NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME

II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	18A2100201	Complex Variables and Fourier Series	3	0	0	3	40	60	100	3
2	18A2101401	Strength of Materials	2	1	0	3	40	60	100	3
3	18A2101402	Fluid Mechanics	2	1	0	3	40	60	100	3
4	18A2101403	Surveying & Geo-Matics	3	0	0	3	40	60	100	3
5	18A2101404	Building Construction Practice	3	0	0	3	40	60	100	3
6	18A2101301	Building Planning & Drawing	1	2	0	3	40	60	100	3
7	18A2101491	Surveying lab	0	0	3	3	40	60	100	1.5
8	18A2101492	Strength of materials Lab	0	0	3	3	40	60	100	1.5
9	18A2100801	Professional Ethics & Human Values	2	0	0	2	40	60	100	0
Total			16	4	6	26	360	540	900	21

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	18A2200201	Probability & Statistics	3	0	0	3	40	60	100	3
2	18A2201401	Concrete technology	2	1	0	2	40	60	100	3
3	18A2201402	Hydraulic Engineering	2	1	0	2	40	60	100	3
4	18A2201403	Engineering Geology	2	0	0	2	40	60	100	2
5	18A2201404	Structural Analysis -I	2	1	0	2	40	60	100	3
6	18A2201601 18A2201602	**Open Elective –I** i) Elements of Civil Engineering ii) Basic Surveying	2	0	0	2	40	60	100	2
7	18A2201491	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	3	40	60	100	1.5
8	18A2201492	Engineering Geology Lab	0	0	2	2	40	60	100	1
9	18A2201493	Advanced Surveying Lab	0	0	3	3	40	60	100	1.5
10	18A2201494	Surveying Camp	0	0	4	4	40	60	100	2
11	18A2200802	IPR & Patents	2	0	0	2	40	60	100	0
Total			15	3	12	40	440	660	1100	22

L - LECTURE   T – TUTORIAL   P - PRACTICAL
CIA – Continuous Internal Assessment   SEA – Semester End Assessment

B.TECH CE
II YEAR-I SEMESTER

18A2100201- COMPLEX VARIABLES AND FOURIER SERIES

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Mathematics I

Course Objectives:
1. To familiarize the techniques in complex variables.
2. To familiarize the techniques in Fourier series.
3. To familiarize the techniques in partial differential equations.
4. To equip the students to solve application problems in their disciplines.

Course Outcomes:

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

CO1	**Write** an analytic function if either real part or imaginary part is known and by **using** Cauchy-Riemann equations or **apply** Milne-Thompson method**(L3)**
CO2	**Evaluate** the integral of complex function over the region bounded by the closed curves by **apply** either Cauchy-Goursat theorem or Cauchy's integral formula or Cauchy's Residue theorem**(L5)**
CO3	**Write** the infinite series expansion of complex function by **apply** Taylor's/Maclaurin's/Laurent's series**(L3)**
CO4	**Write** a Fourier series expansion of a periodic function by **using** Euler's formulae **(L3)**
CO5	**Solve** the Partial difference equations **(L3)**
CO6	Solve one dimensional wave and heat equations by using partial differential equations **(L3)**

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-
CO6	3	3	2	2	-	-	-	-	-	-	-	-

UNIT I

Complex Variable – Differentiation &Integration

Complex function , Real and Imaginary parts of Complex function, Limit**,** Continuity and Derivative of complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function**,** Harmonic functions, Milne-Thomson method**.** Line integral of a complex function, Cauchy's theorem (only statement), Cauchy's Integral Formula.

UNIT II

Complex Variable- Series expansion, Residue Theorem & Evaluation of Real Integrals

Absolutely convergent and uniformly convergent of series of complex terms, Radius of convergence**,** Taylor's series, Maclaurin's series expansion, Laurent's series. Zeros of an analytic function, Singularity, Isolated singularity, Removable singularity, Essential singularity, pole of order m, simple pole, Residues, Residue theorem, Calculation of residues, Residue at a pole of order m**,** Evaluation of real definite integrals: Integration around the unit circle**,** Integration around semi circle.

