

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM**  
**CHOICE BASED CREDIT SYSTEM (CBCS)**  
**SCHEME OF TEACHING AND EXAMINATION 2015-2016**

**B.E. CIVIL ENGINEERING**

(Common to \_\_\_\_\_)

**III SEMESTER**

Sl. No	Subject Code	Title	Teaching Hours / Week		Examination				Credits
			Theory	Practical/ Drawing	Duration	Theory/ Practical Marks	I.A. Marks	Total Marks	
1	15CV31	Engineering Mathematics – III	04		03	80	20	100	4
2	15CV32	Strength of Materials	04		03	80	20	100	4
3	15CV33	Fluid Mechanics	04		03	80	20	100	4
4	15CV34	Basic Surveying	04		03	80	20	100	4
5	15CV35	Engineering Geology	04		03	80	20	100	4
6	15CV36	Building Materials and Construction	04		03	80	20	100	4
7	15CVL37	Building Materials Testing Laboratory		1I+2P	03	80	20	100	2
8	15CVL38	Basic Surveying Practice		1I+2P	03	80	20	100	2
<b>TOTAL</b>			<b>24</b>	<b>6</b>	<b>24</b>	<b>640</b>	<b>160</b>	<b>800</b>	<b>28</b>

*Note:*

<i>Core Subjects:</i>	15CV31, 15CV32, 15CV33, 15CV34, 15CV35, 15CV36
<i>Laboratory &amp; Practice:</i>	15CVL37, 15CVL38

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(Common to \_\_\_\_\_)

**IV SEMESTER**

Sl. No	Subject Code	Title	Teaching Hours / Week		Examination				Credits
			Theory	Practical / Drawing	Duration	Theory/ Practical Marks	I.A. Marks	Total Marks	
1	15CV 41	Engineering Mathematics – IV	04		03	80	20	100	4
2	15CV42	Analysis of Determinate Structures	04		03	80	20	100	4
3	15CV43	Applied Hydraulics	04		03	80	20	100	4
4	15CV 44	Concrete Technology	04		03	80	20	100	4
5	15CV45	Basic Geotechnical Engineering	04		03	80	20	100	4
6	15CV46	Advanced Surveying	04		03	80	20	100	4
7	15CVL47	Fluid Mechanics and Hydraulic Machines Laboratory		1I+2P	03	80	20	100	2
8	15CVL48	Engineering Geology Laboratory		1I+2P	03	80	20	100	2
<b>TOTAL</b>			<b>24</b>	<b>06</b>	<b>24</b>	<b>640</b>	<b>160</b>	<b>800</b>	<b>28</b>

*Note:*

<i>Core Subjects:</i>	<i>15CV 41, 15CV42, 15CV43, 15CV 44, 15CV45, 15CV46</i>
<i>Laboratory &amp; Practice:</i>	<i>15CVL47, 15CVL48</i>

<p align="center"><b>Course Title: Analysis of Determinate Structures</b></p> <p align="center">[As per Choice Based Credit System (CBCS) scheme]</p> <p align="center"><b>SEMESTER – IV</b></p>			
Subject Code	15CV42	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<p><b>Course objectives:</b> This course will enable students to</p> <ol style="list-style-type: none"> <li>1. Apply knowledge of mathematics and engineering in calculating slope and deflections</li> <li>2. Identify, formulate and solve engineering problems</li> <li>3. Analyse structural systems and interpret data</li> <li>4. Engage in lifelong learning with the advances in Structural Engineering</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1</b>			
<p><b>Introduction and Analysis of Plane Trusses</b>            Structural forms, Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and non linear analysis, Static and kinematic indeterminacies of structural systems, Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections.</p>		<b>10 Hours</b>	<b>L2,L4,L5</b>
<b>Module -2</b>			
<p><b>Deflection of Beams</b>            Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment-curvature equation.            Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple. Moment area method: Derivation, Mohr's theorems, Sign conventions, Application of moment area method for determinate prismatic beams, Beams of varying section, Use of moment diagram by parts.            Conjugate beam method: Real beam and conjugate beam, conjugate beam theorems, Application of conjugate beam method of determinate beams of variable cross sections.</p>		<b>10 Hours</b>	<b>L2,L4,L5</b>
<b>Module -3</b>			
<p><b>Energy Principles and Energy Theorems</b>            Principle of virtual displacements, Principle of virtual forces, Strain energy and complimentary energy, Strain energy due to axial force, bending, shear and torsion, Deflection of determinate beams and trusses using total strain energy, Deflection at the point of application of single load, Castigliano's theorems and its application to estimate the deflections of trusses, bent frames, Special applications-Dummy unit load method.</p>		<b>10 Hours</b>	<b>L2,L4,L5</b>

<b>Module -4</b>		
<b>Arches and Cable Structures</b> Three hinged parabolic arches with supports at the same and different levels. Determination of normal thrust, radial shear and bending moment. Analysis of cables under point loads and UDL. Length of cables for supports at same and at different levels- Stiffening trusses for suspension cables.	<b>10 Hours</b>	<b>L2, L4, L5</b>
<b>Module -5</b>		
<b>Influence Lines and Moving Loads</b> Concepts of influence lines-ILD for reactions, SF and BM for determinate beams-ILD for axial forces in determinate trusses- Reactions, BM and SF in determinate beams using rolling loads concepts.	<b>10 Hours</b>	<b>L2, L4, L6</b>
<b>Course outcomes:</b> After studying this course, students will be able to: <ol style="list-style-type: none"> <li>1. Evaluate the forces in determinate trusses by method of joints and sections.</li> <li>2. Evaluate the deflection of cantilever, simply supported and overhanging beams by different methods</li> <li>3. Understand the energy principles and energy theorems and its applications to determine the deflections of trusses and bent frames.</li> <li>4. Determine the stress resultants in arches and cables.</li> <li>5. Understand the concept of influence lines and construct the ILD diagram for the moving loads.</li> </ol>		
<b>Program Objectives (as per NBA)</b> <ul style="list-style-type: none"> <li>○ <i>Engineering Knowledge.</i></li> <li>○ <i>Problem Analysis.</i></li> <li>○ <i>Interpretation of Data.</i></li> </ul>		
<b>Question paper pattern:</b> <ul style="list-style-type: none"> <li>• The question paper will have ten questions, each full question carrying 16 marks.</li> <li>• There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics under a module.</li> <li>• The students shall answer five full questions selecting one full question from each module.</li> <li>• 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.</li> </ul>		
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.</li> <li>2. Muthu K U. etal, Basic Structural Analysis, 2<sup>nd</sup> edition, IK International Pvt. Ltd., New Delhi, 2015.</li> <li>3. Bhavikatti, Structural Analysis, Vikas Publishing House Pvt. Ltd, New Delhi, 2002.</li> </ol>		
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Hibbeler R C, Structural Analysis, Prentice Hall, 9<sup>th</sup> edition, 2014</li> <li>2. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi, 2008.</li> <li>3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd, 2007.</li> </ol>		

<p align="center"><b>Course Title: Applied Hydraulics</b>  [As per Choice Based Credit System (CBCS) scheme]  <b>SEMESTER – IV</b></p>			
Subject Code	15CV43	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<p><b>Course Objectives:</b> The objectives of this course is to make students to learn:</p> <ol style="list-style-type: none"> <li>1. Principles of dimensional analysis to design hydraulic models and Design of various models.</li> <li>2. Design the open channels of various cross sections including design of economical sections.</li> <li>3. Energy concepts of fluid in open channel, Energy dissipation, Water surface profiles at different conditions.</li> <li>4. The working principles of the hydraulic machines for the given data and analyzing the performance of Turbines for various design data.</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module 1: Dimensional and Model analysis</b>		<b>10</b>	
<b>Dimensional analysis</b> Dimensional analysis and similitude: Dimensional homogeneity, Non Dimensional parameter, Rayleigh methods and Buckingham $\pi$ theorem, dimensional analysis, choice of variables, examples on various applications.		<b>03</b>	<b>L1, L2, L3</b>
<b>Model analysis:</b> Model analysis, similitude, types of similarities, force ratios, similarity laws, model classification, Reynolds model, Froude's model, Euler's Model, Webber's model, Mach model, scale effects, Distorted models. Numerical problems on Reynold's, and Froude's Model.		<b>04</b>	<b>L1, L2, L3</b>
<b>Buoyancy and Flotation</b> Buoyancy, Force and Centre of Buoyancy, Metacentre and Metacentric height, Stability of submerged and floating bodies, Determination of Metacentric height, Experimental and theoretical method, Numerical problems		<b>03</b>	<b>L1, L2, L3,L4</b>
<b>Module 2: Open Channel Flow Hydraulics</b>		<b>10</b>	
<b>Uniform Flow</b> Introduction, Classification of flow through channels, Chezy's and Manning's equation for flow through open channel, Most economical channel sections, Uniform flow through Open channels, Numerical Problems.		<b>06</b>	<b>L3,L4</b>
Specific Energy and Specific energy curve, Critical flow and corresponding critical parameters, Metering flumes, Numerical Problems		<b>04</b>	<b>L2, L3</b>
<b>Module 3: Non-Uniform Flow</b>		<b>10</b>	
Hydraulic Jump, Expressions for conjugate depths and Energy loss, Numerical Problems		<b>03</b>	<b>L2,L3,L4</b>
Gradually varied flow, Equation, Back water curve and afflux, Description of water curves or profiles, Mild, steep, critical,		<b>04 03</b>	<b>L2,L3</b>

