

# **B. E. SYLLABUS**

**CIVIL ENGINEERING**

**III & IV SEMESTER**

**With  
Scheme of Teaching  
& Examination**

**DEPARTMENT: CIVIL ENGINEERING**

<b>Sl. No.</b>	<b>Name</b>		<b>Designation</b>
1.	Dr. I. Ramesh Mithanthaya	Ph.D	Prof./ Vice Principal /Dean(Aca)
2.	Dr. A.N. Parameswaran	Ph.D	Professor/ Director (Industry Institute Interaction)
3.	Dr. Udayakmar G.	Ph.D	Professor/HoD
4.	Dr. Srinath Shetty K.	Ph.D	Professor
5.	Dr. Radhakrishnan K.	Ph.D	Professor
6.	Dr. Mahadeve Gowda	Ph.D	Professor
7.	Dr. Arunkumar Bhat	Ph.D	Professor
8.	Mr. Y.R. Suresh	M.E.,M.Tech ( Ph.D.)	Asso. Prof
9.	Mr. J.K. Lokesh	M.Tech	Asst. Prof.Gd III
10.	Mr.Y. Umashankar Shetty	M.Tech	Asst. Prof. Gd III
11.	Mr. Pushparaj	M.Tech ( Ph.D.)	Asst. Prof. Gd III
12.	Dr. Bhojaraja B E	Ph.D.	Asst. Prof. Gd III
13.	Mr.Sundip Shenoy R.	M.Tech	Asst. Prof. Gd II
14.	Mrs.Thangamani R.	M.Tech ( Ph.D.)	Asst. Prof. Gd II
15.	Mr.Anil Kumar	M.Tech ( Ph.D.)	Asst. Prof. Gd II
16.	Mr.Akshay N.K.	M.Tech	Asst. Prof. Gd I
17.	Mr.Prashantha Kumar K.	M.Tech ( Ph.D.)	Asst. Prof. Gd I
18.	Mr.Manjunath M.	M.Tech (Ph.D)	Asst. Prof. Gd I
19.	Mr.Roshan Rai	M.Tech	Asst. Prof. Gd I
20.	Mr.Shriram P Marathe	M.Tech (Ph.D.)	Asst. Prof. Gd I
21.	Mr.Prithviraj H.K.	M.Tech	Asst. Prof. Gd I
22.	Mr. Shaik Kabeer Ahmed	M.Tech	Asst. Prof. Gd I
23.	Mr.Gururaj Acharya	M.Tech	Asst. Prof. Gd I
24.	Mr.Rakshith Kumar Shetty	M.Tech	Asst. Prof. Gd I
25.	Mr.Janakaraj	M.Tech	Asst. Prof. Gd I
26.	Mr.Mithun B.M.	M.Tech ( Ph.D.)	Asst. Prof. Gd I

## Syllabus of III &amp; IV Semester B.E. / Civil Engg.

27.	Mr.Thushar S. Shetty	M.Tech	Asst. Prof. Gd I
28.	Mr.Pradeep Karanth	M.Tech	Asst. Prof. Gd I
29.	Mr.Shanmukha Shetty	M.Tech	Asst. Prof. Gd I
30.	Mr. Sabyath Shetty	M.Tech	Asst. Prof. Gd I
31.	Ms.Thanushree Hegde	M.Tech	Asst. Prof. Gd I

## **DEPARTMENT OF CIVIL ENGINEERING**

### **Vision**

To uphold the Department as a leader in community development through innovation and excellence in diverse areas of Civil Engineering to meet the global challenges and market demands.

### **Mission**

1. To provide the students a strong theoretical knowledge and practical skills to understand the basic concept and fundamentals of various Civil Engineering subjects.
2. To be competent and skilled enough to take the challenges in Research, Consultancy and Entrepreneurship.
3. To encourage the students in developing professional ethics through discipline and principles.

### **Programme Educational Objectives (PEOs):**

The graduates of the program will be

1. Equipped with fundamentals of Civil Engineering along with interdisciplinary science, engineering and management concepts.
2. Equipped with advanced and emerging field of Civil Engineering practices to compete and match with the industrial requirements.
3. Competent enough to conceive the ideas, prepare plan, design, execute, monitor and manage the project with the effective utilization of resources such as men, material, machine and money along with time effectively.
4. Continue to learn and adapt to suit the needs and challenges of real world problems and come up with optimal solutions.

**Programme Outcomes (POs):**

After successful completion of the Civil Engineering Program, Graduates will be able to:

PO1	Apply the knowledge of mathematics, basic science and Civil Engineering and solve practical problems in the field of Civil Engineering.
PO2	Identify, formulate, review research literature, and analyze complex Civil Engineering problems using first principles of mathematics, basic sciences, and Civil Engineering
PO3	Design and conduct tests/experiments in the various domains related to Civil Engineering and develop methodology/technology to implement the solution successfully to meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO4	Conduct investigations of complex problems in Civil Engineering using research based knowledge and research methods.
PO5	Exhibit skills to use modern engineering tools, software and equipment to analyze various problems in the Civil Engineering domain with an understanding of the limitations
PO6	Apply method of reasoning understood by the knowledge of social sciences to assess various issues of society and understand consequent responsibilities of a professional civil engineer.
PO7	Understand the impact of Civil Engineering solutions on existing ecology of a region and demonstrate the knowledge of and need for sustainable development.
PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the Civil Engineering practice.
PO9	Function effectively as an individual member or leader in diverse teams and multidisciplinary settings.
PO10	Communicate effectively on complex Civil Engineering activities with the engineering community and general public, and write effective reports and design documents, make effective

	presentation, and give and receive clear instructions.
PO11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to implement/manage Civil Engineering projects and in multidisciplinary environments.
PO12	Recognize the need for and develop ability to engage in independent and lifelong learning of technological developments and changes

**Program Specific Outcomes (PSOs):**

PSO1	Apply knowledge of various domains of Civil Engineering, conduct experiments, analyze, interpret data, and design the system components.
PSO2	Enrich the knowledge in various specializations of Civil Engineering such as Structural, Geotechnical, Transportation, Environmental, Engineering, by means of research and innovative practices
PSO3	Plan, produce detailed drawings, write specification, and prepare cost estimates, select material, schedule work plans.

**DEPARTMENT OF CIVIL ENGINEERING**  
**SCHEME OF TEACHING AND EXAMINATION**

**III Semester B. E.**

**28 Hours/week**

Sl. No.	Code	Subject	Theory /Tuto./Prac./ Self Study	Total Hrs./Week	CIE	SEE	Credits
1.	16CV301	Engg. Mathematics-III	4+0+0+0	4	50	50	4
2.	16CV302	Building Materials and Construction	3+0+0+S*	3	50	50	3
3.	16CV303	Strength of Materials	3+2+0+0	5	50	50	4
4.	16CV304	Fundamentals of Surveying	3+0+0+0	3	50	50	3
5.	16CV305	Fluid Mechanics	4+0+0+0	4	50	50	4
6.	16CV306	Applied Engg. Geology	3+0+0+0	3	50	50	3
7.	16CV307	Basic Materials Testing Lab	0+0+3+0	3	50	50	2
8.	16CV308	Surveying Practice-I	0+0+3+0	3	50	50	2
<b>TOTAL</b>			<b>28</b>	<b>28</b>	<b>400</b>	<b>400</b>	<b>25</b>

**\*Note: Three credit courses will have three units.**

**DEPARTMENT OF CIVIL ENGINEERING**  
**SCHEME OF TEACHING AND EXAMINATION**

IV Semester B. E.

32 Hours/week

Sl.No.	Code	Subject	Theory /Tuto./Prac./ Self Study	Total Hrs./Week	CIE	SEE	Credits
1.	16CV401	Engg. Mathematics-IV	4+0+0+0	4	50	50	4
2.	16CV402	Structural Analysis-I	3+2+0+0	5	50	50	4
3.	16CV403	Higher Surveying	3+0+0+0	3	50	50	3
4.	16CV404	Hydraulics and Hydraulic Machines	4+0+0+0	4	50	50	4
5.	16CV405	Concrete Technology	3+0+0+S*	3	50	50	3
6.	16CV406	Building Planning & Drawing	0+0+4+0	4	50	50	2
7.	16CV407	Surveying Practice- II	0+0+3+0	3	50	50	2
8.	16CV408	Applied Engg. Geology Lab	0+0+3+0	3	50	50	2
9.	16HU411	Enhancing Self Competence	1+0+2+0	3	50	50	2
<b>TOTAL</b>			<b>32</b>	<b>32</b>	<b>450</b>	<b>450</b>	<b>26</b>

\*Note: Three credit courses will have three units.



**ENGINEERING MATHEMATICS - III****Sub Code : 16CV301****Credits : 04****Hrs/Week : 4+0+0+0****Total Hours : 52****Course Learning Objectives:****This Course will enable students to**

1. **Know** the areas in which vector functions and their derivatives can be used. Apply operators like curl, gradient, divergence, find directional derivatives and know their physical significances.
2. **Determine** analyticity of a function and find the derivative of a function, evaluate an integral using Cauchy's integral formula. Compute the residue of a function and use the residue theory to evaluate a contour integral or an integral over the real line.
3. **Find** Fourier series of a function, obtain the half range series, harmonics, find the Fourier transform and inverse Fourier transform of a function.
4. **Able** to understand different finite difference operators and the concept of interpolation and its application for different types of data.
5. **Apply** numerical differentiation and integration methods whenever analytical methods of differentiation and integration fail or very complicated.