UNIT III
Fourier Series   Introduction- Periodic functions – Fourier series of -periodic function - Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.
UNIT IV

Partial Differentials Equations & Applications
        Introduction, Formation of PDE, Solution of PDE, Linear equations of first order, Non-linear equations of first order.
                                Applications: Method of separation of Variables, One dimensional Wave and Heat equations.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

REFERENCE BOOKS:

1. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

E-RESOURCES:

18A2101401- STRENGTH OF MATERIALS

Lecture – Tutorial:	2-1 Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites: Physics, Mathematics II and Engineering Mechanics.

Course Objectives:

1) To impart procedure for drawing shear force and bending moment diagrams for beams.
2) To make the student able to analyze flexural stresses in beams due to different loads.
3) To enable the student to apply the concepts of strength of materials in engineering applications and design problems.
4) To make the student able to analyze shear stresses in beams due to different loads.

Course Outcomes:

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

CO1	Understand the concepts of stress, strain, generalized Hooke's law, elastic moduli and strain energy.
CO2	Develop shear force and bending moment diagrams for different load cases.
CO3	Compute the flexural stresses for different load cases and different cross-sections. Determine shear stresses for different cross-sections.
CO4	Knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams and deflections due to various loading conditions
CO5	Understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes.
CO6	Can Analyze members subjected to torsion, combined torsion and bending moment & asses stresses in different engineering applications like springs subjected to different loading conditions

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	2	-	-	-	3	-	-	-	-
CO2	3	-	-	2	-	-	-	3	-	-	-	-
CO3	3	-	-	2	-	-	-	3	-	-	-	-
CO4	3	-	-	2	-	-	-	3	-	-	-	-
CO5	3	-	-	2	-	-	-	3	-	-	-	-
CO6	3	-	-	2	-	-	-	3	-	-	-	-

UNIT I

Simple Stresses and Strains: Types of stresses and strains – Hooke's law – Stress – strain diagram for mild steel – working stress – Factor of safety – lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying sections-Composite bars. Strain energy – Resilience – Gradual, Sudden, impact and shock loadings – simple applications.

LOs:
>   1. Understand concepts of stresses, strains, elastic moduli and strain energy.
>   2. Evaluate relations between different moduli
>   3. Understand different types loadings

Shear Force and Bending Moment: Definition of beam – types of beams – Concept of Shear force

and bending moment – S.F and B.M diagrams for cantilever, simply supported and over changing beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads – point of contra flexure – Relation between S.F, B.M and rate of loading at section of a beam.

LOs:
1. *Draw the shear force and bending moment diagrams for cantilevers, simply supported beams and Overhanging beams with different loads*
2. *Understand the relationship between shear force and bending moments*

UNIT II

Flexural Stresses:

Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/Y = E/R$ – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hallow), I, T, Angle and Channel Sections – Design of simple beam sections.

LOs:
1. **Derive bending equations**
2. **Compute the flexural stresses for different cross sections.**
3. **Design beam sections for flexure**

Shear Stresses:

Derivation of formula-Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections. Combined bending and shear.

LOs:
1. **Determine shear stresses for different shapes.**
2. **Evaluate effect of combined bending and shear on sections**

UNIT III

Deflection of Beams:
Uniform bending – slope, deflection and radius of curvature – Differential equation for elastic line of a beam – Double integration and Macaulay's methods. Determination of slope and deflection for cantilever and simply supported beams under point loads, U.D.L. uniformly varying load- Mohr's theorems – Moment area method – application to simply supported and overhanging beams- analysis of propped cantilever beams under UDL and point loads.

LOs:
1. **Compute slopes and deflections of beams with different boundary conditions**
2. **Understand types of loads acting on beams**
3. **Evaluate effect of different loads on propped cantilever beams**

UNIT IV

Compound Stresses and Strains:
Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, and its applications.