horizontal and adverse slope profiles, Numerical problems, Control sections		
<b>Module 4: Hydraulic Machines</b>	<b>10</b>	
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	<b>05</b>	<b>L2,L3</b>
<b>Turbines – Impulse Turbines</b>		
Introduction to turbines, General lay out of a hydro-electric plant, Heads and Efficiencies, classification of turbines. Pelton wheel-components, working principle and velocity triangles. Maximum power, efficiency, working proportions – Numerical problems	<b>05</b>	<b>L1, L2, L3,L4</b>
<b>Module 5: Reaction Turbines and Pumps</b>	<b>10</b>	
Radial flow reaction turbines: (i) Francis turbine- Descriptions, working proportions and design, Numerical problems. (ii) Kaplan turbine- Descriptions, working proportions and design, Numerical problems. Draft tube theory and unit quantities. (No problems)	<b>06</b>	<b>L1,L2, L3,L4</b>
Centrifugal pumps: Components and Working of centrifugal pumps, Types of centrifugal pumps, Work done by the impeller, Heads and Efficiencies, Minimum starting speed of centrifugal pump, Numerical problems, Multi-stage pumps.	<b>04</b>	
<b>COURSE OUTCOMES:</b>		
After a successful completion of the course, the student will be able to:		
<ol style="list-style-type: none"><li>1. Apply dimensional analysis to develop mathematical modeling and compute the parametric values in prototype by analyzing the corresponding model parameters</li><li>2. Design the open channels of various cross sections including economical channel sections</li><li>3. Apply Energy concepts to flow in open channel sections, Calculate Energy dissipation, Compute water surface profiles at different conditions</li><li>4. Design turbines for the given data, and to know their operation characteristics under different operating conditions</li></ol>		
<b>Program Objectives</b>		
<ol style="list-style-type: none"><li>1. PO1: Engineering Knowledge</li><li>2. PO2: Problem analysis</li><li>3. PO3: Analyse and development of Solutions</li></ol>		
<b>Question Paper Pattern:</b>		
<ul style="list-style-type: none"><li>• Total number of Questions to be set is 10. Two full questions are to be set from each module.</li><li>• Not more than 3 sub questions are to be set under any main question</li><li>• Questions are to be set such that the entire module is covered and further, should be answerable for the set marks.</li><li>• Each question should be set for 16 marks</li><li>• Students should answer 5 full questions selecting at least 1 from each module.</li></ul>		

**Text Books:**

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

**Reference Books:**

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

<b>Course Title: Concrete Technology</b> [As per Choice Based Credit System (CBCS) scheme] <b>SEMESTER – IV</b>			
Subject Code	15CV44	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to: <ol style="list-style-type: none"> <li>1. Recognize the importance of material characteristics and their contributions to strength development in Concrete</li> <li>2. Proportion ingredients of Concrete to arrive at most desirable mechanical properties of Concrete.</li> <li>3. Ascertain and measure engineering properties of concrete in fresh and hardened state which meet the requirement of real time structures.</li> </ol>			
Contents		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
<b>Module-1: Concrete Ingredients</b>			
Cement – Cement manufacturing process, steps to reduce carbon footprint, chemical composition and their importance, hydration of cement, types of cement. Testing of cement. Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing. Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregates Water – qualities of water. Chemical admixtures – plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures – Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice husk ash.		10 Hours	L1, L2, L3
<b>Module -2: Fresh Concrete</b>			
Workability-factors affecting workability. Measurement of workability–slump, Compaction factor and Vee-Bee Consistometer tests, flow tests. Segregation and bleeding. Process of manufacturing of concrete- Batching, Mixing, Transporting, Placing and Compaction. Curing – Methods of curing – Water curing, membrane curing, steam curing, accelerated curing, self-curing. Good and Bad practices of making and using fresh concrete and Effect of heat of hydration during mass concreting at project sites.		10 Hours	L1, L2, L3
<b>Module -3: Hardened Concrete</b>			
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. Corrosion, Durability requirements as per		10 Hours	L1, L2, L3



IS-456, Insitu testing of concrete- Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.		
<b>Module -4: Concrete Mix Proportioning</b>		
Concept of Mix Design with and without admixtures, variables in proportioning and Exposure conditions, Selection criteria of ingredients used for mix design, Procedure of mix proportioning. Numerical Examples of Mix Proportioning using IS-10262	10 Hours	L1, L2, L3, L4
<b>Module -5: Special Concretes</b>		
RMC- manufacture and requirement as per QCI-RMCPCS, properties, advantages and disadvantages. Self-Compacting concrete- concept, materials, tests, properties, application and typical mix Fiber reinforced concrete - Fibers types, properties, application of FRC. Light weight concrete-material properties and types. Typical light weight concrete mix and applications	10 hours	L1, L2, L3, L4
<b>Course Outcomes:</b> After studying this course, students will be able to: <b>CO1:</b> Relate material characteristics and their influence on microstructure of concrete. (L2,L3)(PO1) <b>CO 2:</b> Distinguish concrete behaviour based on its fresh and hardened properties. [L2, L4] (PO1, PO2) <b>CO 3:</b> Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes. [L3] (PO1, PO2, PO3)		
<b>Program Objectives (as per NBA):</b> <ul style="list-style-type: none"> <li>• Engineering Knowledge (PO1)</li> <li>• Problem Analysis (PO2)</li> <li>• Design / development of solutions (PO3)</li> </ul>		
<b>Question paper pattern:</b> <ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full question consists of 16 marks.</li> <li>• There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>		
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Neville A.M. “Properties of Concrete”-4th Ed., Longman.</li> <li>2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.</li> <li>3. Kumar Mehta. P and Paulo J.M. Monteiro “Concrete-Microstructure, Property and Materials”, 4th Edition, McGraw Hill Education, 2014</li> <li>4. A.R. Santha Kumar, “Concrete Technology”, Oxford University Press, New Delhi (New Edition)</li> </ol>		
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. M L Gambir, “Concrete Technology”, McGraw Hill Education, 2014.</li> <li>2. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9</li> <li>3. Job Thomas, “Concrete Technology”, CENGAGE Learning, 2015</li> <li>4. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete]</li> </ol>		

5. Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete-BMTPC
6. Specification and Guidelines for Self-Compacting Concrete, EFNARC, Association House