**UNIT - I****VECTOR CALCULUS:**

Vector algebra, Vector differentiation- gradient, divergence, curl, Laplacian, solenoidal and irrotational vectors.

**8 Hours****UNIT – II****THEORY OF COMPLEX VARIABLES:**

Functions of complex variables, Cauchy Riemann equations. Properties of analytic functions, conformal mapping. Bilinear transformations.

Line integrals in complex plane, Cauchy's theorem, Power series, Residues, Cauchy's residue theorem, Evaluation of standard real integrals using contour integration.

**12 Hours****UNIT – III****FOURIER ANALYSIS:**

Periodic functions, Euler's formulae, Fourier series of odd and even functions, functions with arbitrary period, half range series. Harmonic Analysis. Fourier integral theorem, Fourier Transforms, Inverse Fourier transform, Convolution theorem and Parseval's identity. Fourier sine and Fourier cosine transforms, Inverse Fourier sine and Inverse Fourier cosine transforms.

**10 Hours****UNIT – IV****NUMERICAL ANALYSIS:**

Finite differences: forward, backward and central difference operators, Newton-Gregory forward and backward interpolation formulae, Lagrange's interpolation formula, Lagrange's

Inverse interpolation formula. Newton’s divided difference interpolation formula, Central differences- Stirling’s and Bessel’s formulae(without proof) **11 Hours**

**UNIT – V**

**NUMERICAL ANALYSIS-CONTD:**

Numerical differentiation using Newton’s forward & backward formulae.  
 Numerical integration: General quadrature formula, Trapezoidal rule, Simpson’s one third rule, Simpson,s three eighth rule, Weddle’s rule and errors. **11 Hours**

**Course Outcomes:**

At the end of the course the student will be able to

1. **Explain** the concepts of gradient of a function, divergence and curl of a vector field and prove identities involving these. Also able to recognise irrotational and solenoidal vector fields.
2. **Recognize** analytic functions, differentiate and integrate complex functions, compute the residue of a function and use the residue theorem to evaluate a contour integral over the real line.
3. **Find** the Fourier transform and the inverse Fourier transform of a function and will be able to apply these concepts in his technical subjects.
4. **Derive** numerical methods for various mathematical operations and tasks, such as interpolation and inverse interpolation and its application to different types of data.
5. **Apply** numerical differentiation and integration methods whenever analytical methods of differentiation and integration fail or very complicated.

**Mapping of POs & COs:**

POs COs	a	b	c	d	e	F	g	h	i	j	k	l
1	H	H										
2	H	M										
3					M							
4					H						M	
5					M						M	

**L : Low M: Medium H : High**

**TEXT BOOKS:**

1. Kreyszig: “Advanced Engineering Mathematics”, Vol- 1 & II, Wiley, 2013.
2. B.S.Grewal : “Higher Engineering Mathematics” – 42<sup>nd</sup> Edition, Khanna publishers., 2012.

**REFERENCE BOOKS:**

1. M.K.Jain, S.R.K. Iyengar and R.K. Jain: “Numerical methods for Scientific and Engineering computations”, 1985 Edition,Wiley Eastern.
2. Wylie Ray, “Advanced Engineering Mathematics”, 6<sup>th</sup> Edition, McGraw Hill.Inc.
3. Murray R. Spiegel: “Vector Analysis”, Schuam publishing Co.

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## BUILDING MATERIALS AND CONSTRUCTION

Sub Code	: 16CV302	Credits	: 03
Hrs/Week	: 3+0+0+S*	Total Hours	: 39

\* Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.

### Course Learning Objectives:

#### **This Course will enable students to:**

1. Know the types, uses, manufacturing process and properties of building materials like stone, brick and tiles.
2. Understand the properties, types, uses of timber, lime and structural steel.
3. Know the uses and properties of plastics, bitumen and other miscellaneous materials.
4. Discuss various technical terminologies used in Building construction.
5. Identify various components of a building starting from foundation to superstructure.
6. Know the various materials used in different structural components.
7. Identify the construction materials required for the assigned work

### UNIT - I

**BUILDING STONE:** Common building stones and their uses, quarrying, dressing of stones, deterioration and preservation.

**BRICKS:** Classification of bricks, manufacture of bricks, tests on bricks, quality of bricks as per BIS and their uses.

**TILES:** Types of tiles and their uses, tests on roof tiles, classification of Mangalore tiles.

**TIMBER:** Varieties and uses, defects in timber, seasoning of timber, tests for good timber, plywood and its uses, wood boards.

**LIME:** Types, manufacture, mortar and uses.

**OTHER BUILDING MATERIALS:** Properties and uses of - reinforcing steel and structural steel, cast iron and plain carbon steel, glasses, electrical, thermal and sound insulating materials.

**12 Hours**

### UNIT - II

**FOUNDATIONS:** Preliminary investigation of soil, bearing capacity, safe bearing capacity, allowable bearing capacity, determination of bearing capacity by plate load test and by method of dropping weight. classification of foundations, introduction to different type of foundations- masonry footings, isolated footings, combined and strap RCC footings, raft footing. Pile foundations (friction and load bearing piles).

**MASONRY:** definitions of terms used in masonry, bonds in brickwork, English bond, Flemish bond, reinforced brickwork, joints in stone masonry, rubble masonry, coursed rubble masonry, uncoursed rubble masonry, random rubble masonry, ashlar masonry, masonry arches- classification, stability of an arch. Lintels- types and classifications, functions, method of construction. Chejja - functions, method of construction. Canopy – functions, method of construction. Balcony - functions, method of construction.

**13 Hours**

### UNIT - III

**FLOORS, ROOFS AND STAIRS:** Types of flooring (materials and method of laying),

granololitic, mosaic, ceramic, marble, granite, vitrified tile, industrial flooring. flat roof (R.C.C.), sloped roof (R.C.C and tile roof), lean to roof. Wooden truss (king post and queen post trusses), weather proof course for RCC roof. Technical terms of stairs, requirement of a good stair.

**DOORS:** Types - paneled doors, glazed doors, flush doors, collapsible and rolling shutters.

**WINDOWS:** paneled, glazed, bay window, dormer window and corner window.

**PLASTERING:** Purposes, materials, lime mortar, cement mortar. Methods of plastering- stucco plastering, lath plastering.

**PAINTING:** purpose, types, application of paints to new and old surfaces.

Varnishes, distemper and enamels, plastic emulsion, rubber, bitumen and asphalt. **14 Hours**

### **Course Outcomes:**

At the end of the course the student will be able to:

1. Describe the properties, types and applications of common building materials like stone, brick and tiles, timber, lime, structural steel, plastics, bitumen and other miscellaneous materials used in various constructions.
2. Apply the knowledge in different foundation types, their suitability, masonry patterns, arches, lintels, canopy, chajja and balcony in buildings.
3. Describe the different types of structural components like stairs, roof, flooring, doors, windows, plastering and painting works.

### **Mapping of POs & COs:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L				L	L				L	L	M	L		
CO2	M				M	H			L	L	H	L	L	M	M
CO3	L				M	L				L	M	L	M		M

L: Slight (Low) M: Moderate (Medium) H: Substantial (High)

### **TEXT BOOKS:**

1. Rangwala S.G., (2014), "Engineering Materials", Charter Publishing House, Anand, India.
2. Rangwala S.G., (2016), "Building Construction", Charter Publishing House, Anand, India.
3. Sushil Kumar, (2015), "Building Construction", Standard Publication and Distributors, New Delhi.

### **REFERENCE BOOKS:**

1. P.C. Varghese (2015). "Building Materials", PHI Learning Pvt. Ltd Publication.
2. B.C. Punmia, Ashok Kr. Jain, Arun Kr. Jain (2008). "Building Construction". Laxmi Publications Pvt. Limited
3. Mohan Rai and Jai Singh, (2010). "Advanced Building Materials and Construction", CBRI Publications, Roorkee.

### **NPTEL ONLINE SOURCE:**

<http://nptel.ac.in/courses/105102088/>

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**STRENGTH OF MATERIALS**

**Sub Code : 16CV303**  
**Hrs/Week : 3+2+0+0**

**Credits : 04**  
**Total Hours : 52**

**Course Learning Objectives:**

**This Course will enable students to**

1. Understand the behavior of elastic bodies under the action of external forces and establish the relation between elastic moduli
2. Understand the concept of principal stresses, principal planes, normal stress and shear stress on a given plane in a general 2-D stress system, to design thin and thick cylinders subjected to fluid pressure
3. Analyze the determinate beams subjected to various loading and to draw BMD and SFD.
4. Understand the variation in bending and shear stress across various beam sections
5. Understand the behavior of different types of columns subjected to axial load and compute buckling load of long columns and to design a shaft subjected to torque

**UNIT – I**

**Simple Stresses and Strain:** Introduction, Mechanical Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress – Strain Diagram for structural steel and non-ferrous materials

Principle of superposition, St. Venant's Principle, Total elongation of tapering bars of circular and rectangular cross sections. Elongation due to self – weight, Compound bars. Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants, Thermal stresses (excluding thermal stresses in compound bars). **12 Hours**

**UNIT - II**

**Compound stresses and Thin & Thick Cylinders:** Introduction, Stress components on inclined planes, General two dimensional stress system, Principal planes and principal stresses, Mohr's circle of stresses. Thin cylinders subjected to internal pressure, change in length, diameter and volume, Thick cylinders - Lamé's equations (excluding compound cylinders). **10 Hours**

**UNIT – III**

**Bending moment and shear force in beams:** Introduction, Types of beams, loadings and supports, Shear force in beams, Bending moment, Sign convention, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, SFD and BMD for statically determinate beams considering point loads, UDL, UVL and Couple. **8 Hours**

**UNIT – IV**

**Bending stresses and shear stresses in Beams:** Introduction – Bending stress in beams, Simple bending theory, derivation of Bending equations, Modulus of rupture, Section modulus, Flexural rigidity, Expression for horizontal shear stress in beam, Shear stress diagram for rectangular, ‘I’ and ‘T’ section (Fletched beams not included).