LOs:
1. *Identify critical planes in two dimensional stress systems*
2. *Estimate principals stresses* & *Assess safety of structural elements under principal stresses*

Torsion:
Theory of pure torsion – Assumptions and Derivation of Torsion formula for circular shaft – Torsional moment of resistance – Polar section modulus – power transmission through shafts – Combined bending and torsion. Springs - Types of springs – deflection of closed coiled helical springs under axial pull – Carriage or leaf springs.

LOs:
1. *Analyze members subjected to torsion, combined torsion and bending moment*
2. *Calculate power transmission through shafts*
3. *Estimate energy absorption in springs.*

TEXT BOOKS:
3. R. K. Bansal, Strength of Materials, Lakshmi Publications House Pvt. Ltd.
4. Strength of Materials by R. K. Rajput, S. Chand & Co, New Delhi.

REFERENCE BOOKS:

1. Sadhu Singh, Strength of Materials, Khanna Publishers 11th edition 2015.
2. S. Timoshenko, D.H. Young and J.V. Rao, Engineering Mechanics, Tata McGraw-Hill Company.
3. R. Subramanian, Strength of Materials, Oxford University Press.
4. Strength of Materials by S. Ramamrutham.

E-RESOURCES:

18A2101402- FLUID MECHANICS

Lecture – Tutorial:	2-1 Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites: Engineering Mechanics, Mathematics II and Physics

Course Objectives:
1) To explain concepts of fluid mechanics used in Civil Engineering.
2) To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
3) To impart ability to solve engineering problems in fluid mechanics
4) To enable the students measure quantities of fluid flowing in pipes, tanks and channels
5) To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
6) To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

Course Outcomes:

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

CO1	Understand the principles of fluid statics, kinematics and dynamics
CO2	Familiarize basic terms used in fluid mechanics
CO3	Understand flow characteristics and classify the flows
CO4	Apply the continuity, momentum and energy principles
CO5	Estimate various losses in flow through channels
CO6	Understand fundamentals of kinematics and equations Cartesian coordinates.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	2	-	1	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	3	-	-	-	2	-	-	-	-
CO5	2	2	-	3	-	-	-	2	-	-	-	-
CO6	2	2	-	2	-	-	-	-	-	-	-	-

UNIT I

Basic concepts and definitions:

Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavity, surface tension, capillarity, Bulk modulus of elasticity, compressibility.

LOs: 1. Understand basic characteristics of fluids

2. Understand Newton's Law of Viscosity

UNIT II

Fluid statics:

Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges.

Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

LOs: 1. Understand concepts of fluid statics.
    2. Distinguish different equipment and their applications.
    3. Demonstrate stability of floating bodies

UNIT III

Fluid kinematics:

Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three -dimensional continuity equations in Cartesian coordinates.

LOs: 1. Understand fundamentals of fluid kinematics
    2. Differentiate types of fluid flows
    3. Explain equations of different order Cartesian coordinates

UNIT IV

Fluid Dynamics:

Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

Analysis Of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length; Friction factor for pipe flow.

LOs: 1. Demonstrate applications of Bernoulli's equations
    2. Experiment with different equipments under fluid flow
    3. Apply principles of fluid dynamics along with governing equations.
    4. Estimate Energy losses in pipelines
    5. Determine flow characteristics through closed conduits.

TEXT BOOKS:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi, 7th Edition.
2. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, 18th Edition

REFERENCE BOOKS:

1. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill.
3. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
4. K. Subramanya, Open Channel flow, Tata Mc.Grawhill Publishers.

E-RESOURCES:

18A2101403- SURVEYING & GEOMATICS

Lecture – Tutorial:	3-0 Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites: None

Course Objectives:
1. Highlight the purpose of surveying in civil engineering construction,
2. Explain different types of curves, their requirement and curve setting.
3. Formulate survey observations and perform calculations
4. Train on utilization of surveying instruments like EDM, Total station and GPS.
5. Demonstrate basics of photogrammetry and mapping process.
6. Throw light on remote sensing elements.

