

# **CURRICULUM**

**For the Academic year 2018 – 2019**

**DEPARTMENT OF CIVIL ENGINEERING**

**III & IV Semester B. E.**

**RAMAIAH INSTITUTE OF TECHNOLOGY**

(Autonomous Institute, Affiliated to VTU)

**BANGALORE – 54**

## **About the Institute**

Ramaiah Institute of Technology (RIT) (formerly known as M. S. Ramaiah Institute of Technology) is a self financing institution established in the year 1962 by industrialist and philanthropist, Late Dr. M S Ramaiah offering Bachelor of Engineering courses. It is accredited by NBA and NAAC. Ramaiah Institute of Technology is one of the few institutions with faculty & student ratio of 1:15 with excellent performance in both academics and other curricular & co curricular activities. The institute was a participant in Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. Ramaiah Institute of Technology comprises of competent and quality faculty with postgraduates and doctorates. Some of the distinguished features of RIT are: State of the art laboratories, individual computing facility to all faculty members. Many departments are recognized research centers by Visvesvaraya Technological University, Belgaum with many research scholars pursuing research for their Ph D and faculties are involved actively in many sponsored research projects by AICTE, DST etc. More than 130 scholars are pursuing their research for PhD. The Centre for Advanced Training and Continuing Education (CATCE), and Entrepreneurship Development Cell (EDC) have been set up in campus as incubation centers training students for enhancing their innovative ideas, skill, and competence. RIT has a strong Placement and Training department with a committed team, a fully equipped Sports department, large air-conditioned library with over 80,000 & more books with subscription to more than 300 International and National Journals. The Digital Library subscribes to several online e-journals like IEEE, JET etc. RIT is a member of DELNET, and AICTE INDEST Consortium. RIT has a modern air-conditioned auditorium, several hi-tech conference halls with video conferencing facilities. It also provides excellent hostel facilities for boys and girls. RIT has a very vibrant and interactive Alumni Association maintaining contacts with all graduated from institute and also distinguished Alumni, who have occupied very high positions in India and globally also. In the year 2007, VTU, Belgaum accorded Academic Autonomy status for UG and PG programs of the institute. As per the National Institutional Ranking Framework, MHRD, Government of India, Ramaiah Institute of Technology has achieved 60<sup>th</sup> rank in 2018 among the top 100 engineering colleges across India.

## **About the Department**

The Civil Engineering Department was started in the year 1971. Master program [M Tech] in Structural Engineering was started in the year 1984. In the year 1994, department was recognized as Research Center by affiliated university. Over four decades the department has carved its self niche in the areas of academics, research, consultancy, collaborative projects, sponsored research projects and publications. The department was awarded distinction of three years of accreditation by NBA, when it was evaluated for fourth time. Many research scholars have been awarded with PhD degree and many more are pursuing their research to obtain PhD. There is also master degree program M.Sc [by research] degree in Civil Engineering. Around 250 and more technical papers are published in reputed journals and conferences by faculties and research scholars. The Department holds a patent on utilizing pond ash as replacement to sand, “Total Replacement of Sand in Concrete by Pond Ash” (Patent No 244063). The department has been involved actively in conducting conferences, workshops, FDP’s, Site Visits, Project Tours and several students related programs to provide platform for sharing and spreading the latest developments in the field of Civil Engineering.

### **VISION OF THE INSTITUTE**

To evolve into an autonomous institution of international standing for imparting quality technical education

### **MISSION OF THE INSTITUTE**

MSRIT shall deliver global quality technical education by nurturing a conducive learning environment for a better tomorrow through continuous improvement and customization

### **QUALITY POLICY**

We at M. S. Ramaiah Institute of Technology strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stake holders concerned

### **VISION OF THE DEPARTMENT**

To become a premier Department to impart state-of-the-art technical knowledge and professional skills through effective learning process with research ambience to produce global quality Civil Engineers to develop sustainable society.

### **MISSION OF THE DEPARTMENT**

To transform the young minds into employable professionals by providing contemporary technical knowledge and appropriate professional skills through suitable teaching learning process.

To provide rigorous training and acquaint the students with necessary skills and leadership qualities along-with ethical values to address the complex and multi- faceted Civil Engineering Problems.

To provide opportunity to develop their potential by fostering intellectual curiosity to promote them for pursuing higher studies and research through exposure to the modern engineering tools and techno innovative projects.

### **PROGRAM EDUCATIONAL OBJECTIVES (PEOs):**

Bachelor of engineering graduates of Civil Engineering program of M S Ramaiah Institute of Technology shall attain the following PEO's within three to four years of graduation.

<b>PEO 1</b>	To perform well in engineering profession as competent professionals using contemporary technical knowledge and professional skills. <b>(THEME: Perform well in engineering profession as competent professionals)</b>
<b>PEO 2</b>	To pursue higher education and show intellectual curiosity for lifelong learning. <b>(THEME: Higher education and lifelong learning)</b>
<b>PEO 3</b>	To communicate effectively to work in multi-disciplinary environments embedded with ethical values and social responsibilities. <b>(THEME: Effective communication, leadership and ethical values )</b>

## **PROGRAM OUTCOMES (POs):**

**PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that 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:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAM SPECIFIC OUTCOMES (PSOs):**

**PSO1:** Apply the knowledge of basic sciences, geology and environmental science along with the conceptual knowledge of engineering sciences to illustrate the process involved in planning, analysis and design of sustainable civil engineering systems.

**PSO2:** Conduct laboratory experiments/field investigations, and analyze/interpret the experimental results for appropriate conclusions and recommendations to a real-world civil engineering problem with a significant perspective of economy, society and environment.

**PSO3:** Demonstrate professional ethics and implement the principles of project management, business and public policy to lead the project execution as per the design requirement, with the state-of-the-art technology and contemporary skills.

### Curriculum Course Credits Distribution

Semester	Humanities & Social Sciences (HSS)	Basic Sciences / Lab (BS)	Engineering Sciences/ Lab (ES)	Professional Subjects - Core (Hard core, soft core, Lab) (PS-C)	Professional Subjects - Electives (PS-E)	Other Electives (OE)	Project Work (PW)	Internship/other activities (IS/EAC)	Total semester load
First	4	9	10	-	-	-	-	2	25
Second	2	9	14	-	-	-	-	-	25
Third	-	4	-	22	-	-	-	-	26
Fourth	-	-	-	25	-	-	-	-	25
Fifth	2	-	-	21	3	-	-	-	26
Sixth	-	-	-	16	3	-	6	-	25
Seventh	-	-	-	16	6	3	-	-	25
Eighth	-	-	-	-	4	-	13	6	23
<b>Total</b>	<b>08</b>	<b>22</b>	<b>24</b>	<b>100</b>	<b>16</b>	<b>3</b>	<b>19</b>	<b>8</b>	<b>200</b>

