Department of Civil Engineering

K S R M College of Engineering (Autonomous), K A D A P A – 516 003

Proposed Curriculum for R – 15 Batch

3rd Semester

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15212101	BS	Probability and Statistics	3	1	0	30	70	3
15012102	ED	Engineering Mechanics	3	1	0	30	70	3
15012103	PJ	Surveying – 1	3	1	0	30	70	3
15012104	PJ	Building Materials	3	1	0	30	70	3
15012105	PJ	Fluid Mechanics	3	1	0	30	70	3
15012106	PJ	Engineering Geology	3	1	0	30	70	3
15012107	PJ	Surveying Field Work – 1	0	0	3	50	50	2
15012108	PJ	Engineering Geology Laboratory	0	0	3	50	50	2
			18	6	6	280	520	22

4th Semester

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012201	PN	Basic Electrical & Electronics Engineering	3	1	0	30	70	3
15012202	PJ	Mechanics of Materials – 1	3	1	0	30	70	3
15012203	PJ	Surveying – 2	3	1	0	30	70	3
15012204	PJ	Building Construction	3	1	0	30	70	3
15012205	PJ	Hydraulic Machinery	3	1	0	30	70	3
15012206	PJ	Geo-Technical Engineering – 1	3	1	0	30	70	3
15012207	PJ	Surveying Field Work – 2	0	0	3	50	50	2
15012208	PJ	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	50	50	2
15012209	PN	Basic Electrical and Electronics Engineering Lab	0	0	3	-	-	-
			18	6	9	280	520	22

5th Semester

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15013101	PJ	Mechanics of Materials – 2	3	1	0	30	70	3
15013102	PJ	Geo-Technical Engineering – 2	3	1	0	30	70	3
15013103	PJ	Hydrology	3	1	0	30	70	3
15013104	PJ	Highway Engineering	3	1	0	30	70	3
15013105	PJ	Water Supply Engineering	3	1	0	30	70	3
15013106 15013107 15013108 15013109		**Elective – 1 (Non – Core)**	3	1	0	30	70	3
15013110	PJ	Strength of Materials Laboratory	0	0	3	50	50	2
15013111	PJ	Geo-Technical Engineering Laboratory	0	0	3	50	50	2
			18	6	6	280	520	22

6th Semester

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15253201	HS	Managerial Economics & Financial Analysis	3	1	0	30	70	3
15013202	PJ	Structural Analysis – 1	3	1	0	30	70	3
15013203	PJ	Design & Drawing of Reinforced Concrete Structures – 1	3	1	0	30	70	3
15013204	PJ	Water Resources Engineering – 1	3	1	0	30	70	3
15013205	PJ	Sanitary Engineering	3	1	0	30	70	3
15013206 15013207 15013208 15013209	PJ	**Elective – 2 (Core)**	3	1	0	30	70	3
15013210	PJ	Environmental Engineering Laboratory	0	0	3	50	50	2
15013211	PJ	Computer Aided Building Drawing Lab	0	0	3	50	50	2
			18	6	6	280	520	22

7th Semester

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15014101	PJ	Structural Analysis – 2	3	1	0	30	70	3
15014102	PJ	Design & Drawing of Reinforced Concrete Structures – 2	3	1	0	30	70	3
15014103	PJ	Design & Drawing of Steel Structures	3	1	0	30	70	3
15014104	PJ	Concrete Technology	3	1	0	30	70	3
15014105	PJ	Water Resources Engineering – 2	3	1	0	30	70	3
15014106 15014107 15014108 15014109	PJ	**Elective – 3 (Core)**	3	1	0	30	70	3
15014110	PJ	Concrete & Highway Materials Laboratory	0	0	3	50	50	2
15014111	PJ	CADD Lab	0	0	3	50	50	2
			18	6	6	280	520	22

8th Semester

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15014201	PJ	Traffic Engineering	3	1	0	30	70	3
15014202	PJ	Design & Drawing of Irrigation Structures	3	1	0	30	70	3
15014203	PJ	Estimation and Costing	3	1	0	30	70	3
15014204 15014205 15014206 15014207	PJ	**Elective – 4 (Core)**	3	1	0	30	70	3
15014208	PJ	Seminar	0	0	0	50	50	3
15014209	PJ	Project Work	0	0	0	50	50	10
			12	4	0	220	380	25