<p align="center"><b>Course Title: Basic Geotechnical Engineering</b>  [As per Choice Based Credit System (CBCS) scheme]  <b>SEMESTER – IV</b></p>			
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			
<p><b>Course objectives:</b> This course will enable students</p> <ul style="list-style-type: none"> <li>• To appreciate basic concepts of soil mechanics as an integral part in the knowledge of civil engineering. Also to become familiar broadly with geotechnical engineering problems such as, foundation engineering, flow of water through soil medium and terminologies associated with geotechnical engineering.</li> <li>• To know the basic engineering properties and the mechanical behaviour of different types of soil. This includes strength-deformation characteristics under shearing stresses. Also consolidation properties of clayey soils.</li> <li>• To determine the improvement in mechanical behaviour by densification of soil deposits using compaction.</li> <li>• To know how the properties of soils that can be measured in the lab</li> </ul>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<p><b>Module -1: Introduction:</b>  Introduction, origin and formation of soil, Phase Diagram, phase relationships, definitions and their inter relationships.  Determination of Index properties-Specific gravity, water content, in-situ density and particle size analysis (sieve and sedimentation analysis)  Atterberg's Limits, consistency indices, relative density, activity of clay, Plasticity chart, unified and BIS soil classification.</p>		<b>10 Hours</b>	<b>L1, L2</b>
<b>Module -2 : Soil Structure and Clay Mineralogy</b>			
<p>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  <b>Compaction of Soils:</b> Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control - compactive effort &amp; method of compaction, lift thickness and number of passes, Proctor's needle, Compacting equipments and their suitability.</p>		<b>10 Hours</b>	<b>L1, L2</b>
<b>Module -3: Flow through Soils:</b>			
<p>Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity,</p>		<b>10 Hours</b>	<b>L1, L2, L3</b>

<p>superficial velocity and coefficient of percolation, Capillary Phenomena</p> <p><b>Seepage Analysis:</b> Laplace equation, assumptions, limitations and its derivation. Flow nets- characteristics and applications. Flow nets for sheet piles and below the dam section. Unconfined flow, phreatic line (Casagrande's method –with and without toe filter), flow through dams, design of dam filters.</p> <p><b>Effective Stress Analysis:</b> Geostatic stresses, Effective stress concept-total stress, effective stress and Neutral stress and impact of the effective stress in construction of structures, quick sand phenomena</p>		
<b>Module -4: Consolidation of Soil:</b>		
<p>Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory - assumption and limitations. Derivation of Governing differential Equation</p> <p>Pre-consolidation pressure and its determination by Casagrande's method. Over consolidation ratio, normally consolidated, under consolidated and over consolidated soils. Consolidation characteristics of soil (<math>C_c</math>, <math>a_v</math>, <math>m_v</math> and <math>C_v</math>. Laboratory one dimensional consolidation test, characteristics of <math>e</math>-<math>\log(\sigma')</math> curve, Determination of consolidation characteristics of soils-compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method). Primary and secondary consolidation.</p>	<b>10 Hours</b>	<b>L1, L2, L3, L4</b>
<b>Module -5: Shear Strength of Soil:</b>		
<p>Concept of shear strength, Mohr–Coulomb Failure Criterion, Modified Mohr–Coulomb Criterion</p> <p>Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils. Thixotrophy and sensitivity,</p> <p>Measurement of shear strength parameters - Direct shear test, unconfined compression test, triaxial compression test and field Vane shear test, Test under different drainage conditions. Total and effective stress paths.</p>	<b>10 Hours</b>	<b>L2, L3</b>
<p><b>Course outcomes:</b> On the completion of this course students are expected to attain the following outcomes;</p> <ol style="list-style-type: none"> <li>1. Will acquire an understanding of the procedures to determine index properties of any type of soil, classify the soil based on its index properties</li> <li>2. Will be able to determine compaction characteristics of soil and apply that knowledge to assess field compaction procedures</li> <li>3. Will be able to determine permeability property of soils and acquires conceptual knowledge about stresses due to seepage and effective stress; Also acquire ability to estimate seepage losses across hydraulic structure</li> <li>4. Will be able to estimate shear strength parameters of different types of soils using the data of different shear tests and comprehend Mohr-Coulomb failure theory.</li> <li>5. Ability to solve practical problems related to estimation of consolidation settlement of soil deposits also time required for the same.</li> </ol>		

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

**Reference Books:**

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

<p align="center"><b>Course Title: Advanced Surveying</b>  [As per Choice Based Credit System (CBCS) scheme]  <b>SEMESTER – IV</b></p>			
Subject Code	15CV46	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<p>Course objectives: This course will enable students to:</p> <ol style="list-style-type: none"> <li>1. Apply geometric principles to arrive at solutions to surveying problems.</li> <li>2. Analyze spatial data using appropriate computational and analytical techniques.</li> <li>3. Design proper types of curves for deviating type of alignments.</li> <li>4. Use the concepts of advanced data capturing methods necessary for engineering practice</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1: Curve Surveying</b>			
Curves – Necessity – Types, Simple curves, Elements, Designation of curves, Setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankines deflection angle method (numerical problems). Compound curves, Elements, Design of compound curves, Setting out of compound curves (numerical problems). Reverse curve between two parallel straights (numerical problems on Equal radius and unequal radius). Transition curves Characteristics , numerical problems on Length of Transition curve, 7.5 Vertical curves –Types – (theory).		<b>10 Hours</b>	<b>L1,L3,L5</b>
<b>Module -2: Geodetic Surveying and Theory of Errors</b>			
Geodetic Surveying: Principle and Classification of triangulation system, Selection of base line and stations, Orders of triangulation, Triangulation figures, Reduction to Centre, Selection and marking of stations Theory of Errors: Introduction, types of errors, definitions, laws of accidental errors, laws of weights, theory of least squares, rules for giving weights and distribution of errors to the field observations, determination of the most probable values of quantities.		<b>10 Hours</b>	<b>L1,L2, L3</b>
<b>Module -3: Introduction to Field Astronomy:</b>			
Earth, celestial sphere, earth and celestial coordinate systems, spherical triangle, astronomical triangle, Napier's rule		<b>10 Hours</b>	<b>L4,L5</b>
<b>Module -4: Aerial Photogrammetry</b>			
Introduction, Uses, Aerial photographs, Definitions, Scale of vertical and tilted photograph (simple problems), Ground Co-ordinates (simple problems), Relief Displacements (Derivation), Ground control, Procedure of aerial survey, overlaps and mosaics,		<b>10 Hours</b>	<b>L2,L3, L5</b>

Stereoscopes, Derivation Parallax(Derivation) .		
<b>Module -5: Modern Surveying Instruments</b>		
Introduction, Electromagnetic spectrum, Electromagnetic distance measurement, Total station, Lidar scanners for topographical survey. Remote Sensing: Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation. Digital image processing, Global Positioning system Geographical Information System: Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, spatial information system Geospatial analysis, Integration of Remote sensing and GIS and Applications in Civil Engineering(transportation, town planning).	<b>10 Hours</b>	<b>L2,L3, L5</b>
<p style="text-align: center;"><b>Course outcomes:</b></p> <p>After a successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Apply the knowledge of geometric principles to arrive at surveying problems</li> <li>2. Use modern instruments to obtain geo-spatial data and analyse the same to appropriate engineering problems.</li> <li>3. Capture geodetic data to process and perform analysis for survey problems with the use of electronic instruments;</li> <li>4. Design and implement the different types of curves for deviating type of alignments.</li> </ol>		
<p style="text-align: center;"><b>Program Objectives (as per NBA)</b></p> <ul style="list-style-type: none"> <li>• Engineering Knowledge.</li> <li>• Problem Analysis.</li> <li>• Interpretation of data.</li> </ul>		
<p style="text-align: center;"><b>Question paper pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will have Ten questions, each full question carrying 16 marks.</li> <li>• There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics under a module.</li> <li>• The students shall answer Five full questions selecting one full question from each module.</li> <li>• 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.</li> </ul>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. B.C. Punmia, “Surveying Vol.2”, Laxmi Publications pvt. Ltd., New Delhi.</li> <li>2. Kanetkar T P and S V Kulkarni , Surveying and Levelling Part 2, Pune Vidyarthi Griha Prakashan,</li> <li>3. K.R. Arora, “Surveying Vol. 1” Standard Book House, New Delhi.</li> <li>4. Sateesh Gopi, Global Positioning System, Tata McGraw Hill Publishing Co. Ltd. New Delhi</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. S.K. Duggal, “Surveying Vol.I &amp; II”, Tata McGraw Hill Publishing Co. Ltd. New Delhi.</li> <li>2. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi.</li> <li>3. David Clerk, Plane and Geodetic Surveying Vol1 and Vol2, CBS publishers</li> <li>4. B Bhatia, Remote Sensing and GIS , Oxford University Press, New Delhi.</li> <li>5. T.M Lillesand,. R.W Kiefer,. and J.W Chipman, Remote sensing and Image interpretation , 5th edition, John Wiley and Sons India</li> </ol>		