**Deflection of beams:** Introduction – Definitions of slope and deflection, Elastic curve, derivation of differential equation, Sign convention, Slope and deflection for statically determinate beams using first principles and Mecaalay’s method subjected to point loads, UDL and Couple. **12 Hours**

**UNIT – V**

**Torsion of circular shafts:** Introduction – Pure torsion-Torsion equations for circular shafts, Torsional rigidity and polar modulus, Power transmitted by shaft of solid and hollow circular sections.

**Columns and Struts:** Introduction – Short and long columns, Euler’s theory for columns with both ends hinged, Effective length, slenderness ratio, Radius of gyration, Euler’s Buckling load for different end conditions, Limitations of Euler’s theory, Rankine’s formula. **10 Hours**

**Course Outcomes:**

At the end of the course the student will be able to

1. Determine the components of stresses and strains
2. Calculate the different stresses acting on a general 2-D stress system
3. Draw the BMD and SFD of any determinate beams
4. Determine the stresses across the beam section
5. Design the structural elements like shaft and to study the behavior long and short columns under loadings

**Mapping of POs & COs :**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M											M	M	
CO2	H		M	H			H								
CO3	H	H		L		M	M				M	M	M	M	
CO4	H	H		M		L							M	M	
CO5	M		M												

Note : L : Low M: Medium H : High

**TEXT BOOKS:**

1. Andrew Pytel , Ferdinand L. Singer,” Strength of Materials” Harper & Row , 4th Edition 1987
2. Rajput.R.K., “Strength of Materials, (Mechanics of Solids)”, S.Chand and Company Ltd., New Delhi, 2014.

**REFERENCE BOOKS :**

1. Ferdinand P. Beer , E. Russell Johnston Jr. , John T. DeWolf, “ Mechanics of Materials”, McGraw-Hill, 7th Edition 2014
2. S. P. Timoshenko , D. H. Young, “Elements of Strength of Materials”, East West Press 5th Edition
3. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, “Mechanics of Materials”,Laxmi Publications (P) Ltd., 2016.
4. S S Bhavikatti, ‘Strength of materials’, Vikas Publication, 4<sup>th</sup> edition 2013

**E Books / NPTEL**

1. <http://nptel.ac.in/syllabus/112107147/>
2. <https://ocw.mit.edu/courses/mechanical-engineering/2-001-mechanics-materials-i-fall-2006/lecture-notes/>
3. <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv047-Page1.htm>

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**FUNDAMENTALS OF SURVEYING**

**Sub Code : 16CV304**  
**Hrs/Week : 3+0+0+0**

**Credits : 03**  
**Total Hours : 39**

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**Course Learning Objectives:**

**This Course will enable students to**

1. Study the importance of surveying, interpret the Maps and Study the various surveying instruments and their applications.
2. Study the concept of Traversing and determination of Closing error and Study the booking of levels using HI and Rise & Fall method.
3. Study the concept of Contouring and calculation of Areas and Volumes.

**UNIT – I**

**Introduction:** Definition of surveying, Objectives and importance of surveying. Primary divisions of surveying, Classification of surveys. Surveying measurements and errors, types of errors, precision and accuracy.

**Map Study**

Maps, classification of maps, map scale, conventional symbols, topographic maps, map layout, Map numbering systems.

### **Measurement of Distances**

Distance, 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.

### **Compass Measurements**

Basic definitions, Meridians, Bearings, Magnetic and True Bearings, Compass, Prismatic and Surveyor's compass, Temporary adjustments.

### **Leveling Instruments**

Basic terms and definitions, Dumpy level, Auto level, Digital and Laser levels.

### **Theodolite**

Vernier Theodolite, Fundamental axes, Temporary adjustments, Measurement of horizontal and vertical angles. Electronic Theodolite.

**15 Hours**

## **UNIT - II**

### **Traverse Survey**

Traverse, types, procedures, Control establishment. Latitudes and Departures, Checks for Closed Traverse and Determination of Closing Error.

### **Computation of Closing Errors**

Local attraction, Determination & Corrections, Dip & Declination. Bowditch's Graphical method of adjustment of Closed Traverse, Bowditch's rule and Transit rule.

### **Computation of Levels**

Booking and Reduction of levels, Plane of Collimation and Rise-Fall methods, Curvature and refraction. Differential leveling, Profile leveling, Trigonometric leveling (Heights and Distances - Single Plane and Double Plane Method)

**15 Hours**

## **UNIT - III**

### **Contours**

Contours, characteristics and uses.

**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, volume from Contour Maps. **9 Hours**

**Course Outcomes:**

At the end of the course the student will be able to

1. Describe the Basic Principles of surveying and read / interpret the maps needed for the site selection, development and design of various Civil Engineering projects and Interpret the various Angle, Direction and leveling instruments.
2. Apply the correction in a traverse due to local attraction and closing error also determine the elevations and profile of the ground.
3. Draw contours and compute the areas, volumes using different methods.

**Mapping of POs & COs :**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H		M	L	M								M	L	M
CO2	M				M								H	L	M
CO3	L	M		L										L	

Note : **L : Low M: Medium H : High**

**TEXT BOOK:**

1. B.C. Punmia, "Surveying Vol.1", Laxmi Publications Pvt. Ltd., New Delhi. – 2014.

**REFERENCE BOOKS:**

1. Alak De, "Plane Surveying", S. Chand and Co. ltd. New Delhi. – 2009.
2. S.K. Roy, "Fundamentals of Surveying", Prentice Hall of India New Delhi - 2009.
3. James M. Anderson, Edward M. Mikhail, "Introduction to Surveying" Mc Graw Hill Book Company, NY. – 2009.
4. Manoj K Arora and R.C. Badjatia, "Geomatics Engineering" Nem Chand and Bros. Roorkee – 2011.
5. S.K. Duggal, "Surveying Vol. 1", Tata McGraw Hill Publishing Co. Ltd. New Delhi – 2009
6. K.R. Arora, "Surveying (Vol. 1, 2, 3)" Standard Book House, New Delhi. – 2011.

**NPTEL SOURCE:** <http://nptel.ac.in/courses/105104101/>

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## FLUID MECHANICS

Sub Code : 16CV305

Credits : 04

Hrs/Week : 4+0+0+0

Total Hours : 52

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### Course Learning Objectives:

#### **This Course will enable students to**

1. Understand the basic properties of fluids with their SI units, types of fluids.
2. Understand problems related to fluid pressure measurements and hydrostatics.
3. Understand the procedure to find the velocity and acceleration of fluid motion.
4. Understand the various forces acting in a fluid motion and flow mechanism in pipes along with various losses
5. Know the various flow measuring devices

### UNIT – I

#### **INTRODUCTION**

Scope and Importance of the subject, Definition of fluid, Distinction between solids & fluids, liquid & gas, fluid continuum.

#### **FLUID PROPERTIES AND CLASSIFICATION OF FLUIDS**

Definitions: Mass density, Specific Volume, Specific Weight, Relative density, units and dimensions, Viscosity, Newton's law of viscosity, Newtonian and Non-Newtonian Fluids, Ideal and Real fluids, Compressibility, Vapour pressure, Surface tension, Equation for stability of bubble, Capillarity.

**8 Hours**

### UNIT – II

#### **FLUID PRESSURE AND ITS MEASUREMENT**

Definition of pressure, Units and dimensions, Pressure at a point, Pascal's law, Hydrostatic pressure law, Absolute and Gauge pressure, Measurement of pressure, Simple & Differential manometers, Mechanical pressure gauges.

#### **HYDROSTATICS**

Definition of total pressure, Center of pressure, Centroid, centroidal depth, depth of center of pressure, Equation for hydrostatic force and depth of center of pressure for plane surfaces (vertical and inclined), Hydrostatic force on curved submerged surfaces, concept of pressure diagram, Related practical problems.

**12 Hours**

### UNIT - III

#### **KINEMATICS OF FLUIDS**

Description of fluid flow, Lagrangian and Eulerian approaches. Classification of flow, steady & unsteady, Uniform and non-uniform, Definition of path line, Streamline, Streak line, Stream tube, One, Two, Three dimensional flows, Rotational and irrotational flow, Acceleration of flow, Derivation of continuity equation in differential form, Definition of velocity potential, Stream functions, Stream line, Equipotential line, Relation between velocity potential and stream function, Laplace equation, Related problems.

**8 Hours**

**UNIT - IV****DYNAMICS OF FLUID FLOW**

Concept of Inertia force and other forces causing motion, Derivation of Euler's equation and Bernoulli's equation with assumptions and limitations, Modification of Bernoulli's equation, Application of Bernoulli's equation - Pitot tube, Venturimeter, Momentum equation.

**FLOW THROUGH PIPES**

Flow through pipes, Reynolds number, Classification of flow, Definition of hydraulic gradient line, Energy gradient line, Major and minor losses in pipe flow, Equation for head loss due to friction (Darcy-Weishbach equation), Friction factor for commercial pipes, Minor losses (types), Equation for head loss due to sudden expansion. Pipes in series, Parallel and equivalent pipe, Related problems. **12 Hours**

**UNIT - V****FLOW MEASUREMENTS**

Flow through Orifices; classification, Hydraulic co-efficients of an Orifice and relationship between them, Submerged and large rectangular Orifices, Flow through mouth pieces, Classification, Equation for discharge and pressure head for an external cylindrical mouth piece.