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012102	**ED**	**Engineering Mechanics**	**3**	**1**	**0**	**30**	**70**	**3**

Unit – 1 Basic Concepts and Coplanar Force Systems

Concept of Force, particle and ridgid body, - Basic laws of Mechancis – Newton's laws – Dimensions and units – Numerical accuracy – Operations with forces : Addition and resolution - moment about a point, couple, replacing force-couple system by a single force – resultant of coplanar force systems : resultant of concurrent system, parallel system, non-concurrent non-parallel system – Concept of equilibrium – Applications of concurrent, parallel, non-concurrent non-parallel systems.

Unit – 2 Beams and Friction

Beams: Types of supports : Simple, roller, fixed, inclined roller – Types of beams : Simple, cantilever, propped, fixed, continuous beams – Types of Loads : Point, UDL, UVL – Free body diagrams – Support reactions for determinate beams with concentrated and distributed forces.

Friction: Types of friction – Laws of friction – Limiting friction – Cone of limiting friction – Static and Dynamic frictions – Ladder friction.

Unit – 3 Analysis of Plane Trusses

Trusses – Uses – parts of Truss – Geometry : Partt, Warren, North Light, Howe, Fink – Stability – Cantilever and Simply Supported trusses – Analysis of Trusses using Method of Joints and Method of Sections.

Unit – 4 Properties of Plane Areas

Centroids of simple areas – Centroids of Composite areas – Second and Product moment of areas – Parallel axis and Perpendicular axis theorems – Moments of Inertia of Composite Figures.

Unit – 5 Kinematics and Kinetics of Particle

Kinematics of Particle: Rectilinear and Curvilinear motion – Projectile Motion

Kinetics of Particle: Central force motion – Equations of Plane motion – Work Energy Principle, application to Particle motion.

Text Books:

1. Engineering Mechancis by Dr. R. K. Bansal, Laxmi Publications.
2. Engineering Mechancis by Shames & rao, Pearson Education.

Reference Books:

1. Engineering Mechancis by Bhavikatty, New Age Publications.
2. Engineering Mechancis by Seshagiri Rao, Universities Press, Hyderabad.
3. Engineering Mechanics by B. Bhattacharyya, Oxford University Publications.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012103	**PJ**	**Surveying – 1**	**3**	**1**	**0**	**30**	**70**	**3**

Unit – 1 Introduction and Chain Surveying

Introduction: Definition, Significance, classification, objectives and basic principles of surveying

Chain Surveying: Significance and principle, Instruments used for setting out perpendiculars, Ranging of a survey line, Reconnaissance and Location of site, Methods for overcoming the obstacles and Errors in chain surveying.

Unit – 2 Compass Surveying, Areas and Volumes

Compass surveying: Principles, Types of compasses, Bearings, Local Attractions and its rectifications, Magnetic declination, Dip of a needle and sources of errors in compass surveying.

Areas and volumes: Different methods for calculating areas, Offsets at regular intervals and irregular intervals, Methods for measuring volumes- from Cross sections, from spot levels and from contours, Reservoir capacity.

Unit – 3 Levelling and Contouring

Leveling: Introduction, Basic definitions, Detail of dumpy Level, Automatic level, Tilting Level, Temporary adjustment of Levels, Methods of Leveling, Sensitiveness of bubble tube; Methods of leveling – Differential, Profile & fly Leveling, Effect of curvature and refraction, Plotting longitudinal sections and Cross sections.

Contouring: Definition, Topographical Map, Characteristics of Contour, Types and Contour Interval, Methods of Locating Contours, Interpolation of Contours

Unit – 4 Theodolite

Theodolite: Components of Transit Theodolite, Temporary adjustments, Measurement of horizontal and vertical angles, Fundamental lines and their relations, Sources of errors, Methods of traversing, Checks in traversing and Omitted measurements.

