Course Title: Strength of Materials

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – III

Subject Code	15CV32	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

1. To understand the basic concept of the stresses and strains for different materials and strength of structural elements.
2. To know the development of internal forces and resistive 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.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1: Simple Stresses and Strain:		
A brief introduction to strength of materials, Concept and definition of stress and strain, Assumptions in strength of materials, Hook's law, Poission's Ratio, Stress – strain diagrams for ferrous and non – ferrous materials, Elongation of tapering bars of circular and rectangular cross – sections, Elongation due to self – weight . Compound bars, Temperature stresses, Compound section subjected to Temperature stress, Elastic constants and their relationship, ApplicationProblems.	**10 Hours**	**L2,L3**
Module -2: Compound Stresses:		
Introduction to Stresses on inclined plane, General two dimensional stress system, Principal stresses and principal planes, Numerical problems, Concept of Mohr's circle of stresses (with numerical problems)	**5 Hours**	**L2,L4**

Thin and Thick Cylinders: Introduction, Thin Shells-Hoop stress, Longitudinal stress, change in volume, design of shells, Thick cylinder. Lames equation, radial and hoop stress distribution.	**5 Hours**	**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 simply supported beams (with and without over hangs) cantilever beams subjected to points load UDL, UVL and Couple and their combinations.	**10 Hours**	**L2,L4**
Module -4: Bending and Shear Stresses in Beams.		
Introduction to bending stresses and shearing stresses in beams, Bernoulli's pure bending theory, Assumptions, derivation, Definition of modulus of rupture, section modulus, Flexural rigidity simple problems, Expression for tranverse shear stress in beam, Bending and shear stress distribution diagrams for circular, rectangular, 'I', 'T' and L sections.	**6 Hours**	**L2.L4**
Columns and Struts: Introduction to short and long columns, Euler's theory of columns, definition of effective length, slenderness ratio, radius of gyration, Buckling load, Assumptions made, Derivation of Euler's Buckling load for different end conditions, Limitations of Euler's theory, Rankine's formula for columns, Application problems.	**4 Hours**	**L2,L4**
Module -5: Torsion in Circular Shaft:		
Introduction to theory of pure torsion, Assumptions, torsion equation to circular shafts, Strength and stiffness, torsional rigidity and polar modulus, Strengths of a hollow shaft, Power transmitted by a shaft (Solid and hollow).	**7 Hours**	**L2,L4**
Shear Centre: Introduction to shear centre-Shear centre for an equal angle-shear flow-shear centre for channel section.	**3 Hours**	**L1,L2**

Course outcomes:

After studying this course, students will be able to:

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.
6. To understand the basic concept of analysis and design of structural elements such as columns and struts.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. B.S. Basavarajaiah, P Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition (2010)
2. Shesha Prakash MN and Suresh GS, Mechanics of Materials, Prentice Hall, New Delhi,2011
3. R. Subramanian "Strength of Materials" Oxford University Press. 3rd Edition (2016)
4. P.N. Chandramouli "Fundamentals of Strength of Materials" PHI Learning Pvt. Ltd., 2013.

Reference Books:

1. D.H. Young, S.P. Timoshenko " Elements of Strength of Materials" East West Press Pvt. Ltd., 5th Edition (Reprint 2014)
2. S.S. Rattan " Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013)

Course Title: Mechanics of Fluids

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – III

Subject Code	15CV33	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

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

1. Fundamental properties and its applications.
2. Hydrostatic laws and application to practical problem solutions
3. Principles of Kinematics and Hydro-Dynamics for practical applications
4. Design of pipes and pipe networks for various pressures and losses.
5. The behavior of fluids and flow measurements.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
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	**5 Hours**	**L2,L3**
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	**5 Hours**	**L2,L3**

Module -2: Hydrostatic Pressure on Surfaces :		
Definition-Total pressure force, centre of pressure, total pressure force on horizontal, vertical and inclined plane surface, total pressure force on curved surfaces, water pressure on gravity dams, Lock gates. Numerical Problems. **Fluid Kinematics:** Kinematics of fluid flow, scalar, vector and tensor quantities, classification of fluid flow, methods of describing fluid motion, fundamentals of flow visualization, discharge or rate of flow, three-dimensional continuity equation in Cartesian coordinate, stream line, potential function, stream function, orthogonality of streamlines and potential lines. Numerical problems on Stream function and velocity potential.	**4 Hours** **6 Hours**	**L2,L4** **L2,L4**
Module -3: Fluid Dynamics:		
Introduction, Energy possessed by a fluid body. 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). Introduction to kinetic energy correction factor. Momentum equation problems on pipe bends, Problems. **Applications:** Introduction, Venturimeter, Orificemeter, Rotameter, Venturiflume, Pitot tube, Numerical Problems	**10 Hours**	**L2,L4**
Module -4		
Flow through Closed conduits 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	**8 Hours**	**L2.L4**

<u>Surge Analysis in Pipes</u>: Water hammer in pipes, equation for pressure rise due to gradual valve closure & sudden closure for rigid and elastic pipes- problems.	**2 Hours**	**L2,L4**
Module -5: Weirs and Notches		
Introduction, classification, discharge over rectangular, triangular, trapezoidal notches, Cippoletti notch, broad crested weirs, relative error and Sensitivity, Numerical problems. Concept of Proportional weir, classification of sharp crested weirs, Stout weir, Sutro weir, Advantages of proportional weirs, concept of Geometrically simple weirs **Orifice and Mouthpiece**	**7 Hours**	**L2,L4**
Introduction, classification, flow through orifice, hydraulic coefficients, Numerical problems, Mouthpiece, classification, Borda's Mouthpiece (No problems).	**3 Hours**	**L1,L2**

Course outcomes:

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

1. Posses a sound ***knowledge*** of fundamental properties fluids and fluid continuum[L1][PO1]
2. ***Compute*** and solve problems on hydrostatics, including practical applications[L2][PO2]
3. ***Apply*** principles of mathematics to represent kinematic concepts related to fluid flow[L3][PO3]
4. ***Apply*** fundamental laws of fluid mechanics- conservation of mass, conservation of linear momentum, & the Bernoulli's principle for practical applications[L3][PO3]
5. ***Compute*** theflow through pipes inclusive of their head losses [L3][PO3]
6. ***Compute*** the discharge through the weirs, notches, orifices and mouthpieces[L3][PO3]

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.

- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. **Modi and Seth,** Hydraulics and Fluid Mechanics, including Hydraulic Machines, 20th edition, Standard Book House, New Delhi
2. **Dr. R.K. Bansal,** A Text book of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi
3. **SheshaPrakash M N,** Mechanics of Fluids, Wiely India Pvt Ltd, New Delhi 2016

Reference Books:

1. **Streeter** , Fluid Mechanics, Wylie, Bedford New Delhi, 2008(Ed)
2. **R.K.Rajput ,** A TextBook of Fluid mechanics & Hydraulic Machines'-, S.Chand& Co, New Delhi, 2006 Edition.
3. **K Subramanya**, Fluid Mechanics and Hydraulic Machines, Tata McGraw Hill Publishing Co Ltd

Course Title: GEODETIC ENGINEERING

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – III

Subject Code	15CV34	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

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

1. *Understand the basic principles of Geodetics*
2. *Vertical and horizontal, 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.*

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1: Introduction		
Definition of surveying, Objectives and importance of surveying. Primary divisions of surveying, Classification of surveys. Principles of surveying. Units of measurements, Surveying measurements and errors, types of errors, precision and accuracy. Maps, classification of maps, map scale, conventional symbols, topographic maps, map layout, Map numbering systems.	**6 Hours**	**L1,L2**
Measurement of Horizontal Distances Methods of Distance measurements, Measurement using tapes, Equipment for taping, Taping on level ground and sloping ground, Systematic errors in taping and tape corrections, ranging of lines, direct and indirect methods of ranging, Electronic distance measurement, basic principle.	**4 Hours**	**L1,L2**

