JSS Mahavidyapeetha

JSS Science and Technology University, Mysuru

Sri Jayachamarajendra College of Engineering

DEPARTMENT OF CIVIL ENGINEERING

- **Scheme of Teaching & Examination for B.E. I to IV Semesters.**
- **Syllabi for the subjects of B.E. I to IV Semesters**

2017-18

Semester Wise Credits

Sl. No.	Semester	Credits
1.	I	25.00
2.	II	25.00
3.	III	27.00
4.	IV	27.00
5.	V	26.50
6.	VI	26.50
7.	VII	22.00
8.	VIII	21.00
TOTAL		**200.00**

Grading system

Marks	Grade
90 – 100	S
75 – 89	A
66 – 74	B
56 – 65	C
50 – 55	D
45 – 49	E
< 45	F

Notations in the Scheme

CIE	Continuous Internal Evaluation
SEE	Semester End Examination
L	Lecture
T	Tutorial
P	Practical

JSS Science and Technology University, Mysuru

Sri Jayachamarajendra College of Engineering, Mysuru

Scheme of Teaching and Examination for B.E.

I Semester B.E. (Civil, CT&M, Env., Biotech)

Sl. No	Subject code	Course title	Teaching department	Credits				Contact hours	Marks			Exam duration in hrs
				L	T	P	Total		CIE	SEE	Total	
1	MA110	Engineering Mathematics-I	Maths.	3	1	0	04	05	50	50	100	03
2	PH110	Engineering Physics	Physics	4	0	0	04	04	50	50	100	03
3	CV110	Engineering Mechanics	Civil	4	0	0	04	04	50	50	100	03
4	EE110	Basic Electrical and Electronics Engineering	E&EE	4	0	0	04	04	50	50	100	03
5	ME110	Fundamentals of Mechanical Engineering	Mech	4	0	0	04	04	50	50	100	03
6	PH12L	Engineering Physics Laboratory	Physics	0	0	1.5	1.5	03	50	-	50	-
7	CV12L	Basic Computational Laboratory	Civil	0	0	1.5	1.5	03	50	-	50	-
8	HU120/ HU220	Functional English	Humanities	2	0	0	02	02	50	-	50	-
				Total credits			**25**	**29**	**Total marks**		**650**	-

JSS Science and Technology University, Mysuru

Sri Jayachamarajendra College of Engineering, Mysuru

Scheme of Teaching and Examination for B.E.

II Semester B.E. (Civil, CT&M, Env., Biotech)

Sl. No	Subject code	Course title	Teaching department	CREDITS				Contact hours	Marks			Exam duration in hrs
				L	T	P	TOTAL		CIE	SEE	Total	
1	MA210	Engineering Mathematics–II	Maths.	3	1	0	04	05	50	50	100	03
2	CH210	Engineering Chemistry	Chemistry	4	0	0	04	04	50	50	100	03
3	CV210	Strength of Materials	Civil	4	0	0	04	04	50	50	100	03
4	CS210	Programming in C	CS&E / IS	4	0	0	04	04	50	50	100	03
5	ME220	Computer Aided Engineering Graphics	Mech.	2	0	2	04	06	50	50	100	03
6	CH22L	Engineering Chemistry Lab	Chemistry	0	0	1.5	1.5	03	50	-	50	-
7	CS22L	C Programming Laboratory	CS&E / IS	0	0	1.5	1.5	03	50	-	50	-
8	HU110/ HU210	Innovation	Humanities	2	0	0	02	02	50	-	50	-
9	HU130/ HU230	Kannada	Humanities	-	-	-	-	02	50	-	50	-
				Total marks			**25**	**33**	**Total marks**		**700**	-

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Scheme of Teaching and Examination for B.E. (CV)

Semester: III

Sl. No	Subject code	Course title	Teaching department	Credits				Contact hours	Marks			Exam duration in hrs
				L	T	P	Total		CIE	SEE	Total	
1	MA310	Engineering Mathematics – III	Maths.	4	0	0	04	04	50	50	100	03
2	CV310	Materials of Construction	Civil	4	0	0	04	04	50	50	100	03
3	CV320	Analysis of Determinate Structures	Civil	4	0	0	04	04	50	50	100	03
4	CV330	Fundamentals of Surveying	Civil	4	0	0	04	04	50	50	100	03
5	CV340	Mechanics of Fluids	Civil	4	0	0	04	04	50	50	100	03
6	CV350	Concrete Technology	Civil	4	0	0	04	04	50	50	100	03
7	CV36L	Surveying Practice-I	Civil	0	0	1.5	1.5	03	50	-	50	-
8	CV37L	Basic Materials Testing Laboratory	Civil	0	0	1.5	1.5	03	50	-	50	-
9	HU310 /HU410	Constitution of India and Professional Ethics	Humanities	-	-	-	-	02	50	-	50	-
				Total credits			**27**	**32**	**Total marks**		**750**	-

JSS Science and Technology University, Mysuru

Sri Jayachamarajendra College of Engineering, Mysuru

Scheme of Teaching and Examination for B.E. (CV)

Semester: IV

Sl. No	Subject code	Course title	Teaching department	Credits				Contact hours	Marks			Exam duration in hrs
				L	T	P	Total		CIE	SEE	Total	
1	MA410	Engineering Mathematics-IV	Maths.	3	1	0	04	05	50	50	100	03
2	CV410	Building Construction	Civil	4	0	0	04	04	50	50	100	03
3	CV420	Analysis of Indeterminate Structures	Civil	4	0	0	04	04	50	50	100	03
4	CV430	Higher Surveying	Civil	4	0	0	04	04	50	50	100	03
5	CV440	Hydraulics and Flow Measurements	Civil	4	0	0	04	04	50	50	100	03
6	CV450	Elements of Engineering Geology and Geotechnical Engineering	Civil	4	0	0	04	04	50	50	100	03
7	CV46L	Surveying Practice-II	Civil	0	0	1.5	1.5	03	50	-	50	-
8	CV47L	Concrete Laboratory	Civil	0	0	1.5	1.5	03	50	-	50	-
9	HU420 /HU320	Environmental Studies	Env./ Humanities	-	-	-	-	02	50	-	50	-
				Total credits			**27**	**33**	**Total marks**		**750**	-

Engineering Mechanics

I Semester B.E. (Civil, CT&M, Env., Biotech, Mech., IP and PST)

Sub Code : CV110 Contact Hrs : 4/week
Credits : 04: 0: 0

Course Objectives:

- To analyse problems in engineering subjected to a force system and to compute the net effect.
- To analyse the equilibrium of rigid bodies.
- To determine the geometric properties of plane sections.

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1. Introduction to Engineering mechanics: Basic idealisations: Particle, Continuum, Rigid body and Point force; Newton's laws of motion, Definition of Force, Introduction to SI units, Elements of a force, Classification of force and force systems; Principle of physical independence of forces, Principle of superposition of forces, Principle of transmissibility of forces; Moment of a force, couple, moment of a couple, characteristics of a couple, Equivalent force: couple system; Resolution of a force, Composition of forces; Numerical problems on resolution of forces, moment of forces and couples and on equivalent force – couple system.
2. Composition of forces: Definition of Resultant; Composition of coplanar - concurrent force system, Principle of resolved parts; Numerical problems on composition of coplanar–concurrent force systems.
3. Composition of Coplanar: non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanar non-concurrent force systems.
4. Centroid of Plane Figures and Simple Built up Sections: Numerical problems.
5. Moment of inertia of plane figures; polar moment of inertia, Radius of gyration, Perpendicular axis theorem and Parallel axis theorem; Moment of inertia of built up plane figures; Numerical problems.
6. Equilibrium of forces: Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent force system.
7. Types of supports, statically determinate beams, Numerical problems on equilibrium of coplanar – non-concurrent force system and support reactions for statically determinate beams; Numerical problems.
8. Friction: Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Numerical problems.