Unit – 5 Tacheometry

Tacheometry: Basic Principle, Stadia Tacheometric methods, Anallactic Lens, Tangential Tacheometry and Sources of errors in Tacheometric surveying.

Text Books:

1. Surveying Vol. 1 & 2 by B. C. Punmia
2. Surveying and Leveling by R. Subramanian
3. Surveying Vol. 1 & 2 by S. K. Duggal

Reference Books:

1. Surveying Vol. 1 & 2 by Dr. K. R. Arora

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012104	**PJ**	**Building Materials**	**3**	**1**	**0**	**30**	**70**	**3**

Unit 1 – Load Bearing Materials

Conventional Materials: Stones: classification of rocks – quarrying – dressing – properties –uses of stones – tests for stones. Bricks: composition – manufacturing – classification – qualities – uses – test for bricks. Timber: classification of trees – structure of tree – seasoning – wood product – uses.

Unit 2 – Cementitious Materials

Cement: Introduction – ingredients – manufacture – dry and wet process – types of cement – properties – tests - uses – Mortar: functions – requirements – types – properties – uses – tests on mortar. Concrete: Ingredients – functions – w/c ratio – grades – admixtures – test on concrete – properties – uses. RCC: Characteristics – elements - advantages – disadvantages – lime – flyash – pozzolona – GGBS.

Unit 3 – Special Construction Materials

Steel: introduction – types – properties – uses – market forms - Fiber reinforced concrete – types of fibres – steel fibres – SFRC – properties – applications. Lightweight concrete – types. High density concrete, High strength concrete – advantages – applications, High performance concrete – properties – Applications of steel, aluminum, lead, zinc, copper and gun metals.

Unit 4 – Finishings

Paints: Functions – constituents – characteristics – selection – types of paints – defects. Varnishes: Elements – properties – types. Distempers: composition – properties. Asbestos: Properties – uses – asbestos cements products. Glass: Constituents – composition – classification – properties – market form – uses. Plastic: constituents – classification – properties – uses.

Unit 5 – Recent Construction Materials

Reactive powder concrete – properties, Geopolymer concrete – advantages, Blended cement concrete – use of mineral admixtures – properties, Self health monitoring concrete, Bacterial concrete, Self compacting concrete – properties – advantages, Ready mixed concrete – advantages – stone as a flooring material – ceramic tiles – vitrified tiles – wooden tiles – flooring tiles – miscellaneous materials.

Text Books:

1. Building Materials by P.C. Varghese
2. Building Materials by S. K. Duggal
3. Building Materials by S.C. Rangwala

Reference Books:

1. Building Materials by Sushil Kumar

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012105	**PJ**	**Fluid Mechanics**	**3**	**1**	**0**	**30**	**70**	**3**

Unit – 1 Fluid Properties and Statics

Dimensions and units – Definition of a fluid – Fluid as continuum - Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion, related problems, pressure at a point, Pascal's law, Hydrostatic law – atmospheric, gauge and vacuum pressure – measurement of pressure, Pressure gauges, Manometers : Differential and Micro meters related problems. Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure, Derivations and problems - Buoyant force and centre of buoyancy.

Unit – 2 Fluid Kinematics and Dynamics

Fluid Kinematics: Description of Fluid flow, Stream line, path line and streak lines and stream tube, Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions, flow net analysis.

Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line, Applications of Bernoulli's Equations, Flow measuring devices - Momentum equation and its application – forces on pipe bend.

Unit – 3 Reynold's Experiment and Closed Conduit Flow

Reynold's Experiment – Characteristics of Laminar & Turbulent flows, Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

Closed Conduit Flow: Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, Pipe network problems, variation of friction factor with Reynold's number – Moody's Chart.

Unit – 4 Boundary Layers

Concept, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Von Karmen momentum integral equation, laminar and turbulent boundary layers, no deviation BL in transition, separation of BL, Control of BL, flow around submerged objects – Drag and Lift – Magnus effect.