Module -2: Measurement of Directions and Angles		
Basic definitions, meridians, bearings, magnetic and true bearings, compasses, prismatic and surveyor's compasses, temporary adjustments, declination, local attraction. Vernier theodolite, fundamental axes, temporary adjustments, measurement of horizontal and vertical angles. **Traverse Survey and Computations** Traverse, types, procedures, control establishment. Latitudes and departures, rectangular coordinates, traverse adjustments, compass rule and transit rule, Numerical Problems	**5 Hours** **5 Hours**	**L2,L3** **L2,L3**
Module -3: Leveling and Contouring		
Basic terms and definitions, Methods of leveling, instruments, dumpy level, auto level, digital and laser levels. Curvature and refraction. Booking and reduction of levels, plane of collimation and rise-fall methods, Differential leveling, profile leveling, fly leveling, check leveling, trigonometric leveling (heights and distances- single plane and double plane methods)	**10 Hours**	**L1, L2**
Module -4: Theodolite Survey and Instrument Adjustment		
Theodolite and types, Fundamental axis and parts of transit theodolite, uses of theodolite, Temporary adjustments of transit theodolite, measurement of horizontal and vertical angles, prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment. Inter-relation between fundamental axis of instrument to be in adjustment and step by step procedure for obtaining permanent adjustment of Dumpy level and Transit theodolite	**5 Hours** **5 Hours**	**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-trapezoidal and prismoidal formula. Contours, Methods of contouring, Interpolation of contours, contour gradient, characteristics of contours and uses.	**8 Hours** **2 Hours**	**L2,L3** **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[L1][PO1]
2. *Measurement of vertical and horizontal plane, linear and angular dimensions to arrive at solutions to basic surveying problems.[L2][L3][PO3]*
3. *Capture geodetic data to process and perform analysis for survey problems [L4]*[PO2]
4. *Analyse the obtained spatial data and compute areas and volumes. Represent 3D data on plane figures as contours [L4] [PO2]*

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. B.C. Punmia, **"Surveying Vol.1"**, Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. SheshaPrakash M N and Shivakumar N, **GeodeticEngineering and Practice, Including excel**, Wiley India Pvt. Ltd, New Delhi
3. Venkataramaiah, Text book of surveying, Universities Press
4. Kanetkar T P and S V Kulkarni , **Surveying and Levelling Part I**, Pune VidyarthiGrihaPrakashan, 1988
5. R Subramanian, Surveying and Levelling, Second edition, Oxford University Press, New Delhi

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

Course Title: Engineering Earth Science and Materials

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – III

Subject Code	15CV35	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

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

1. To recite on the importance and its role in Civil Engineering and in understanding the internal structure and composition of the earth.
2. Discussion on the properties, occurrence and uses of minerals in various industries.
3. To provide knowledge on the geomorphological agents such as river, wind, sea waves, and their implications in implementing civil engineering projects.
4. To provide knowledge about the structures of the rocks and their considerations in the selection of site for dams, tunnels, bridges and highways.
5. To study the application of Topo sheets, Remote sensing, and GIS in Civil Engineering practices and natural resource management.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1: Introduction:		
Application of Earth Science in Civil Engineering Practices, Understanding the earth, internal structure and composition. **Mineralogy:** Mineral properties, composition and uses, 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)	**8 Hours**	**L1,L2**

Module -2: Rock as Construction Material:		
Formation, Classification, Engineering Properties and uses of rocks in construction. 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, Dolerite, Gabbro, Basalt; Sedimentary rocks - Sandstone, Shale, Limestone, Laterite; Metamorphic rocks - Gneiss, Quartzite, Slate, Charnockite: Decorative stones - Porphyries, Marble and Quartzite.	**12 Hours**	**L2,L3**
Module -3: Geomorphology and Seismology:		
Landforms – Classification, Rock weathering and its effect on Civil Engineering Projects. Study of Geomorphological 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.	**8 Hours**	**L2, L3, L5**
Module -4: Building Materials:		
Introduction, Classification of Materials; Stones and Aggregates Source and Classification, Artificial Stones, Bricks and Tiles – Manufacturing, Lime and Gypsum - their properties and classification, Ferrous and Non-ferrous materials, Raw Materials of Glass, Selection of good quality rocks. Flooring slabs, Roofing Materials (Asbestos, Granite, Slate, Limestone), Stone Masonry, Decorative stones, Cladding Stones, Railway Ballast, Sand and its types.	**5 Hours**	**L4,L5**
Module -5: 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, Remote Sensing Techniques	**12 Hours**	**L2,L3, L5**

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.		

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

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. DimitriP.Krynine, Willian R. Judd, "Principles of Engineering geology and Geotechnics" CBS publishers & Distributors -2003
2. Principles of Engineering Geology - K V G K Gokhale, BS Publications, Hyderabad.
3. Vasudev Kanithi, Engineering Geology, Universities Press

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. Fundamentals of Geology - A B Roy, Narosa Publishing House, New Delhi.
3. Text book of Remote Sensing and Geographical Information System - M Anji Reddy, BS Publications, Hyderabad.
4. Physical Geology - Arthur Holmes, Tata Mac Grow Hill, New Delhi.
5. Groundwater - K. Todd, Tata Mac Grow Hill, New Delhi.
6. Structural Geology - M P Billings, CBS Publishers and Distributors, New Delhi.
7. Engineering Geology - D. Venkata Reddy, New Age International Publications, New Delhi

Course Title: Building Construction and Pre Fabrication

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – III

Subject Code	15CV361	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

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

1. This course will develop a student in reconginising the materials to be used for the construction work

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1: 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, design of strip and combined footings **Masonry** Definition and terms used in masonry , classification of masonry and qualities of bricks , bondes in brick works(English Bond and Flemish bond), reinforced brick masonry, common building stones, their properties and uses, classification of stone masonry, joints in stones masonry	**8 Hours**	**L1,L2**
Module -2: Lintels and Arches		
Definition, function and classification of lintels and arches (including Balconies, chejja and canopy). Elements of Arch (brick and stone masonry). Roofs and Floors: Types of Roofs and roofing material, Types of flooring, factors affecting the selection of flooring roofing materials	**8 Hours**	**L3**

Module -3: Doors and Windows:		
Definition, technical terms and classification of doors and windows. Materials for doors and windows with their properties. Stairs: Definitions, technical terms and classification of stairs based on the function, material and structural function. Geometrical design of RCC doglegged and open new-well stairs,	**8 Hours**	**L2, L3, L5**
Module -4		
Plastering and Pointing : purpose, materials and methods of plastering and pointing, defects in plastering **Damp proofing**- causes and effects and methods, **Paints**- Purpose, types, ingredients and defects, applications of paints to new and old surfaces	**8 Hours**	**L4,L5**
Module -5		
Introduction to form work and Scaffolding, shoring, underpinning. Prefabiraction Construction: Necessity, advantages and disadvantages, Classification Types Prefabrication: Mass produced steel, Reinforced concrete and masonry system, industralised building Modular co-ordination, standardization, Disuniting of Prefabricates as per National Building Code	**8 Hours**	**L2,L3, L5**

Course outcomes:

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

1. Students have an understanding of legal Principles relating to construction activities
2. Be able to identify type of brickwork, plastering and wood
3. Understand the methodology of prefabrication

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. "Building Materials and construction" Sushil Kumar,
2. Building Materials Rangawala

Reference Books:

1. Building Materials by P G Vergese, PHI
2. Building Materials and Components, CBRI, 1990, India
3. Building with Large Prefabricates, Elsevier Publishing Company, B.Lewicki,, Amsterdam/ London/New York, 1966

Course Title: INTELLECTUAL PROPERTY RIGHTS

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – III

Subject Code	15CV362	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

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

3. The course is designed to introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
4. The course introduces all aspects of the IPR Acts.
5. It also includes case studies to demonstrate the application of the legal concepts in Science, Engineering, Technology and Creative Design.
6. The course is designed for raising awareness of a multidisciplinary audience and has been catagorised under 'General'.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
OVERVIEW OF INTELLECTUAL PROPERTY Introduction and the need for intellectual property right (IPR) IPR in India – Genesis and Development IPR in abroad , Some important examples of IPR **COPYRIGHT** What is copyright, What is covered by copyright, How long does copyright last, protection of copyright **RELATED RIGHTS** What are related rights, Distinction between related rights and copyright, Rights covered by copyright	**8 Hours**	**L1,L2**
Module -2		
PATENTS Macro economic impact of the patent system. Patent and kind of inventions protected by a patent. Patent document How to protect your inventions?	**8 Hours**	**L3**

Granting of patent Rights of a patent. How extensive is patent protection? Why protect inventions by patents? Searching a patent Drafting of a patent. Filing of a patent. The different layers of the international patent system (national, regional and international options). Utility models Differences between a utility model and a patent? Trade secrets and know-how agreements		
Module -3		
TRADEMARKS Trademark, Rights of trademar, Kind of signs can be used as trademarks, types of trademark, function does a trademark perform, trademark protected, trademark registration,registred trademark protected time, extentof trademark protection, Well known marks and its protection Domain name and relation to trademarks **GEOGRAPHICAL INDICATIONS** Geographical indication, protection of geographical indication Necessity of geographical indication protection	**8 Hours**	**L2, L3, L5**
Module -4		
INDUSTRIAL DESIGNS Industrial design and it's protection, kinds of protection in the industrial design, period of protection and necessity of protection Procedure for Registration, Duration of Protection and Renewal Infringement, Penalties and Remedies **NEW PLANT VARIETIES** Protection of new plants (industries), methods of protection, length and extent of protection, breeder's right and its length of protection	**8 Hours**	**L4,L5**
Module -5		
UNFAIR COMPETITION Unfair competition, relationship between unfair competition and intellectual property laws **ENFORCEMENT OF INTELLECTUAL PROPERTY RIGHTS** Infringer, Direct, Contributory, and Induced , Defences to Infringement, Research exemption, invalidity Infringement of intellectual property rights Enforcement Measures ,EMERGING ISSUES, civil issues, **INTELLECTUAL PROPERTY** Case studies of patents in IPR in different fields of engineering	**8 Hours**	**L2,L3, L5**

Course outcomes:

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

4. Students have an understanding of legal Principles relating to confidential information, copy-write, patents, designs, trademarks and unfair competition
5. Be able to identify, apply and assess to principal of law related to IPR
6. Understand the legal and practical steps needed to ensure that IPR remain valid and enforceable

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. T. M Murray and M.J. Mehlman, Encyclopedia of Ethical, Legal and Policy issues in Biotechnology, John Wiley & Sons 2000
2. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi , 2010

Reference Books:

1. P.N. Cheremisinoff, R.P. Ouellette and R.M.Bartholomew,Biotechnology Applications and Research, Technomic Publishing Co., Inc. USA, 1985
2. D.Balasubramaniam, C.F.A.Bryce,K. Dharmalingam, J. Green and K. Jayaraman, Concepts in Biotechnology, University Press (Orient Longman Ltd.), 2002
3. Bourgagaize, Jewell and Buiser,Biotechnology: Demystifying the Concepts, Wesley Longman, USA, 2000.
4. AjitParulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd , 2006
5. B.L.Wadehra; Law Relating to Patents, Trade Marks, Copyright, Designs Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000

Course Title: RURAL WATER SUPPLY AND SANITATION

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Subject Code	15CV363	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

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

1. The course is designed to know the various current practice in rural water supply and sanitation.
2. The course is designed for raising awareness on innovative approaches to improve water supply and sanitation

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Concept of environmental and scope of sanitation in rural areas. Magnitude of problem of water supply and sanitation – population to be covered and difficulties National policy. Various approaches for planning of water supply systems in rural areas. Selection and development of preferred sources of water, springs, wells and infiltration galleries, collection of raw water from surface source.	**8 Hours**	**L1,L2**
Module -2		
Specific problem in rural water supply and treatment e.g. iron, manganese, fluorides etc. Low cost treatment , appropriate technology for water supply and sanitation. Improvised method and compact system of treatment of surface and ground waters such as MB settlers, slow and sand filter, chlorine diffusion cartridge etc. Water supply through spot sources, hand pumps, open dug –well	**8 Hours**	**L2**
Module -3		
Planning of distribution system in rural areas. Water supply during fairs, festivals and emergencies. Treatment and disposal of wastewater/sewage. various method of collection and disposal of night soil.	**8 Hours**	**L2, L3, L5**

Module -4		
On site sanitation system and community latrines. Simple wastewater treatment system for rural areas and small communities such as stabilization ponds, septic tanks, soakage pits etc.	**8 Hours**	**L4,L5**
Module -5		
INDUSTRIAL HYGIENE AND SANITATION: Occupational Hazards- Schools- Public Buildings- Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation. SOLID WASTE MANAGEMENT: Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.	**8 Hours**	**L2,L3, L5**

Course outcomes:

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

1. Identify problems pertaining to rural water supply and sanitation.
2. Design water supply and sanitation system for rural community
3. Design low cost waste management systems for rural areas
4. Plan and design an effluent disposal mechanism.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. T. M Murray and M.J. Mehlman,Encyclopedia of Ethical, Legal and Policy issues in Biotechnology, John Wiley & Sons 2000
2. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi , 2010

Reference Books:

1. P.N. Cheremisinoff, R.P. Ouellette and R.M.Bartholomew,Biotechnology Applications and Research, Technomic Publishing Co., Inc. USA, 1985
2. D.Balasubramaniam, C.F.A.Bryce,K. Dharmalingam, J. Green and K. Jayaraman, Concepts in Biotechnology, University Press (Orient Longman Ltd.), 2002
3. Bourgagaize, Jewell and Buiser,Biotechnology: Demystifying the Concepts, Wesley Longman, USA, 2000.
4. AjitParulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd , 2006
5. B.L.Wadehra; Law Relating to Patents, Trade Marks, Copyright, Designs Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000

Course Title: Rural Urban Planning and Architecture

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – III

Subject Code	15CV364	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

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

1. The course is designed to know the various current practices in rural and urban planning methods.
2. The course is designed to acquaint the students the development of Architecture in India from the Indus Valley Civilization