## SCHEME OF TEACHING

### III SEMESTER

Sl. No.	Course Code	Course Name	Category	Credits					Contact Hours
				L	T	P	S	Total	
1.	CV MAT 31	Engineering Mathematics - III	BS	3	1	0	0	4	<b>56</b>
2.	CV 32	Strength of Materials	PS-C	3	1	0	0	4	<b>56</b>
3.	CV 33	Surveying	PS-C	3	0	0	1	4	<b>56</b>
4.	CV 34	Fluid Mechanics	PS-C	3	1	0	0	4	<b>56</b>
5.	CV 35	Materials and Constructions	PS-C	2	0	0	1	3	<b>42</b>
6.	CV 36	Engineering Geology	PS-C	3	0	0	0	3	<b>42</b>
7.	CVL 37	Strength of Materials Lab	PS-C	0	0	2	0	2	<b>28</b>
8.	CVL 38	Building Graphics Laboratory	PS-C	0	0	2	0	2	<b>28</b>
<b>Total</b>				17	3	4	2	26	

### IV SEMESTER

Sl. No.	Course Code	Course Name	Category	Credits					Contact Hours
				L	T	P	S	Total	
1.	CV 41	Structural Analysis – I	PS-C	3	1	0	0	4	<b>56</b>
2.	CV 42	Hydraulics and Hydraulic Machinery	PS-C	3	1	0	0	4	<b>56</b>
3.	CV 43	Transportation Engineering – I	PS-C	4	0	0	0	4	<b>56</b>
4.	CV 44	Concrete Technology	PS-C	3	0	0	1	4	<b>56</b>
5.	CV 45	Environmental Engineering – I	PS-C	3	0	0	0	3	<b>42</b>
6.	CV 46	Engineering Management & Entrepreneurship	PS-C	2	0	0	1	3	<b>42</b>
7.	CVL 47	Surveying Practice	PS-C	0	0	2	0	2	<b>28</b>
8.	CVL 48	Engineering Geology Laboratory	PS-C	0	0	1	0	1	<b>14</b>
<b>Total</b>				18	2	3	2	25	

(L= Lecture    T=Tutorial    P=Practical    S= Self Study)

## ENGINEERING MATHEMATICS-III

**Course Code:** CV31

**Course Credits:** 3:1:0:0

**Prerequisite:** Engineering Mathematics I & II

**Contract Hours:** 56

### Course Outcomes

Students will be able to:

1. Solve the problems of algebraic, transcendental and ordinary differential equations using numerical methods fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data.
2. Use a given data for equal and unequal intervals to find a polynomial function for estimation. Compute maxima, minima, curvature, radius of curvature using numerical differentiation and compute arc length, area, surface area and volume using numerical integration.
3. Find the rank of a matrix and testing the consistency and the solution by Gauss elimination and Gauss-Seidel iteration methods.
4. Form functional as integral and find external curve using Euler-Lagrange equation.
5. Apply the concepts of probability distributions to solve the engineering problems

### Course contents

#### Unit I

**Numerical solution of Algebraic and Transcendental equations:** Method of false position, Newton - Raphson method.

**Numerical solution of Differential equations:** Taylor's series method, Euler's & modified Euler method, fourth order Runge-Kutta method.

**Statistics:** Curve fitting by the method of least squares, fitting a linear curve, fitting a parabola, fitting a Geometric curve, Correlation and Regression.

#### Unit II

**Finite differences and interpolation:** Forward and backward differences, Interpolation, Newton - Gregory forward and backward interpolation formulae, Lagrange's interpolation formula, Newton's divided difference interpolation formula (no proof).

**Numerical differentiation and Numerical Integration:** Derivatives using Newton-Gregory forward and backward interpolation formulae, Newton - Cote's quadrature formula, Trapezoidal rule, Simpson's (1/3)rd rule, Simpson's (3/8)th rule.

#### Unit - III

**Linear Algebra:** Elementary transformations on a matrix, Echelon form of a matrix, rank of a matrix, Consistency of system of linear equations, Gauss elimination and Gauss - Seidal method to solve system of linear equations, eigen values and eigen vectors of a matrix, Rayleigh power method to determine the dominant eigen value of a matrix, diagonalization of a matrix, system of ODEs as matrix differential equations.

#### Unit IV

**Calculus of variation:** Variation of a function and a functional, Extremal of a functional, Euler's equation, Standard variational problems, Geodesics, Minimal surface of revolution, Hanging cable and Brachistochrone problems.

#### Unit V

**Random Variables:** Random Variables (Discrete and Continuous), Probability density function, Cumulative density function, Mean, Variance, Moment generating function.

**Probability Distributions:** Binomial and Poisson distributions, Normal distribution, Exponential distribution, Uniform distribution.

**Text Books:**

1. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley publication – 10<sup>th</sup> edition-2015.
2. B. S. Grewal "Higher Engineering Mathematics", Khanna Publishers – 43<sup>rd</sup> edition – 2015.

**References:**

1. Glyn James "Advanced Modern Engineering Mathematics", Pearson Education – 4<sup>th</sup> edition – 2010.
2. Murray R. Spiegel, John Schiller & R. Alu Srinivasan "Probability & Statistics", Schaum's outlines -2<sup>nd</sup> edition - 2007.

## STRENGTH OF MATERIALS

**Course Code:** CV32

**Prerequisite:** Basic Civil Engg. and Mechanics

**Course Credits:** 3:1:0:0

**Contract Hours:** 56

### Course Outcomes:

Students will be able to:

1. Evaluate the engineering properties of the materials and compile to analyze their structural behavior under axial loading.
2. Analyze the behavior of structural elements subjected to compound stresses
3. Evaluate the shear and flexure forces in determinant beams for various combinations of loads and supporting conditions
4. Analyze the bending, shear and torsional stresses across various beam sections
5. Determine deflection in beams and stability of the compression members

### Course Contents:

#### UNIT-I

**Simple Stresses and Strains:** Introduction, Engineering Properties of Materials: Elasticity, Plasticity, Isotropy, anisotropy, orthotropic, Ductility, Malleability, Tenacity, Stress, Strain, types of stress and strains, Hook's law, Poisson's Ratio, Stress – Strain Diagram for ferrous and non-ferrous metals, components of stress strain diagram: Proportional limit, Elastic point, Upper and lower yield points, Ultimate and breaking points, Significance of ductile and brittle failure. Application of Hook's law in the calculation of the elongation of a prismatic bar. Demonstration of Principles of superposition for obtaining elongation of prismatic and non prismatic bar subjected to force system, Derivation of Total elongation of tapering bars of circular and rectangular cross sections from first principles. Obtaining expressions to the elongation due to self-weight. Derivation of the expression to shear modulus, volumetric strains-expression for volumetric strain, bulk modulus, Elastic constants, relationship among elastic constants, Thermal stresses in restrained and non restrained prismatic bars.

#### UNIT-II

**Compound Stresses:** Introduction – Derivation of expressions to Stress components such as normal and shear stress on an inclined plane in one dimensional stress system - General two dimensional stress system derived from beam subjected flexure and shear. Derivation of expressions to normal and shear stress on an inclined plane. Principal planes and stresses, derivation of corresponding expressions, obtaining the maximum and minimum shear and normal stress including their planes – Graphical representation of two dimensional stress system. Obtaining the shear, normal and principal stresses on an inclined plane including principal stresses using Mohr's Circle of stresses. Application of compound stress principle to evaluate the stresses in thin cylinders subjected to pressure and change in dimension.