Unit – 5 Dimensional Analysis and Similitude

Dimensional Analysis: Physical properties, base and derived – Units – Dimensions – Principle of dimensional homogeneity –Methods of dimensional analysis: Rayleigh's method, Buckingham Pi theorem; Similitude – Laws of similitude: Geometric, kinematic and dynamic similarities – Dimensionless numbers – Model and prototype relations – Distorted models

Text Books:

1. Fluid Mechanics by Modi and Seth, Standard Book House
2. Introduction to Fluid Machines by S.K. Som & G. Biswas, Tata McGaw Hill Pvt. Ltd.

Reference Books:

1. Fluid Mechanics by Merie C. Potter and David C. Wiggert, Cengage learning.
2. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer, Oxford University Press, New Delhi.
3. Fluid Mechanics by A.K. Mohanty, Prentice hall of India Pvt. Ltd., New Delhi.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012106	**PJ**	**Engineering Geology**	**3**	**1**	**0**	**30**	**70**	**3**

Unit – 1 Introduction and Weathering of Rocks

Introduction: Importance of geology from Civil Engineering point of view. Brief case studies of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology

Weathering of Rocks: Its effect over the properties of rocks, importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like —Granite.

Unit – 2 Mineralogy

Definition of mineral, Importance of study of minerals, Different methodsof study of minerals Physical properties of minerals in the identification of minerals - Study of physical properties of following common rock forming minerals: Feldspar, Quartiz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economicsminerals such as Pyrite, Hematite, Magnetite, Chrorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

Unit – 3 Petrology

Definition of rock: Geological classification of rock, formation of rocks, common structures and textures of Igneous. Sedimentary and Metamorphic rocks. Their distinguishing features, megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

Unit – 4 Structural Geology

Definition, Strike, dip, outcrop, study of common geological structures associating with the rocks such as folds, faults un conformities, and joints– their important types. Their importance in civil engineering works - types of soils, their origin and occurrence in India.

Unit – 5 Engineering Geology

Geology of dams and reservoirs, tunnels, land slides, rock falls, earth quakes Ground water exploration. Rock as a construction material.

Text Books:

1. A Text Book of Geology by Mukharjee P.K
2. Engineering Geology by N.Chennkesavulu, Mc-Millan, India Ltd. 2005
3. Engineering Geology by D.Venkata Reddy, Vikas Publications, New Delhi.
4. A Text Book of Engineering Geology by S.K. Garg.

Reference Books:

1. Engineerring Geology by Prabin Singh
2. Fundamental of Engineering Geology by F.G. Bell, Butterworths Publications, New Delhi, 1992
3. Principles of Engineering Geology & Geotechnics by Krynine & Judd, CBS Publishers & Distribution,
4. Foundations of Engineering Geology by Tony Waltham, Special Indian Edition, CRC Press New Delhi.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012107	**PJ**	**Surveying Field Work – 1**	**0**	**0**	**3**	**50**	**50**	**2**

List of Experiments:

1. To find the area of the given field by Chain & Cross Staff
2. Find the distance between two inaccessible points using chaining Obstacles.
3. Locate the corners of the building structure with chain surveying.
4. Find the distance between two inaccessible points by the use of compass.
5. Locate a building by using compass with allowable adjustments.
6. Locate points by using Radiation and Intersection methods of Plane Tabling.
7. Locate a new Instrument Station point by using two point problems.
8. Locate a new instrument station by Bessels's Graphical Method.
9. Find the level difference between two points using Height of Instrument and Rise and fall methods.
10. To Prepare a Contour Chart.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012108	**PJ**	**Engineering Geology Laboratory**	**0**	**0**	**3**	**50**	**50**	**2**

1. Identification Minerals [A. Rock Forming Minerals]
2. Identification Minerals [B. Ore Forming Minerals]
3. Identification Minerals [C. Clay Minerals]
4. Identification Rocks [A. Igneous Rocks]
5. Identification Rocks [B. Sedimentary Rocks]
6. Identification Rocks [C. Metamorphic Rocks]
7. Simple Dip & Strike Problems
8. Thickness of Beds Problems
9. Interpretation of Geological Maps [Horizontal Beds, Inclined Beds]
10. Interpretation of Geological Maps [Fold, Fault Beds]