Flow over notches, classification, Equation for discharge over rectangular, trapezoidal, V-notch, Cippoletti notch, Flow over broad crested weirs, Submerged weirs, Types of Nappe, Ventilation of weirs. **12 Hours**

**Course Outcomes:**

At the end of the course the student should be able to

1. Solve problems related to properties of fluids
2. Analyse problems of fluid pressure measurements and practical problems on hydrostatics
3. Determine the velocity and acceleration of fluid motion
4. Analyse problems on finding the discharge in pipes and channels and compute various losses in pipes
5. Compute the discharge in flow measuring devices like notches, weirs, and orifice and mouthpiece.

**Course Articulation Matrix :**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L	L										L		
CO2	M	M	L										M		
CO3	M	L	L										L		
CO4	M	M	M										M		
CO5	M	H	M										M		

Note : L : Low M: Medium H : High

**TEXT BOOKS:**

1. P.N.Modi &S.N. Seth., “Hydraulics & Fluid Mechanics”, Standard Book House, New Delhi,19<sup>th</sup> edition,2014.
2. R. K. Bansal., “Text Book on Fluid mechanics & Hydraulic Machines”, Laxmi publications. 9<sup>th</sup> edition,2014.

**REFERENCE BOOKS:**

1. A.K. Jain., “Fluid Mechanics”, Khanna Publishers, New Delhi. 8<sup>th</sup> edition,1995.
2. S. Ramamrutham., “*Hydraulics, Fluid Mechanics and Fluid Machines*”. Dhanpat Rai Publishing Company (P) Limited, 9<sup>th</sup> edition,2009.
3. H. M. Raghunath., “Fluid Mechanics & Machinery in SI Units”, CBS Publishers.1999
4. John F. Douglas et al, “Fluid Mechanics”, Pearson Education India, 2004.

**NPTEL ONLINE SOURCE:**

<http://nptel.ac.in/courses/105103095/>

<http://nptel.ac.in/courses/112105218/>

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**APPLIED ENGINEERING GEOLOGY**

**Sub Code : 16CV306**

**Hrs/Week : 3+0+0+0**

**Credits : 03**

**Total Hours : 42**

**Course Learning Objectives :**

1. This course aims to provide a general understanding of the significance of Earth sciences especially geology in the field of civil engineering practices.
2. This course helps to develop understanding the earth, appreciate its structure and composition, appraise the forces and process operating on it, evaluate the geological structures formed and appraise the natural phenomena observed around us.
3. This course will help the students to identify, differentiate, distinguish, describe and assess the natural resources such as minerals, rocks, soil, water, etc.,
4. This course aims to equip the students with geological knowledge to deal with engineering geological problems coming under Civil Engineering practices
5. This course intends to prepare the students into better and responsible civil engineers to face the challenges of the present world.

**UNIT - I**

<b>Physical Geology &amp; Structural Geology:</b>	<b>16 Hours</b>
<b>Chapter 1: Geology</b> and its importance in Civil Engineering practices; Parts of the Earth- Internal Structure and its Composition.	2

<b>Chapter 2: Weathering-</b> agents, types and engineering significance, influence of climate and lithology on weathering.	1
<b>Chapter 3: Soil-</b> Soil Profile, Geological classification, soil erosion and its control.	1
<b>Chapter 4: Rivers-</b> Drainage pattern, drainage basin, concept of water shed, geological work of rivers, major erosional and depositional land forms, engineering significance	2
<b>Chapter 5: Ground water-</b> source, occurrence, zones, aquifers- types and properties; Ground water investigation- Selection of Well sites, geological, hydrological and geophysical methods (electrical resistivity method).	3
<b>Chapter 6: Forces, stress, strain-</b> Definition and description	1
<b>Chapter 7: Attitude of beds,</b> Clinometer compass, Outcrops, Escarpments, Outlier and Inlier.	1
<b>Chapter 8: Folds, Faults, Joints and Unconformities-</b> definition, causes, parts, classification, recognition and engineering importance.	5

## UNIT - II

<b>Materials of the Earth:</b>	<b>16 Hours</b>
<b>Chapter 9: Minerals and Rocks-</b> rock forming minerals and economic minerals; physical properties of Minerals.	2
<b>Chapter 10: Rock forming minerals and economic minerals-</b> Classification, chemical composition, general characteristics, properties and uses of common rock forming minerals- Quartz group, Feldspars, Pyroxenes, Amphiboles, Micas, Carbonates, Olivine, Asbestos, Garnet, Talc, Gypsum, magnetite and Kaolinite; economic minerals and their uses.	3
<b>Chapter 11: Rocks-</b> definition, threefold division of rocks, Rock cycle, distinguishing features of igneous, sedimentary and metamorphic rocks; Characteristics and identification factors of rocks- textures and structures.	3
<b>Chapter 12: Igneous rocks-</b> forms, textures and structures, classification, Tabular classification; varieties- Granite, Gabbro, Dunite, Dolerite, Pegmatite and Basalt, their engineering properties and uses.	4
<b>Chapter 13: Sedimentary rocks-</b> classification, textures and structures, varieties- Sandstone, Limestone, Shale, Breccias, Conglomerate and Laterite, their engineering importance and uses.	2
<b>Chapter 14: Metamorphic Rocks-</b> Metamorphism, process, agents, types, textures and structures; varieties- Gneiss, Quartzite, Marble, Slate, Phyllite, Schist, their engineering importance and uses.	2

## UNIT - III

<b>Engineering Geology:</b>	<b>08 Hours</b>
<b>Chapter 15: Earthquakes-</b> Causes and effects, Seismographs, seismic resistant structures and engineering considerations.	3
<b>Chapter 16: Geospatial Technology:</b> - basic concepts of Remote Sensing (RS), Geographic Information System (GIS) & GPS, their application in Civil Engineering.	2

<b>Chapter 17: Engineering Geology in Dams and Reservoirs</b>	1
<b>Chapter 18: Engineering geology in Tunneling practices.</b>	1
<b>Chapter 19: Mass movements- causes, classification and control.</b>	1

**Course Outcomes:**

At the end of the course, upon successful completion, each student will be able to:

1. **Define, Describe, Identify, Analyze, Explain and Appraise** the significance of Geology, the structure and composition of the Earth, the geological structures formed and the forces and processes operating on it.
2. **Identify, Differentiate, Distinguish, Describe and Assess** the earth materials and natural resources such as minerals, rocks, soil, water, etc.
3. **Identify, Analyze, Interpret, Evaluate and Solve** the geological problems coming under Civil Engineering practices

**Mapping of POs & COs :**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H						L				M				
CO2	L	L					L				H				
CO3	H	H				H	H				M		L		

Note : L: Slight (Low) M: Moderate (Medium) H: Substantial (High)

**TEXT BOOKS:**

1. Singh, Parbin (1994), "*Engineering and General Geology*", 6<sup>th</sup> ed., Katson Publishing House, Ludhiana
2. Gokhale, K.V.G.K. (2010), "*Principles of Engineering Geology*", BS Publications, Hyderabad

**REFERENCE BOOKS:**

1. Mukherjee, P.K. (1994), "*Text Book of Geology*", World Press Pvt. Ltd., Calcutta
2. Legget, Robert F. & Hatheway, Allen W. (1988), "*Geology and Engineering*", 3<sup>rd</sup> ed., Mc. Graw Hill Book Company, Singapore
3. Read, H.H. (1984), "*Rutley's Elements of Mineralogy*", 26<sup>th</sup> ed., CBS, New Delhi
4. Reddy, D.V. (2010), "*Engineering Geology for Civil Engineers*", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
5. Maruthesh Reddy (2008), "*Text Book of Applied Engineering Geology*", New Age International Pvt. Ltd. Publishers, New Delhi

**Additional Reference Books:**

1. Billings, Marland P. (1987), "*Structural Geology*", 3<sup>rd</sup> ed., PHI, Delhi
2. Blyth, F.G.H & De Freitas M.H. (1984), "*A Geology for Engineers*", 7th ed. ELBS, Delhi

3. Dana, E.S & Ford, W.E., (1985), “A Text Book of Mineralogy”, WEL, Delhi
4. Holmes, Arthur (1966), “Principles of Physical Geology”, ELBS, London
5. Johnson, Robert. B & De Graff V. Jerome (1989), “Principles of Engineering Geology And Geotechnics”, Mc Graw Hill Book co.. London
6. Karanth, K.R. (1992), “Groundwater Assessment, Development & Management”, CBS, Delhi
7. Krynine, Dimitri. P & Judd, William. R (1957), “Principles of Engineering Geology”, Tata McGraw Hill Publ. Co., New Delhi
8. Pichamuthu, C.S., (1967), “Physical Geography of India”, 1989 ed., NBT, India
9. Robinson, E.S (1982), “Basic Physical Geology”, John wiley, New York
10. Todd, D.K (1980), “Ground Water Hydrology”, John Wiley, New York
11. Tyrrell, G.W (1980), “Igneous Petrology”, WEL, Delhi

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## BASIC MATERIALS TESTING LAB

**Sub Code : 16CV307**

**Credits : 02**

**Hrs/Week : 0+0+3+0**

**Total Hours : 39**

### Course Learning Objectives:

**This Course will enable students to**

1. Understand the mechanical properties of materials and its characteristics.
2. Analyze and to conduct the various mechanical tests.
3. Determine the properties of building materials.