### UNIT-III

**Bending Moment and Shear Force in Beams:** Introduction - Types of beams, loadings and supports – Shear force & bending moment (SF & BM) and Sign conventions. From the fundamentals derivation of the Relationship between loads, shear force and bending. Drawing the SFD and BMD with salient values for cantilever beams, simply supported beams and overhanging beams subjected to point loads, UDL, UVL and Couple. Evolution of loading diagram from the SFD and BMD. Significance of contra flexure point (Point of inflexion) to draw the elastic curve in overhanging beams.

### UNIT-IV

**Bending and Shear Stress in Beams:** Introduction – Bending stress in beam - Assumptions in simple bending theory - Derivation of Bernoulli's equation using principles of simple bending – Highlights of strength and stiffness equations of simple bending theory in the analysis and design of cross sections of beams. Bending stress distribution over the cross section. Significance of Section modulus and Flexural rigidity in bending - Expression for horizontal shear stress in beam from the first principles – Derivation of Shear stress distribution for rectangular, 'I' and 'T' sections. – Application principles of superposition in the analysis of Combined Direct and Bending stresses – Only application of torsional equation in understanding the behaviour of circular Shaft under Torsion.

### UNIT-V

**Deflection of Prismatic Beams & Elastic Stability Of Columns :** Introduction – Definitions of slope, deflection - Elastic curve derivation of differential equation for flexure - Slope and deflection using Macaulay's method for simply supported, cantilever and overhanging beams subjected to point loads, UDL and Couple. - Elastic stability of columns- Introduction – Short and long columns - Euler's theory on columns - Effective length slenderness ratio - radius of gyration, buckling load - Assumptions, derivations of Euler's Buckling load for different end conditions - Limitations of Euler's theory - Rankine's formula and problems.

#### Text Books

1. Basavarajaiah and Mahadevappa, "Strength of Materials", CBS Publishers, New Delhi.
2. Ferdinand Singer, "Strength of Materials", Harper and Row Publications
3. Srinath L S, Prakash Desayi, Srinivasa Murthy N, S.Anantha Ramu, "Strength of Materials", MacMillan, India, New Delhi.

#### Reference Books

1. Timoshenko and Young, "Elements of Strength of Materials" Affiliated East-West Press.
2. James M. Gere, "Mechanics of Materials" - (5th Edition), Thomson Learning.
3. Beer & Johnston, "Mechanics of Materials", TATA McGraw Hill.

## SURVEYING

**Course Code:** CV33  
**Prerequisite:** Nil

**Course Credits:** 3:0:0:1  
**Contract Hours:** 56

### Course outcomes

Students will be able to:

1. Describe types of surveying through time and measure distance using different instruments
2. Establish reduced levels, plot profile and contours and use theodolite.
3. Demonstrate the use of total station. Summarize application of GIS and GPS.
4. Compute data and set curves for the construction.
5. Estimate the area/ volume and mark center line for different construction projects.

### Course Contents:

#### UNIT- I

**Introduction:** Definition of surveying / Geomatics. Importance of surveying to Civil Engineering. Types of surveying- control survey, topographic survey, cadastral survey, hydrographic survey, alignment survey, mine surveying and construction survey. Surveying through the ages- chain surveying, compass surveying and plane table surveying- concepts and limitations only.  
Distance Measurement: Using tapes, Hand held distance meter and distance measuring wheel.  
Electronic Distance Measurements (EDM) - Total station and GPS.

#### UNIT- II

**Leveling:** Definition, terms used in leveling. Methods of determining difference of elevation- plane of collimation method using dumpy level and using total station. Longitudinal and cross sectioning using total station. Plotting of L/S and C/S using software's. Contouring- definition, terms used, characteristics of contours and applications of contours in civil engineering practice. Contouring with total station and plotting. Theodolite surveying: Terms used in theodolite. Features of theodolite. Measurement of horizontal angles (method of repetition and reiteration).

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#### UNIT-III

**Trigonometric leveling:** Finding elevation using single and double plane method and Total Station. Total station- Features and advantages. Measurement of coordinates using total station. Data collection, storage, data transferring and plotting in CAD. Geographic Information system: Introduction to GIS.

Definition of GIS, Key Components of GIS, Functions of GIS, Data structures in GIS, layer concepts, analysis of data and output. Applications of GIS in Civil Engineering. Global Positioning system- GPS satellite systems, components of GPS, positioning and relative positioning with GPS. Surveying using GPS. Applications of GPS in civil engineering.

#### **UNIT-IV**

**Setting Curves** :Types of Curves- Application of curves in civil engineering. Setting out curve by theodolite (Rankine's method and using Total Station). Components of compound, Reverse curve (Between 2 parallel straights). Transition Curve and its related problems.

#### **UNIT-V**

**Areas And Volumes:** Methods of determining areas by trapezoidal and Simpsons' rule. Measurement of volume by prismatical and trapezoidal formula- volume calculation from spot levels and from contour plans-Problems on Railway and Highway embankments - Construction Surveying-Setting out works using Total Station. Setting out building by Centre line method.

#### **Text Books:**

1. Dr. B.C.Punmia, Ashok Kumar Jain, Dr Arun Kuma Jain, "Surveying Vol.I," ,Laxmi Publications, 2017, 17<sup>th</sup> edition. ISBN: 9788170088534
2. Charles D. Ghilani, "Elementary Surveying : An Introduction to Geomatics",13th ed, Prentice Hall, 2012, ISBN-13: 978-0-13-255434-3
3. A M Chandra, "Higher Surveying",New Age International, 2005, ISBN: 81:224:1628:4

#### **Reference Books:**

1. S.K.Duggal ,(2008), "Surveying – Vol I", Tata McGraw hill publishing company Ltd, New Delhi.
2. B Bhatia "Remote Sensing and GIS",Oxford University Press
3. James M Anderson and Adward M Mikhail, "Surveying theory and practice", Tata McGraw Hill Publication

## FLUID MECHANICS

**Course Code:** CV34

**Prerequisite:** Nil

**Course Credits:** 3:1:0:0

**Contract Hours:** 56

### Course outcomes:

Students will be able to:

1. Describe fluid properties and their significance in fluid mechanics. Demonstrate the skills in evaluation of fluid pressure
2. Evaluate the hydrostatic forces acting on submerged bodies and stability analysis of floating bodies
3. Apply principles of conservation of mass and momentum on fluid flow
4. Analyze the energy principle and its applications in fluid dynamics and flow measuring devices
5. Apply the concepts of fluid mechanics for analyzing viscous flow and boundary layer phenomenon.

### Course Contents

#### UNIT-I

**Fluid Properties and Fluid Pressure:** Introduction. Difference between solid and fluid. Units and dimensions. Definitions – Fluid, Continuum, Mass density, Specific weight, Specific Volume, Relative density, Bulk modulus of elasticity, Vapour pressure. Viscosity - Newton's law of viscosity, Classification of fluids. Surface tension and Capillarity – Pressure intensity inside a droplet, a soap bubble and a liquid jet, Equation for capillarity. Fluid Pressure – Definition, Variation of pressure in a fluid, Pascal's law, Absolute, Gauge and Negative pressures. Measurement of Pressure - Simple and Differential Manometers, Types of pressure gauges.