Self-Learning:

- Vector method for resolution and composition of forces.
- Vector method for solving problems on equilibrium.
- Screw friction and belt friction.

Text Books:

- Beer, F.P. and Johnston Jr., E.R. (1982), Mechanics for Engineers, Vol. 1 – Statics, *McGraw-Hill Book Company, New York.*
- Rahman S.S. and Madhava Rao, V. (2006), Elements of Civil Engineering and Engineering Mechanics, *Sanguine Technical Publishers, Bengaluru.*

Reference Books:

- Merium, J.L. and Kraige, L.G. (2006), Engineering Mechanics, Vol. 1 – Statics, 3rd Edition, *John Wiley and Sons Inc., New York.*
- Kumar, K.L. (2008), Engineering Mechanics, 3rd Revised Edition, *Tata McGraw-Hill Publishing Company, New Delhi.*
- Boresi, A.P. and Schmidt, R.J. (2000), Engineering Mechanics*, CL-Engineering, USA.*

Course Outcome:

The student has the ability to

- analyse the given force system to compute its resultant (CO1).
- analyse the system of forces in equilibrium with or without frictional forces (CO2).
- determine the reactions at the supports of statically determinate systems (CO3).
- locate the centroid of plane figures and to compute the second moment of areas of standard sections (CO4).

Basic Computational Laboratory

I Semester B.E. (Civil, CT&M, Env. and Biotech)

Sub Code : BT/CV/CT/EV/12L Contact Hrs : 4/week
Credits : 0: 0: 1.5

Course Objectives:

- To identify and to define a computational engineering problem
- To develop experience in specifying and designing a solution to an engineering problem using a software tool
- To facilitate the students to the use of electronic spread sheet programs for engineering problem solving.

Use of Electronic spread sheet in Engineering

- Introduction to electronic spread sheets and their usage in engineering problem solving.
- Identify and describe the purpose and function of the extensive features of electronic spread sheet program.
- Working with electronic spread sheet for – Creating, saving, retrieving, formatting, editing, and printing worksheets – Simple calculations and creating formulas – Charting and Graphing – Performing What-If Analysis – Naming cells and ranges – Array Formulae, matrix manipulations – Working with Tables – Lookup tables – Conditional Formatting, Data Validation – Statistical Analysis – Numerical Analysis. Application of electronic spread sheets for solving Engineering problems – Macros and Programing electronic spread sheets (only demonstration).

References:

1. Larsen, R.W. (2017), Engineering with Excel, *5th Edition, Pearson Education Inc., USA.*
2. Parsons, J.J., Oja, D, Carey, P. and Des Jardins, C.A. (2017), Microsoft® Office 365™ & Excel 2016, Cengage Learning, USA.
3. Software user manuals.

Course Outcome:

The student has the

- ability to Identify, to define and to solve a computational engineering problem using software tool (CO1).
- ability to solve engineering problems using electronic spread sheet (CO2).

Strength of Materials

II Semester B.E. (Civil, CT&M, Env., Biotech, Mech., IP and PST)

Sub Code : CV210 Contact Hrs : 4/week
Credits : 4:0:0

Course Objectives:

- To introduce the concept of stress and strain.
- To calculate the stresses and strains due to axial & shear loading and due to temperature variations.
- To analyse the two dimensional compound stress system.
- To study the variation of bending and shear force along the length of the loaded beam due to different types of loads and to study the resulting stresses.
- To analyse the circular shafts subjected to torsional moment.
- To analyse the long columns for their critical loads.

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1. Simple Stresses and Strains: Concept of Stress and Strain; St. Venant's Principle; Hooke's Law; Stress–Strain Diagram for ferrous and non-ferrous materials, True stress and strain; Elastic Constants – Young's modulus, Rigidity modulus, Bulk modulus and Poisson's ratio; Relationships among elastic constants; Deformation of uniform bars; Bars of varying cross section; Deformation due to self weight; Volumetric strain; Generalized Hooke's law; Composite sections; Temperature stresses; Statically indeterminate problems; Relevant numerical problems.
2. Bending Moment and Shear Force in Beams: Definitions – Bending moment and Shear force, Relationship among Bending Moment, Shear Force and Load Intensity; Bending moment and Shear force diagrams for statistically determinate beams subjected to point force, UDL, UVL, Couple and their combinations; Relevant numerical problems.
3. Simple Bending Theory; Moment of resistance; Section modulus of different cross sectional shapes; Bending and shear stresses in beams and their distribution over the beam cross section, Relevant numerical problems.
4. Torsion of Prismatic Circular Shafts: Torsion equation; Strength and Stiffness of solid and Hallow circular shafts (Uniform cross sections); Transmission of power; Relevant numerical problems.
5. Compound Stresses: Analysis of generalized two dimensional stress system – Normal and shear stresses on any inclined plane; Principal stresses and Principal planes; Maximum shear stresses and maximum shear planes; Pure shear stresses and pure shear planes; Mohr's circle of stresses; Relevant numerical problems.
6. Thin and Thick Cylinders: Stresses in thin cylinders subjected to internal and external pressures; Hoop, Longitudinal and Volumetric strains in thin cylinders; Lame's equations for stresses in thick cylinders; Relevant numerical problems.
7. Theory of Long Columns: Euler's formula for different end conditions; Effective length of column; Slenderness ratio; Rankine – Gordon Formula; Eccentrically loaded columns – Secant formula; Relevant numerical problems.

Self-Learning:

- Beams of uniform strength.
- Stresses in spherical shells.
- Principal stresses in shafts.

Text Books:

- Beer, F.P. and Johnston, E.R. (Jr.), (2014), Mechanics of Materials 7th Edition, *McGraw-Hill Book Co., New York.*
- Basavarajaiah, B.S. and Mahadevappa, P. (2010), Strength of Materials, 3rd Edition, *CRC Press, India.*

References Books:

- Subramanian, R. (2007), Strength of Materials*, Oxford University Press, New Delhi.*
- Popov, E.P. (2005), Engineering Mechanics of Solids, 2nd Edition, *Prentice Hall of India Pvt. Ltd., New Delhi.*

Course Outcome:

The student has the

- ability to calculate the stresses and strains due to axial, shear, radial and longitudinal forces and also due to temperature variations (CO1).
- ability to analyse a two dimensional compound stress system (CO2).
- ability to draw bending moment and shear force diagrams for beams subjected to transverse loads and also to determine the bending and shearing stresses in beams (CO3).
- ability to determine the shear stress developed in shafts due to torsion and to design a shaft for the given conditions (CO4).
- ability to determine the critical and safe loads on long columns and also to determine the section of the long columns for the given conditions (CO5).