Sl No.	List of the Experiments	No. of Hours
<b>Major Experiments</b>		
1	Tension test on mild steel and cast iron specimens.	03
2	Compression test on mild steel, cast iron and wood specimens.	06
3	Torsion test on mild steel circular sections.	03
4	Bending Test on Wood specimens under two point loading	03
<b>Minor experiments</b>		
5	Shear Test on Mild steel (single shear & double shear)	03
6	Impact test on Mild Steel (Charpy & Izod)	03
7	Hardness tests on ferrous and non-ferrous metals – Brinell’s, Rockwell and Vicker’s	03
8	Tests on Fine aggregates – Moisture content, Specific gravity, Bulk density, Sieve analysis and Bulking	09
9	Tests on Coarse aggregates – Specific gravity and Sieve analysis	03
10	Test on Bricks and Tiles (Demonstration Tests)	03

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

**Course Outcomes:**

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

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

**Mapping of POs & COs:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M			L					M				H	L	
CO2	M								M		L		H	L	
CO3				L		L		H	M				H		H

Note : L: Slight (Low) M: Moderate (Medium) H: Substantial (High)

**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.

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## SURVEYING PRACTICE -I

**Sub Code : 16CV308**  
**Hrs/Week : 0+0+3+0**

**Credits : 02**  
**Total Hours : 39**

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### Course Learning Objectives:

**This Course will enable students to**

1. Study the various surveying instruments and their applications in the field.
2. Learn the use of Auto level and booking of levels.
3. Know the contours and preparation of contour maps.
4. Study the trigonometric leveling.
5. Compute and analyze the survey data.

#### **Exercise – 1**

Study of Topographic Maps and preparation of a chart of conventional symbols.

#### **Exercise – 2**

Measurement of bearings / directions using prismatic compass.

#### **Exercise – 3**

Determination of reduced levels of points using dumpy level.

#### **Exercise – 4**

Determination of Reduced levels of points using Auto Level.

#### **Exercise – 5**

To conduct Profile Leveling and Cross Sectioning, plotting

#### **Exercise – 6**

Study of parts of a Vernier Theodolite / Electronic Theodolite and practice of taking readings.

#### **Exercise – 7**

Measurement of Horizontal angle by Repetition and Re-iteration methods.

#### **Exercise – 8**

Measurement of Vertical angles using Theodolite.

#### **Exercise – 9**

To determine the Elevation of the Top of a Tower / Building using Single Plane Method.

#### **Exercise – 10**

To determine the Elevation of the top of a Tower / Building using Double Plane Method.

**Course Outcomes:**

At the end of the course the student will be able to

1. Handle the surveying instruments appropriately in the field.
2. Determine reduced levels of different points in the field.
3. Prepare and draw contour maps.
4. Determine the heights of the objects.
5. Accurate computations and analysis to be a professional surveyor.

**Mapping of POs & COs :**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M		L	M	L								M	L	
CO2	H		M										M	L	M
CO3	L												L	L	
CO4	M				M								H		M
CO5	L	M		L										L	

Note : L: Slight (Low) M: Moderate (Medium) H: Substantial (High)

**TEXT BOOK:**

1. B.C. Punmia, “Surveying Vol.1”, Laxmi Publications pvt. Ltd., New Delhi. – 2014.

**REFERENCE BOOKS:**

1. Alak De, “Plane Surveying”, S. Chand and Co. Ltd. New Delhi. – 2009.
  2. S.K. Roy, “Fundamentals of Surveying”, Prentice Hall of India New Delhi.-2009.
  3. James M. Anderson, Edward M. Mikhail, “Introduction to Surveying” Mc Graw Hill Book Company, NY. – 2009.
  4. Manoj K Arora and R.C. Badjatia, “Geomatics Engineering” Nem Chand and Bros. Roorkee – 2011.
  5. S.K. Duggal, “Surveying Vol. 1”, Tata McGraw Hill Publishing Co. Ltd. New Delhi - 2009
  6. K.R. Arora, “Surveying (Vol. 1, 2, 3)” Standard Book House, New Delhi. – 2011.
- .....

**ENGINEERING MATHEMATICS - IV****Sub Code : 16CV401****Credits : 04****Hrs/Week : 4+0+0+0****Total Hours : 52****Course Learning Objectives:****This Course will enable students to**

1. **Solve** problems using Bayes' theorem and find marginal distribution and variance of two dimensional random variable.
2. **State** the importance of probability distribution and derive the mean and variance of Binomial, Poisson and normal distributions.
3. **Make use of sampling techniques** to solve life related problems.
4. **Solve** first order initial value problems using methods like Taylor's series, Runge-Kutta etc.
5. **Classify** second order partial differential equations and apply suitable techniques to solve such problems.

**UNIT – I****INTRODUCTION TO PROBABILITY:**

Finite sample space, conditional probability and independence. Bayes' theorem (overview). One dimensional random variable- discrete and continuous random variable, probability distribution function and cumulative distribution function. Mean and variance. Two and higher dimensional random variables, joint probability distributions, marginal distributions, covariance and correlation coefficient. **12 Hours**

**UNIT – II****PROBABILITY DISTRIBUTIONS:**

Binomial, Poisson, normal and exponential distributions. Curve fitting-curve fitting by the method of least squares:  $y=a+bx$ ,  $y=a+bx+cx^2$ . Correlation and regression. **10 Hours**

**UNIT - III****SAMPLING THEORY:**

Random samples, sampling distributions, t & F distributions. The central limit theorem and its applications. **10 Hours**

**UNIT - IV****NUMERICAL METHODS:**

Roots of algebraic and transcendental equations, Numerical solution of first order ordinary differential equations: Taylor's series Method, Modified Euler's method, Runge –Kutta 4<sup>th</sup> order Method. Milne's predictor-corrector methods. **10 Hours**

**UNIT – V****NUMERICAL METHODS-CONTD.:**

Finite difference expressions for first and second order derivatives (ordinary and partial). Classification of second order partial differential equations. Numerical solutions of Laplace

and Poisson equations by standard five point formulae and heat and wave equations by explicit method.

**10 Hours**

**Course Outcomes:**

At the end of the course the student will be able to

1. **Classify** and **appreciate** probabilistic models for situations involving chance effect and appreciate the concepts of probability density function, cumulative density function, random variables and its properties.
2. **Illustrate** some of the important distributions of discrete random variables and continuous random variables.
3. **Apply** the concepts of sampling in real life situations.
4. **Find** the roots of algebraic and transcendental equations by finding a small interval in which the root lies. Solve first order initial value problems by single step as well as multi step methods.
5. **Solve** second order partial differential equations using various numerical techniques.

**Mapping of POs & COs:**

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H											
2	H				L							
3					M							
4					H						M	
5					M						M	

**L : Low M: Medium H : High**

**TEXT BOOKS:**

1. P.L. Meyer, “Introduction of probability and Statistical applications”, second edition, 1975, American Publishing Co.
2. B.S.Grewal, “Higher Engineering Mathematics” – 36<sup>th</sup> edition.
3. S.S.Sastry, “Introductory methods of Numerical Analysis”-2<sup>nd</sup> edition,1990,Prentice Hall.

**REFERENCE BOOKS:**

1. Hogg and Craig, “Introduction of Mathematical Statistics”, 4<sup>th</sup> edition ,1975, McMillan.
2. Wylie Ray, “Advanced Engineering Mathematics”, 6<sup>th</sup> edition, McGrow Hill Inc.
3. M.K.Jain, S.R.K. Iyengar and R.K. Jain, “Numerical methods for Scientific and Engineering computations”, edition,1985, Wiley Eastern.

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## STRUCTURAL ANALYSIS – I

Sub Code : 16CV402

Credits : 04

Hrs/Week : 3+2+0+0

Total Hours : 26+16

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### Course Learning Objectives:

This Course will enable students to

1. To analyze the components of truss structure by using method of section and method of joint.
2. To determine the deflection of determinate structures by using moment area and conjugate beam method.
3. To know the basic concepts of strain energy and able to assess the deflection of structures.
4. To determine the end moments of indeterminate structure by using clapeyron's theorem.
5. To determine the normal thrust, radial shear, horizontal reaction and bending moment in the arches. Analysis of cables under point loads and UDL, to find the length of cables whose supports at same level and at different level.

### UNIT – I

#### STRUCTURAL SYSTEMS

Forms of structures, Conditions of equilibrium, degree of Freedom. Linear and nonlinear structures. One, two & three dimensional structural systems, Determinate and indeterminate structures- Static and Kinematics Indeterminacy.

#### PLANE TRUSSES

Introduction, Assumptions in the analysis of plane trusses. Analysis by the method of joints.

**10 Hours**

### UNIT – II

#### DEFLECTION OF BEAMS

Moment area method, conjugate beam method

**8 Hours**

### UNIT – III

#### STRAIN ENERGY

Strain Energy concept. Complementary strain energy, Strain energy due to axial load, bending and shear. Theorem of minimum potential energy. Law of conservation of energy, Principle of virtual work, the first theorem of Castiglione-problems on beams, frames and trusses, Betti's Law, Clarke-Maxwell's theorem of reciprocal deflection. Deflection of beam and trusses by strain energy and unit load methods.