#### UNIT-II

**HYDROSTATICS:** Introduction - Total Pressure and Centre of Pressure – Definitions, Total pressure and Centre of pressure on plane Vertical, Inclined and Curved surfaces, Pressure diagrams, Practical applications of Total pressure and centre of pressure. Buoyancy and Flotation- Archimedes principle, Buoyant force and Centre of buoyancy, Meta centre, Stability of submerged and floating bodies. Problems on total pressure, centre of pressure and buoyancy & flotation. Liquids in relative equilibrium – Introduction, Pressure exerted by the fluid when subject to constant linear acceleration.

#### UNIT-III

**Fundamentals of Fluid Flow:** Introduction, Continuum, Control volume. Hydro-Kinematics – Lagrangian and Eulerian approach, Types of fluid flow. Description of fluid flow - Stream line, Path line and Streak line. Principle of Conservation of Mass - Continuity equation in Cartesian coordinates, Continuity equation for One-Dimensional flow. Acceleration of fluid particle – tangential, normal, convective and local accelerations. Circulation and vorticity. Incompressible flow – Stream function,

velocity potential, Flownet analysis. Principle of Momentum equation and its Applications: Principle of Conservation of Momentum - Impulse-momentum equation, Momentum correction factor. Applications - force on a pipe bend. Angular momentum principle – Moment of momentum equation and its applications, Problems on sprinklers.

#### UNIT-IV

**Energy Equation and Its Applications:** Conservation of Energy – Euler’s equation of motion, Bernoulli’s (Energy) equation, assumptions and limitations, Kinetic energy correction factor. Applications of Bernoulli’s Equation – Free liquid jet, Vortex motion. Flow Measurements - Introduction. Orifices & Mouth pieces – Classification, Coefficients, Time of emptying a tank (with no inflow). Notches & Weirs – Classification, Equation for discharge over triangular notch, Rectangular notch, Trapezoidal notch and Broad Crested weir, End contractions, Cipolletti weir. Pipe flow measurement – Venturi meter, Orifice meter. Velocity measurement – Pitot tube and Static pitot tube. Current meter.

#### UNIT-V

**Viscous Flow and Boundary Layer theory :** Reynolds experiment – Description of laminar flow and turbulent flow. Laminar flow - Relation between shear and pressure gradients, Hagen-poiseuille equation, Laminar flow between parallel flat Introduction plates, Couette flow. . Boundary Layer Theory - , Thickness of boundary layer, Laminar Boundary layer, Turbulent Boundary layer and Laminar sub-layer. Separation of Boundary layer, formation of wake, Methods of controlling boundary layer. Drag and Lift – Introduction, Types of Drag, Drag on a sphere, Lift on an airfoil.

#### Text Books:

1. P.N. Modi & S.M. Seth, “Hydraulics and Fluid Mechanics”, Standard Book House
2. Madan Mohan Das, “Fluid Mechanics and Turbo Machines”, PHI Learning Pvt. Ltd. 2011
3. S K Som & G Biswas “Introduction to Fluid Mechanics and Fluid Machines” Tata McGraw HILL Publishing Company Ltd.

#### Reference Books:

1. Streeter, Wylie and Bedford, “Fluid Mechanics”, Tata McGraw-hill Edition 2010
2. Subramanya .K, “Fluid Mechanics through Problems”, Tata McGraw-hill Publishing Company

## ENGINEERING MATERIALS AND CONSTRUCTIONS

**Course Code:** CV35

**Prerequisite:** Nil

**Course Credits:** 2:0:0:1

**Contract Hours:** 56

### **Course Outcomes:**

The students will able to

1. Determine suitable materials for construction purpose.
2. Demonstrate the use of binders and construction materials
3. Demonstrate the construction of Masonry, Reinforced cement concrete and Trusses
4. Illustrate the functions of doors, windows and staircases.
5. Outline the methods of building finishes and contemporary construction practices.

### **COURSE CONTENTS:**

#### **UNIT-I**

**Conventional Materials:** Stones, Bricks, Tiles & Timber, Types of building stones, uses, deterioration and preservation. Tests on bricks and concrete blocks. Types of tiles and their uses. Varieties of timber, defects in timber, tests for good timber, seasoning of timber, plywood and wooden boards.

#### **UNIT-II**

**Other Construction Materials:** Lime, Cement, Cementitious materials such as fly ash, metakaolin, silica fume, rice husk ash and blast furnace slag. Composition of Portland cement. Types of cements and their uses. Lime and cement mortar. Cement concrete-ingredients, importance of mix proportioning, desirable properties of Reinforcing steel, structural steel and aluminum. Glass, electrical-thermal & sound insulating materials. Plastics & rubber.

#### **UNIT-III**

**Structural Components :** Foundations, Masonry and Roof Coverings, Excavation, Bearing capacity of soil. Classification of foundations, different types of foundations, rubble and ashlar stone masonry. Terminologies used in brick masonry, Construction of brick masonry using English and Flemish bond. Solid and hollow block masonry, cavity wall construction. Tools, tackles and necessary staging used construction to be discussed. RCC slab and beam type flat roof, wooden and steel truss supported pitched roof systems with tiles and sheets.

#### **UNIT-IV**

**Functional Components:** Flooring Requirements of floor finish. Types of floor finishes. Doors panelled and flush doors. Windows Louvered, Bay, Corner and Dormer windows. Ventilators. Stairs

requirements of stairs. Types of stairs Doglegged and open well type. Lintel, Chajja, Balcony.

### **UNIT-V**

**Finishing's and Other Methods Of Constructions:** Purposes and methods of plastering, Purpose of pointing and damp proofing. Purpose of painting, method of painting on old and new surfaces. Formwork, scaffolding, shoring and underpinning. Cost effective construction: Pre fabrication techniques, pre-cast building elements. Different types of construction- load bearing wall, framed construction, tubular construction, tunnel form construction and slip form construction. Introduction to safety measures during construction.

#### **Text Books:**

1. Sushil Kumar, "Building Construction", Standard Publishers Distributors, New Delhi.
2. S .G Rangwala, "Building Construction Engineering materials Book Stall", Anand.

#### **Reference Books:**

1. Mohan Raj and Jai Singh, "Advanced Building Materials and Construction", CBRI Publications, Roorkee.
2. B.C. PUNMIA, "Building Construction", Lakshmi Publications, New Delhi.

## ENGINEERING GEOLOGY

**Course Code:** CV36

**Prerequisite:** Nil

**Course Credits:** 3:0:0:0

**Contract Hours:** 42

### Course outcomes

Students will be able to:

1. Describe index properties of earth dynamic and justify geological hazards.
2. Identify natural resources for construction and mineral based industries
3. Determine rock mass properties and its suitability in engineering projects
4. Estimate and evaluate the ground behavior and conditions of rocks.
5. Delineate the interactions between groundwater systems and change detection of thematic layers through geo-informatics techniques

### Course Contents

#### UNIT I

**Geomorphology and Geodynamics** : Geology and its importance in Civil Engineering projects; Internal structure of the Earth and its composition; Geological agents and their processes in restructuring the earth's surface, Weathering of rocks, Kinds of weathering, Formation of soil and its classification, Soil profile, Soil erosion and its conservation; Geological work of rivers; Concept of Plate tectonics, Geological hazards such as landslides and earthquakes, Causes, Effects, Slope stabilization, Construction of seismic resistant structures.