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012202	**PJ**	**Mechanics of Materials – 1**	**3**	**1**	**0**	**30**	**70**	**3**

Unit – 1 Basics of Deformable Bodies

Deformable solids – Concept of stress – Types of stress: tension, compression, shear, bearing stresses – Concept of strain – Types of strain: linear, shear strains – Poisson effect and lateral strain – Volumetric strain – Elastic constants – Deformation of simple and compound bars – Thermal stresses – Gradual, sudden and impact loadings – Endurance and fatigue limits – Strain energy due to normal and shear stresses – Stress-strain relationships for different materials – Yield, ultimate and working stresses – Factor of safety – Hook's law in 1, 2, and 3 dimensions – Stress concentrations and Saint-Venent's principle

Unit – 2 Shear force and Bending Moment Diagrams

Action of beam – Internal forces at a section: axial force, shear force and bending moment – Relations among rate of loading, shear force and bending moment at a section – Shear force and bending moment diagrams for cantilever, simple and overhanging beams with point and distributed forces – Maximum bending moment – Points of contra flexure

Unit – 3 Bending Theory of Beams

Theory of simple bending – Assumptions – Location of neutral axis – Flexural stress and shear stress distribution across beam sections – Design of beams for strength – Stresses in composite beams: equivalent section and modular ratio – Shear flow in thin and hollow sections

Unit – 4 Deflections of Beams

Deformation under transverse loading – Equation of elastic curve– Macaulay's method – Area-Moment theorems – Conjugate beam method – Computation of slopes and deflections in cantilever and simple beams – Application to leaf springs – Application to propped cantilever

Unit – 5 Torsion and Helical Springs

Circular shafts – Deformation and stresses – Statically indeterminate shafts – Design of transmission shafts – Thin-walled hollow shafts – Torsion of noncircular shafts

Helical Springs – Close and open coiled springs – Deformation and stresses due to axial force and twisting moment – Springs in series and parallel – Design of springs

Text Books:

1. Mechanics of Materials – BC Punmia, AK Jain and AK Jain

Reference Books:

1. Strength of Materials: Mechanics of Solids – RK Rajput
2. Mechanics of Materials – Beer, Johnston and DeWolf

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012203	**PJ**	**Surveying – 2**	**3**	**1**	**0**	**30**	**70**	**3**

Unit – 1 Trigonometric Leveling and Geodetic Surveying

Trigonometric Leveling: Basic principles, Calculation of heights and distances (same vertical plane and Not in a same vertical plane), Refraction and curvature.

Geodetic Surveying: Basic concepts of Triangulation, size and shape of triangles, Strength of figure, Triangulation field works, Baseline measurement, Trilateration and precise leveling.

Unit – 2 Curves

Concept, Significance, types and principles of Horizontal curves, Setting out- Circular curve, Compound curve , Reverse curve, Transition curve, Elements of lemniscate curve, Vertical curve- Types, setting out vertical curves, sight distance, chord gradient, method of length of vertical curve.

Unit – 3 Hydrographic Surveying and Introduction to GPS

Hydrographic Surveying: Concept and its importance, Mean sea level, Tides, Shoreline survey, Soundings- Equipment and field work, Types of locating soundings, Reduction and plotting.

Introduction to GPS; Concept, significance, Advantages, GPS signal structure, Types of GPS Receivers, current limitations and applications, and determination of GPS satellite coordinates

Unit – 4 Aerial Surveying

Terrestrial Photogrammetric surveying, Aerial photogrammetric Surveying- Terminology, Equipment, types and procedure, scale of vertical photograph, Ground coordinates from a vertical photograph, Relief displacement on a vertical photograph, Flying height of vertical photograph, Stereoscopic vision, Photo interception, Overlaps, Parallax and plotting

Unit – 5 Introduction to the Total Station

Concept and significance, Components, Setting up, Measurement with total station- Angle and Distance Measurement, Coordinate Measurement, Remote Elevation Measurement (REM), Missing Line Measurement (MLM), Offset Measurement, Setting Out/Construction layout, Resection Measurement, Traverse Style Measurement, Area Calculation. Sources of errors in total station work.