**12 Hours**

**UNIT - IV****ANALYSIS OF BEAMS**

Consistent deformation method - Propped cantilevers and fixed beams, second theorem of Castiglione-(Minimum strain energy method) – Propped cantilever and fixed beams. Clapeyron's theorem of three moment- continuous beam and fixed beams. **10 Hours**

**UNIT – V****ARCHES AND CABLES**

Three hinged circular arches and parabolic arches with supports at same levels and different levels, Determination of thrust, shear and bending moment, Analysis of cables under point loads and UDL, Length of cables (Support at same levels and at different levels). Two hinged parabolic arch, two hinged circular arch. **14 Hours**

**Course Outcomes:**

At the end of the course the student will be able to

1. To know basics of structure, able to find unknown reaction and forces by using conditions of equilibrium.
2. By using the concepts of moment area method and conjugate beam method able to determine the deflection at particular points in determinate structure.
3. Develop strain energy expression for particular structure, and able to determine the probable deflection at required points.
4. Analyze the continuous beams by using three moment equation and able to determine moments at supports.
5. Able to determine the support reaction, normal thrust, radial shear and bending moment in the arches. To find length of cables whose supports at different level.

**Mapping of POs & COs:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M			L			L						M	
CO2	H	M											L		
CO3	M					M								L	
CO4	M				M								M		
CO5	M					L							L		

**L:** Slight (Low)    **M:** Moderate (Medium)    **H:** Substantial (High)

**TEXT BOOKS:**

1. Punmia B.C, Ashok Kumar Jain, Arun Kumar Jain, “Strength of materials and Theory of Structures”, Volume I & Volume II, Laxmi Publications (P) Ltd.,2015
2. Shah H.J and Junnarkar S.B., “Mechanics of Structures”, Volume I & II, Charotar Publications, New Delhi, 2014

**REFERENCE BOOKS:**

1. Reddy S.C, “Basic Structural Analysis”, Tata McGraw Hill, New Delhi, March 2014
2. Ramamrutham S, “Theory of Structures”, Dhanpal Rai & Sons, New Delhi, 2015
3. Vazirani V.N. and M.M.Ratwani, “Analysis of Structures”, Khanna Publications, New Delhi, 2014
4. Thandava Murthy, (2005) “Analysis of Structural”, Oxford University press.

**NPTTEL ONLINE SOURCE:** <http://nptel.ac.in/courses/105101085/>

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**HIGHER SURVEYING**

**Sub Code : 16CV403**  
**Hrs/Week : 3+0+0+0**

**Credits : 03**  
**Total Hours : 39**

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**Course Learning Objectives:**

**This Course will enable students:**

1. Learn the errors and distribution of errors using various methods in surveying and Study the route construction survey methods.
2. Learn the usage of modern surveying instrument like Total Station and Study the setting out works in surveying.
3. Study the usage of photogrammetry in surveying.

**UNIT – I**

**Triangulation & Trilateration**

Introduction to Triangulation, Trilateration. Triangulation measurements and computations, Triangulation Adjustment, Station and Figure Adjustments.

**Theory of Errors**

Errors, Accuracy, Precision, Systematic and Random errors, Law of Weights, Root Mean Square error, Observation Equations, Weighted observations, Principles of least squares, Normal Equations, Method of Differences, Method of Correlates (Simple Numerical Problems).

**Route and Construction Surveys**

General requirements and specifications for Engineering projects survey, Reconnaissance, Preliminary and Location surveys for Highways. **15 Hours**

**UNIT - II**

**Curve Fitting**

Introduction to Curves, Transition curves and Vertical curves, Elements of Simple Circular Curve, Curves for Horizontal and Vertical alignment, Setting out a curve by Rankine’s Deflection Angle. (No derivations and Simple Numerical Problems).

**Total Station Survey**

Introduction, Basic Concepts, Total Station, Components, Adjustments, Use of Total Station, Measurement of distance using Phase Difference, Errors, Accuracy, Effect of Atmospheric conditions. **15 Hours**

**UNIT – III**

**Setting Out Works**

Setting out Buildings, Tunnels, Bridges, Culverts, Sewers, Pipelines. Surface and Underground surveys.

**Global Positioning Systems**

Introduction, Segments of GPS, working principle, Hand held GPS and Differential GPS, Methods of GPS surveying, Errors and Accuracy, Applications of GPS.

**Aerial Photogrammetry**

Definitions, Advantages, Applications. Geometry of Aerial Photographs - Scale of Vertical Photographs, Relief Displacement, Flight planning. **9 Hours**

**Course Outcomes:**

At the end of the course the student will be able to

1. The students are able to develop the knowledge on errors and distribution of errors in surveying and Locate the shortest routes, suitable curves, alignment of highways.
2. To make the students familiar with the total station and its application in the field and should able to describe GPS and its applications; Also students will mark the centerline of various civil engineering structures.
3. Explain the applications of Photogrammetry.

**Mapping of POs & COs :**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M		M										L	H	
CO2					H									L	M
CO3	M				M										

**Note: (L=40%, M=60%, H=100%)**



**TEXT BOOK:**

1. B.C. Punmia, Ashok K. Jain, Arun K. Jain, “Higher Surveying”, Laxmi Publications Pvt. Ltd. New Delhi. – 2014 (All chapters except Chapter 4)

**REFERENCE BOOKS:**

1. S. K. Roy, “Fundamentals of Surveying”, Prentice Hall of India New Delhi.-2009 (Chapter4)
2. P. R. Wolf, “Elements of Photogrammetry”, McGraw Hill Publications - 2009
3. Satheesh Gopi, “Global Positioning System - Principles and Applications”, Tata McGraw Hill Publishing Co. Ltd. New Delhi.- 2005
4. B. C. Punmia, “Surveying Vol.2”, Laxmi Publications Pvt. Ltd., New Delhi. - 2008
5. K.R. Arora, “Surveying (Vol. 1, 2, 3)” Standard Book House, New Delhi. – 2011
6. Manoj K Arora and R.C. Badjatia, “Geomatics Engineering” Nem Chand and Bros. Roorkee – 2011.

**NPTEL SOURCE:** <http://nptel.ac.in/courses/105104100/>  
<http://nptel.ac.in/courses/105107157/>  
<http://nptel.ac.in/courses/105107158/>

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**HYDRAULICS AND HYDRAULIC MACHINES**

**Sub Code : 16CV404**

**Credits : 04**

**Hrs/Week: 4+0+0+0**

**Total Hours : 52**

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**Course Learning Objectives:**

**This Course will enable students to**

1. Explain open channel and its classification, evaluate uniform flow in channels, decide on the most economical channel sections, estimate specific energy of flow and explain hydraulic jump with the relevant equations
2. Discuss dimensional analysis and model studies
3. Demonstrate water hammer in pipes and analyze force of jet on stationary and moving flat and curved vanes
4. Classify turbines and their working
5. Explain centrifugal pumps and their working and other commercial pumps

**UNIT - I**

**FLOW IN OPEN CHANNELS**

Definition of open channels, classification, difference between pipe flow & open channel flow, types of flow, Geometric properties of open channels, Uniform flow in open channels, Chezy’s and Manning’s formulae, Most economical open channels. Derivation of conditions

for most economical rectangular, triangular and trapezoidal sections, Specific energy, specific energy curve, conditions for minimum specific energy and maximum discharge, Critical flow in rectangular channels, Hydraulic jump in rectangular channels, Froude number concept, Venturi flume and standing wave flume. **12 Hours**

## UNIT – II

### **DIMENSIONAL ANALYSIS & MODEL SIMILITUDE**

Introduction to Dimensional Analysis , units & dimensions, Dimensional Homogeneity, Methods of Analysis-Raleigh's & Buckingham's method, Model Studies, Similitude, Dimensionless parameters, Types of models, Froude's and Reynolds model laws, Distorted Models, Scale effects. **8 Hours**

## UNIT – III

### **WATER HAMMER IN PIPES**

Definition, Equations for pressure rise due to gradual and sudden closure of valves in rigid & elastic pipes, Surge tanks, Functions & types.

### **IMPACT OF JET ON VANES**

Introduction, Impulse – momentum equation and its applications, Force exerted by a jet on fixed and moving vanes, Force exerted by a jet on a series of flat vanes and curved vanes, Concept of velocity triangles, Equation for work done & efficiency. **12 Hours**

## UNIT- IV

### **HYDRAULIC TURBINES**

Introduction, Types and classifications, Pelton Wheel and Kaplan Turbine- Theory, Equation for work done and efficiency, Design parameters, Draft tubes- types, Efficiency, Cavitation and governing of turbines, Specific speed of a turbine, Unit quantities of a turbine, Characteristics curves of a turbine, General layout of an hydroelectric plant. **12 Hours**

## UNIT – V

### **CENTRIFUGAL PUMPS AND OTHER COMMERCIAL PUMPS**

Definition of pump, classification, Description & general principle of working, priming, Work done & efficiencies of a centrifugal pump, Minimum starting speed, Cavitation in centrifugal pumps, Multistage pumps, Description and working principle of jet pump and submersible pump. **8 Hours**

### **Course Outcomes:**

At the end of the course the student will be able to

1. Acquire knowledge of energy and uniform flow in open channels and hydraulic jump
2. Develop dimensionless parameters which can explain fluid flow problems and to predict the behaviour of prototypes by model studies
3. Explain the concept of water hammer in pipes, force of a jet striking various types of vanes

4. Analyze the performance of Pelton Turbine and Kaplan Turbine
5. Explain the principle of centrifugal pumps and to compute its minimum starting speed

**Mapping of POs & COs :**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	M	H			L	M						M		
CO2	M	M	M										M		
CO3	M	M	M											L	
CO4	L	M	M			L	M						M		
CO5	L	M	M			L	M							M	

Note: L: Slight (Low) M: Moderate (Medium) H: Substantial (High)

**TEXT BOOKS:**

1. P. N. Modi & S.N. Seth., “Hydraulics & Fluid Mechanics”, Standard Book House, New Delhi, 19<sup>th</sup> edition, 2014.
2. R. K. Bansal., “Text Book on Fluid mechanics & Hydraulic Machines”, Laxmi Publications. 9<sup>th</sup> edition, 2014.