6. James M Anderson and Adward M Mikhail, Surveying theory and practice, 7th Edition, Tata McGraw Hill Publication.
7. Kang-tsung Chang, Introduction to geographic information systems, McGraw Hill Higher Education



<b>Course Title: Fluid Mechanics and Hydraulic Machines Laboratory (0:1:2)</b>			
[As per Choice Based Credit System (CBCS) scheme]			
<b>SEMESTER – IV</b>			
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
<b>CREDITS – 02</b>			
<b>Course objectives:</b> This course will enable students to;			
1. calibrate flow measuring devices			
2. determine the force exerted by jet of water on vanes			
3. measure discharge and head losses in pipes			
4. understand the fluid flow pattern			
<b>Modules</b>	<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>	
1. Verification of Bernoulli's equation	<b>3 Hours</b>	<b>L1, L2</b>	
2. Determination of $C_d$ for Venturimeter and Orifice meter	<b>3 Hours</b>	<b>L1, L2</b>	
3. Determination of hydraulic coefficients of small vertical orifice	<b>3 Hours</b>	<b>L1, L2</b>	
4. Calibration of Rectangular and Triangular notch	<b>3 Hours</b>	<b>L1, L2</b>	
5. Calibration of Ogee and Broad crested weir	<b>3 Hours</b>	<b>L1, L2</b>	
6. Determination of $C_d$ for Venturiflume	<b>3 Hours</b>	<b>L1, L2</b>	
7. Experimental determination of force exerted by a jet on flat and curved plates (Hemispherical Vane).	<b>3 Hours</b>	<b>L1, L2</b>	
8. Experimental determination of operating characteristics of Pelton turbine	<b>3 Hours</b>	<b>L1, L2</b>	
9. Determination of efficiency of Francis turbine	<b>3 Hours</b>	<b>L1, L2</b>	
10. Determination of efficiency of Kaplan turbine	<b>3 Hours</b>	<b>L1, L2</b>	
11. Determination of efficiency of centrifugal pump.	<b>3 Hours</b>	<b>L1, L2</b>	
12. Determination of Major and Minor Losses in Pipes	<b>3 Hours</b>	<b>L1, L2</b>	
13. Demonstration Experiments: a. Reynold's experiment to understand laminar and turbulent flow b. Flow Visualization c. Calibration of Sutro-weir	<b>6 Hours</b>	<b>L1, L2</b>	
<b>Course outcomes:</b> During the course of study students will develop understanding: • Properties of fluids and the use of various instruments for fluid flow measurement. • Working of hydraulic machines under various conditions of working and their characteristics.			
<b>Program Objectives (as per NBA):</b> ○ Engineering Knowledge.			

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

**Question paper pattern:**

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

**Text Books:**

1. Sarbjit Singh , *Experiments in Fluid Mechanics* - PHI Pvt. Ltd.- New Delhi
2. Mohd. Kaleem Khan, “Fluid Mechanics and Machinery”, Oxford University Press

**Reference Books:**

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

<p align="center"><b>Course Title: Engineering Geology Laboratory (0:1:2)</b></p> <p align="center">[As per Choice Based Credit System (CBCS) scheme]</p> <p align="center"><b>SEMESTER – IV</b></p>			
Subject Code	<b>15CVL48</b>	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
<b>CREDITS – 02</b>			
<p><b>Course objectives:</b> This course will enable students</p> <ol style="list-style-type: none"> <li>1. To identify the minerals and rocks based on their inherent properties and uses in civil engineering</li> <li>2. To interpret the geological maps related to civil engineering projects.</li> <li>3. To learn the dip and strike, borehole problems, thickness of geological formation related to foundation, tunnels, reservoirs and mining.</li> <li>4. To understand subsurface geological conditions through a geophysical techniques and watershed management.</li> <li>5. To visit the civil engineering projects like dams, reservoirs, tunnels, quarry sites etc.</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
1. Identification of minerals as mentioned in theory, their properties, uses and manufacturing of construction materials.		<b>6 Hours</b>	L1, L2
2. Identification of rocks as mentioned in theory, their engineering properties and uses in construction and decorative purposes		<b>6 Hours</b>	L2, L3
3. Dip and Strike problems: Determination of dip and strike direction in Civil Engineering projects (Railway lines, tunnels, dams, reservoirs) –graphical or any other method.		<b>6 Hours</b>	L4
4. Bore hole problems: Determination of subsurface behavior of rocks, their attitude related to foundation, tunnels, reservoirs and mining. Triangular and Square land, assuming ground is horizontal.		<b>6 Hours</b>	L3, L4, L5
5. Calculation of Vertical, True thickness and width of the outcrops.		<b>6 Hours</b>	L4, L5
6. Interpretation of Electrical resistivity curves to find out subsurface information such as thickness of soil, weathered zone, depth of hard rock and saturated zone		<b>4 Hours</b>	L3, L4
7. Interpretation of Toposheets and geological maps related to Civil Engineering projects.		<b>8 Hours</b>	L5, L6
<p><b>Course outcomes:</b></p> <p>During this course, students will develop expertise in;</p> <ol style="list-style-type: none"> <li>1. Identifying the minerals and rocks and utilize them effectively in civil engineering practices.</li> <li>2. Understanding and interpreting the geological conditions of the area for the</li> </ol>			

<p>implementation of civil engineering projects.</p> <p>3. Interpreting subsurface information such as thickness of soil, weathered zone, depth of hard rock and saturated zone by using geophysical methods.</p> <p>4. The techniques of drawing the curves of electrical resistivity data and its interpretation for geotechnical and aquifer boundaries</p>																																			
<p><b>Program Objectives (as per NBA):</b></p> <ul style="list-style-type: none"> <li>○ Engineering Knowledge.</li> <li>○ Problem Analysis.</li> <li>○ Design / development of solutions (partly).</li> <li>○ Interpretation of data.</li> </ul>																																			
<p><b>Question paper pattern:</b></p> <ul style="list-style-type: none"> <li>• All are individual experiments</li> <li>• Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.</li> <li>• All exercises are to be included for practical examination.</li> </ul>																																			
<table border="1"> <thead> <tr> <th colspan="3">Question Paper Pattern</th></tr> <tr> <th>Qn. No.</th><th>EXPERIMENT</th><th>MARKS (80 )</th></tr> </thead> <tbody> <tr> <td>1</td><td>Identification of Minerals by giving their physical properties and civil engineering applications (5 minerals)</td><td>20 (5 x 4)</td></tr> <tr> <td>2</td><td>Identification of rocks by giving their physical properties, classification and their civil engineering applications (5 rocks)</td><td>20 (5 x 4)</td></tr> <tr> <td>3</td><td>Dip and strike problems</td><td>6</td></tr> <tr> <td>4</td><td>Bore hole problems (3 point method)</td><td>10</td></tr> <tr> <td>5</td><td>Thickness of strata problems including calculation of vertical, true thickness and its width of out crop.</td><td>4</td></tr> <tr> <td>6</td><td>Electrical resistivity curves drawing and its interpretation for Geotechnical and Aquifer investigations.</td><td>6</td></tr> <tr> <td>7</td><td>Interpretation of Toposheets</td><td>5</td></tr> <tr> <td>8</td><td>Geological maps, their cross sections and description</td><td>10</td></tr> <tr> <td>9</td><td>Viva voce</td><td>5</td></tr> </tbody> </table> <p>Note:</p> <p>1) Question nos. 1,2,4,5,7, 8 &amp; 9 are compulsory.</p> <p>2) Among question no. 3 &amp; 6 any one shall be given.</p> <p>3) Internal Assessment Marks=20: By conducting at least one test for 10 marks and remaining 10 marks for record.</p>			Question Paper Pattern			Qn. No.	EXPERIMENT	MARKS (80 )	1	Identification of Minerals by giving their physical properties and civil engineering applications (5 minerals)	20 (5 x 4)	2	Identification of rocks by giving their physical properties, classification and their civil engineering applications (5 rocks)	20 (5 x 4)	3	Dip and strike problems	6	4	Bore hole problems (3 point method)	10	5	Thickness of strata problems including calculation of vertical, true thickness and its width of out crop.	4	6	Electrical resistivity curves drawing and its interpretation for Geotechnical and Aquifer investigations.	6	7	Interpretation of Toposheets	5	8	Geological maps, their cross sections and description	10	9	Viva voce	5
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<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. M P Billings, Structural Geology , CBS Publishers and Distributors, New Delhi</li> <li>2. B.S.Satyanarayana Swamy , Engineering Geology Laboratory Manual , Dhanpat Rai Sons, New Delhi.</li> <li>3. L R A Narayan, Remote sensing and its applications, University Press.</li> <li>4. P.K.MUKERJEE, Text book of Geology , World Press Pvt. Ltd., Kolkatta</li> <li>5. John I Platt and John Challinor, Simple Geological Structures, Thomas Murthy &amp; Co, London</li> </ol>																																			