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Basic characters of a village, village as a sustainable human settlement, identification of rural infrastructure, need & importance of rural infrastructure in settlements. Provision of rural infrastructure in the light of Constitutional Amendment, approaches and strategies to provide infrastructure for rural settlement – some examples.	**8 Hours**	**L1,L2**
Module -2		
Definition of Settlements: Theoretical- Hamlet, village, focal village, town, city. Polis, Metropolis, Megalopolis, Census Classification of Towns, Standard Urban Areas, Urban Agglomeration, Mega Cities, Urban Regions. Urban - rural relationships. Common issues in cities illustrated with examples. Urbanization Process: Characteristics, function, growth, size, migration, Social-Economic profile of a city, Major components of settlement, Evolution of City Ancient town planning, Medieval City planning Modern urban planning concepts; Frank Lloyd Wright's broad acre city. Le Corbusier, Manual Castal's concept.	**8 Hours**	**L2**
Module -3		
Planning process: definition, need and importance, function, objective and type of planning sectoral and	**8 Hours**	**L2, L3,**

spatial, administrative level of planning (national, state, district, block, local), City planning – meaning and significance; Planning approaches – objectives, scope of Comprehensive Planning (Master plan,), Structure Planning, Action Area Planning, Advocacy Planning.		
Module -4		
Residential Planning Building Bye-Laws: Role in the healthy development of Architecture. Site planning: meaning, purpose and methodology; site surveys: types, relevance, components; functional and technical factors in site planning, Orientation, planning of a house, apartment: design-principles and methodology: use of a comprehensive-approach. Application of Vaastu Shastra Terminology of vaastu-shastra, fundamental-concepts, elements of vaastu, The designs based on directional alignments, laws of nature. Residential vaastu: planning for different-rooms.	**8 Hours**	**L2,L4**
Module -5		
Indus Valley Civilisation Development of Architecture in Indus Valley. Hindu Architecture Development of Hindu Architecture, Gupta & the Chalukyan period, Dravidian Architecture through different phases (Pallavas, Cholas, Pandyas, Vijainagar& Madura), Indo–Aryan Architecture (Orissa, Khajuraho& Gujarat).	**8 Hours**	**L2,L3, L5**
Course outcomes: After a successful completion of the course, the student will be able to: 1. Identify problems pertaining to rural and urban development. 2. Identify the settlement of the human a 3. Design the buildings with good planning 4. Design the structures with earlier architecture.		
Program Objectives (as per NBA) o *Engineering Knowledge.* o *Problem Analysis.* o *Interpretation of data.*		
Question paper pattern: • The question paper will have ten questions, each full question carrying 16 marks. • There will be two full questions (with a maximum Three sub divisions, if necessary) from each module. • Each full question shall cover the topics under a module. • The students shall answer Five full questions selecting one full question from each module. • If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each		

module.

Text Books:

1. Gupta, K.R. (2004), Rural Development in India (Vol.2), Atlantic Publishers abd Distributors Pvt. Ltd.
2. Hall. P, "Cities in Civilization; Culture, Technology and Urban Order", Weidenfield and Nicolson, London. (1998),
3. Brown, P, – Indian Architecture (Buddhist and Hindu Periods), DB Taraporevala Sons & Co. Private Ltd., Bombay (1971).

Reference Books:

1. Time Saver Standards.
2. Kopardekar&Diwan (1994), 'Urban and Regional Planning-Principles, Practice and Law', S.H. Kopardekar, Talegaon – Dabhade.
3. Grover, S.– Buddhist and Hindu Architecture in India, CBS Publishers & Distributors, Delhi (2003).
4. National Building Code–2005 published by Bureau of Indian Standards, New Delhi.
5. Tiwari, Satish, (2000), Rural Development, Anmol Publications Pvt. Ltd.

Course Title: Strength of Materials Laboratory

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Subject Code	15CVL37	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	42	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.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
1. Tension test on mild steel and HYSD bars.	**03 Hours**	**L_2, L_3, L_5**
2. Compression test on mild steel, cast iron and wood.	**03 Hours**	**L_1, L_2, L_3, L_5**
3.Torsion test on mild steel circular sections.	**03 Hours**	**L_1, L_2, L_3, L_5**
4. Bending Test on Wood Under two point loading	**03 Hours**	**L_1, L_2, L_3, L_5**
5. Shear Test on Mild steel.	**03 Hours**	**L_1, L_2, L_3, L_5**
6. Impact test on Mild Steel (Charpy&Izod)	**03 Hours**	**L_1, L_2, L_3, L_5**
7. Hardness tests on ferrous and non-ferrous metals – Brinell's, Rockwell and Vicker's	**06 Hours**	**L_1, L_2, L_3, L_5**
8. Test on Bricks and Tiles	**03 Hours**	**L_1, L_2, L_3, L_5**
9. Tests on Fine aggregates – Moisture content, Specific gravity, Bulk density, Sieve analysis and Bulking	**06 Hours**	**L_1, L_2, L_3, L_5**
10. Tests on Coarse aggregates – Absorption, Moisture content, specific gravity, Bulk density and Sieve analysis	**06 Hours**	**L_1, L_2, L_3, L_5**
11. Demonstration of Strain gauges and Strain indicators NOTE: All tests to be carried out as per relevant BIS Codes	**03 Hours**	**L_1, L_2, L_3, L_5**

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 wll be aware of contemporary issues regarding failure of structures due to undesirable materials.

Program Objectives (as per NBA)

1. *Engineering Knowledge.*
2. *Evaluation of mechanical properties of structural materials.*
3. *Interpretation of test results.*

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. Testing of Engineering Materials, Davis, Troxell and Hawk, International Student Edition – McGraw Hill Book Co. New Delhi.
2. Mechanical Testing of Materials", Fenner, George Newnes Ltd. London.
3. "Experimental Strength of Materials", Holes K A, English Universities Press Ltd. London.
4. "Testing of Metallic Materials", Suryanarayana A K, Prentice Hall of India Pvt. Ltd. New Delhi.
5. Relevant IS Codes
6. "Material Testing Laboratory Manual", Kukreja C B- Kishore K. Ravi Chawla Standard Publishers & Distributors 1996.

Course Title: Geodetic Engineering Laboratory

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – III

Subject Code	15CVL38	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to

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

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..*

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
1.Study of topographic maps and preparation of a chart of conventional symbols. *Introduction to Map projection systems.Coordinate systems (spherical and plane).*	**3 Hours**	**L1,L2**
2.Measurement of distances using tape along horizontal planes and slopes, direct/indirect ranging, setting out perpendiculars. *Use of cross staff, optical square,*	03	L3
3.Obstacles in chaining and ranging – Chaining but not ranging, ranging but not chaining, both ranging and chaining.	03	L3
4.Measurement of bearings/directions using prismatic compass – Measurement of bearings of sides of a closed traverse and adjustment of closing error by Bowditch method and Transit method	03	L3
5.Determination of distance between two inaccessible points using compass and accessories	03	L4
6.Determination of reduced levels of points using dumpy level/auto level (simple leveling)	03	L4
7.Determination of reduced levels of points using dumpy level/auto level (differential leveling).	03	L4
8. To determine the difference in elevation between using Reciprocal leveling and to determine the collimation error	03	L4
9. Determination of RL of an object above the plane of collimation using inverted leveling.	03	L3

10. To conduct profile leveling and cross sectioning, plotting using excel	03	L4
11. To conduct block leveling, preparation of contour plan using excel. Use of planimeter/graph and computations of Areas and volumes.	03	L4
12. Measurement of horizontal angle by repetition and reiteration methods	03	L3
13. Measurement of vertical angles using theodolite.	03	L3
14. Demonstration of Minor instruments like Clinometer, Ceylon Ghat tracer, Box sextant, Hand level, Planimeter and Pentagraph	03	L3

Course outcomes:

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

1. Apply the basic principles of engineering surveying and for linear and angular measurements [L1,L2][PO1]
2. comprehend effectively field procedures required for a professional surveyor[L1,L2][PO1]
3. Use techniques, skills and conventional surveying instruments necessary for engineering practice.[L3,L4][PO5]

Program Objectives (as per NBA)

1. *Engineering Knowledge.*
2. *Problem Analysis.*
3. *Interpretation of data.*

Question paper pattern:

- All are 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.