**REFERENCE BOOKS:**

1. A.K. Jain, “Fluid Mechanics”, Khanna Publishers, New Delhi, 8<sup>th</sup> edition, 1995.
2. K.R. Arora, “Hydraulics & Fluid Mechanics”, Standard Book house, New Delhi, 9<sup>th</sup> edition, 2005.
3. S. Ramamrutham., “Hydraulics, Fluid Mechanics and Fluid Machines”, Dhanpat Rai Publishing Company (P) Limited, 9<sup>th</sup> edition, 2009.
4. H. M. Raghunath, “Fluid Mechanics & Machinery in SI Units”, CBS Publishers, 1999.

**NPTEL ONLINE SOURCE:** <http://nptel.ac.in/courses/105103096/>  
<http://nptel.ac.in/courses/105106114/>

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**CONCRETE TECHNOLOGY****Sub Code : 16CV405****Credits : 03****Hrs/Week : 3+0+0+S\*****Total Hours : 39**

**\* Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.**

**Course Learning Objectives:**

This Course will enable students to:

1. Study the different properties and tests on cement, aggregates for making concrete.
2. Impart the knowledge on workability and its assessment of concrete in fresh state
3. Know properties of hardened concrete, tests, dimensional stability and durability aspects.
4. Study the durability of hardened concrete when subjected to atmospheric and chemical attacks.
5. Study the mix design of cement concrete by BIS method.
6. Know the different properties of LWC, HVFA, HDC and HPC.

**UNIT – 1**

**CONCRETE INGREDIENTS:** Cement- chemical composition and hydration of Portland cement, manufacture of portland-pozzolana cement, types of cement and their uses, cement mortar. Testing of Cement: Field testing, fineness by sieve test and Blaine's air permeability test, normal consistency, setting time and soundness. Quality of mixing water, compressive strength and grades of cement. **Fine aggregate:** grading as per BIS using sieve analysis, specific gravity, bulking, moisture content and deleterious materials. **Coarse aggregate:** Importance of size, shape and texture, grading by sieve analysis, specific gravity, flakiness and elongation index. Crushing, impact and abrasion tests

**FRESH CONCRETE:** Workability- factors affecting workability, measurement of workability-slump and flow tests, compaction factor and Vee-bee consistometer tests. Segregation and bleeding. Steps in the manufacture of concrete: Batching, mixing, transporting, placing, compaction and curing. **Chemical admixtures:** plasticizers, accelerators, retarders and air entraining agents. **Mineral admixtures:** fly ash, silica fumes and rice husk ash.

**13 Hours****UNIT – II**

**HARDENED CONCRETE:** Factors affecting strength: w/c ratio, gel/space ratio and maturity concept. Effect of aggregate properties. Relation between compressive strength and tensile strength, bond strength, modulus of rupture. Accelerated curing, aggregate-cement bond strength. Elasticity: relation between compressive strength and modulus of elasticity. Poissons ratio. Testing of hardened concrete: compressive strength, split tensile strength, flexural strength factors, influencing results of strength tests. Shrinkage: plastic and drying shrinkages, factors affecting shrinkage. Creep - measurement of creep, factors affecting creep and effect of creep.

**DURABILITY:** Definition, significance, permeability. Sulphate attack, chloride attack, carbonation, freezing and thawing. Factors contributing to cracks in concrete: shrinkage cracks, settlement cracks, construction joints, thermal expansion, structural design deficiencies. **13 Hours**

### UNIT - III

**MIX DESIGN:** Factors affecting mix design, concrete mix design by BIS method using IS: 10262-2009.

High volume fly ash concrete, light weight concrete, high density concrete and high performance concrete: materials, properties and applications. **13 Hours**

#### Course Outcomes:

At the end of the course the student will be able to

1. Apply different properties, test on concrete ingredients and fresh concrete. Also to understand the properties, uses, benefits and limitations of admixtures.
2. Understand properties of hardened concrete, dimensional stability, associated tests and durability aspects.
3. Design cement concrete proportions for different grades by BIS method and to understand different properties of LWC, HVFA, HDC and HPC in practice.

#### Mapping of POs & COs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L		H			L	M	H	L	M	M	M	M		M
CO2	M		H			L	M	L	L	M	H	M	H		H
CO3	M		H			L	M	H	M	H	H	H	H	M	M

Note: L: Slight (Low) M: Moderate (Medium) H: Substantial (High)

#### **TEXT BOOKS:**

1. M.S.Shetty, (2014). "Concrete Technology- Theory and Practice", S. Chand and Company, New Delhi.
2. Gambhir. M.L (2013). Concrete Technology: Theory and Practice, Dhanpat Rai and Sons, New Delhi.

#### **REFERENCE BOOKS**

1. Adam M. Neville and J. J. Brooks (2010). "Concrete Technology, Prentice Hall
2. A. R Santhakumar (2012). "Concrete Technology", Oxford University Press India.

#### **NPTEL ONLINE COURSE:**

- <http://nptel.ac.in/courses/105102012/>
- <http://nptel.ac.in/courses/105104030/>

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## BUILDING PLANNING AND DRAWING

Sub Code : 16CV406  
Hrs/Week: 0+0+4+0

Credits : 02  
Total Hours : 52

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### Course Learning Objectives:

#### **This Course will enable students to**

1. Understand the different terminologies and importance of building byelaws used in residential building drawing.
2. Know different notations, symbols and representations used in building drawing and to draw the different views like elevation, section and plan for given line diagram and to represent basic structural detailing.
3. Plan and develop line diagram for the client's requirement.
4. Use concept of connectivity diagram, water supply, sanitary layout in building.
5. Know the application of Autocad in civil engineering drawings.

### **UNIT - I**

Functional design of buildings (Residential, Industrial and Public), positioning of various components of buildings, orientation of buildings, building standards, bye laws, set back distances.

Development of plan, elevation, section and schedule of openings from the given line diagram of two bed room building. **16 Hours**

### **UNIT - II**

Functional designs of building using inter connectivity diagrams: i) Primary health center, ii) Primary school building, iii) College canteen.

For a given single line diagram, preparation of water supply, Sanitary layout. Layout Development.

**Basics of CAD:** Basic commands in Autocad to draw lines and different geometrical shapes, determine angles, areas of geometrical shapes. To draw plan, section, elevation of residential building. **36 Hours**

### Course Outcomes:

1. Apply the different terminologies and building byelaws used to draw building drawing.
2. Apply different notations, symbols and representations used to draw the different views for given line diagram and structural detailing.
3. Development of line diagram to plan the client's requirement.
4. Know the concept of connectivity diagram and thereby plan the line diagram based on requirements. Draw the water supply and sewerage lines for a residential building showing all the check points.
5. Use the application of Autocad to draw civil engineering drawings.

**Course Articulation Matrix:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO1	L				M					L					M
CO2					L					M					
CO3	L				M					M	L				M
CO4					M					M	L				M
CO5					M					M	L				M

L: Slight (Low) 40% M: Moderate (Medium) 60% H: Substantial (High)100%

**TEXT BOOKS:**

1. Shah M.H. and Kale C.M. "Building Drawing" Tata Mc Graw Hill Publishing Co.Ltd, New Delhi, 3<sup>rd</sup> edition 2004.
2. National Building Code, BIS. New Delhi, 2005.

**REFERENCE BOOKS:**

1. Sushil Kumar "Building Construction" Lakshmi Publications, New Delhi. Standard Publishers 2008.
2. Gurucharn Singh, Planning Designing & Scheduling, Standard Publishers Distributors, 5<sup>th</sup> edition, Reprint 2004.
3. Deshpande, Modern ideal home for India, Deshpande Publications, 10th edition, December 1982.
4. Dr. B.P. Verma, Civil Engineering Drawing & Housing, Khanna Publishers, Delhi, edition 11, 2014
5. Balagopal T.S. Prabhu, Building drawing and detailing, Spades Publishers, Calicut 1987

**SCHEME OF EXAMINATION: Semester End Examinations(SEE)**

**Only Manual Drawings to be drawn in SEE.**

1. UNIT 1 is compulsory and one question for 60 marks is to be answered.
2. UNIT 2 consists of four questions and two questions to be answered for 40 marks.

**SCHEME OF EXAMINATION: Continuous Internal Evaluation (CIE)**

1. Manual drawing sheets **20 marks.**
  2. Autocad Evaluation **30 marks.**
- (MSE 20 marks and class performance 10 marks)**

**Total Marks: 50 Marks**

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## SURVEYING PRACTICE II

**Sub Code : 16CV407**  
**Hrs/Week : 0+0+3+0**

**Credits : 02**

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### Course Learning Objectives:

**This Course will enable students to**

1. Study the use and application of Total Station.
2. Learn the measurement of vertical angles using Total Station.
3. Learn the measurement of horizontal angles using Total Station.
4. Learn the measurement of Height of objects using Total Station.
5. Learn the stakeout methods for centre line marking.

#### **Exercise – 1**

Introduction to Total Station, Components, Temporary Adjustments

#### **Exercise – 2**

Horizontal and Sloping Distance measurement using Total Station

#### **Exercise – 3**

Measurement of Horizontal and Vertical angles using Total Station

#### **Exercise – 4**

Orientation of Total Station using compass and Measurement of Magnetic Bearings

#### **Exercise – 5**

Measurement of co-ordinates (N, E, Z) of various points from one instrument position.