Course Outcomes:

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

CO1	Understand basics of surveying and identifying the needs of surveying.
CO2	Apply the knowledge, techniques and survey tools in engineering practices
CO3	Calculate angles, distances and levels.
CO4	Translate the knowledge gained for implementation infrastructure facilities.
CO5	Correlate knowledge to frontiers like Hydrography, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing.
CO6	Identify data collection methods and prepare field notes. Estimate errors in measurements and apply corrections

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	3	-	-	1	-	-	-	-	-	-	-
CO2	-	3	-	-	1	-	-	-	-	-	-	-
CO3	-	3	-	1	-	-	-	-	-	-	-	-
CO4	-	3	-	-	1	-	-	-	-	-	-	-
CO5	-	3	-	-	1	-	3	1	-	-	-	-
CO6	-	-	-	-	-	-	2	1	-	-	-	-

UNIT I

Introduction to surveying:

Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Levelling: Plane table surveying, Principles of levelling - booking and reducing levels; differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes.

LOs:
1. *Understand basic procedures in surveying*
2. *Estimate errors in levelling*
3. *Computing areas and volumes.*

UNIT II

Trigonometric Levelling and Curves:
Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods -triangulation -network- Signals. Baseline - choices - instruments and accessories - extension of base lines -corrections - Satellite station - reduction to centre - Inter-visibility of height and distances - Trigonometric levelling - Axis single corrections. Curves - Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves

LOs:

1. *Measure angles using Theodolite*
2. *Carryout trigonometric levelling*
3. *Set simple and compound curve*

UNIT III

*Modern Field Survey Systems***:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

LOs:

1. *Illustrate distance measurements using modern field survey systems*
2. *Carryout surveying using Total Station*
3. *Determine Coordinates using GPS*

UNIT IV

*Photogrammetry Surveying***:** Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.

LOs:

 1. *Understand photogrammetry adopting various techniques.*
2. *Mapping areas using triangulation*
3. *Distinguish different types of plotting instruments*

Remote Sensing: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

LOs:
1. *Understand principles of remote sensing.*
2. *Carryout date acquisition and interpretation*

TEXT BOOKS:
1. Arora, K.R. I, Surveying, Vol-I, II and II, Standard Book House, 2015.
2. C. Venkatramaiah, Text Book of Surveying, Universities Press Pvt Ltd, Hyderabad. Revised Edition 2011.

REFERENCE BOOKS:
1. Manoj K., Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011.
2. Madhu N., Sathikumar, R. and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
3. Chandra A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
4. Anji Reddy M., Remote sensing and Geographical information system, B.S. Publications, 2001.

E-RESOURCES:

18A2101301- BUILDING PLANNING & DRAWING

Lecture – Tutorial:	1-2 Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites: Engineering drawing

Course Objectives:

1. Initiating the student to different building bye-laws and regulations.
2. Imparting the planning aspects of residential buildings and public buildings.
3. Giving training exercises on various signs and bonds and different building units.
4. Imparting the skills and methods of planning of various buildings.

Course Outcomes:

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

CO1	Student should be able to plan various buildings as per the building by-laws.
CO2	Student should know the minimum standards for various parts of buildings & characteristics.
CO3	The student should be able to distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.
CO4	The student is expected to learn the skills of drawing building elements and plan
CO5	Student should be able to understand various brick masonry & building elements standard drawings.
CO6	Student should be able to develop drawing of building plan, section and elevation.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	2	1	-	-	2	-	-	-	-	-	-	-
CO4	1	2	-	-	3	-	-	-	-	-	-	-
CO5	-	1	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	3	-	-	-	-	-	-	-

UNIT I

Introduction of building drawing: Building Byelaws and Regulations Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements. Types of buildings and principals of planning of buildings

LOs:

1. **Understand building bye-laws**
2. **Understand planning components of building and standard dimensions.**

UNIT II

Residential Buildings: Minimum standards for various parts of buildings requirements of different rooms and their grouping- characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions

Public Buildings: Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation, Landscaping requirements.