<b>Course Title: STRENGTH OF MATERIALS</b>			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – III			
Subject Code	15CV32	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students;			
1. To understand the basic concepts of the stresses and strains for different materials and strength of structural elements.			
2. To know the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements.			
3. To analyse and understand different internal forces and stresses induced due to representative loads on structural elements.			
4. To analyse and understand principal stresses due to the combination of two dimensional stresses on an element and failure mechanisms in materials.			
5. To evaluate the behavior of torsional members, columns and struts.			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1:</b>			
<b>Simple Stresses and Strain:</b> Introduction, Definition and concept and of stress and strain. Hooke's law, Stress-Strain diagrams for ferrous and non-ferrous materials, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self-weight. Saint Venant's principle, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, state of simple shear, Elastic constants and their relationship.		<b>10 Hours</b>	<b>L2,L3</b>
<b>Module -2:</b>			
<b>Compound Stresses:</b> Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses		<b>5 Hours</b>	<b>L2,L4</b>
<b>Thin and Thick Cylinders:</b> Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lamé's equation, radial and hoop stress distribution.		<b>5 Hours</b>	<b>L2,L4</b>
<b>Module-3:</b>			

<b>Shear Force and Bending Moment in Beams:</b> Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations.	10 Hours	L2,L4
<b>Module -4:</b>		
<b>Bending and Shear Stresses in Beams:</b> Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections. Shear centre(only concept)	6 Hours	L2,L4
<b>Columns and Struts:</b> Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.	4 Hours	L2,L4
<b>Module -5:</b>		
<b>Torsion in Circular Shaft:</b> Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft, combined bending and torsion.	7 Hours	L2,L4
<b>Theories of Failure:</b> Introduction, maximum principal stress theory (Rankine's theory), Maximum shearing stress theory (Tresca's theory), Strain energy theory (Beltrami and Haigh), and maximum strain theory (St. Venant's theory).	3 Hours	L1,L2

**Course outcomes:**

After studying this course, students will be able;

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

**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., 3<sup>rd</sup> Edition, 2010
2. Ferdinand P. Beer, E. Russell Johnston and Jr. John T. DeWolf “Mechanics of Materials”, Tata McGraw-Hill, Third Edition, SI Units

**Reference Books:**

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

<p align="center"><b>Course Title: FLUIDS MECHANICS</b></p> <p align="center">[As per Choice Based Credit System (CBCS) scheme]</p> <p align="center"><b>SEMESTER – III</b></p>			
Subject Code	15CV33	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<p><b>Course objectives:</b></p> <p><b>The objectives of this course is to make students to learn:</b></p> <ol style="list-style-type: none"> <li>1. The Fundamental properties of fluids and its applications.</li> <li>2. Hydrostatic laws and application to practical problem solving</li> <li>3. Principles of Kinematics and Hydro-Dynamics for practical applications</li> <li>4. Basic design of pipes and pipe networks considering flow, pressure and its losses.</li> <li>5. The basic flow rate measurements</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1</b>			
<p><b>Fluids &amp; Their Properties:</b></p> <p>Concept of fluid, Systems of units. Properties of fluid; Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension&amp; Capillarity. Fluid as a continuum, Newton's law of viscosity (theory &amp; problems).Capillary rise in a vertical tube and between two plane surfaces (theory &amp; 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</p>		<b>5 Hours</b>	<b>L2,L3</b>
<p><b>Fluid Pressure and Its Measurements:</b></p> <p>Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth. Types of pressure. Measurement of pressure using simple, differential &amp; inclined manometers (theory &amp; problems). Introduction to Mechanical and electronic pressure measuring devices.</p>		<b>5 Hours</b>	<b>L2,L3</b>



<b>Module -2</b>		
<b>Hydrostatic forces on Surfaces :</b> Definition, Total pressure, centre of pressure, total pressure on horizontal, vertical and inclined plane surface, total pressure on curved surfaces, water pressure on gravity dams, Lock gates. Numerical Problems.  <b>Fundamentals of fluid flow (Kinematics):</b> Introduction. Methods of describing fluid motion. Velocity and Total acceleration of a fluid particle. Types of fluid flow, Description of flow pattern. Basic principles of fluid flow, three-dimensional continuity equation in Cartesian coordinate system. Derivation for Rotational and irrotational motion. Potential function, stream function, orthogonality of streamlines and equipotential lines. Numerical problems on Stream function and velocity potential. Introduction to flow net.	<b>3 Hours</b>	<b>L2,L4</b>
	<b>7 Hours</b>	<b>L2,L4</b>
<b>Module -3</b>		
<b>Fluid Dynamics:</b> Introduction. Forces acting on fluid in motion. Euler's equation of motion along a streamline and Bernoulli's equation. Assumptions and limitations of Bernoulli's equation. Modified Bernoulli's equation. Problems on applications of Bernoulli's equation (with and without losses). Vortex motion; forced vortex, free vortex, problems Momentum equation problems on pipe bends. <b>Applications:</b> Introduction. Venturimeter, Orificemeter, Pitot tube. Numerical Problems	<b>10 Hours</b>	<b>L2,L4</b>
<b>Module -4</b>		
<b>Orifice and Mouthpiece:</b> Introduction, classification, flow through orifice, hydraulic coefficients, Numerical problems. Mouthpiece, classification, Borda's Mouthpiece (No problems). <b>Notches and Weirs:</b> Introduction. Classification, discharge over rectangular, triangular, trapezoidal notches, Cippoletti notch, broad crested weirs. Numerical problems. Ventilation of weirs, submerged weirs.	<b>3 Hours</b>	<b>L1,L2</b>
	<b>7 Hours</b>	<b>L2,L4</b>

**Module -5****Flow through Pipes:**

Introduction. Major and minor losses in pipe flow. Darcy-Weisbach equation for head loss due to friction in a pipe. Pipes in series, pipes in parallel, equivalent pipe-problems. Minor losses in pipe flow, equation for head loss due to sudden expansion. Numerical problems.

Hydraulic gradient line, energy gradient line.

Pipe Networks, Hardy Cross method, Numerical problems.

**Surge Analysis in Pipes:**

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

**7 Hours****L2,L4****3 Hours****L2,L4****Course outcomes:**

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

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

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

**Reference Books:**

1. Victor L Streeter, Benjamin Wylie E and Keith W Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008(Ed)
2. K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co. Ltd.
3. K Subramanya, "Fluid Mechanics and Hydraulic Machines-problems and solutions", Tata McGraw Hill Publishing Co. Ltd.
4. J. F. Douglas, J. M. Gasoriek, John Swaffield, Lynne Jack, "Fluid Mechanics", Pearson, Fifth Edition
5. Mohd.Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press

<b>Course Title: BASIC SURVEYING</b>			
[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
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to; <ol style="list-style-type: none"> <li>1. Understand the basic principles of Surveying</li> <li>2. Learn Linear and Angular measurements to arrive at solutions to basic surveying problems.</li> <li>3. Employ conventional surveying data capturing techniques and process the data for computations.</li> <li>4. Analyze the obtained spatial data to compute areas and volumes and draw contours to represent 3D data on plane figures.</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1</b>			
<b>Introduction:</b> Definition of surveying, Objectives and importance of surveying. Classification of surveys. Principles of surveying. Units of measurements, Surveying measurements and errors, types of errors, precision and accuracy. Classification of maps, map scale, conventional symbols, topographic maps, map layout, Survey of India Map numbering systems.		<b>6 Hours</b>	<b>L1, L2</b>
<b>Measurement of Horizontal Distances:</b> Measuring tape and types. Measurement using tapes, Taping on level ground and sloping ground. Errors and corrections in tape measurements, ranging of lines, direct and indirect methods of ranging, Electronic distance measurement, basic principle. Booking of tape survey work, Field book, entries, Conventional symbols, Obstacles in tape survey, Numerical problems.		<b>4 Hours</b>	<b>L1, L2</b>