JSS Science and Technology University, Mysuru

Sri Jayachamarajendra College of Engineering

Scheme of Teaching and Examination for B.E.
II Semester B.E. (E&E, E&C, IT, CS&E, IS)

Sl. No	Subject code	Course title	Teaching department	Credits				Contact hours	Marks			Exam duration in hrs
				L	T	P	Total		CIE	SEE	Total	
3	CV220	Elements of Civil Engineering and Engineering Mechanics	Civil	4	0	0	04	04	50	50	100	03

Elements of Civil Engineering & Engineering Mechanics

II Semester B.E. (EE, EC, IT, CS and IS)

Sub Code	:	CV220	Contact Hrs	:	4/week
Credits	:	4 : 0 : 0	Total Hrs	:	52

Course Objectives:

- The students of circuit branches are introduced to the field of Civil Engineering.
- To students are introduced to the basic infrastructural facilities such as Roads, Bridges and Dams.
- To students are introduced to analyse the problems in engineering subjected to a force system and to compute the net effect.
- To students are introduced to analyse the equilibrium of rigid bodies.
- To students are introduced to the determination of the geometric properties of plane sections.

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1. Introduction to Civil Engineering, Scope of different fields of Civil Engineering – Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.
   Infrastructure: Types of infrastructure, Role of a Civil Engineer in the Infrastructural Development, Effect of the infrastructural facilities on socio-economic development of a country.
2. Roads: Basic Definitions, Cross sectional elements of roads, Components of road, Types of roads, and their functions.
3. Bridges and Dams: Definitions, Functions and Classification.
4. Introduction to Engineering mechanics: Basic idealisations – Particle, Continuum, Rigid body and Point force; Newton's laws of motion, Definition of force, Introduction to SI units, Elements of a force, Classification of force and force systems; Principle of physical independence of forces, Principle of superposition of forces, Principle of transmissibility of forces; Moment of a force, couple, moment of a couple, characteristics of a couple, Equivalent force - couple system; Resolution of forces, Composition of forces; Numerical problems on resolution of forces, moment of forces and couples, on equivalent force – couple system.
5. Composition of forces – Definition of Resultant; Composition of coplanar - concurrent force system, Principle of resolved parts; Numerical problems on composition of coplanar–concurrent force systems.
6. Composition of coplanar – non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanar non-concurrent force systems.
7. Centroid of plane figures; Locating the centroid of triangle, semi-circle, quadrant of a circle and sector of a circle using method of integration, Centroid of simple built up plane figures; Numerical problems.
8. Equilibrium of forces – Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent force system.
9. Types of supports, statically determinate beams, Numerical problems on equilibrium of coplanar – non-concurrent force system and support reactions for statically determinate beams.
10. Friction – Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Wedge friction; Ladder friction; Numerical problems
11. Moment of inertia of plane figures, polar moment of inertia, Radius of gyration, Perpendicular axis theorem and Parallel axis theorem; Moment of Inertia of rectangular, circular and triangular plane figures from method of integration; Moment of inertia of composite plane figures; Numerical problems.

Self-Learning:

- Fundamentals of railways and airways.

Text Books:

- Beer, F.P. and Johnston Jr., E.R. (1982), Mechanics for Engineers, Vol. 1 – Statics, *McGraw-Hill Book Company, New York.*
- Rahman S.S. and Madhava Rao, V. (2006), Elements of Civil Engineering and Engineering Mechanics, *Sanguine Technical Publishers, Bengaluru.*

Reference Books:

- Merium, J.L. and Kraige, L.G. (2006), Engineering Mechanics, Vol. 1 – Statics, 3rd Edition, *John Wiley and Sons Inc., New York.*
- Kumar, K.L. (2008), Engineering Mechanics, 3rd Revised Edition, *Tata McGraw-Hill Publishing Company, New Delhi.*
- Boresi, A.P. and Schmidt, R.J. (2000), Engineering Mechanics*, CL-Engineering, USA.*

Course Outcome:

The student has the

- knowledge of various streams of Civil Engineering, role of Civil Engineers in any constructional project and the ability to identify & classify the Civil Engineering infrastructural facilities (CO1).
- ability to analyse the given force system to compute its resultant (CO2).
- ability to analyse the system of forces in equilibrium with or without frictional forces (CO3).
- ability to determine the reactions at the supports of statically determinate systems (CO4).
- ability to locate the centroid of plane figures and to compute the second moment of areas of standard and built up sections (CO5).

Materials of Construction

Sub Code : CV310 Contact Hrs : 4/week
Credits : 04:0:0

Course Objectives:

- To study naturally available building materials.
- To study manufactured building materials.
- To study types of building materials, manufacturing processes, properties and uses.

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1. **Building Stones**
   - Classification
   - Quarrying of stones
   - Dressing of stones
   - Deterioration and preservation of stones
   - Requirements of good stones
   - Tests on stones
2. **Bricks and Tiles**
   - Classification of bricks
   - Good brick earth
   - Harmful ingredients
   - Properties of good bricks
   - Manufacture of bricks
   - Tests of bricks
   - Roofing tiles – properties
   - Flooring tiles – properties
3. **Cementitious Materials**
   - Lime -
     - Composition of lime
     - Classification of lime
     - Manufacture of lime
     - Activated – lime – puzzolona mixture
   - Cement – Introduction only
   - Puzzolanas – Meta kaolin, Silica Fume, Fly ash, Ground Blast Furness Slag and rice husk ash.
4. **Timber**
   - Classification of trees
   - Cross-section of an exogenous tree
   - Properties of good timber
   - Defects in timber
   - Decay of timber
   - Seasoning of timber
   - Preservation of timber
   - Fire resistance of timber
   - Tests on timber
   - Timber based products – Plywood, Wood Wool Boards, Lamin Boards.
5. **Metals and Alloys**
   - Ferrous metals – Cast iron, wrought iron, steel – types, properties and their uses in building industry.
   - Non-ferrous metal – Al, Copper, Lead, Tui, Zuic, Nickel – properties and their uses.
   - Alloys of copper and Al, Copper, Lead, Tui, Zuic, Nickel – properties and their uses.
6. **Paints, Varnishes and Distempers**
   - Definition
   - Functions
   - Characteristics
   - Types
7. **Composite Materials**
   - Introduction
   - Classification - Particle reinforced composite, Fiber reinforced composite, Structural composite – their applications.
8. **Insulating Materials**
   - Classification
   - Thermal insulating materials –
     - General aspects
     - Requirements
     - Classification
   - Sound insulating materials –
     - Requirements
     - Classification
9. **Glass, Rubber and Plastics**
   - Types
   - Properties
   - Uses
10. **Other Building Materials**
    - Construction chemicals and adhesives.
    - Alternative building blocks
    - Smart materials

Self-Learning:

- Alternative building blocks for masonry.
- Market forms of timber.
- Reinforced plastics.
- Types of structural steel.

Text Books:

- Varghese, P.C. (2009), Building Materials, *Prentice Hall of India, New Delhi.*
- Duggal, S.K., (2016), Building Materials, *New Age International Publications, New Delhi.*

Reference Books:

- Rai, M. and Jaisingh, M.P. (1986) Advances in Building Materials and Construction, *CBRI Publications, Roorkee.*
- Manjunath, K.S. (2008), Materials of Construction, *Sanguine Technical Publishers, Bengaluru.*
- Bhavikatti, S.S., (2012), Building Materials, *Vikas Publishing House Pvt. Ltd., New Delhi.*
- Rangwala .S.C, (2012), "Engineering Materials", *Charotor Publishing House, New Delhi.*
- Rajput, R.K. (2009), Engineering Materials, *S. Chand & Co., New Delhi.*

Course Outcome:

The student has the knowledge of

- masonry and cementitious materials (CO1).
- Timber and its products (CO2).
- metallic and composite materials (CO3).
- finishing and other building materials (CO4).