LOs:

1. Understand various requirements of building by visualizing the details.
2. Identify differences between residential buildings and public building standards.

UNIT III

Sign Conventions: Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminium alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles.

Bonds: English bond and Flemish bond - odd and even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

Doors, Windows, Ventilators: Panelled door, glazed door, panelled and glazed door, panelled windows glazed windows, fixed ventilators, swing ventilators.

Roofs: coupled roof, collar roofs, King Post truss and Queen Post truss.

LOs:

1. Identify sign conventions and symbols used in civil engineering drawing.
2. Understand detailed Drawing of building and structural elements and visualize.

UNIT IV

Planning and Designing of Buildings: Draw the Plan, Elevation and Sections of a Residential and Public buildings from the given line diagram.

LOs:

1. Understand basic terms plan section and elevation in drawing
2. Introduction to computer applications in developing drawing skills

TEXT BOOKS:

1. Planning, designing and Scheduling, Gurucharan Singh and Jagadish Singh
2. Building planning and drawing by M. Chakravarthi.
3. 3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur,

REFERENCE BOOKS:

1. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, New Delhi.
4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai.

E-RESOURCES:

18A2101404- BUILDING CONSRUCTION PRACTICE

Lecture – Tutorial:	3-0 Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites: None

Course Objectives:
1. Initiating the student with the knowledge of basic building materials and their properties.
2. Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, walls, sloped and flat roofs.
3. The student is to be exposed to the various patterns of floors, walls, different types of paints and varnishes.
4. Imparting the students with the techniques of formwork and scaffolding.
5. The students should be exposed to classification of aggregates, moisture content of the aggregate.

Course Outcomes:

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

CO1	Get the knowledge of different construction materials and their properties
CO2	Know the classification of aggregates and their structural requirements.
CO3	Understand properties and the components of lime and cement
CO4	Understand the types of masonry , uses of timber and its properties
CO5	Identify components of building and types of floors and roof
CO6	Gain the knowledge of proofing materials and formworks

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	-	1	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	3	-	-	-	-	-	-	-	-
CO4	2	2	-	3	-	-	-	-	-	-	-	-
CO5	2	1	-	2	-	-	-	-	-	-	-	-
CO6	2	1	-	1	-	-	-	-	-	-	-	-

UNIT I

Stones, Bricks And Tiles Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminous materials

> **LOs:**
> 1. Understand components of structures and their performance
> 2. Explain construction materials their importance

UNIT II

Lime And Cement Lime: Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime. Cement: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance – various tests for concrete.

Aggregates: Classification of aggregate – Coarse and fine aggregates- particle shape and

texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis.

LO: 1Understand materials used for components of structures
2.Explain construction materials their importance
3.Compare different types of construction materials

UNIT III

Masonry -Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls. Wood: Structure – Properties- Seasoning of timber. Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiber Reinforced Plastics, Steel, Aluminium.

LO: 1. Understand components of structures and their performance

UNIT IV

Building Components Lintels, arches, vaults, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs.

Finishing: Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering. Paints: Constituents of paint – Types of paints – Painting of new/old wood- Varnish. Form Works and Scaffoldings.

LO: 1. Classify types of roofs based on features materials and engineering
2. Understand components of structures and their performance

TEXT BOOKS:

1. Building Material &Construction, S. S. Bhavikatti, Vices publications.
2. Building Construction, B.C. Punmia, Laxmi Publications private ltd.

REFERENCE BOOKS:

1. Building Materials, S. K. Duggal, New Age International Publications.
2. Building Materials, P. C. Verghese, PHI learning (P) ltd.
3. Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Building construction, P. C. Verghese, PHI Learning (P) Ltd.
5. Building Materials, Construction and Planning, S. Mahaboob Basha, Anuradha Publications, Chennai.