Text Books:

1. B.C. Punmia, **"Surveying Vol.1"**, Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. SheshaPrakash M N and Shivakumar N, **GeodeticEngineering and Practice, Including excel**, Wiley India Pvt. Ltd, New Delhi
3. R Subramanian, Surveying and Levelling, Second edition, Oxford University Press, New Delhi
4. Kanetkar T P and S V Kulkarni , **Surveying and Levelling Part I**, Pune VidyarthiGrihaPrakashan, 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

Course Title: Analysis of Determinate Structures

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	15CV42	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

1. Ability to apply knowledge of mathematics and engineering in calculating slope, definitions,
2. bending moment and shearing force using various methods of approach.
3. Ability to identify, formulate and solve engineering problems.
4. Ability to analyse structural system and interpret data.
5. Ability to communicate effectively in design of structural elements.
6. Ability to engage in lifelong learning with the advances in structural problems.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Introduction and Analysis Of Plane Trusses Structural forms, Conditions of equilibrium-Degree of freedom-Linear and non linear analysis-Static and kinematic in determinacies of structural systems-Types of trusses-Assumptions in analysis-Analysis of determinate trusses by method of joints and method of sections.	**10 Hours**	**L2,L4,L5**
Module -2		
Deflection of Beams Introduction and definitions of slope, Deflection and moment curvature, Sign conventions, Derivation of differential equations of flexure, Double integration method, Use of discontinuity. Function: Macaulay's method, slope and deflection for standard loading cases using Macaulay's Method for basically determinate prismatic beams subjected to point loads, udl, uvl and couple, Moment area method-Derivation, Deflectance(slope) and Deflection, Mohrs 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, Application of conjugate beam method of determinate beam of variable cross Sections.	**10 Hours**	**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 direct force, Strain energy due to bending, Deflection of determinate beams and trusses using total strain energy, Deflection at the point of application of single load, Castiglianos theorems and its application to estimate the deflections of trusses, bent frames, Special applications-Dummy unit load method.	**10 Hours**	**L2,L4,L5**
Module -4		
Arches And Cable Structures Three hinged (circular & 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.	**10 Hours**	**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-BM,SF and axial forces in determinate beams using rolling loads concepts.	**10 Hours**	**L2,L4,L6**

Course outcomes:

After studying this course, students will be able to:

1. Evaluate the forces in determinate stresses by method of joins and sections.
2. Evaluate the deflection of beams-cantilever, simply supported and overhanging beams by different methods and also evaluations using moment diagram by parts.
3. Understand the energy principles and energy theorems and its applications to determine the deflections of trussess 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.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Reddy C S, Basic structural Analysis , Tata McGraw Hill, New Delhi.
2. Muthu K U.et al,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. Prakash Rao D S, Structual Analysis, Universities Press Pvt. Ltd,2007.
2. Hibbetlr R C,Structual Analysis, Prentice Hall, 9th edition,2014
3. Devadoss Menon, Structual Anlysis, Narosa Publishing House,New Delhi,2008.

Course Title: Applied Hydraulics

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Subject Code	**15CV43**	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	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 optimum design sections.
3. Energy concepts of fluid in open channel, Energy dissipation, Water profiles at different conditions

Analysis of the performance of Turbines and Pumps for various design data and to know their corresponding operation characteristics, including designing the required hydraulic machines for the given data

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module 1: Dimensional and Model analysis	**10**	
Dimensional analysis Dimensional analysis and similitude: Dimensional homogeneity, Non Dimensional parameter, Buckingham π theorem, dimensional analysis□choice of variables, Rayleigh methods, examples □ Rise in capillary tube, head characteristics of a pump, drag on a ship, velocity in an open channel, pipe orifice, discharge over a sharp edge weir, celerity of a gravity wave.	**03**	**L1,L2,L3**
Model analysis: Model analysis□similitude, types of similarities, force ratios, similarity laws, model classification, Reynolds model, Froude's model, Eulers Model, Webber's model, Mach model, scale effects, problems involving Reynolds, Froudes and Eulers Model. Distorted models, Numerical problems	**04**	
Buoyancy and Flotation Buoyancy, Force and Centre of Buoyancy, Metacentre and Metacentric height, Stability of submerged bodies, Determination of Metacentric height – Experimental and theoretical method, Numerical problems	**03**	
Module 2: Open Channel Flow Hydraulics	**10**	
Uniform Flow Introduction, Classification of flow through channels, Chezys and Manning's equation for flow through open channel, Most economical sections, Uniform flow through Open channels, Numerical Problems.	**06**	**L3,L4**
Specific Energy and Specific energy curve, Critical flow and	**04**	

corresponding critical parameters, Numerical Problems		
Module 3: Non-Uniform Flow	**10**	
Hydraulic Jump, Expressions for conjugate depths and Energy loss, Numerical Problems	**03**	**L2,L3**
Gradually varied flow, Equation, Back water curve and afflux, Length of back water curve, Numerical Problems Description of water curves or profiles, Mild, steep, critical, horizontal and adverse slope profiles, Numerical problems	**04** **03**	**L2,L3**
Module 4: Hydraulic Machines	**10**	
Introduction, Impulse-Momentum equation. Direct impact of a jet on a stationary and moving curved vanes, Introduction to concept of velocity triangles, impact of jet on a series of curved vanes- Problems	**05**	**L2,L3**
Turbines – Impulse Turbines		
Introduction to turbines, General lay out of a hydro-electric plant, Properties of turbines, classification of turbines. Pelton wheel-components, working principle and velocity triangles. Maximum power, efficiency, working proportions – Numerical problems	**05**	
Module 5: Reaction Turbines and Miscellaneous	**10**	
Introduction, Radial flow reaction turbines, Numerical problems, Francis Turbine, Numerical problems. Introduction and description of Axial Flow turbines, Centrifugal pump, Draft tube theory (No problems) Specific speed, Unit quantities, Numerical problems	**05** **03** **02**	**L1,L2**

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[L3,L4][PO2,PO3]
2. Design the open channels of various cross sections including optimum design sections [L4][PO3]
3. Apply Energy concepts of fluid in open channel, calculate Energy dissipation, compute Water profiles at different conditions [L1][L2][PO3]
4. Analyze the performance of Turbines and Pumps for various design data and to know their corresponding operation characteristics, including designing the required hydraulic machines for the given data[L2][L3][PO2]

Program Objectives

1. PO1: Engineering Knowledge
2. PO2: Problem analysis
3. PO3: Design/Development of Solutions

Question Paper Pattern:

- 10 Questions are to be set such that 2 questions are selected from each module.
- 2 Questions are to be set under respective modules.
- Intra module questions are to be set such that the questions should cover the entire module and further, should be answerable for the set marks.
- Each question should be set for 16 marks (Preferably 8 marks each)
- Not more than 3 sub questions are to be set under any main question
- Students should answer 5 full questions selecting at least 1 from each module.

A Model question paper will be sent shortly.

Text Books:

1. R.K. Bansal, "***Fluid mechanics and hydraulic machines",*** Laxmi Publishing (P) Ltd., India.- 2011.
2. Shesha Prakash M N, ***Hydraulics and Hydraulic Machines***, Wiley India Pvt Ltd., New Delhi (2015)
3. **Naryan Pillai,** Principals of Fluid Mechanics & Fluid Machines, Universities Press
4. Jagadish Lal, ***Hydraulic Machines***, Metropolitan Book Co Pvt Ltd., New Delhi

Reference Books:

1. C.S.P. Ojha, R. Berndtsson, and P.N. Chandramouli, ***"Fluid Mechanics and Machinery"***, Oxford University Publication - 2010.
2. K.Subramanya, "***Fluid mechanics"*** Tata McGraw-Hill publishing company limited.
3. **Modi and Seth,** Hydraulics and Fluid Mechanics, including Hydraulic Machines, 20th edition,
4. J.B. Evett, and C. Liu, ***"Fluid mechanics and Hydraulics***", McGraw-Hill Book Company.- 2009.