Analysis of Determinate Structures

Sub Code : CV320 Contact Hrs : 4/week
Credits : 04:0:0

Course Objectives:

- To understand the role of structural analysis in the structural design process.
- To identify, idealise and analyse simple engineering structures.
- To apply the knowledge of mathematics, science and engineering fundamentals to analyse simple engineering structures.

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1. **Structural System:** Introduction, Forms of Structures, Conditions of Equilibrium, Determinate and Indeterminate Structures, one-, two- and three-dimensional idealization of structural systems, Betti's law, Maxwell's Reciprocal theorem, Strain Energy Principle, Strain energy due to Axial load, Bending and Shear.
2. **Analysis of Pin Jointed Determinate Plane Truss:** Introduction, Assumptions, Analysis of truss by
   a). Method of joints,
   b). Method of Sections.
3. **Analysis of Cables:** Introduction, Analysis of Cables under concentrated loads and uniformly distributed loads with supports at same and different levels; Analysis of anchor cables.
4. **Analysis of Three Hinged Arches:** Introduction, Analysis of Three hinged Parabolic and Circular arches with supports at same and different levels.
5. **Moving Loads and ILD for Beams:** Introduction, ILD for simply supported beams, Analysis of simply supported beams under various standard types of moving loads.
6. **Deflection of Beams:** Introduction, Deflection and slope of beams by –
   a) Macaulay's Method
   b) Moment Area Theorems (Concepts only)
   c) Conjugate Beam Method (prismatic and non-prismatic beams)
   d) Castigliano's theorem (prismatic and non-prismatic beams)
   e) Unit load method (prismatic and non-prismatic beams)
7. **Deflection of Trusses:** Deflection of Trusses using Castigliano's theorem and Unit load method.

Self-Learning:

- Determination of slope and deflection of cantilever beams using Moment area method.

Text Books:

- Pandit, G.S., Gupta, S.P. and Gupta, R., (1999), Theory of Structures, Vol.–I, *Tata McGraw Hill, New Delhi.*
- Reddy C.S., (2010), Basic Structural Analysis, *Tata McGraw Hill, New Delhi.*
- Punmia, B.C., Jain, A.K. and Jain, A.K. (2004), Theory of Structures, *Laxmi Publication New Delhi.*

Reference Books:

- Norris, C.H. and Wilbur, J.B. (1960), Elementary Structural Analysis, International Student Edition. *McGraw Hill Book Co., New York.*

Course Outcome:

The student has the

- knowledge of basic concepts of structural analysis in the structural design process (CO1).
- ability to analyse and compute internal forces in plane trusses (CO2),
- ability to analyse arches and cables (CO3).
- ability to compute the deformations in determinate beams and trusses (CO4).
- ability to use the concept of ILD to find internal forces in determinate beams (CO5).

Fundamentals of Surveying

Sub Code : CV330 Contact Hrs : 4/week
Credits : 04:0:0

Course Objectives:

- To know the importance of surveying in Civil Engineering and to introduce the basic concepts of surveying.
- To learn fundamental concepts of planimetric survey and relief survey.

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1. **Introduction:** Surveying – Classification – Uses – Map and plan – Topographical maps – Basic principles of surveying – Precision and accuracy – Errors and types.
2. **Measurement of Horizontal Distances:** Chain and its types – Tape and its types – EDM devices – Ranging of a line – Chain and tape corrections – Numerical problems.
3. **Chain Surveying:** Accessories required – selection of stations and lines – Offsets and its types – Booking and chain survey work – Conventional symbols – Obstacles in chain survey – Numerical problems – Errors and precautions to be taken.
4. **Compass Surveying:** Prismatic compass and surveyor's compass - Bearing and types – Dip and declination – Accessories required for compass survey – computation of angles from bearings – Computation of Bearings of legs of a traverse knowing bearing of one leg and interior angles – local attraction – Detection and correction – Numerical problems – Errors and precautions to be taken.
5. **Introduction to Levelling:** Basic definitions – Fundamental axes and parts of a Dumpy level – Temporary adjustments – Curvature and refraction – simple levelling – Reciprocal levelling – Profile levelling – Cross sectioning – Fly levelling – Methods of booking – Fly back levelling – Arithmetic checks – Errors and precautions to be taken – Numerical problems.
6. **Contours:** Characteristics – Methods of contouring – Interpolation techniques – Uses – Grade contour – Inter-visibility problems.
7. **Plane Table Survey:** Accessories – Advantages and limitations – Orientation – Methods of plotting – Two point and three point problems and solutions – Errors and precautions to be taken.

Self-Learning:

- Survey of India topographic maps and map numbering.
- Latitude and longitude of a place.
- Overcoming obstacles in levelling.
- Computation of volume of earth work using cross-sectional details.
- Computation of volume of reservoir using contour maps.

Text Books:

- Chandra, A.M. (2002), Plane Surveying, *New Age International (P) Ltd., New Delhi.*
- Alak De, (2000), Plane Surveying, *S. Chand & Co. Ltd., New Delhi.*

Reference Books:

- Anderson, J. and Mikhail, E. (1985), Introduction to Surveying, *Mc-Graw Hill Book Co., New York.*
- Benister, A. (2006), Surveying, *Pearson Education, New Delhi.*

Course Outcome:

The student has the

- knowledge of basic principles of surveying considering the types of errors (CO1).
- ability to determine plannimetric distances (CO2).
- ability to determine directions using bearings and angles (CO3).
- ability to determine relative elevations of points and to develop contour maps (CO4).
- ability to prepare small maps using plane table survey (CO5)

Mechanics of Fluids

Sub Code : CV340 Contact Hrs : 4/week
Credits : 04:0:0

Course Objectives:

- To introduce the students to the properties of fluids and classification of fluids.
- To introduce the concept of static pressure of fluid and its measurement.
- To introduce the students to kinematics of fluid flow.
- To introduce the students to the basic equations of fluid flow and their applications.

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1. **Introduction:** Definition of Fluid, Distinction between solids & fluid, Distinction between liquids & gases, Concept of fluid continuum.
2. **Fluid Properties and Classification of Fluids:** Mass density, Specific Volume, Specific Weight, Specific gravity – Definitions, units and Dimensions. Viscosity, Newton's law of viscosity, Newtonian, Non-Newtonian Fluids, Ideal and Real fluids, Compressibility vapour pressure, surface tension – Definitions, units and dimensions. Capillarity – Theory and problems. Problems on Newton's law of viscosity.
3. **Fluid Pressure and its Measurement:** Definition of pressure, units and dimensions, pressure at a point in a static fluid. Pascal's law – Hydrostatic pressure law. Absolute, gauge and vacuum pressure. Measurement of pressure – Simple and Differential Manometer – Theory and problems, Micro-manometers and Mechanical pressure gauges.
4. **Hydrostatics:** Definition of total pressure, center of pressure, centroid, centroidal depth, depth of center of pressure, moment of Inertia, table of centroid & moment of Inertia for different geometric shapes, – Equation for hydrostatic force and depth of center of pressure on plane surfaces (vertical and inclined), – Problems on hydrostatic force vertically submerged surfaces – Problems on inclined submerged surfaces, –Hydrostatic force on submerged curved surfaces, problems, – Pressure diagram, problems.
5. **Kinematics of Fluid Flow:** 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 in one dimensional 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. Problem on continuity equation – Problem on velocity potential and stream function.
6. **Dynamics of Fluid Flow:** Concept of Inertia force and other forces causing motion. Introduction to Non-dimensional numbers. – Derivation of Euler's equation and Bernoulli's equation with assumption and limitation. – Modification of Bernoulli's equation, problem on Bernoulli's equation without and with losses. – Problems on Bernoulli's equation – Application of Bernoulli's equation – Venturimeter, Pitot tube, problems. Momentum equation, problems.