<b>Module -2</b>		
<b>Measurement of Directions and Angles:</b> <b>Compass survey:</b> Basic definitions; meridians, bearings, magnetic and True bearings. Prismatic and surveyor's compasses, temporary adjustments, declination. Quadrantal bearings, whole circle bearings, local attraction and related problems <b>Theodolite Survey and Instrument Adjustment:</b> Theodolite and types, Fundamental axes and parts of Transit theodolite, uses of theodolite, Temporary adjustments of transit theodolite, measurement of horizontal and vertical angles, step by step procedure for obtaining permanent adjustment of Transit theodolite	<b>5 Hours</b>	<b>L2,L3</b>
	<b>5 Hours</b>	<b>L2,L3</b>
<b>Module -3</b>		
<b>Traversing:</b> Traverse Survey and Computations: Latitudes and departures, rectangular coordinates, Traverse adjustments, Bowditch rule and transit rule, Numerical Problems <b>Tacheometry:</b> basic principle, types of tacheometry, distance equation for horizontal and inclined line of sight in fixed hair method, problems	<b>5 Hours</b>	<b>L1, L2</b>
	<b>5 Hours</b>	<b>L1, L2</b>
<b>Module -4</b>		
<b>Leveling:</b> Basic terms and definitions, Methods of leveling, Dumpy level, auto level, digital and laser levels. Curvature and refraction corrections. Booking and reduction of levels. Differential leveling, profile leveling, fly leveling, check leveling, reciprocal leveling, trigonometric leveling (heights and distances-single plane and double plane methods.	<b>10Hours</b>	<b>L3,L4</b>
<b>Module -5:</b>		
<b>Areas and Volumes:</b> 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. <b>Contouring</b> Contours, Methods of contouring, Interpolation of contours, contour gradient, characteristics of contours and uses.	<b>8Hours</b>	<b>L2,L3</b>
	<b>2 Hours</b>	<b>L2,L3</b>

**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. Kanetkar T P and S V Kulkarni , Surveying and Leveling Part I, Pune Vidyarthi Griha Prakashan, 1988

**Reference Books:**

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

<p align="center"><b>Course Title: ENGINEERING GEOLOGY</b></p> <p align="center">[As per Choice Based Credit System (CBCS) scheme]</p> <p align="center"><b>SEMESTER – III</b></p>			
Subject Code	15CV35	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<p><b>Course objectives:</b></p> <p>This course will enable students;</p> <ol style="list-style-type: none"> <li>1. To understand the internal structure and composition of the earth.</li> <li>2. To comprehend the properties, occurrence and uses of minerals in various industries.</li> <li>3. To learn about geo-morphological agents such as river, wind, sea waves, and their implications in implementing civil engineering projects.</li> <li>4. To gain knowledge about the structures of the rocks and their considerations in the selection of site for dams, tunnels, bridges and highways.</li> <li>5. To learn the application of Topographic maps, remote sensing and GIS in Civil engineering practices and natural resource management.</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1</b>			
<p><b>Introduction:</b> Application of Earth Science in Civil Engineering Practices, Understanding the earth, internal structure and composition.</p> <p><b>Mineralogy:</b> Mineral properties, composition and their use in the manufacture of construction materials - Quartz Group (Glass); Feldspar Group (Ceramic wares and Flooring tiles); Kaolin (Paper, paint and textile); Asbestos (AC sheets); Carbonate Group (Cement); Gypsum (POP, gypsum sheets, cement); Mica Group (Electrical industries); Ore minerals - Iron ores (Steel); Chromite (Alloy); Bauxite (aluminum); Chalcopyrite (copper)</p>		<b>10 Hours</b>	<b>L1,L2</b>

<b>Module -2</b>		
<b>Petrology:</b> Formation, Classification and Engineering Properties. Rock as construction material, concrete aggregate, railway ballast, roofing, flooring, cladding and foundation. Deformation of rocks, Development of Joints, Folds, Faults and Unconformities. Their impact in the selection of sites for Dams, Reservoirs, Tunnels, Highways and Bridges, Rock Quality Determination (RQD), Rock Structure Rating (RSR),: Igneous Rocks - Granite, Gabbro, Dolerite, Basalt; Sedimentary rocks - Sandstone, Shale, Limestone, Laterite; Metamorphic rocks - Gneiss, Quartzite, Slate, Charnockite: Decorative stones - Porphyries, Marble and Quartzite.	<b>10 Hours</b>	<b>L2,L3</b>
<b>Module -3</b>		
<b>Geomorphology and Seismology:</b> Landforms – Classification, Rock weathering, types and its effects on Civil Engineering Projects. Study of Geo-morphological aspects in the selection of sites for Dams, Reservoirs, Tunnels, Highways and Bridges. Watershed management, Floods and their control, River valley, Drainage pattern – parameters and development; Coastlines and their engineering considerations. Earthquake - Causes and Effects,, Seismic waves, Engineering problems related to Earthquakes, Earthquake intensity, Richter Scale, Seismograph, Seismic zones- World and India, Tsunami – causes and effects. Early warning system. Reservoir Induced Seismicity; Landslides – causes and their control.	<b>12 Hours</b>	<b>L2, L3, L5</b>
<b>Module -4</b>		
<b>Hydrogeology:</b> Hydrological cycle, Occurrence of Groundwater in different terrains -Weathered, Hard and Stratified rocks; Determination of Quality aspects - SAR, RSC and TH of Groundwater. Groundwater Pollution, Groundwater Exploration- Electrical Resistivity and Seismic methods, Resistivity curves, Water Bearing Formations, Aquifer types and parameters - Porosity, Specific yield and retention, Permeability, Transmissibility and Storage Coefficient. Springs and Artesian Wells, Artificial Recharging of Groundwater, Sea water intrusion and remedies.	<b>8 Hours</b>	<b>L4,L5</b>



<b>Module -5:</b>		
<b>Geodesy:</b> Study of Topographic maps and Contour maps; Remote Sensing – Concept, Application and its Limitations; Geographic Information System (GIS) and Global Positioning System (GPS) – Concept and their use resource mapping. LANDSAT Imagery – Definition and its use. Impact of Mining, Quarrying and Reservoirs on Environment. Natural Disasters and their mitigation.	<b>10 Hours</b>	<b>L2,L3, L5</b>
<b>Course outcomes:</b> After a successful completion of the course, the student will be able to: <ol style="list-style-type: none"> <li>1. Students will able to apply the knowledge of geology and its role in Civil Engineering</li> <li>2. Students will effectively utilize earth’s materials such as mineral, rocks and water in civil engineering practices.</li> <li>3. Analyze the natural disasters and their mitigation.</li> <li>4. Assess various structural features and geological tools in ground water exploration, Natural resource estimation and solving civil engineering problems.</li> <li>5. Apply and asses use of building materials in construction and asses their properties</li> </ol>		
<b>Program Objectives (as per NBA)</b> <ul style="list-style-type: none"> <li>○ <i>Engineering Knowledge.</i></li> <li>○ <i>Problem Analysis.</i></li> <li>○ <i>Interpretation of data.</i></li> </ul>		
<b>Question paper pattern:</b> <ul style="list-style-type: none"> <li>• The question paper will have Ten questions, each full question carrying 16 marks.</li> <li>• There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics under a module.</li> <li>• The students shall answer Five full questions selecting one full question from each module.</li> <li>• 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.</li> </ul>		
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. P.K. Mukerjee, “A Text Book of Geology”, World Press Pvt., Ltd. Kolkatta.</li> <li>2. Parbin Singh, “Text Book of Engineering and General Geology”, Published by S.K. Kataria and Sons, New Dehli</li> </ol>		