Course Title: CONCRETE TECHNOLOGY

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III

Subject Code	15CV44	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to:

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

Contents	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module-1: Concrete Ingredients. Cement – chemical composition, hydration of cement, types of cement. Testing of cement. Fine aggregate – Importance of Grading analysis, specific gravity, bulking, moisture content, deleterious materials. Testing of fine aggregates. Coarse aggregate – Importance of size, shape and texture, Grading of aggregates. Fineness modulus, Testing of coarse aggregates. Water – qualities of water.	**10 Hours**	**L1, L2, L3**
Module -2: Admixtures.		
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.	**10 Hours**	**L1, L2, L3**
Module -3: 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.	**10 Hours**	**L1, L2, L3**
Module -4: Hardened Concrete.		
Factors influencing strength, W/C ratio, gel/space ratio, Maturity concept, Testing of hardened concrete, Creep –factors 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.	**10 Hours**	**L1,L2, L3,**

Insitu testing of concrete- Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.		
Module -5: Concrete Mix Proportioning		
Concept of Mix Design with and without admixtures , variables in proportioning and Exposure conditions, Procedure of mix proportioning (includes flowchart). Numerical Examples of Mix Proportioning using IS-10262-2009.	**10 Hours**	**L1, L2, L3, L4**

Course outcomes:

After studying this course, students will be able to:

CO1 : Relate material characteristics and their influence on microstructure of concrete. (L2, L3)(PO1)

CO 2: **Distinguish** concrete behaviour based on its fresh and hardened properties. [L2, L4] (PO1, PO2)

CO 3: **Illustrate** proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes. [L3] (PO1, PO2, PO3)

Program Objectives (as per NBA):

- Engineering Knowledge (PO1)
- Problem Analysis (PO2)
- Design / development of solutions (PO3)

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Neville A.M. "Properties of Concrete"-4th Ed., Longman.
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-Microstructure, Property and Materials", 4th Edition, McGraw Hill Education, 2014
4. A.R. Santha Kumar, "Concrete Technology", Oxford University Press, New Delhi (New Edition)

Reference Books:

1. M L Gambir, "Concrete Technology", McGraw Hill Education, 2014.

Course Title: BASICS OF GEOTECHNICAL ENGINEERING

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – IV

Subject Code	**15CV45**	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students

- To identify the soil type in a job site or in a professional setting, determination of soil properties based on type and to evaluate the design decisions from the understanding of that soil properties.
- To explore the scientific principles used to describe the major engineering properties of soil, engineering testing methods used to quantify these properties
- The ability to understand logically, critically and creatively
- To explain role of water in soil behavior and the soil stresses, permeability and quantity of seepage including flow net
- To analyse shear parameters and stress changes in soil due to foundation loads
- To evaluate the magnitude and time-rate of settlement due to consolidation

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1: Introduction: Introduction, origin and formation of soil. Phase Diagram, relationships and their inter - relationships. Determination of Index properties (Specific gravity, water content , in-situ density, particle size analysis and sedimentation analysis, Atterberg's Limits, relative density, thixotrophy, sensitivity, activity of clay) Classification of soils as per BIS and HRB and their applications in construction of highways, earthen dams etc., BIS Plasticity chart and its practical application	**10 Hours**	**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 Montmorillonite and their application in Engineering **Compaction of Soils:** Definition, Phenomena of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control – compactive effort & method, lift thickness and number of passes, Proctor's needle, Compacting equipment	**10 Hours**	**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, quick sand phenomena, Capillary Phenomena**.** Application problems with respect to the analysis of dams and sub-base of roads **Seepage Analysis :** Lapalace equation, assumptions, limitations and its derivation. Flow nets- characteristics and applications. Flow nets for sheet piles and below the dam section **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	**10 Hours**	**L1, L2, L3**
Module -4: **Consolidation of Soil**:		
Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption, limitations Derivation of Governing Equation, Solution of Governing Consolidation Equation Using Fourier Series, Finite Difference Solution of the Governing Consolidation equation, Normally consolidated, under consolidated and over consolidated soils. Pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_c, a_v, m_v and C_v). Effect of unloading/reloading of a soil sample taken from field, Laboratory one dimensional consolidation test, 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 compression (for normally and over consolidated clays), consolidation- one dimensional problems, Consolidation of partially saturated soils, Creep/Secondary Compression in soils.	**10 Hours**	**L1, L2, L3, L4**
Module -5: Shear Strength of Soil:		
Concept of shear strength,Typical response of soils to shearing forces - Effects of increasing the normal effective Stress, effects of over consolidation ratio in soils, Effects of drainage of excess pore water pressure, Effects of cohesion, Effects of soil tension, Effects of cementation. Four Models for interpreting the shear strength of soils- Coulomb's failure Criterion, Taylor's Failure Criterion, Mohr–Coulomb Failure Criterion, Tresca Failure Criterion, Practical Implications of Failure Criteria Conventional and modified failure envelops, Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils. Measurement of shear strength parameters in laboratory and field- Direct shear test, Unconfined compression test, Triaxial compression test and Vane shear test, Test under different drainage conditions. Total and effective stress paths	**10 Hours**	**L2, L3**

Course outcomes:

During this course, students will develop expertise in :

- Solving any practical problems related to Geotechnical properties of soils
- Estimating the geostatical stresses
- Solving practical problems related to consolidation settlement and time rate of settlement in soils
- Communicating with other engineers (geotechnical engineers or non-geotechnical engineers) using the proper soil terminology.

Program Objectives (as per NBA):

- Engineering Knowledge.
- Problem Analysis.
- Design / development of solutions (partly).
- Interpretation of data.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

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

Reference Books:

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

Course Title: PROGRAMMING IN C++

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	15CV461	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

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

1. To provide a comprehensive working knowledge on the object oriented language C++ and to provide implementation experience on abstract data types, linear and nonlinear data structures for problem solving.
2. To provide a working knowledge on generic programming based on over loading concepts, inheritance and virtuality.
3. To provide an application oriented working knowledge on searching and sorting techniques and to write programs to solve problems on arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
C++ Overview- Class Definition, Objects, Class Members, Access Control, Class Scope, Constructors and destructors, parameter passing methods, Inline functions, static class members, this pointer, friend functions, dynamic memory allocation and deallocation (new and delete), exception handling. Function Over Loading, Operator Overloading, Generic Programming- Function and class templates, Inheritance basics, base and derived classes, inheritance types, base class access control, runtime polymorphism using virtual functions, abstract classes, streams I/O.	**8 Hours**	**L1,L2**
Module -2		
Basic data structures - The list ADT, Stack ADT, Queue ADT, Implementation using template classes in C++. Linked list operations insertion, deletion and searching. Hash table representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing, comparison of hashing and skip lists.	**8 Hours**	**L3**

Module -3		
Search Trees: Binary Search Trees, Definition, ADT, Implementation, OperationsSearching, Insertion and Deletion. Graphs: Basic terminology, representations of graphs, graph search methods DFS, BFS	**8 Hours**	**L2, L3, L5**
Module -4		
Programming Numerical Methods with C++ floating-point computations, numerical errors, interpolation, integration, solution of linear systems of equations, optimization, initial-value problems of ordinary differential equations, and matrix and vector computations. Implementation of algorithms will be investigated using C++ Programming Language as well as Matlab	**8 Hours**	**L4,L5**
Module -5		
Artificial Intelligence Basics in programming of AI language tools. Evolutionary algorithms, neural networks, fuzzy logic, robotics, natural language processing, and computer vision (only the Basics)	**8 Hours**	**L2,L3, L5**

Course outcomes:

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

1. An ability to apply knowledge of mathematics, science, and engineering to real-world problems
2. Ability to model, understand, and develop complex software for System Software as well as Application Software.
3. An ability to communicate effectively, both in writing and oral.
4. A recognition of the need for, and an ability to engage in life-long learning.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. T. M Murray and M.J. Mehlman,Encyclopedia of Ethical, Legal and Policy issues in Biotechnology, John Wiley & Sons 2000
2. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi , 2010

Reference Books:

1. P.N. Cheremisinoff, R.P. Ouellette and R.M.Bartholomew,Biotechnology Applications and Research, Technomic Publishing Co., Inc. USA, 1985
2. D.Balasubramaniam, C.F.A.Bryce,K. Dharmalingam, J. Green and K. Jayaraman, Concepts in Biotechnology, University Press (Orient Longman Ltd.), 2002
3. Bourgagaize, Jewell and Buiser,Biotechnology: Demystifying the Concepts, Wesley Longman, USA, 2000.

4. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd , 2006
5. B.L.Wadehra; Law Relating to Patents, Trade Marks, Copyright, Designs Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000

Course Title: AIR POLLUTION AND CONTROL

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	15CV462	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

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

1. This subject provides comprehencive knowledge on the effects of air pollutants on human beings and environment,
2. the sources of air pollution, and the physical and chemical behavior of pollutants in the atmosphere.
3. Also, it covers legislation and regulation; control technologies and future trends toward preventing air pollution.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Air pollution – sources and effects – Definition and concentrations, classification and properties of air pollutants, emission sources, major emissions from global sources, importance of Anthropogenic sources, behaviour and fate of air pollutants. Photochemical smog, Effects of air pollution on health, vegetation and materials damages. Meteorological aspects of air pollutant dispersion – Temperature lapse rates and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, solutions to the atmospheric dispersion equation, The Gaussian plume model	**8 Hours**	**L1,L2**
Module -2		
Air pollution sampling and measurement – Types of pollutant sampling and measurement, ambient air sampling, collection of gaseous air pollutants, collection of particulate pollutants, stack sampling, analysis of air pollutants – sulphur dioxide, nitrogen oxides, carbon monoxide, oxidants and ozone, hydrocarbons, particulate matter	**8 Hours**	**L3**
Module -3		
Air pollution control methods and equipment – Control methods, source correction methods, cleaning of gaseous effluents, particulate emission control – gravitational settling chambers, cyclone separators, fabric filters, electrostatic precipitators, wet scrubbers, selection of a particulate collector, control of gaseous emissions, absorption by liquids, adsorption by solids, combustion, biological methods	**8 Hours**	**L2, L3, L5**

Module -4		
Control of specific gaseous pollutants – Control of sulphur dioxide emission, desulphurisation of flue gases, Dry methods, wet scrubbing methods, control of nitrogen oxides, Modification of operating conditions, modification of design conditions, effluent gas treatment methods, Carbon monoxide control, control of hydrocarbons, mobile sources.	**8 Hours**	**L4,L5**
Module -5		
Burning environmental issues, such as Acid Rain, Global Warming, Ozone Depletion in Stratosphere, Indoor Air Pollution etc., ENVIRONMENTAL LEGISLATION: Environmental Policy, Environmental Acts, Water, Air and Noise Pollution Standards	**8 Hours**	**L2,L3, L5**

Course outcomes:

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

1. An ability to apply knowledge of mathematics, science, and engineering to real-world problems
2. Ability to model, understand, and develop complex software for System Software as well as Application Software.
3. An ability to communicate effectively, both in writing and oral.
4. A recognition of the need for, and an ability to engage in life-long learning.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. C.S.Rao. Environmental Pollution Control Engineering, Wiley Eastern Ltd, Delhi
2. Stern A. Air pollution Control vols 1, 2, 3. Academic press, New York
3. Magill. P. L. Air pollution hand book McGraw -Hill.

Reference Books:

1. De Nevers Air Pollution Control Engineering McGraw-Hill.
2. Ch hatwal G.R. Encyclopedia of Environmental Pollution and Control. Vol 1,2,3 Anmol Publications
3. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986), Environmental Engineering –Mc Graw Hill Book Co.
4. Sincero, A.P and Sincero, G.A., (1999), Environmental Engineering - A Design Approach – Prentice Hall of India.

Course Title: ALTERNATIVE BUILDING MATERIALS

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	15CV463	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

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

2. Introduce the students to the concept of low-energy and low-cost building, locally available materials and technologies

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
INTRODUCTION: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Environmental friendly and cost effective building technologies, Requirements for building of different climatic regions, Traditional building methods and vernacular architecture, Green building ratings – IGBC and LEED manuals – mandatory requirements ALTERNATIVE MASONRY UNITS: Characteristics of building blocks for walls, Stones and Laterite blocks, Bricks and hollow clay blocks, Concrete blocks, Stabilized blocks: mud blocks, steam cured blocks, Fal-G Blocks, stone masonry block LIME-POZZOLANA CEMENTS Raw materials, Manufacturing process, Properties and uses	**8 Hours**	**L1,L2**
Module -2		
FIBRE REINFORCED CONCRETE Matrix materials, Fibers: metal and synthetic, Properties and applications, Fibre reinforced plastics, Matrix materials, Fibers: organic and synthetic, Properties and applications BUILDING MATERIALS FROM AGRO AND INDUSTRIAL WASTES Types of agro wastes, Types of industrial and mine wastes, Properties and applications, Field quality control test methods	**8 Hours**	**L3**
Module -3		
FERROCEMENT AND FERROCONCRETE Properties, Ferrocement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications ALTERNATIVE ROOFING SYSTEMS Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes	**8 Hours**	**L2, L3,**

Module -4		
Different materials used as alternatives such as, Aluminum, Bitumen Materials, Soil Conditioning Agents, Tempered Glass, Crumb Rubber, Fibre Reinforced Polymer, Glass Fibre, Reinforced Plastics, Bamboo reinforced plastics etc., their properties and sustainability COST EFFECTIVE BUILDING DESIGN Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives	**8 Hours**	**L4**
Module -5		
EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements	**8 Hours**	**L2,L3**

Course outcomes:

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

1. The knowledge on use of different materials for walls, roofs and other building materials
2. Their usage aslternative

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. "Alternative Building Materials and Technologies", KS Jagadish, BV Venkatarama Reddy and KS Nanjunda Rao, New Age International pu
2. Structural Masonry", Arnold W. Hendry
3. "Building materials in Developing Countries", RJS Spence and DJ Cook, Wiley pub. 1983

Reference Books:

1. LEED India, Green Building Rating System, IGBC pub.
2. . IGBC Green Homes Rating System, CII pub.

Course Title: Advanced Geodetic Engineering

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	15CV464	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

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

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

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1: Tachometry:		
Basic principle, types of tacheometric survey, tacheometric equation for horizontal and inclined line of sight in fixed hair method, analytic lens in external focusing telescope, reducing the constant in internal focusing telescope, moving hair method and tangential method, substance bar, Beaman's stadia arc.	**8 Hours**	**L1,L2**
Module -2: Total Station:		
Introduction, basic concepts, measurement of distance using phase difference, total station, components, adjustments, uses of total station, errors, accuracy, effect of atmospheric conditions.	**8 Hours**	**L3**
Module -3: Curve Surveying:		
Horizontal curves, elements of a simple curve, designation, Compound curves, reverse curves, numerical problems, transition curves, vertical curves (introduction only, no numerical problems)	**8 Hours**	**L2, L3, L5**
Module -4: Introduction to Astronomy:		
Earth, celestial sphere, earth and celestial coordinate systems, spherical triangle, astronomical triangle, Napier's rule, simple numerical problems.	**8 Hours**	**L4,L5**
Module -5: Introduction to Advanced Surveying and Mapping Systems:		
Introduction to aerial photogrammetry: Definitions, advantages, applications. Geometry of vertical aerial photographs- scale, ground coordinates, relief displacement, photographic overlaps, flight planning, Global Positioning Systems, segments of GPS, working principle, Hand held GPS and differential GPS, methods of GPS surveying, errors and accuracy, applications of GPS.	**8 Hours**	**L2,L3, L5**