Self-Learning:

- Basic principles of stability of floating and submerged bodies.

Text Books:

- Modi, P.N. and Seth, S.M. (2002), Hydraulics and Fluid Mechanics including Hydraulic Machines, *Standard Book House, Delhi.*
- Subramanya, (2001), Fluid Mechanics & Hydraulic Machines, *Tata McGraw-Hill Education, New Delhi.*
- Bansal, R.K. (2009), Fluid Mechanics and Hydraulic Machines, *Laxmi Publications, New Delhi.*

Reference Books:

- Rouse, H. (2011), Elementary Mechanics of Fluids, *Dover Publications, Inc. New York*.
- Arora, K.R. (2005), Fluid Mechanics, Hydraulic and Hydraulics, *Standard Book House, Delhi.*
- Cruise, J.F., Singh, V.P. and Sherif, M.M. (2007), Elementary Hydraulics, (1st Edition), *Thomson Learning, USA.*
- Douglas, J.F., Gasoriek, J.M., Swaffield, J. and Jack L. (2006), Fluid Mechanics, *Prentice Hall, USA.*

Course Outcome:

The student has

- the ability to analyse the properties of fluids (CO1).
- the ability to determine / measure static fluid pressure (CO2).
- knowledge of kinematics of flow and to analyse the stream lines & equi-potential lines of fluid flow (CO3).
- the ability to analyse the dynamics of fluid flow and its applications (CO4).

Concrete Technology

Sub Code : CV350 Contact Hrs : 4/week
Credits : 04:0:0

Course Objectives:

- To introduce the students to concrete and its ingredients.
- To introduce the students to properties of fresh and hardened concrete.
- To introduce the students to mix design of concrete and testing of concrete.

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1. Concrete ingredients: Cement- chemical composition, manufacture of OPC by wet and dry process, hydration of cement, types of cement. Testing of cement.
Fine aggregate- grading analysis, specific gravity, bulking, moisture content, deleterious materials.
Coarse aggregate- Importance of size, shape and texture. Grading of aggregates. Fineness modulus.
Water- qualities of water. Use of sea water for mixing concrete.
Admixtures – chemical admixtures- Plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures- Fly ash, silica fumes and rice husk ash

2. Fresh Concrete: Workability – factors affecting workability,
Measurement of workability – slump, compaction factor, vee -bee and flow tests.
Segregation and bleeding.
Process of manufacturing of concrete – Batching, Mixing, transporting, Placing and compaction.
Curing – methods of curing- Water curing, membrane curing, steam curing. Accelerated curing; Ready Mix Concrete.

3. Hardened concrete: Factors affecting strength, w/c ratio, gel-space ratio. Maturity concept
Effect of aggregate properties,
Relations between compressive strength, tensile strength and bond strength and modulus of rupture.
Elasticity – Relation between modulus of elasticity and strength,
Factors affecting modulus of elasticity, Poison's ratio.
Creep – measurement of creep, factors affecting creep, effect of creep
Shrinkage of concrete- plastic shrinkage and drying shrinkage, factors affecting shrinkage, moisture movement.
Durability – definition and significance of durability. Permeability.
Sulphate attack, chloride attack, carbonation, freezing and thawing.

4. Concrete Mix Design: Concept of Mix design, Variables in proportioning and exposure conditions.
Procedure of mix design as per IS 10262-2009.
Numerical examples of Mix design.

5. Non Destructive Testing of Concrete: Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity – Principles, applications and limitations.

Self-Learning:

- Mix design of concrete by methods other than the Indian Standard code of practice.

Text Books:

- Neville, A.M., (2011), Properties of Concrete, *Pearson Education Ltd., England.*
- Shetty, M.S. (1982), Concrete Technology (Theory and Practice), *S. Chand and company, New Delhi.*
- Gambhir, M.L. (2004), Concrete Technology, *Tata McGraw-Hill Education, New Delhi.*

Reference Books:

- Neville, A.M. and Brooks J.J. (2010), Concrete Technology, *Prentice Hall, England.*
- Gambhir, M.L. (1992), Concrete Manual, *Dhanpat Rai & Sons, New Delhi.*
- IS: 10262-2009: Indian Standard Concrete Mix Proportioning-Guidelines, *BIS, New Delhi.*
- SP 23 (1982), Handbook on Concrete Mixes, *BIS, New Delhi.*
- Manual of Concrete Practice (2015), *ACI, USA.*

Course Outcome:

The student has the

- knowledge of the ingredients of good concrete (CO1).
- ability to analyse the properties of fresh concrete (CO2).
- ability to analyse the properties of hardened concrete (CO3).
- ability to design concrete as per Indian Standard code of practice (CO4).
- ability to do Non-destructive testing of concrete (CO5).

Surveying Practice-I

Sub Code : CV36L Contact Hrs : 3/week
Credits : 0:0:1.5

Course Objectives:

- To facilitate the students to develop their intellectual and motor skills to conduct the surveying works based on objectives.
- To train the students of civil engineering in using various surveying Instruments - care and adjustments.
- To train the students to collect the field data, field notes and to apply corrections required using suitable methods before plotting or setting-out.

Part – A

Exercise-1 : To study different types of chains and types (LC, capacity, IS: specification). Defect detection.
To study about ranging rods, pegs and arrows and there uses.

Exercise-2 : To study perpendicular setting devices like cross staff, optical square, prism square – Understanding of basic principle of construction.

Exercise-3 : To study prismatic compass, surveyor's compass – comparison.

Exercise-4 : To study Dumpy level, Temporary adjustments.
Other types of levels.

Exercise-5 : To study accessories used in plane table survey.
Adjustments in the field.

Part – B

Exercise-1 : To determine the distance between two points by direct ranging.
To setout perpendicular by geometrical and instrumental methods.

Exercise-2 : To setout rectangles, triangles, hexagons using chain / type and other accessories.

Exercise-3 : To measure the bearing of lines.
To measure legs and bearings of closed traverse and to compute angles. Determination of errors after plotting.

Exercise-4 : To determine distance of an inaccessible object using compass.
To determine distance between two inaccessible objects using compass.

Exercise-5 : To setout triangles, rectangles, pentagon and hexagon using compass and other accessories.

Exercise-6 : To establish temporary bench mark in the field by carrying levels from permanent bench mark. Fly back to check accuracy.

Exercise-7 : To determine RL of points starting from TBM – different methods of booking and checks.
To conduct reciprocal levelling.

Exercise-8 : Profile levelling for water supply line / sewage line – plotting.
Profile levelling for highways including cross section levelling – plotting.

Exercise-9 : Block levelling and contour map generation.

Exercise-10 : Plotting by radiation and intersection.
Plotting traverse on plane table.
Bessel's solutions to 3 point problem.

NOTE: Exercise of Part-B is to be performed only after completing corresponding exercise in Part-A.

Reference Books:

- Chandra, A.M. (2002), Plane Surveying, *New Age International (P) Ltd., New Delhi.*
- Alak De, (2000), Plane Surveying, *S. Chand & Co. Ltd., New Delhi.*
- Anderson, J. and Mikhail, E. (1985), Introduction to Surveying, *Mc-Graw Hill Book Co., New York.*
- Benister, A. (2006), Surveying, *Pearson Education, New Delhi.*

Course Outcome:

The student has the ability to

- use various surveying instruments (CO1).
- prepare planimetric and topographic maps of small areas (CO2).
- prepare comprehensive report of the survey work conducted (CO3).