**Reference Books:**

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

<b>Course Title: Building Materials and Construction</b> [As per Choice Based Credit System (CBCS) scheme] SEMESTER – III			
Subject Code	15CV36	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will develop a student; <ol style="list-style-type: none"> <li>1. In recognizing the good materials to be used for the construction work</li> <li>2. In investigation of soil condition, Deciding and design of suitable foundation for different structures</li> <li>3. In supervision of different types of masonry</li> <li>4. In selection of materials, design and supervision of suitable type of floor and roof.</li> <li>5. To gain knowledge about doors, windows, plastering, painting, damp proofing, scaffolding, shoring, underpinning and to take suitable engineering measures.</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1</b>			
<b>Building Materials:</b> Stone as building material; Requirement of good building stones, Dressing of stones, Deterioration and Preservation of stone work. Bricks; Classification, Manufacturing of clay bricks, Requirement of good bricks. Field and laboratory tests on bricks; compressive strength, water absorption, efflorescence, dimension and warpage. Cement Concrete blocks, Stabilized Mud Blocks, Sizes, requirement of good blocks. Mortar: types and requirements. Timber as construction material Fine aggregate: Natural and manufactured: Sieve analysis, zoning, specify gravity, bulking, moisture content, deleterious materials. Coarse aggregate: Natural and manufactured: Importance of size, shape and texture. Grading of aggregates, Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests.		10 Hours	L1 L2
<b>Module -2</b>			

<b>Foundation:</b> 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 <b>Masonry:</b> Definition and terms used in masonry. Brick masonry, characteristics and requirements of good brick masonry, Bonds in brick work, Header, Stretcher, English, Flemish bond, Stone masonry, Requirements of good stone masonry, Classification, characteristics of different stone masonry, Joints in stone masonry. Types of walls; load bearing, partition walls, cavitywalls	10Hours	L1,L2
<b>Module -3</b>		
<b>Lintels and Arches:</b> Definition, function and classification of lintels, Balconies, chejja and canopy. Arches; Elements and Stability of an Arch. <b>Floors and roofs:</b> Floors; Requirement of good floor, Components of ground floor, Selection of flooring material, Laying of Concrete, Mosaic, Marble, Granite, Tile flooring, Cladding of tiles. Roof;-Requirement of good roof, Types of roof, Elements of a pitched roof, Trussed roof, King post Truss, Queen Post Truss, Steel Truss, Different roofing materials, R.C.C.Roof.	10 hours	L3
<b>Module -4:</b>		
<b>Doors, Windows and Ventilators:</b> Location of doors and windows, technical terms, Materials for doors and windows, Paneled door, Flush door, Collapsible door, Rolling shutter, PVC Door, Paneled and glazed Window, Bay Window, French window. Ventilators. Sizes as per IS recommendations <b>Stairs:</b> Definitions, technical terms and types of stairs, Requirements of good stairs. Geometrical design of RCC doglegged and open-well stairs. <b>Formwork:</b> Introduction to form work, scaffolding, shoring, under pinning.	10 Hours	L2 L3 L5
<b>Module -5</b>		
<b>Plastering and Pointing :</b> purpose, materials and methods of plastering and pointing, defects in plastering-Stucco plastering, lathe plastering <b>Damp proofing-</b> causes, effects and methods. <b>Paints-</b> Purpose, types, ingredients and defects,	10 Hours	L4 L5

Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces.		
<b>Course outcomes:</b> After a successful completion of the course, the student will be able to: <ol style="list-style-type: none"> <li>1. Select suitable materials for buildings and adopt suitable construction techniques.</li> <li>2. Adopt suitable repair and maintenance work to enhance durability of buildings.</li> </ol>		
<b>Program Objectives (as per NBA)</b> <ul style="list-style-type: none"> <li>o <i>Engineering Knowledge.</i></li> <li>o <i>Problem Analysis.</i></li> <li>o <i>Interpretation of data.</i></li> </ul>		
<b>Question paper pattern:</b> <ul style="list-style-type: none"> <li>• The question paper will have Ten questions, each full question carrying 16 marks.</li> <li>• There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics under a module.</li> <li>• The students shall answer Five full questions selecting one full question from each module.</li> <li>• 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.</li> </ul>		
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Sushil Kumar “Building Materials and construction”, 20th edition, reprint 2015, Standard Publishers</li> <li>2. Dr. B.C.Punmia, Ashok kumar Jain, Arun Kumar Jain, “Building Construction, Laxmi Publications (P) ltd., New Delhi.</li> <li>3. Rangawala S. C. “Engineering Materials”, Charter Publishing House, Anand, India.</li> </ol>		
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. S.K.Duggal, “Building Materials”, (Fourth Edition)New Age International (P) Limited, 2016</li> <li>2. National Building Code(NBC) of India</li> <li>3. P C Vergese, “Building Materials”, PHI Learning Pvt. Ltd</li> <li>4. Building Materials and Components, CBRI, 1990, India</li> <li>5. Jagadish.K.S, “Alternative Building Materials Technology”, New Age International, 2007.</li> <li>6. M. S. Shetty, “Concrete Technology”, S. Chand &amp; Co. New Delhi.</li> </ol>		

<b>Course Title: MATERIALS TESTING LABORATORY</b> [As per Choice Based Credit System (CBCS) scheme] <b>SEMESTER – III</b>			
Subject Code	15CVL37	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03
<b>CREDITS – 02</b>			
<b>Course objectives:</b>			
<b>The objectives of this course is to make students to learn:</b>			
<div>1. Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.</div> <div>2. Ability to function on multi-disciplinary teams in the area of materials testing.</div> <div>3. Ability to use the techniques, skills and modern engineering tools necessary for engineering.</div> <div>4. Understanding of professional and ethical responsibility in the areas of material testing.</div> <div>5. 5. Ability to communicate effectively the mechanical properties of materials.</div>			
<b>Modules</b>	<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>	
1. Tension test on mild steel and HYSD bars.	<b>03 Hours</b>	<b>L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
2. Compression test on mild steel, cast iron and wood.	<b>03 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
3. Torsion test on mild steel circular sections.	<b>03 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
4. Bending Test on Wood Under two point loading	<b>03 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
5. Shear Test on Mild steel- single and double shear	<b>03 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
6. Impact test on Mild Steel (Charpy & Izod)	<b>03 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
7. Hardness tests on ferrous and non-ferrous metals – Brinell's, Rockwell and Vicker's	<b>06 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
8. Tests on Bricks and Tiles	<b>03 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
9. Tests on Fine aggregates – Moisture content, Specific gravity, Bulk density, Sieve analysis and Bulking	<b>06 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
10. Tests on Coarse aggregates – Absorption, Moisture content, specific gravity, Bulk density and Sieve analysis	<b>06 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
11. Demonstration of Strain gauges and Strain indicators	<b>03 Hours</b>	<b>L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, L<sub>5</sub></b>	
<i>NOTE: All tests to be carried out as per relevant latest BIS Codes</i>			

**Course outcomes:**

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

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

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

<b>Course Title: BASIC SURVEYING PRACTICE</b> [As per Choice Based Credit System (CBCS) scheme] <b>SEMESTER – III</b>			
Subject Code	15CVL38	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03
<b>CREDITS – 02</b>			
<b>Course objectives:</b> This course will enable students to <b>The objectives of this course is to make students to learn:</b> <ol style="list-style-type: none"> <li>1. <i>Apply the basic principles of engineering surveying and measurements</i></li> <li>2. <i>Follow effectively field procedures required for a professional surveyor</i></li> <li>3. <i>Use techniques, skills and conventional surveying instruments necessary for engineering practice..</i></li> </ol>			
<b>Modules</b>	<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>	
1. a) Measurements of distances using tape along with horizontal planes and slopes, direct ranging. b) Setting out perpendiculars. Use of cross staff, optical square.	03	<b>L3, L4</b>	
2. Obstacles in chaining and ranging – Chaining but not ranging, ranging but not chaining, both ranging and chaining.	03	<b>L3</b>	
3. Measurements of bearings / directions using prismatic compass, setting of geometrical figures using prismatic compass.	03	<b>L3</b>	
4. Measurement of bearings of sides of a closed traverse and adjustment of closing error by Bowditch method.	03	<b>L3</b>	
5. Determination of distance between two inaccessible points using compass and accessories	03	<b>L4</b>	
6. Determination of reduced levels of points using dumpy level/auto level (simple leveling)	03	<b>L4</b>	
7. Determination of reduced levels of points using dumpy level/auto level (differential leveling and inverted leveling)	03	<b>L4</b>	
8. To determine the difference in elevation between two points using Reciprocal leveling and to determine the collimation error	03	<b>L4</b>	
9. To conduct profile leveling, cross sectioning and block leveling. Plotting profile and cross sectioning in excel. Block contour on graph paper to scale	03	<b>L3</b>	
10. Measurement of horizontal angle by repetition and reiteration methods and Measurement of vertical angles using theodolite.	03	<b>L4</b>	