Course outcomes:

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

1. Apply the knowledge of geomatic 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.*

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. B.C. Punmia, **"Surveying Vol.2"**, Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. Kanetkar T P and S V Kulkarni , **Surveying and Levelling Part 2**, Pune Vidyarthi Griha Prakashan, 1988
3. K.R. Arora, **"Surveying Vol. 1"** Standard Book House, New Delhi. – 2010
4. Sateesh Gopi, Global Positioning System, Tata McGraw Hill Publishing Co. Ltd. New Delhi
5. Venkataramaiah, Text book of surveying, Universities Press

Reference Books:

1. .K. Duggal, **"Surveying Vol.1"**, Tata McGraw Hill Publishing Co. Ltd. New Delhi. – 2009.
2. R Subramanian, Surveying and Levelling, Second edition, Oxford University Press, New Delhi
3. David Clerk, Plane and Geodetic Surveying Vol1 and Vol2, CBS publishers

Course Title: Mechanics Of Fluids Laboratory (0:1:2)

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	**15CVL47**	IA Marks	20
Number of Lecture Hours/Week	03 (1hr tutorial + 2hr laboratory)	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students

1. Fundamental fluid properties
2. Pressure measurement and Hydrostatic forces on immersed surfaces
3. Discharge measurement in pipes and open channel flow including head losses
4. Understand about the fluid flow using basic flow visualization techniques

Special Note : All the graphs are to be plotted using MS Excel and the resulting parameters of the experiment should be found

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
1. Calibration of collecting tank (gravimetric method)	**3 Hours**	**L1, L2**
2. Finding the basic properties of the given fluid:- Specific mass, Specific Weight, Specific Gravity and Specific Volume	**6 Hours**	**L1, L2**
3. Calibration of Pressure gauge (dead weight method)	**3 Hours**	**L1, L2**
4. Verification of Bernoulli's equation	**3 Hours**	**L1, L2**
5. Calibration of Rectangular and 90^{o} Triangular notches	**3 Hours**	**L1, L2**
6. Calibration of Cipoletti notch and Broad- crested weir	**3 Hours**	**L1, L2**
7. Calibration of Sutro-weir (Proportional weir)	**3 Hours**	**L1, L2**
8. Experiment of Manometers – Simple and differential monometers, pressure gauges, inclined manometers, comparison of pressure measurement	**3 Hours**	**L1, L2**
9. Calibration of Venturimeter	**3 Hours**	**L1, L2**
10. Determination of Hydraulic coefficients of a vertical orifice	**3 Hours**	**L1, L2**

11. Reynolds Experiment for laminar & turbulent flows	**3 Hours**	**L1, L2**
12. Experiments on Hydro-static Force exerted on immersed flat and curved plates.	**3 Hours**	**L1, L2**
13. Demonstration of flow visualization.	**3 Hours**	**L1, L2**

Course outcomes:

During this course, students will develop expertise in :

- Posses a sound ***knowledge*** of fundamental properties fluids and fluid continuum[L1][PO1]
- ***Compute*** and solve problems on hydrostatics, including practical applications[L2][PO3,PO5]

Program Objectives (as per NBA):

- Engineering Knowledge.
- Problem Analysis.
- Design / development of solutions (partly).
- Interpretation of data.

Question paper pattern:

- All are 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.

Text Books:

1. **Shesha Prakash M N,** *Experiments in Hydraulics and Hydraulic Machineries: Theory and Procedures.* PHI Learning Pvt Ltd, New Delhi (2010)
2. **Sarbjit Singh** , *Experiments in Fluid Mechanics* - PHI Pvt. Ltd.- New Delhi- 2009-12-30

Reference Books:

1. Hydraulics and Fluid Mechanics' – Dr. P.N. Modi & Dr S.M. Seth, Standard Book House- New Delhi. 2009 Edition

Course Title: Engineering Earth Science and Materials (0:1:2)

[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	**15CVL48**	IA Marks	20
Number of Lecture Hours/Week	03 (1hr tutorial + 2hr laboratory)	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students

1. To expose the students to identify the minerals and rocks based on their inherent properties and uses in civil engineering,
2. To educate the students in the interpretation of the geological maps related to civil engineering projects.
3. Students will learn the dip and strike, thickness of geological formation related to foundation, tunnels, reservoirs and mining.
4. Students will understand subsurface geological conditions through a geophysical techniques and watershed management.

Special Note : All the graphs are to be plotted using MSexcel and the resulting parameters of the experiment should be found

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
1. Identification of minerals as mentioned in theory, their properties, uses and manufacturing of construction materials	**3 Hours**	L1, L2
2. Identification of rocks as mentioned in theory, their engineering properties and uses in construction and decorative purposes	**6 Hours**	L2, L3
3. Dip and Strike problems: Determination of dip and strike direction in Civil Engineering projects (Railway lines, tunnels, dams, reservoirs) - graphical method	**6 Hours**	L4
4. Bore hole problems: Determination of subsurface behavior of rocks, their attitude related to foundation, tunnels, reservoirs and mining	**6 Hours**	L3, L4, L5
5. Interpretation of Electrical resistivity curves to find out subsurface information such as thickness of soil, weathered zone, depth of hard rock and saturated zone	**6 Hours**	L4, L5
6. Interpretation of LANDSAT imageries: Drainage pattern, geological features, faults, dykes, lineaments	**6 Hours**	L5, L6
7. Calculation of bifurcation ratio, drainage density and drainage frequency of a river basin	**6 Hours**	L4, L5
8. Interpretation of geological maps related to Civil Engineering projects	**3 Hours**	L5

Course outcomes:

During this course, students will develop expertise in :

1. The students able to identify the minerals and rocks and utilize them effectively in civil engineering practices.
2. The students will interpret and understand the geological conditions of the area for the implementation of civil engineering projects.
3. The students will interpret subsurface information such as thickness of soil, weathered zone, depth of hard rock and saturated zone by using geophysical methods.
4. The students will learn the techniques in the interpretation of LANDSAT Imageries to find out the presence of lineaments and other structural features for the given area

Program Objectives (as per NBA):

- Engineering Knowledge.
- Problem Analysis.
- Design / development of solutions (partly).
- Interpretation of data.

Question paper pattern:

- All are 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.

Question Paper Pattern

Q. NO.	EXPERIMENT	MARKS (80)
1	Identification of Minerals (5 minerals)	20 (5 x 4)
2	Identification of rocks (5 rocks)	20 (5 x 4)
3	Dip and strike problems	5
4	Bore hole problems	8
5	Interpretation of Electrical resistivity curves	6
6	Interpretation of land sate imageries	6
7	Calculation of bifurcation ratio, stream density, stream frequency for a given river basin	6
8	Geological maps	10
9	Viva voce	5

Note:
1) Question nos. 1,2,3,4, 8 & 9 are compulsory.
2) Among question no. 5, 6 & 7 any two shall be given.

Reference Books:

1. Structural Geology - M P Billings, CBS Publishers and Distributors, New Delhi
2. Remote Sensing & Its Application, by LRA Narayanan, Universities Press.