Basic Materials Testing Laboratory

Sub Code : CV37L Contact Hrs : 3/week
Credits : 0:0:1.5

Course Objectives:

- To introduce the students of civil engineering, the philosophy behind the material testing and various methods of testing of materials used in construction industry and the importance of the results thus obtained.
- To facilitate the students to develop their intellectual and motor skills to conduct tests on basic engineering materials used in construction industry.
- To train the students to analyse the data obtained from the laboratory testing rationally to get meaningful results, which are helpful in the analysis and design of structural elements.

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1. Tension tests on Mild steel and HYSD bars.
2. Compression tests on Mild steel, Cast iron and Wood.
3. Torsion test on Mild steel.
4. Double shear test on Mild steel.
5. Impact tests on Mild steel: Izod test and Charpy test.
6. Bending test on wood (Two point loading)
7. Hardness tests on metals: Rockwell, Brinell's and Vicker's hardness tests.
8. Test on open coiled helical spring.
9. Test on bricks and Masonry blocks: Dimension tolerance tests, Density test, Water Absorption test, Compressive Strength test,
10. Test on Tiles: Water Absorption test, Wet Transverse Strength test.
11. Use of strain gauges (Demonstration):

Text Books:

- Davis, H.E., Troxell, G. and Hauck, G. (1982), Testing of Engineering Materials, IV Edition, *McGraw Hill Publications, New York.*
- Relevant Bureau of Indian Standard Codes.

Course Outcome:

The student has the

- knowledge of various procedures of testing of engineering materials and the fundamentals of testing methodology (CO1).
- ability to conduct testing of engineering materials as per the standard procedures of testing (CO2).
- ability to analyse the test data rationally and to prepare the test report (CO3).

Building Construction

Sub Code : CV410 Contact Hrs : 4/week
Credits : 04:0:0

Course Objectives:

- To introduce the students to various components of buildings.
- To introduce the students to the concept of green buildings and earthquake resistant construction practices.

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1. **Foundations**
   a. Definitions
   b. Foundations
   c. Setting out of foundation works
   d. Timbering of trenches
   e. Types of foundations
   f. Foundations in black cotton soils / problematic soils.
2. **Masonry**
   a. Stone masonry – Setting out, joints, types
   b. Brick masonry – Terminologies, Bonds and Reinforced brick work.
   c. Block masonry – Concrete block, Stone composite, brick – stone composite.
   d. Types of walls
   e. Masonry arches and types
   f. Lintel, Chejja, Canopy and balcony - Functions
3. **Roofs**
   a. Features of a good roof
   b. Classification
   c. Steel and timber trusses.
4. **Lifts and Elevators**
   a. Types
   b. Requirements
   c. Geometric design
5. **Flooring, Plastering and Painting:**
   a. Purpose
   b. Types
6. **Door and Windows:**
   a. Positioning and proportioning
   b. Types
7. **Damp Proofing and Water Proofing:**
   a. Causes
   b. Effects
   c. Methods
8. **Ancillary Works:**
   a. Form works
   b. Shoring
   c. Scaffolding
9. **Green Buildings:**
   a. Concepts and requirements
   b. Energy conservation in buildings
   c. Rating of buildings
10. **Earthquake – Resistant Buildings:**
    a. Terminology
    b. Magnitude and intensity of earthquake
    c. Zones
11. **Improving earthquake resistance of buildings**

Self-Learning:

- Causes of failure of foundation and remedial measures.
- Fixtures for doors and windows.
- Safety, health and welfare facilities at construction sites.

Text Books:

- Varghese, (2007), Building Construction, *Prentice Hall of India, New Delhi.*
- Punmia, B.C. (1993), Building Construction, *Laxmi Publishers, New Delhi.*
- Bhavikatti, S.S. (2012), Building Construction, *Vikas Publishing House Pvt. Ltd., New Delhi.*

Course Outcome:

The student has the

- ability to identify and understand the significance of each and every component of a building (CO1).
- ability to do the geometric design of stair cases (CO2).
- knowledge of the earthquake resistant and green buildings (CO3).

Analysis of Indeterminate Structures

Sub Code : CV420 Contact Hrs : 4/week
Credits : 04:0:0

Course Objectives:

- To apply the knowledge of mathematics, science and engineering fundamentals to solve relatively complex engineering structures.
- To apply the knowledge of matrix approach in classical methods of structural analysis.
- To introduce the concept of plastic analysis and carryout plastic analysis of continuous beams.

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1. **Introduction:** Degree of static and kinematic indeterminacy – Beams, plane frames and trusses, Methods of analysis of indeterminate structures – Force and displacement methods.

2. **Force Method of Analysis:**
   a) Consistent deformation method: Concept, Application to analysis of propped cantilever beam and fixed beams.
   b) Clapeyron's theorem – Applications.
   c) Matrix Method- Flexibility approach - Introduction, Analysis of continuous beams using system approach (static indeterminacy ≤ 3).

3. **Displacement Method of Analysis:**
   a) Slope deflection method - Introduction, Analysis of continuous beams and simple orthogonal portal frames without sway (kinematic indeterminacy ≤ 3).
   b) Moment distribution method - Introduction, Analysis of continuous beams and simple orthogonal portal frames with and without sway.
   c) Matrix Method – Stiffness Approach - Introduction, Analysis of continuous beams using system approach (kinematic indeterminacy ≤ 3).

4. **Plastic Analysis:** Introduction, Plastic hinge, Plastic moment capacity, Shape factor, Collapse load, Basic theorems, Plastic analysis of beams.

Self-Learning:

- .Analysis of simple orthogonal portal frames with sway using slope deflection method.

Text Books:

- Reddy C.S., (2010), Basic Structural Analysis, *Tata McGraw Hill, New Delhi.*
- Pandit, G.S., Gupta, S.P. and Gupta, R., (1999), Theory of Structures, *Tata McGraw Hill, New Delhi.*
- Rajasekaran, S. and Sankarasubramanian, G. (2015), Computational Structural Mechanics, *Prentice Hall India Pvt. Ltd., New Delhi.*

Reference Books:

- Kinney, J.S. (1962), Indeterminate Structural Analysis, *Oxford Book Co., New Delhi.*
- Norris, C.H. and Wilbur, J.B. (1960), Elementary Structural Analysis, International Student Edition. *McGraw Hill Book Co., New York.*
- Jain, A.K. (2015), Advanced Structural Analysis, *Nem Chand & Bros., Roorkee, India.*
- Prakash Rao, D.S. (1996), Structural Analysis: A Unified Approach, *University Press, England.*
- Wang, C.K. (2014), Intermediate Structural Analysis, *Tata McGraw-Hill Education Pvt. Ltd., New Delhi.*

Course Outcome:

The student has the

- ability to identify indeterminate structures and determine the degree of indeterminacy (CO1).
- ability to analyze simple indeterminate beams using consistent deformation method (CO2).
- ability to analyze continuous beams & simple portal frames using slope deflection and moment distribution methods (CO3).
- ability to use matrix methods to analyse indeterminate beams (CO4).
- ability to determine shape factors & plastic moments and to perform plastic analysis of continuous beams (CO5).

Higher Surveying

Sub Code : CV430 Contact Hrs : 4/week
Credits : 04:0:0

Course Objectives:

- To introduce the students to accurate and higher order survey methods.
- To introduce the students to design and setting-out of curves for highways and railways.
- To introduce the students to the computation of earth works.