#### UNIT II

**Applied Mineralogy and Igneous Petrology**: Definition of Mineral, Physical and chemical properties in minerals, Classification of minerals based on chemistry such as Rock forming minerals, Economic ore forming minerals and industrial minerals; Description of quartz and its varieties, Feldspars group, Mica Group, Amphibole Group, Pyroxene Group, Carbonate Group such as Calcite, Dolomite, Magnesite; Ores such as Magnetite, Haematite, Limonite, Chalcopyrite, Pyrolusite and Bauxite.

Introduction, definition and classification based on their genesis of Igneous rocks - Mode of occurrence, Textures, Structure and their importance in Civil Engineering practice, Description of some common rock types such as Granite, Granite Porphyry, Diorite, Syenite, Dolerite, Basalt.

#### UNIT III

**Sedimentary Petrology and Metamorphic Petrology**: Mode of occurrence, Textures, Structure and their importance in Civil Engineering practice; Metamorphic rocks - Metamorphism, Agents of Metamorphism & types of Metamorphism, Textures, Structure and their importance in Civil Engineering practice; Description of some common rock types such as Conglomerate, Breccia, Sandstone, Limestone and Shale; Gneiss, Mica-schist, Slate, Quartzite, Marble and its varieties.

#### UNIT IV

**Rock Mechanics and Engineering Geology:** Definition - Outcrops, Dip and Strike, Compass clinometers; Description of folds and its types; Faults and its types; Joints and its types; Recognition of folds, faults in the field and its consideration in Civil Engg projects; Geological site investigation, Surface and subsurface explorations by Geological and Geo-Physical investigations; Selection of site for Dams, Reservoirs, Tunnels, Bridge sites and Highways; Rock as a Engg material in construction of foundations, Concrete Aggregate, Road metal, Railway ballast with reference to Engg properties.

#### UNIT V

**Hydrogeology and Geoinformatics:** Hydrological cycle, Water bearing properties of Rocks and Soils, Aquifers and its types, Geological factors for selecting a site for sinking wells and Electrical Resistivity survey for Ground water explorations, Artificial Recharge of Groundwater by different methods, Effect of ground water on various Civil Engg structures. Introduction to remote sensing and GIS, Remote sensing platforms - Airborne, Space borne satellites, Satellite imageries; Applications of RS and GIS techniques for Civil Engineering - Lithological discrimination, Structural mapping, Land use and land cover, Deforestation, Water resources studies.

#### Text Books:

- 1) Parbin Singh. "Text book of Engineering and General Geology", Katson publishing house, Ludhiana, 2009.
- 2) Mukerjee, P. K. "Text book of Geology", World Press Pvt. Ltd., Kolkatta.
- 3) Gokhale, K. V. G. "Principles of Engineering Geology, B S Publication, Hyderabad, 2011.
- 4) Venkata Reddy, D. "Engineering Geology for Civil Engineering", Oxford and IBH Publishing company, New Delhi, 1997.
- 5) Sathya Narayanswami, B. S. "Engineering Geology", Dhanpat Rai & Co.
- 6) Maruthesha Reddy, M.T. "Applied Engineering Geology", Subhas Stores, Bangalore, 2013.

#### Reference Books:

- 1) Tyrrell, G. W. "Principles of Petrology" Chapman & Hall Ltd, 1978.
- 2) Todd, D. K. "Groundwater Hydrology" John Wiley & Sons, New York, 1980.
- 3) Billings, M. P. "Structural Geology" Prentice Hall, 1972.
- 4) Ravi, P Gupta. "Remote sensing Geology", Springer Verilag, New York.
- 5) Anji Reddy, M. "Remote sensing and GIS", B S Publications, 2008.

## **STRENGTH OF MATERIALS LABORATORY**

**Course Code:** CVL37

**Course Credits:** 0:0:2:0

**Prerequisite:** Strength of Materials (CV32)

**Contract Hours:** 28

### **Course outcome:**

Students will be able to:

- 1 Classify the type of engineering material based on the energy absorption capacity
- 2 Demonstrate the experiments and evaluate the mechanical strength of various ductile materials
- 3 Demonstrate the experiments and evaluate the mechanical strength of various brittle materials
- 4 Demonstrate the experiments and evaluate the strength of various materials
- 5 Summarize various properties of the materials and compile their suitability as per the provisions given in I.S code

### **List of Experiments:**

1. Hardness tests of mild steel and aluminum samples
2. Impact energy absorbed tests by mild steel and aluminum
3. Determination of mechanical properties of the ferrous metals
4. Determination of compressive strength of steel & wood.
5. Determination of shear strength of steel sample.
6. Determination of flexural strength test of wood and demonstrate strain ageing of steel bar.
7. Determination of tensional strength of steel sample.
8. Determination of stiffness and modulus of rigidity of steel springs under tension and compression
9. Determination of young's modulus of steel and wood by deflection equation.
10. Determination of compressive strength of bricks & roof tiles.
11. Verification of Laws of friction using friction test for different material on different surface conditions.

**Note:** Hierarchy of the experiments is based on the machines and instruments used for testing.

### **Reference Books:**

1. Timoshenko and Young, "Strength of Materials - Vol II", Von Nastrand Company, New York
2. Laboratory Manual prepared by the Department

### **Reference IS code:**

IS 5652 (Part 1): 1993, IS 1500: 2005, IS 1598: 1977, IS 1757: 1988, IS 1608:2005, IS 1708 part (8-9):1986, IS 5242:1979, IS 2408:1963, IS 1786:2008, IS 1717:2012, IS 1717:2012, IS 3495 part (1-4):1992, IS 654:1992

## **BUILDING GRAPHICS LABORATORY**

**Course Code:** CVL38

**Prerequisite:** Nil

**Course Credits:** 0:0:2:0

**Contract Hours:** 28

### **Course outcomes:**

The students will be able to:

1. Develop the ability to draft civil engineering drawing using CAD software.
2. Demonstrate the knowledge of local bylaws and will be able to design the building in accordance with local regulations.
3. Design the different types of building in accordance with climatic conditions, with environmentally responsibility and as per the requirements of the owner.
4. Create working drawings for construction.
5. Create detailed drawing of utilities including water supply, sanitary and electrical layout as layers.

### **LIST OF EXERCISES**

1. Principles of civil engineering drawing and introduction to AutoCAD.
2. Sectional elevation of masonry wall including footing.
3. Concept of plan, elevation, cross section, schedule of opening and site plan of a single bed residential building.
4. Development of plan, elevation and section of building from single line diagram.
5. Development of plan, elevation and section of two storied building from single line diagram.
6. Concept of setbacks, carpet area, plinth area, floor area ratio, and floor space index, super built up area and coverage. Introduction to urban and municipal bylaws as per national building codes
7. Space design of a apartment building using circulation diagram (bubble diagram) satisfying the given requirement.
8. Space design of a primary health centre.
9. Space design of a educational building
10. Development of water supply, sanitary and electrical drawing for a given residential building as a layer.
11. Development of center line drawing for a storied building- footing, column, beam locations.