Text Books:

1. Surveying Vol 2 & 3 by B. C. Punmia
2. Higher Surveying by Dr. A. M. Chandra
3. Surveying and Leveling by R. Subramanian
4. Essentials of Aerial surveying and Photo Interpretation by Tal Bert Abram

Reference books:

1. Advanced Surveying by N.Madhu, R.Santhikumar and Sateesh Kumar
2. Global Positioning System: Signals, Measurements and Performance by Pratap Misra and Per Enge:

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012204	**PJ**	**Building Construction**	**3**	**1**	**0**	**30**	**70**	**3**

Unit – 1 Building Planning Concepts

Principles of Planning of Buildings - Building Byelaws –Orientation – Guidelines for planning and drawing of residential buildings – Plan, Section and Elevation – Standard Dimensions for various building units.

Unit – 2 Masonry

Masonry - Stone Masonry - Rubble and Ashlar Masonry - Brick Masonry - Bond - Types of bonds - English and Flemish bonds - Composite masonry – Stone masonry - Concrete Masonry - Reinforced masonry - Types of walls - Types of Partition walls, Design of brick walls – estimating brick wall thickness for a high rise building

Unit – 3 Floors, Roofs & Staircase

Floors - Types of floor - Details of concrete and Terrazzo floors - Roofs - Types of Roofs - Flat roofs – Sloping roofs - Roof coverings - AC sheets - GI sheets - Lintels - Classification of lintels- Arches - Classification of arches - Staircase – types of staircase

Unit – 4 Fenestrations, Ventilations & Building Amenities

Types of doors and windows – materials (Wood, Plywood, Steel, and Fiber) – method of installations - Fixtures and fastening for doors and windows – plumbing – Ventilation - principles of acoustical design of buildings - Damp proofing - Methods of damp proofing for foundations, floors and roofs

Unit – 5 Green Buildings and Intelligent Buildings

Green Buildings: Principles – Benefits – Disadvantages; Design criteria for green building
Intelligent Buildings: Development – Benefits – Limitations – Intelligent buildings in India

Text Books:

1. Building construction and Materials by Gurucharan Singh
2. Building Construction by Dr. B. C Punmia
3. Building Planning and Drawing by Dr. N. Kumara Swamy and A. Kameswara Rao
4. Building Construction by S. C. Rangwala

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012205	**PJ**	**Hydraulic Machinery**	**3**	**1**	**0**	**30**	**70**	**3**

Unit – 1 Basic of Fluid Machinery and Hydraulic Turbines – 1

Basic of Fluid Machinery: Impact of free jets – Force exerted by fluid jet on stationary and moving plates – Flat, inclined and curved vanes – Velocity triangles at inlet and outlet of the vane – Angular momentum equation – Evaluation of torque exerted on a wheel with curved vanes.

Hydraulic Turbines – I: Elements of hydroelectric power plants – Heads and efficiencies of turbines – Classification of turbines – Pelton wheel – Main components and working principle – Expressions for work done and efficiency – Working proportions and design.

Unit – 2 Hydraulic Turbine – 2 and Performance of Turbines

Hydraulic Turbine - II: Radial flow reaction turbines – Modern Francis turbine – Work done and efficiency – Working proportions and design – Draft tube theory – Kaplan turbine – Working proportions – Governing of turbines – Runaway speed.

Performance of Turbines: Performance under unit head – Unit quantities – Performance under specific conditions – Specific speed – Expressions for specific seed – Performance characteristic curves – Model testing of turbines – Cavitation in turbines – Selection of turbines.

Unit – 3 Centifugal Pumps – I and Centifugal Pumps – II

Centifugal Pumps – I: Advantages of centrifugal pumps over reciprocating pumps – Classification and types of pumps – Components and working of a centrifugal pump – Work done by the impeller – Heads and efficiencies – Net positive suction head (NPSH).