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1. **Theodolite:** Types – Fundamental axes and parts – Temporary adjustments – Measurement of horizontal angles and vertical angles.
2. **Trigonometric Levelling:** Problems with base accessible and inaccessible – Single plane and double plane methods – Total station instruments – Capabilities – Numerical problems.
3. **Tacheometry:** Basic principle – Tacheometric equation for horizontal and inclined line of sight – Method of tacheometry – Numerical problems.
4. **Traverse Survey:** Latitude and departure – Dependent and independent coordinates – Methods of plotting – Error of closure – Balancing the closed traverse using Bowditch's rule and Transit rule.
5. **Simple Curves:** Elements – Methods of setting out – Numerical problems.
6. **Compound and Reverse Curves:** Elements – Methods of setting out – Numerical problems.
7. **Transition Curves:** Types – Methods of setting out.
8. **Vertical Curves:** Types – Methods of setting out.
9. **Measurement of Earthwork for Roads:** Methods for computation of earthwork - trapezoidal & prismoidal formulae with and without cross slopes.

Self-Learning:

- Prolonging straight lines using theodolite.
- Digital theodolites.
- Trigonometric levelling in geodetic survey.
- Setting out of curves using total station.

Text Books:

- Chandra A.M. (2002), Plane Surveying, *New Age International (P) Ltd., New Delhi.*
- Alak De, (2000), Plane Surveying, *S. Chand & Co. Ltd., New Delhi.*

Reference Books:

- James Anderson and Edward Mikhail, (1985), Introduction to Surveying, *McGraw Hill Book Co., New York.*
- Benister, A. (2006), Surveying, *Pearson Education, New Delhi.*

Course Outcome:

The student has the ability to

- analyse theodolite and tacheometric survey data (CO1).
- balance and compute the coordinates the closed traverse (CO2).
- design the elements of curves for setting (CO3).
- compute volume of earth work (CO4).

Hydraulics and Flow Measurements

Sub Code : CV440 Contact Hrs : 4/week
Credits : 04:0:0

Course Objectives:

- To introduce the students to flow through pipes.
- To introduce the students to open channel flow.
- To introduce the students to flow measurements.
- To introduce the students to dimensional analysis and model studies.

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1. **Flow Through Pipes:** Definition of flow through pipes, Reynolds' number, classification of flow, Definition of hydraulic gradient, energy gradient. – Major and minor losses in pipe flow, equation for head loss due to friction (Darcy-Weishbach equation). – Friction factor for pipes. Pipes in series, pipes in parallel and equivalent pipe. – .Problems on Darcy-Weishbach equation – Minor losses (types), equation for head loss due to sudden expansion. – Problem on minor losses; Pipe networks – Hardy Cross Method.
2. **Water Hammer in Pipes:** Definition, Equation for pressure rise due to gradual closure of valves. Equation for pressure due to sudden closure of valves in rigid & Elastic pipes, problems. Surge tanks, their functions and types.
3. **Flow Measurements:** Flow through Orifices; classification, hydraulic coefficients of an Orifice and relation between them. – Equation for co-efficient of velocity, problems. – 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 a V-notch, problems. – Equation for discharge over rectangular and trapezoidal notches, Cippoletti notch, problems. Types of Nappe, ventilation of weirs, Broad crested weirs, problems.
4. **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 equation derivation and Manning's formulae.
   Problems on uniform flow, Most economical open channels. Derivation of conditions for rectangle, triangle trapezoidal and circular sections, Problems on most economical sections.
   Specific energy, definitions, specific energy curve, Critical flow concept, Conditions for minimum specific energy and maximum discharge.
   Critical flow in rectangular channels, problems
   Hydraulic jump in rectangular channels, derivations with Froude number concept.
   Problems on Hydraulic Jump.
5. **Dimensional Analysis & Model Similitude:** Introduction to Dimensional Analysis, units & dimensions, Table of Dimensions.
   Dimensional Homogeneity.
   Methods of Analysis – Rayleigh's & Buckingham's π theorem.
   Problems on Raleigh's & Buckingham's π theorem.
   Model Studies – Introduction, Similitude, Dimensionless parameters.
   Types of models – Undistorted and Distorted models.
   Froude's model law – theory & problems.
   Reynolds' model law, Theory and problems.

Self-Learning:

- Introduction to gradually varied flow and Venturi flume – theory and problems.

Text Books:

- Modi, P.N. and Seth, S.M. (2002), Hydraulics and Fluid Mechanics including Hydraulic Machines, *Standard Book House, Delhi.*
- Bansal, R.K. (2009), Fluid Mechanics and Hydraulic Machines, *Laxmi Publications, New Delhi.*
- Ven Te Chow, (2009), Open-Channel Hydraulics, *The Blackburn Press, USA.*

Reference Books:

- Arora, K.R. (2005), Fluid Mechanics, Hydraulic and Hydraulics, *Standard Book House, Delhi.*
- Cruise, J.F., Singh, V.P. and Sherif, M.M. (2007), Elementary Hydraulics, (1st Edition), *Thomson Learning, USA.*
- Douglas, J.F., Gasoriek, J.M., Swaffield, J. and Jack L. (2006), Fluid Mechanics, *Prentice Hall, USA.*

Course Outcome:

The student has the ability to

- analyse pipe flow and design the pipes & pipe networks (CO1).
- analyse open channel flow and design open channels (CO2).
- obtain the coefficients of flow measuring devices (CO3).
- analyse fluid flow problems using dimensional analysis (CO4).
- do model analysis (CO5).

Elements of Engineering Geology and Geotechnical Engineering

Sub Code : CV450 Contact Hrs : 4/week
Credits : 04: 0:0

Course Objectives:

- To introduce the students of Civil Engineering to the basics of engineering geology, processes involved in the formation of rocks and soils, structural geological features and their importance in the field of Civil Engineering.
- To introduce the students the basics of geotechnical engineering, soil composition, soil – water interaction, index properties of soils & their determination and soil classification systems.

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1. Engineering Geology and its importance in Civil Engineering practice; Geology & Groundwater; Rocks – Rock formation and Rock classification (i.e. igneous, sedimentary and metamorphic rocks); Rock forming minerals.
2. Structural Geology – Outcrop; Stratification; Dip and strike; Fractures in rocks; Folds – folding in rocks, classification of folds; Faults – basic definitions, classification of faults; Significance of folds and faults in engineering; Joints in rocks; Unconformity – types and engineering significance.
3. Definitions of Soil and Geotechnical Engineering; Soil formation – Weathering processes (i.e. physical and chemical weathering); Different types of soil sediments.
4. Introduction to chemical bonds – Primary valence bonds (i.e. covalent, ionic and metallic bonds) and secondary valence bonds (i.e. hydrogen bond and van der Waals' forces).
5. Soil composition – Clay minerals and non-clay minerals; Clay minerals – Building blocks of clay minerals, Typical clay minerals in soils (kaolinite, illite and montmorillonite) – their formation and structure; Isomorphous substitution in soils; specific surface of clay minerals.
6. Soil – water interaction: Electrical diffuse double layer, Cation exchange capacity of clays; Soil fabric and structure of granular soils (i.e. single grained structure) and of clay soil (i.e. flocculent and dispersed structures), composite soil structure.
7. Soil as a three phase system; Definitions of water content, void ratio, porosity, air content, percentage air voids, degree of saturation, specific gravity, densities (i.e. bulk density, dry density, saturated density and submerged density), unit weights (i.e. bulk unit weight, dry unit weight, saturated unit weight and submerged unit weight) and inter-relationship.
8. Water content of soil and its determination; Specific gravity of soil solids and its determination.
   Index properties of soils and their determination: Particle size distribution – particle size classification (i.e. IS and MIT systems), sieve analysis, sedimentation analysis (hydrometer analysis only); Consistency limits – liquid limit, plastic limit and shrinkage limit; Mechanisms controlling liquid and shrinkage limits; Laboratory determination of consistency limits and controlling mechanisms; Flow index, plasticity index, consistency index, toughness index and liquidity index; Activity of clays; Characteristic water contents: Free swell limit and settling limit – Definitions, Mechanisms involved and laboratory determination, significance; Free swell index, Modified free swell index, Free swell ratio – controlling mechanisms, determination procedures and uses; In-situ density and its determination – core cutter and sand replacement methods; Density index and its determination.
9. Soil classification: Plasticity chart and its importance / limitations; Unified soil classification system and Indian standard classification system.
   Field identification of soils.