**Text Books:**

1. Gurucharan Singh and Subash Chander, "Civil engineering drawing".(2014), English Standard Publishers and Dist., Delhi
2. Sikka V B Kataria S K & Sons. "A Course in Civil Engineering Drawing"

**Reference Books:**

1. Shah M H and Kale C M, "Building drawing", Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi.
2. Gurucharan Singh, "Building Construction", Standard publishers and distributors, New Delhi.
3. National Building Code, BIS, New Delhi.
4. Sham Tickoo, "Understanding AUTOCAD 2004 A beginner's Guide", Wiley Dreamtech India Pvt Ltd.
5. Jayaram M A., Rajendra Prasad D S., "A referral on CAD Laboratory", Sapna Publications.

## STRUCTURAL ANALYSIS-I

**Course Code:** CV41

**Prerequisite:** Strength of Materials

**Course Credits:** 3:1:0:0

**Contract Hours:** 56

### Course outcomes

The students will be able to:

1. Describe different forms of structures and evaluate their indeterminacy, and analyze determinate truss
2. Analyze the deflection of simple beams by different methods
3. Analyze arches and cables with supports at same and different levels
4. Develop influence lines for long spans structures and describe the behavior of structural components subjected to rolling loads
5. Analyze indeterminate structures using method of consistent deformation

### Course Contents:

#### UNIT I

**Introduction and Analysis of Plane Trusses:** Structural forms- Conditional of equilibrium- 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.

#### UNIT II

**Deflection of Beams:** Deflection of determinate beams by moment area and Conjugate beam methods - Strain energy due to axial force, BM and SF- Principle of virtual work and Castiglione's theorems- Unit load and its application to deflection of determinate beam and truss.

#### UNIT III

**Arches and Cable Structures:** Three hinged parabolic arches with supports at 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.

#### UNIT IV

**Influence Lines and Moving Loads:** Concept of influence lines- ILD for reactions, SF and BM for determinate beams- ILD for axial forces in determinate trusses- BM, SF and axial forces in determinate systems using ILD- Maximum BM, Absolute BM and Maximum SF in determinate beams using rolling loads concepts.

#### UNIT V

**Analysis of Indeterminate Beams:** Propped cantilever and fixed beams using method of consistent. Deformations- Forces due to rotation and settlement of supports.

**Text books:**

1. Reddy C.S., “Basic Structural Analysis”, Tata McGraw Hill, New Delhi.
2. KU Muthu e.t al “Structural Analysis”, IK International publications, New Delhi.

**Reference books:**

1. Pandit and Guptha, “Theory of Structures, Vol I and II”, Tata McGraw Hill, New Delhi.
2. Norris and Wilur, “Elementary Structural Analysis”, International Student Edition, McGraw Hill, New York.
3. Negi and Jangid, “Structural Analysis”, Tata McGraw Hill, New Delhi.
4. Kinney S., “Indeterminate Structural Analysis”, Oxford Publishing House, New Delhi.
5. Ashok K Jain, “Elementary Structural Analysis”, Nemchand Publishers, Roorkee

## HYDRAULICS AND HYDRAULIC MACHINERY

**Course Code:** CV42

**Prerequisite:** Fluid Mechanics

**Course Credits:** 3:1:0:0

**Contract Hours:** 56

### Course outcomes:

The students will be able to

1. Analyze pipe-flow system and design pipe line system as per the requirements
2. Design open channels for various types of flow systems in open channels
3. Evaluate the performance of centrifugal pumps and selection of suitable pump for various design conditions.
4. Apply the concepts of hydraulics for estimating the performance of turbines and their suitability
5. Apply similarity laws and study of models to evaluate the behavior of proto type.

### Course Contents:

#### UNIT – I

**Flow in Pipes:** Turbulent flow - Introduction, Moody's chart, Laws of Fluid friction, Hydrodynamically smooth and rough boundaries. Pipe flow - Darcy's- Weisbach equation. Losses in pipe flow – Frictional (major) loss, minor losses, Expressions for loss of energy due to sudden contraction and sudden expansion. H.G.L and T.E.L, Pipes in series – Compound pipe and Equivalent pipe, Pipes in parallel – Bye pass pipe, Branched pipes. Siphon, Transmission of power through pipes, Water hammer in pipes, Equations for pressure rise due to gradual and sudden closure of valves.

#### UNIT – II

**Open Channel Flow:** Introduction. Types of open channels. Geometrical properties of channel sections. Uniform flow in channels – Chezy's formula, Manning's formula. Most economical channel sections – Rectangular, triangular and Trapezoidal sections. Computation of uniform flow. Specific energy & Critical flow – Sp. energy curve, Critical flow in rectangular channels. Problems on humps. G.V.F- Dynamic equation, Classification of flow profiles. Computation of flow profiles by Single Step (energy) Method. R.V.F - Hydraulic jump in rectangular channels, Types of jumps, Applications of hydraulic jumps.

#### UNIT – III

**Impact of Jet On Vanes And Centrifugal Pumps:** Introduction. Force exerted by fluid jet on stationary and moving flat plates (normal & inclined). Force exerted by fluid jet on moving curved vane striking at its centre and one of the tips, Velocity triangles, Equation for work done and efficiency. Pumps- centrifugal pumps, Classification of centrifugal pumps, Work done by the impeller, Priming of pumps, Head of a pump, Losses and efficiencies, Minimum starting speed, NPSH, Cavitation in centrifugal pumps, Multistage pump, Performance of centrifugal pumps. Introduction to submersible pump.

#### UNIT – IV

**Turbines:** Introduction. Head and Efficiency of turbines, Classifications of turbines, Pelton wheel, Equation for work done and efficiency, Working proportions of Pelton wheel and Kaplan turbine, Draft

tube theory, Design parameters, Governing of turbines. Performance of Turbines - Unit quantities, Specific speed of Pelton Wheel, Francis turbine and Kaplan turbine, Performance characteristics curves. Components and Layout of Hydroelectric power plant.

#### UNIT – V

**Dimensional Analysis and Model Studies:** Introduction. Units and dimensions. Dimensional Homogeneity. Methods of Dimensional Analysis - Raleigh's method and Buckingham's method. Model studies. Similitude – Geometric, Kinematic and Dynamic similarities. Force ratio & Dimensionless numbers. Similarity laws – Reynold's model law, Froude model law, Euler model law. Types of models – Undistorted models and distorted models.

#### **Text Books:**

1. P.N. Modi & S.M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House
2. Madan Mohan Das, "Fluid Mechanics and Turbo Machines", PHI Learning Pvt. Ltd. 2011
3. S K Som & G Biswas "Introduction to Fluid Mechanics and Fluid Machines" Tata McGraw HILL Publishing Company Ltd.

#### **Reference Books:**

1. Streeter, Wylie and Bedford, "Fluid Mechanics", Tata McGraw-hill Edition 2010
2. Subramanya .K, "Fluid Mechanics through Problems", Tata McGraw-hill Publishing Company

## TRANSPORTATION ENGINEERING I

**Course Code:** CV43  
**Prerequisite:** Surveying

**Course Credits:** 4:0:0:0  
**Contract Hours:** 56

### Course outcomes

The students will be able to:

1. Describe transportation modes and necessitate the planning of road development
2. Define highway geometrics and traffic engineering.
3. Characterize materials for pavement construction.
4. Design the flexible and rigid pavements.
5. Design the drainage systems and carry out economic feasibility analysis for road projects

### Course Contents:

#### UNIT I

**Transportation Systems:** Importance of transportation, different modes of transportation and their characteristics, Jayakar committee recommendations, implementation, highway planning, phasing, road development plans in India, recent developments, highway alignment, new and re-alignment projects, numerical examples. Introduction of multi model transport for urban areas.