11. Determination of horizontal distance and vertical height to a base inaccessible object using theodolite by single plane and double plane method.	03	<b>L4</b>
12. To determine distance and elevation using tachometric surveying with horizontal and inclined line of sight.	03	<b>L3</b>
13. Closed traverse surveying using Theodolite and applying corrections for error of closure by transit rule.	03	<b>L3</b>
14. Demonstration of Minor instruments like Clinometer, Ceylon Ghat tracer, Box sextant, Hand level, Planimeter, nautical sextant and Pentagraph.	03	<b>L3</b>
<b>Course outcomes:</b> After a successful completion of the course, the student will be able to: <ol style="list-style-type: none"> <li>1. Apply the basic principles of engineering surveying and for linear and angular measurements.</li> <li>2. comprehend effectively field procedures required for a professional surveyor.</li> <li>3. Use techniques, skills and conventional surveying instruments necessary for engineering practice.[L3,L4][PO5]</li> </ol>		
<b>Program Objectives (as per NBA)</b> <ol style="list-style-type: none"> <li>1. <i>Engineering Knowledge.</i></li> <li>2. <i>Problem Analysis.</i></li> <li>3. <i>Interpretation of data.</i></li> </ol>		
<b>Question paper pattern:</b> <ul style="list-style-type: none"> <li>• All are individual experiments.</li> <li>• Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.</li> <li>• All exercises are to be included for practical examination.</li> </ul>		
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. B.C. Punmia, <b>“Surveying Vol.1”</b>, Laxmi Publications pvt. Ltd., New Delhi – 2009.</li> <li>2. Kanetkar T P and S V Kulkarni , <b>Surveying and Levelling Part I</b>, Pune VidyarthiGrihaPrakashan, 1988</li> </ol>		
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. S.K. Duggal, <b>“Surveying Vol.1”</b>, Tata McGraw Hill Publishing Co. Ltd. New Delhi. – 2009.</li> <li>2. K.R. Arora, <b>“Surveying Vol. 1”</b> Standard Book House, New Delhi. – 2010</li> </ol>		

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM**  
**CHOICE BASED CREDIT SYSTEM (CBCS)**  
**SCHEME OF TEACHING AND EXAMINATION 2015-2016**

**B.E. CIVIL ENGINEERING**

**V SEMESTER**

Sl. No.	Subject Code	Title	Teaching Hours /Week		Examination				Credits
			Theory	Practical/ Drawing	Duration	Theory/ Practical Marks	I.A. Marks	Total Marks	
1	15CV51	Design of RC Structural Elements	04		03	80	20	100	4
2	15CV52	Analysis of Indeterminate Structures	04		03	80	20	100	4
3	15CV53	Applied Geotechnical Engineering	04		03	80	20	100	4
4	15CV54	Computer Aided Building Planning and Drawing	01	3D	03	80	20	100	4
5	15CV55X	Professional Elective-1	03		03	80	20	100	3
6	15CV56X	Open Elective-1	03		03	80	20	100	3
7	15CVL57	Geotechnical Engineering Laboratory		1I+2P	03	80	20	100	2
8	15CVL58	Concrete and Highway Materials Laboratory		1I+2P	03	80	20	100	2
<b>TOTAL</b>			<b>19</b>	<b>09</b>	<b>24</b>	<b>640</b>	<b>160</b>	<b>800</b>	<b>26</b>

Professional Elective 1		Open Elective 1	
15CV551	Air pollution and Control	15CV561	Traffic Engineering
15CV552	Railways, Harbours, tunneling and Airports	15CV562	Sustainability Concepts in Engineering
15CV553	Masonry Structures	15CV563	Remote Sensing and GIS
15CV554	Theory of Elasticity	15CV564	Occupational Health and Safety
		15NC565	NCC

- 1. Professional Elective:** Elective relevant to chosen specialization/ branch  
**2. Open Elective:** Electives from other technical and/or emerging subject areas

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**VI SEMESTER**

Sl. No.	Subject Code	Title	Teaching Hours /Week		Examination				Credits
			Theory	Practical/ Drawing	Duration	Theory/ Practical Marks	I.A. Marks	Total Marks	
1	15CV61	Construction Management and Entrepreneurship	04		03	80	20	100	4
2	15CV62	Design of Steel Structural Elements	04		03	80	20	100	4
3	15CV63	Highway Engineering	04		03	80	20	100	4
4	15CV64	Water Supply and Treatment Engineering	04		03	80	20	100	4
5	15CV65X	Professional Elective 2	03		03	80	20	100	3
6	15CV66X	Open Elective 2	03		03	80	20	100	3
7	15CVL67	Software Application Lab		1I+2P	03	80	20	100	2
8	15CVP68	Extensive Survey Project /Camp		1I+2P	03	80	20	100	2
<b>TOTAL</b>			<b>22</b>	<b>6</b>	<b>24</b>	<b>640</b>	<b>160</b>	<b>800</b>	<b>26</b>

Professional Elective-2		Open Elective-2	
15CV651	Solid Waste Management	15CV661	Water Resource Management
15CV652	Matrix Method of Structural Analysis	15CV662	Environmental Protection and Management
15CV653	Alternative Building Materials	15CV663	Numerical Methods and applications
15CV654	Ground Improvement Techniques	15CV664	Finite Element Analysis

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**VII SEMESTER**

Sl. No.	Subject Code	Title	Teaching Hours /Week		Examination				Credits
			Theory	Practical/ Drawing	Duration	I.A. Marks	Theory/ Practical Marks	Total Marks	
1	15CV71	Municipal and Industrial Waste Water Engineering	04		03	20	80	100	4
2	15CV72	Design of RCC and Steel Structures	04		03	20	80	100	4
3	15CV73	Hydrology and Irrigation Engineering	04		03	20	80	100	4
4	15CV74X	Professional Elective 3	03		03	20	80	100	3
5	15CV75X	Professional Elective 4	03		03	20	80	100	3
6	15CVL76	Environmental Engineering Laboratory		1I+2P	03	20	80	100	2
7	15CVL77	Computer Aided Detailing of Structures		1I+2D	03	20	80	100	2
8	15CVP78	Project Phase I +Project Seminar		3		100		100	2
<b>TOTAL</b>			<b>18</b>	<b>9</b>	<b>21</b>	<b>240</b>	<b>560</b>	<b>800</b>	<b>24</b>

Professional Elective 3		Professional Elective 4	
15CV741	Design of Bridges	15CV751	Urban Transportation and Planning
15CV742	Ground Water & Hydraulics	15CV752	Prefabricated Structures
15CV743	Design Concept of Building Services	15CV753	Rehabilitation and Retrofitting of Structures
15CV744	Structural Dynamics	15CV754	Reinforced Earth Structures

1. Project Phase-I + Seminar: Literature Survey, Problem Identification, objectives and Methodology, Submission of synopsis and seminar

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**VIII SEMESTER**

Sl. No.	Subject Code	Title	Teaching Hours /Week		Examination				Credits
			Theory	Practical/ Drawing	Duration	I.A. Marks	Theory/ Practical Marks	Total Marks	
1	15CV81	Quantity Surveying and Contracts Management	4	-	3	20	80	100	4
2	15CV82	Design of Pre Stressed Concrete Elements	4	-	3	20	80	100	4
3	15CV83X	Professional Elective 5	3	-	3	20	80	100	3
4	15CV84	Internship/Professional Practice	Industry Oriented		3	50	50	100	2
5	15CVP85	Project Work	-	6	3	100	100	200	6
6	15CVS86	Seminar on current trends in Engineering and Technology	-	4	-	100	-	100	1
<b>TOTAL</b>			<b>11</b>	<b>10</b>	<b>15</b>	<b>310</b>	<b>390</b>	<b>700</b>	<b>20</b>

<b>Professional Elective 5</b>	
15CV831	Earthquake Engineering
15CV832	Hydraulic Structures
15CV833	Pavement Design
15CV834	Advanced Foundation Design