Self-Learning:

- Elements of physical geology and geological processes on earth.
- Methods of determining specific gravity and liquid limit of fine-grained soils by methods other than the conventional methods.

Text Books:

- Murthy, V.N.S. (2007), Text Book of Soil Mechanics and Foundation Engineering, *CBS Publishers and distributors, New Delhi.*
- Gopal Ranjan and Rao, A.S. (2006), Basic and Applied Soil Mechanics, *New Age International (P) Ltd., Publishers, New Delhi.*
- Parbin Singh, (2006), Engineering and General Geology, *S.K. Kataria and Sons, Delhi.*

Reference Books:

- Alam Sing, (2006), Soil Engineering: In Theory and Practice, *CBS Publishers, New Delhi.*
- Krynine D.P. and Judd, W.R. (1957), Principles of Engineering Geology and Geotechnics, *McGraw–Hill Book Company, New York.*
- Punmia, B.C., Jain, A.K. and Jain, A.K. (2005), Soil Mechanics and Foundations, *Laxmi Publicaiton (P) Ltd., Bengaluru.*
- Holtz, R.D. and Kovacs, W.D. (1981), An Introduction to Geotechnical Engineering, *Prentice Hall, Engle Wood Cliffs, New Jersey.*
- SP: 36 (Part-I): 1987, Compendium of Indian Standards on Soil Engineering, *BIS, New Delhi.*

Course Outcome:

The student has the

- ability to explain various geological processes taking place on the surface of the earth, to identify structural features of geological formations and to explain their importance in the field of Civil Engineering (CO1).
- knowledge of various soil forming processes, bonding forces, soil composition and soil-water interaction (CO2).
- ability to use the interrelationships among various soil parameters to solve soil related problems (CO3).
- ability to determine the water content, specific gravity and index properties of soils and to understand the mechanisms involved (CO4).
- ability to classify / identify the soils (CO5).

Surveying Practice – II

Sub Code : CV46L Contact Hrs : 3/weak
Credits : 0:0:1.5

Course Objectives:

- To facilitate the students to develop their intellectual and motor skills to conduct the surveying works based on objectives.
- To train the students of civil engineering in using Theodolite and Tacheometers.
- To train the students to set-out horizontal curves.

Exercise-1 **:** To learn the use of Theodolite – Temporary adjustment – Least count of scales.

Exercise-2 **:** To use a Theodolite to measure horizontal angles – Method of repetitions and Reiterations.

Exercise-3 **:** Measurement of vertical angles.
Trigonometric levelling – Elevation of an object when base is accessible.

Exercise-4 **:** Elevation of an object – Base inaccessible – Single plane and double plane method.

Exercise-5 **:** Distance and difference in elevation between two inaccessible points – Double plane method.

Exercise-6 **:** Determination of Tacheometric constants (Dumpy level and theodolite)
Use of Tachemeter to determine distances

Exercise-7 **:** Setting out simple curves by linear methods – Ordinates from long cord and back.

Exercise-8 **:** Setting out compound curves and reverse curves.

Exercise-9 **:** Study of minor instruments – Clinometer – Ghat tracer – Planimeter – Pantograph – Telescopic alidade with Beaman stadia arc.

Exercise-10 **:** Study and use of Total station instruments

Reference Books:

- Chandra A.M., (2002), Plane Surveying, *New Age International (P) Ltd., New Delhi.*
- Alak De, (2000), Plane Surveying, *S. Chand & Co. Ltd., New Delhi.*
- Anderson, J. and Mikhail, E. (1985), Introduction to Surveying, *McGraw Hill Book Company, New York.*
- Benister, A. (2006), Surveying, *Pearson Education, New Delhi.*

Course Outcome:

The student has the ability to

- use Thodolite and Techeometer for data collection (CO1).
- set-out horizontal curves for Highways and Railways (CO2).
- prepare comprehensive report of the survey work conducted (CO3).

Concrete Laboratory

Sub Code : CV47L Contact Hrs : 3/week
Credits : 0:0:1.5

Course Objectives:

- To facilitate the students to develop their intellectual and motor skills to conduct the tests as per the standards.
- To provide the students of civil engineering hands on experience in the testing of cement, aggregates and concrete both in plastic and hardened states.
- To train the students to analyse the test data to conform to IS specifications.

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1. TESTS ON CEMENT

Normal consistency, setting time, Soundness by Le chatelier's method, Soundness by autoclave method, Compression strength test, Fineness by sieving, Fineness by Blaine's air permeability method, Specific gravity of cement and cementations materials.

2. TESTS ON AGGREGATES

Specific Gravity test, Water absorption test, rodded density test, Angularity number, Determination of voids by density approach.

3. TESTS ON FRESH CONCRETE

Slump test, Compaction factor test, Vee Bee test, Flow test.

4. HARDENED CONCRETE

Compressive strength test using cubes and cylinder for medium and high strength concrete, Split tensile strength test using cylinders and cubes, Flexural strength test, Use of accelerated curing tank.

5. CONCRETE MIX DESIGN

A study on concrete mix design as per IS: 10262-2009 for medium strength and high strength concrete with and without admixtures.

6. USE OF NDT INSTRUMENTS

Introduction to Non-destructive Testing, Codal Provisions, Use of rebound hammer, UPV tester, Profometer, Resistivity meter, Corrosion meter, Core cutter. To establish relation between rebound number and UPV for 3 different grades of concrete cast for nominal mix proportion.

Text Books:

- Shetty, M.S. (1982), Concrete Technology (Theory and Practice), *S. Chand and company, New Delhi.*
- Gambhir, M.L. (2004), Concrete Technology, *Tata McGraw-Hill Education, New Delhi.*
- Relevant BIS codes on Cement, Concrete and Aggregates.

Reference Books:

- Neville A.M. and Brooks J.J. (2010), Concrete Technology, *Prentice Hall, England.*
- Kumar Mehta, P. (2002), Concrete – Structure, Properties and Materials, *Prentice Hall, New Jersey, USA*.
- IS: 10262-2009: Indian Standard Concrete Mix Proportioning-Guidelines, *BIS, New Delhi.*
- SP 23 (1982), Handbook on Concrete Mixes, *BIS, New Delhi.*

Course Outcome:

The student has the

- ability to test concrete and its ingredients using relevant IS codes (CO1).
- ability to carry out mix design as per IS code provisions (CO2)
- knowledge of NDT instruments and their usage (CO3)
- ability to analyse the test results rationally, to certify the materials and to prepare the test report (CO4).