#### **Exercise – 6**

Traversing using Total Station (Orientation at the first station by compass and at subsequent stations by back sighting) and Area measurement.

#### **Exercise – 7**

Detailed survey of an area including creation of job file, selecting appropriate point codes, measurement of coordinates, downloading of data and preparation of contour map.

#### **Exercise – 8**

Determination of Height of Buildings / Towers / Power line (remote elevation measurement),  
Determination of Distance between two points (missing line measurement).

#### **Exercise – 9**

Setting out works - Distances, Angles and co-ordinates

#### **Exercise – 10**

Setting out a Simple Circular Curve by Deflection Angles.



**Exercise – 11**

Setting out positions of column centers of a Multistorey Building

**Exercise – 12**

Use of hand held GPS for coordinate measurement

**Exercise – 13**

Demonstration of Mapping Software

**Course Outcomes:**

At the end of the course the student will be able to

1. Use Total station for distance measurements in the field.
2. Use Total station for the measurement of vertical angles in the field.
3. Use Total station for the measurement of horizontal angles in the field.
4. Determine the heights of the objects using total station in the field.
5. Mark the centre line of various civil engineering structures using total station.

**Mapping of POs & COs:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H		L	M	L								M	L	
CO2	M		M										M	L	L
CO3	L												M	L	
CO4	M				H								H		M
CO5	L	M		L										L	

Note : L: Slight (Low) M: Moderate (Medium) H: Substantial (High)

**TEXT BOOK:**

1. B.C. Punmia, “Surveying Vol.1”, Laxmi Publications pvt. Ltd., New Delhi. – 2014.

**REFERENCE BOOKS:**

1. Alak De, “Plane Surveying”, S. Chand and Co. Ltd. New Delhi. – 2009.
2. S.K. Roy, “Fundamentals of Surveying”, Prentice Hall of India New Delhi. - 2009.
3. James M. Anderson, Edward M. Mikhail, “Introduction to Surveying” Mc Graw Hill Book Company, NY. – 2009.
4. Manoj K Arora and R.C. Badjatia, “Geomatics Engineering” Nem Chand and Bros. Roorkee – 2011.
5. S.K. Duggal, “Surveying Vol. 1”, Tata McGraw Hill Publishing Co. Ltd. New Delhi – 2009
6. K.R. Arora, “Surveying (Vol. 1, 2, 3)” Standard Book House, New Delhi. – 2011.

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## APPLIED ENGINEERING GEOLOGY LAB

**Sub Code : 16CV408**

**Credits : 02**

**Hrs/Week : 0+0+3+0**

**Total Hours : 39**

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### **Course Learning Objectives :**

1. This course will help the students to identify, differentiate, distinguish, describe and assess the rocks and minerals for construction which are the fundamental building blocks of civil engineering.
2. This course aims to equip the students with map reading of simple contour maps to geological and structural maps, preparing profile of maps and geological sections, and evolve solution for engineering geological problems in the construction site.
3. This course will equip the students to solve engineering geological problems coming under Civil Engineering practices such as foundation, footing and excavation using geological knowledge and data with simple methods evolved out of outcrop data and bore hole data.

### **ROCKS AND MINERALS**

Minerals & Rocks differentiation; Physical properties of Minerals; Classification of minerals: Silicate and Non-silicate Minerals; Rock forming, Ore minerals and Industrial Minerals; Common Rock forming Minerals and their identification- Quartz and its varieties, Feldspars, Micas, pyroxenes, amphiboles, Carbonates and Olivine, Ore Minerals of- Iron, Copper, Aluminium, Chromium and Manganese; Industrial Minerals: Sulphides & Sulphates, Garnet group, Kaoline & Talc, Corundum and other silicates group.

Rocks: identification and distinguishing properties; 3 fold classification based on Textures & structures: igneous, sedimentary & metamorphic and subgroups; identification of individual rocks: Igneous Rocks- Granite, Syenite, Diorite, Gabbro, Dunite, Porphyries, Dolerite, Pegmatite, Basalt, Rhyolite and Pumice; Sedimentary Rocks: Sandstone, Limestone, Shale, Breccia, Conglomerate and Laterite; Metamorphic Rocks: Gneiss, Quartzite, Marble, Slate, Phyllite, Schists and Charnockite.

### **STRUCTURAL GEOLOGY**

Maps: Types of Maps and SOI Toposheets, Map reading; Contour Maps –profiling, interpretation, Geological maps- without contours, horizontal beds, inclined beds, fold, fault, unconformity, with multi structures, preparation of geological sections of them, and interpretations. Engineering Geological problems analyzed with respect to geology.

In situ Engineering Geological Problems: Width of outcrop and Thickness problems; Dip and Strike Problems; Borehole problems.

### **Course Outcomes :**

At the end of the course, upon successful completion, each student will be able to:

1. **Identify, Describe, Classify, Select, Explain, Compare, Contrast, Justify, Differentiate, Distinguish, Assess and Appraise** the properties and uses of common rock forming minerals, important Ores, economic and industrial minerals **Illustrating** and recording them in a chart and record.
2. **Identify, Describe, Classify, Select, Explain, Compare, Contrast, Justify, Differentiate, Distinguish, Assess and Appraise** the properties and uses of common rocks which are used as building blocks for foundation to masonry, concrete aggregates to road metals and railway ballasts, facing and paving stones to roofing stones, **Illustrating** and recording them in a chart and record.
3. **Calculate, Determine, Estimate and Solve** the problems used to encounter in the field regarding the geological structures underlying the super structure such as the thickness of the beds and the width of outcrops, Dip and strike of the beds, depth of foundation, etc.
4. **Analyze, Interpret, Evaluate and Appraise** the simple contour maps to structural geology laboratory maps, **Deduce** the three dimensional problems illustrating with profile and geological sections of the same and **Interpret** the structural features and **Discuss** the geological problems coming under Civil Engineering practices.

### Mapping of POs & COs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	H	H	M	M						L		H	M	
CO2	H	H	H	M	M						L		H	M	
CO3	H	H	M	L	L						H		H	H	H
CO4	H	H	H	M	H	L	H			M	H		H	H	H

Note : L: Slight (Low) M: Moderate (Medium) H: Substantial (High)

### **TEXT BOOKS :**

1. Satyanarayana Swamy B.S., "Engineering Geology Laboratory Manual", Eurasia Publishing House, New Delhi, (1985)
2. Dana, E.S & Ford, W.E., "A Text Book of Mineralogy", WEL, Delhi. (1985)
3. Goghale, N.W., "Manual of Geological Maps", CBS Publishers, New Delhi, (1987)
4. Reddy, Maruthesh, M.T., "Engineering Geology Practicals", New Age International Pvt. Ltd. Publishers, New Delhi, (2002)

### **REFERENCE BOOKS:**

1. Read, H.H. *Rutley's Elements of Mineralogy*, 26<sup>th</sup> ed., CBS, N. Delhi, (1984)
2. Billings, Marland P, *Structural Geology*, 3<sup>rd</sup> ed., PHI, Delhi, (1987)

3. Mukherjee, P.K. *Text Book of Geology*, World Press Pvt. Ltd., Calcutta, (1994).
4. Singh, Parbin, *Engineering and General Geology*, 8<sup>th</sup> ed., Katson, Publishing House, Ludhiana, (2013).
5. Roy, A.K., *Introduction to the Study of the Geological Maps*, World Press Limited, Kolkatta, (1982).

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### ENHANCING SELF COMPETENCE

<b>Sub Code : 16HU411</b>	<b>Credits : 02</b>
<b>Hrs/Week : 1+0+2+0</b>	<b>Total Hours : 26</b>

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#### Course Learning Objectives:

This Course will enable students to

1. Introspect and learn more about oneself,
2. Learn social behaviour and etiquette,
3. Develop positive attitude and values in life,
4. Learn to be effective in communication and interactive skills; and
5. To educate on writing and presentation skills and also to educate oneself on legal and ethical aspects.

#### UNIT - I

**Self Awareness and Emotional Quotient 4 Hours**

#### UNIT – II

##### **Grooming and Etiquette:**

Personal grooming, hygiene, dressing for different occasions, making small talk, showing respect to women, eye contact, being appreciative, dos and don'ts in a conversation; Time Management. **4 Hours**

#### UNIT – III

##### **Attitude Development:**

Building self worth, confidence, developing empathy; Goal Setting; Motivation. **5 Hours**

#### UNIT – IV

##### **Interactive Behavior:**

Inculcate active listening, verbal non verbal communication, interview skills, group discussions, dealing with people in an organization, handling feed back and criticism. **7 Hours**

#### UNIT – V

##### **Writing and Presentation:**

How to write formal and informal e mails, how to frame requests, accept or reject proposals, greetings, salutations, ending. Plagiarism, Presentation Skills. **6 Hours**

**Course Outcomes:**

At the end of the course the student will be able to:

1. He or she is aware of his or her strengths and weaknesses and is able to handle emotions.
2. Ensuring a refined behavior.
3. Ensure a student who is an asset to the society.
4. A person who is well adjusted and a good communicator.
5. Will be able to present to a group, on a one to one basis and create an impact.

**REFERENCE BOOKS :**

1. "Communicating at work – Principles and Practices for Business and the Professions" - Ronald B Adler & Jeanne Marquardt Elmhorst; McGraw-Hill College; Sixth Edition.
2. "Organizational Behaviour", - Stephen P Robbins; Prentice Hall, India.
3. "Organizational Behaviour", - Fred Luthans; McGraw Hill International Edition.

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