Centifugal Pumps – II: Priming – Priming devices – Minimum starting speed – Multistage pumps – Pumps in series and parallel – Submersible pumps – Limiting suction head – Cavitations – Expression for specific speed – Model testing – Performance characteristics.

Unit – 4 Reciprocating Pump

Main components – Working of a Reciprocating Pump – Types of reciprocating pumps – Work done by single acting and double acting pumps – Coefficient of discharge, slip, percentage slip – Negative slip – Acceleration head – Indicator diagram – Air vessels – Operating characteristics.

Unit – 5 Miscellaneous Hydraulic Machines

Principle of working of hydraulic accumulator – Intensifier – Crane – Lift - Hydraulic ram – Fluid coupling and torque converter and air lift pump.

Text Books:

1. Hydraulics and Fluid Mechanics Including Hydraulic Machines by P.N. Modi & S.M. Seth, Standard Book House, New Delhi.
2. A Test Book of Fluid Mechanics and Hydraulic Machinery by R.K. Bansal, Laxmi Publication Limited

Reference Books:

1. Hydraulic Machines by Jagadish Lal, Metropolitan Book Company Pvt. Ltd.
2. Hydraulic Turbines by Nachleba, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012206	**PJ**	**Geo-Technical Engineering – 1**	**3**	**1**	**0**	**30**	**70**	**3**

Unit – 1 Soil and its Index Properties

Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship – Relative density

Moisture Content, Specific Gravity, In-situ Density, Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Tests for field identification and classification of soils - I.S. Classification of soils

Unit – 2 Permeability and Seepage through Soils

Permeability: Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting – laboratory determination of coefficient of permeability – Field determination of permeability - Permeability of layered systems

Seepage through Soils: Total, neutral and effective stresses – quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

Unit – 3 Stress Distribution in Soils

Boussinesq's equation - Vertical stress due to line load, strip load, and uniformly loaded circular area and Wester Gaard's theories for point loads and areas of different shapes – Pressure bulb concept - Newmark's influence chart – Approximate methods

Unit – 4 Compaction and Consolidation

Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties – Field compaction Equipment - compaction quality control

Consolidation: Pressure – void ratio curve – Compression index – Coefficient of Compressibility – Modulus of volume change – Consolidation process – Consolidation settlement - Terzaghi's theory of one dimensional consolidation – coefficient of consolidation – Pre-consolidation pressure – Normally consolidated and over consolidated soils.

Unit – 5 Shear Strength of Soils

Mohr – Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands – Critical Void Ratio – Liquefaction- shear strength of clays.

Text Books:

1. Geotechnical Engineering by C Venkatramaiah
2. Soil Mechanics & Foundation Engineering by Dr. K. R. Arora
3. Soil Mechanics & Foundation Engineering by BC Punmia

Reference Books:

1. Soil Mechanics by TW Lambe & RV Whitman
2. Basic Soil Mechanics by R Whitlow
3. Soil Mechanics by R F Craig

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
15012207	**PJ**	**Surveying Field Work – 2**	**0**	**0**	**3**	**50**	**50**	**2**

List of Experiments:

1. Operation of Theodolite: Measurement of Horizontal and Vertical angles.
2. Distance between two inaccessible points using horizontal angle observations by a theodolite.
3. Evaluation of Tacheometric Constants.
4. Find the distance and gradient between two inaccessible points using principle of stadia tacheometry.
5. Find the distance between two inaccessible ground points by using the principle of Tangential Tacheometry.
6. Height and Elevation of objects using the principle of Trigonometric leveling.
7. Setting out the curves by offsets from the chords produced.
8. Setting out curves by Rankine's Deflection angles.
9. Distance between two inaccessible points, calculation of area and remote height by using Total Station.
10. Traverse using Total Station.

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15012208	**PJ**	**Fluid Mechanics & Hydraulic Machinery Lab**	**0**	**0**	**3**	**50**	**50**	**2**

List of Experiments:

1. Calibration of Venturimenter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contacted Rectangular Notch and / or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jet on vanes
8. Study of Hydraulic jump
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine
11. Efficiency test on centrifugal pump.
12. Efficiency test on reciprocating pump.