#### UNIT II

**Geometric Design:** Importance of highway geometric design, highway cross sectional elements. Sight distances, elements of horizontal and vertical alignments, scope of traffic engineering, traffic characteristics, volume studies, speed studies, O & D studies, PCU and Traffic Capacity.

#### UNIT - III

**Pavement Materials:** Significance and requirements of subgrade soil, soil classification, plate load test and CBR test on soil, properties and requirements of aggregates and bitumen, tar and emulsions. Use of new and marginal materials in road construction. Numerical examples.

#### UNIT - IV

**Pavement Design:** Requirements of highway pavements - Types and design factors, ESWL, design of flexible pavements by IRC method, stresses in rigid pavements - wheel load stresses, temperature and frictional stresses, combination of stresses, design of rigid pavements by IRC method. Numerical examples. Failures and causes in flexible and rigid pavements and remedial measures.

#### UNIT – V

**Highway Drainage:** Significance and requirements of highway drainage - design of surface and subsurface system. Highway user benefits - tangible and intangible - motor vehicle operation cost - annual highway costs, methods of economic analysis - highway financing, BOT, BOOT, numerical examples.

**Text Books:**

1. Khanna S.K. and Justo C.E.G, “Highway Engineering”, Nemchand and Bros, Roorkee.
2. Kadiyali L.R, “Highway Engineering”, Khanna Publishers, New Delhi

**Reference Books:**

1. Subramanyam. K.P, “Transportation Engineering”, Scitech Publications, Chennai.
2. Khanna SK and Justo CEG, “Highway Material Testing Laboratory Manual”, Nemchand and Bros.

## CONCRETE TECHNOLOGY

**Course Code:** CV44

**Prerequisite:** Engineering Materials and Construction

**Course Credits:** 3:0:0:1

**Contract Hours:** 56

### Course outcomes

The students will be able to:

1. Describe the basic Engineering Properties of the concrete
2. Demonstrate fresh properties of concrete
3. Evaluate hardened properties of concrete
4. Design required grade of concrete using concrete mix design principles
5. Describe properties of durability of concrete

### Course Contents:

#### UNIT-I

**Concrete Ingredients and Microstructure:** Cement – Chemical composition, hydration of cement, types of cement, manufacture of OPC with flow charts. Bogue's compound and transition zone in cement paste. Tests on cement – field test, fineness, normal consistency, setting time, soundness, and compressive strength (detailed procedures covered in laboratory). Quality of mixing water. Fine aggregate – grading of aggregates, sieve analysis, specific gravity, bulking, moisture content and deleterious materials. Coarse aggregate – importance of size, shape and texture, grading of aggregates, sieve analysis, specific gravity, flakiness and elongation index, crushing, impact and abrasion tests (detailed procedures to be covered in laboratory). Structure of aggregate phase, structure of hydrated cement paste, structure - property relationship in hydrated cement paste. Manufactured sand its significance and differences.

#### UNIT-II

**Rheology of Fresh Concrete:** Workability – definition, factors affecting workability, measurement of workability by slump, compaction factor, vee-bee and flow tests. Segregation and bleeding. Process of manufacture of concrete – batching, mixing, transporting, placing, compaction and curing of concrete. Chemical admixtures – plasticizers, accelerator, retarders and air entraining agents. Mineral admixtures – fly ash, blast furnace slag, meta-kaolin, Silica fume and rice husk ash.

#### Unit-III

**Hardened Concrete:** Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, effect of aggregate properties, compressive strength, tensile strength, bond strength, modulus of rupture, modulus of elasticity, poisson ratio and the relationship between these parameters. Accelerated curing, Aggregate-cement bond strength. Shrinkage – plastic shrinkage and drying shrinkage, factors affecting shrinkage. Creep – measurement of creep, factors affecting creep, effect of creep. Hot weather concreting.

#### UNIT-IV

**Concrete Mix Design:** Concept of mix design, variables in proportioning, exposure conditions, procedure of mix design as per IS 10262-2009 and numerical examples of mix design.

#### UNIT-V

**Hardened Concrete:** Durability – definition and significance. Permeability, sulphate attack, chloride attack and carbonation. Factors contributing to cracks in concrete – plastic shrinkage, settlement cracks and construction joints. Thermal expansion, transition zone and structural design

deficiencies. Tests on hardened concrete – compressive strength, split tensile strength, flexural strength and non-destructive testing of concrete. (Detailed test procedures to be covered in laboratory)

**Text Books:**

1. Shetty MS, “Concrete technology”, Chand S and Co.
2. Gambhir B L, “Concrete Technology”, Tata McGraw Hill, New Delhi

**Reference Books: -**

1. Neville, A M, “Properties of Concrete”, ELBS Publications
2. IS: 10262 – “Recommended guidelines for Concrete Mix design”, – BIS Publications  
Mehta PK, Properties of Concrete, ICI, Chennai

## ENVIRONMENTAL ENGINEERING I

**Course Code:** CV45

**Prerequisite:** Nil

**Course Credits:** 3:0:0:0

**Contract Hours:** 42

### Course outcomes:

The students will be able to

1. Forecast population and identify sources of water
2. Analyze the water for its suitability
3. Describe primary water treatment.
4. Demonstrate different methods of treatment of raw water.
5. Design water supply distribution system.

### Course Contents:

#### UNIT-I

**Need for public water supply and role of engineers:** Quantity of water-Different water demands-domestic, institutional and commercial demand, public uses, fire demand-estimation by Kuichling's formula, Freeman formula and National Board of Fire Underwriters formula. Per-capita consumption- factors affecting per capita demand. Design period. Population forecast-Arithmetic mean, Geometric mean and incremental increase method. Sources of water - Classification, quantity aspects.

#### UNIT-II

**Quality of water:** Concept of safe water, wholesome water and palatable water. Physical, chemical and bacteriological analysis of water. Standards of Water quality desired for domestic water supplies – BIS and WHO Standards – Health significance of Fluorides, Nitrates and Heavy metals like Mercury, Cadmium, Arsenic etc.. Water borne diseases. Bacterial examination of water-multiple fermentation tube and membrane filter test –MPN.

#### UNIT-III

**Treatment of water:** Objectives. Conventional treatment plant layout. Different treatment units (location and its function) - Screening, Aeration-Types of aerators, Sedimentation-Coagulant aided sedimentation; jar test, chemical feeding, flash mixing and clari-flocculator. Design of sedimentation units.

#### UNIT-IV

**Filtration:** theory of filtration, types of filters-rapid sand filters and pressure filters including construction, operation and cleaning. Disinfection- Types of disinfection, chlorination, chlorine demand, residual chlorine, use of bleaching powder. Design of filtration units.

#### UNIT

#### V

**Distribution Systems:** Different distribution systems and layouts. Storage and Distribution Reservoirs. Layout of Distribution system. Pumps. Pipe sizes and recommended velocities and pressures. Pipe fittings and pipe joints. Testing of pipe lines, pressure test for pipe distribution, causes of leakages in pipe joints. Water supply to buildings -Street connection, internal storage (sump and overhead tank) - Capacity calculations. Distribution of water – Supply systems within the building (overhead tanks and Hydro pneumatic systems).

**Text Books:**

1. Garg, S.K., “Environmental Engineering Vols. I and II”, Khanna Publishers, New Delhi,
2. Punmia B C, “Environmental Engineering Vol. I”, Laxmi Publication (P) Ltd., Delhi.

**Reference Books:**

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi.
2. Panchdhari. A.C., “Water Supply and Sanitary Installations”, New Age International Publishers, New Delhi.

## ENGINEERING MANAGEMENT AND ENTREPRENEURSHIP

**Course Code:** CV46

**Prerequisite:** Nil

**Course Credits:** 2:0:0:1

**Contract Hours:** 42

### Course outcomes:

The students will be able to

1. Enumerate various parameters involved in estimation of the projects feasibility
2. Formulate the given physical problem as linear program to yield the solution
3. Select the type of machine and equipment shall be used for various construction purposes
4. Provide optimal construction planning, scheduling and controlling of project execution
5. Demonstrate the management of construction projects.

### Course Contents:

#### UNIT I

**Introduction To Engineering Economics:** Project Feasibility , Economic and Financial – Time value of Money, Cash flow – diagram – Interest formulae , Basis for comparison of alternatives benefit – cost ratio , Present worth Future worth Annual equivalent, capital recovery , Rate of return, Depreciation and taxes, Break-even analysis.

#### UNIT II

**Linear Programming:** Linear Programming: Introduction, problem formulation, graphical method of LP -, Standard form of LPP, Simplex method- Maximization case, Simplex algorithm – Minimization case.

#### UNIT III

**Construction Mechanization:** Introduction to mechanization, Mechanization through construction equipment: earth excavation, moving and hauling, aggregate manufacturing; concrete production and placement- types of equipment, trench-less technology. Factors for selecting equipment and performance and economic life

#### UNIT IV

**Construction Planning:** Basic Concepts in the Development of Construction Plans - Choice of Technology and Construction Method - Defining Work Tasks - Defining Precedence Relationships among Activities - Estimating Activity Durations, Estimating Resource Requirements for Work Activities, Scheduling and controlling, Introduction-CPM and PERT, resource allocation, time-cost tradeoff

#### UNIT V

**Construction Industry and Management:** Management- Meaning – nature and characteristics of Management, Scope and functional areas of management , Management as a science, art or profession, Planning- importance and purpose of planning process, steps in planning, Organization-purpose,

principles of organization ,Types of organization. Directing and controlling-Meaning, Leadership styles. Coordination-meaning, importance and techniques.

**Text Book:**

1. Subramanian K, “Construction Management”, Anuradha Publications – Madras.
2. Peurifoy R L, “Construction Planning Equipments and Method”, McGraw Hill Publication 3rd Edition. New Delhi
3. NVR Naidu, “Management and Entrepreneurship” I K International New Delhi

**Reference Books:**

1. N K Jha, “Construction Project Management”, Pearson, 1st edition New Delhi (2011)
2. Tung Au,“ Project Management for construction”, Prentice hall, London, 2nd edition (1989)

## SURVEYING PRACTICE

**Course Code:** CVL 47  
**Prerequisite:** Surveying

**Course Credits:** 0:0:2:0  
**Contract Hours:** 28

### Course outcomes

The students will be able to:

1. Determine distances and angles using different instruments
2. Determine the levels of accessible and inaccessible points. Plot profiles
3. Demonstrate the use of total station, find areas and plot contours using Total station
4. Set curves using theodolite and total station
5. Mark centerline of building for construction

### LIST OF EXERCISES

1. Distance measurement- Using tapes, hand held distance meter, distance measuring wheel and Electronic Distance Measurements (EDM)
2. Angle measurement using Theodolite- Horizontal and vertical angle measurement.
3. Angle measurement using Total station - Horizontal and vertical angle measurement.
4. Leveling - finding elevation by differential leveling (Plane of collimation method)
5. Measurements of heights and distances by single and double plane method using Theodolite
6. Finding areas using total station.
7. Setting out a simple curve by deflection angle method.
8. Contouring using total station. Plotting using CAD
9. Profile survey L/S, C/S using total station. Plotting using CAD
10. Setting out simple curve using Total station
11. Setting out building by centre line method.
12. Setting out sewer line using total station.

### Text Books:

1. Dr. B.C.Punmia, Ashok Kumar Jain, Dr Arun Kuma Jain, “Surveying Vol.I”, Laxmi Publications, 2017, 17<sup>th</sup> edition. ISBN: 9788170088534
2. Charles D. Ghilani, “Elementary surveying : An Introduction to Geomatics”, 13th ed, Prentice Hall, 2012, ISBN-13: 978-0-13-255434-3
3. A M Chandra, “Higher Surveying”, New Age International, 2005, ISBN: 81:224:1628:4

### Reference Books:

1. S K Duggal, (2008), “Surveying – Vol. I”, Tata McGraw hill publishing company Ltd, New Delhi.
2. B Bhatia “Remote Sensing and GIS” ,Oxford University Press
3. James M Anderson and Adward M Mikhail, “Surveying theory and practice”, Tata McGraw Hill Publication

## ENGINEERING GEOLOGY LABORATORY

**Course Code:** CVL 48

**Course Credits:** 0:0:2:0

**Prerequisite:** Engineering Geology

**Contract Hours:** 28

### Course outcomes

Student will be able to:

1. Determine rock forming minerals and ore/industry forming minerals
2. Scrutinize the different types of rocks and their properties
3. Demonstrate Construction of surface and subsurface geological maps
4. Estimate the thickness of ground strata from drill-hole logs
5. Delineate thematic layers through geo-informatics techniques

### List of Experiments:

1. Identification of Rock forming minerals (Silicate minerals)
2. Identification of Rock forming minerals (Non-silicate minerals)
3. Identification of Ore forming/Industrial based minerals (Non-silicate minerals)
4. Recognition and descriptive study of Igneous rocks
5. Recognition and descriptive study of sedimentary rocks
6. Recognition and descriptive study of Metamorphic rocks
7. Study of Geological maps and their interpretation of Sections
8. To find out the Dip and strike of the geological formation (Surface method problems)
9. To find out the thickness of Beds of the geological formation (True thickness & vertical thickness problems)
10. To find out the Borehole problems of three and four level (Sub surface dip and strike)
11. Visual interpretation of satellite imagery, Digitization of thematic layer, lay-outting and map preparation

### Text Book:

1. Parbin Singh "Text book of Engineering and General Geology", Katson publication house, Ludhiana, 2009.
2. Mukerjee, P.K "Text book of Geology", World press Pvt. Ltd. Kolkatta
3. Maruthesha Reddy, M.T. "Applied Engineering Geology", Subhas stores, Bangalore, 2013.

### Reference Lab Manual:

1. Gurrappa, "Standard geological and topographical maps"
2. Satyanarayana Swamy, Engineering Geology lab manual"
3. Maruthesha Reddy, M.T. "Lab manual of engineering Geology observation book", Subhas stores, Bangalore, 2017.