E-RESOURCES:

18A2101491- SURVEYING LAB

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites: Surveying

Course Objectives:

To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

Course Outcomes:

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

CO1	Conduct survey and collect field data.
CO2	Prepare field notes from survey data
CO3	Interpret survey data and compute areas and volumes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	-	1	1	-	-	-	-	-	-	2
CO2	2	1	-	1	1	-	-	-	-	-	-	-
CO3	3	3	-	2	1	-	-	-	-	-	-	2

LIST OF EXPERIMENTS

1. Survey by chain survey of road profile with offsets in case of road widening.

2. Survey in an area by chain survey (Closed circuit)

3. Determination of distance between two inaccessible points by using compass.

4. Survey in an area using compass (Closed Traverse) – Local Attraction

5. Plane table survey; finding the area of a given boundary by the method of Radiation

6. Plane table survey; finding the area of a given boundary by the method of intersection.

7. Two Point Problem by the plane table survey.

8. Fly levelling : Height of the instrument method (differential levelling)

9. Fly levelling: rise and fall method.

10. Fly levelling: closed circuit/ open circuit.

11. Fly levelling; Longitudinal Section and Cross sections of a given road profile.

18A2101492- STRENGTH OF MATERIALS LAB

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites: Strength of materials			

Course Objectives:

Course Outcomes:
1. Conduct tension test on steel
2. Conduct compression tests on spring, wood, brick and concrete
3. Conduct flexural and torsion test to determine elastic constants
4. Determine hardness of metals

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	-	-	-	-	2	-	-	-	2
CO2	3	1	2	-	-	-	-	2	-	-	-	2
CO3	3	1	2	-	-	-	-	2	-	-	-	-
CO4	3	1	2	-	-	-	-	2	-	-	-	2

LIST OF EXPERIMENTS

1. Tension test on Steel bar
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Continuous beam – deflection test
5. Torsion test
6. Hardness test
7. Spring test
8. Compression test on wood or brick.
9. Impact test
10. Shear test
11. Verification of Maxwell's Reciprocal theorem on beams.
12. Use of Electrical resistance strain gauges

18A2100801- PROFESSIONAL ETHICS AND HUMAN VALUES

(Common to CE, CSE and IT)

Lecture – Tutorial:	2-0 Hours	Internal Marks:	40
Credits:	0	External Marks:	60

Prerequisites: Basic understanding about Engineering profession.

Course Objectives:

1) To create awareness on engineering ethics and human values.
2) To understand social responsibility of an engineer.
3) To instill moral and social values and loyalty.

Course Outcomes:

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

CO1	Grooms themselves as ethical, responsible and societal beings.
CO2	Discuss ethics in society and apply the ethical issues related to engineering.
CO3	Exhibit the understanding of ethical theories in professional environment.
CO4	Recognize their roe as social experimenters (engineers) and comprehend codes of ethics.
CO5	Identify the risks likely to come across in the professional world, analyzing them and find solutions.
CO6	Realize the responsibilities and rights of engineers in the society.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	1	1	2	-	-	-	1
CO2	-	-	-	-	-	1	1	2	-	-	-	1
CO3	-	-	-	-	-	1	1	2	-	-	-	1
CO4	-	-	-	-	-	1	1	2	-	-	-	1
CO5	-	-	-	-	-	1	1	2	-	-	-	1
CO6	-	-	-	-	-	1	1	2	-	-	-	1

UNIT I

Human Values: Objectives, Morals, Values, Ethics, Integrity, Work ethics, Service learning , Virtues, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Challenges in the work place.

UNIT II

Engineering ethics Senses of 'Engineering Ethics' — Variety of moral issues — Types of inquiry — Moral dilemmas — Moral Autonomy — Kohlberg's theory — Gilligan's theory — Consensus and Controversy — Models of professional roles — Theories about right action — Self-interest — Customs and Religion — Uses of Ethical Theories

UNIT III

Engineering as Social Experimentation: Engineering as experimentation, Engineers as responsible experimenters, Codes of ethics, Industrial standards, A balanced outlook on law, Case study: The challenger.

UNIT IV

Safety, Responsibilities and Rights: Safety and risk, types of risks, Assessment of safety and risk, Safe exit, Risk-benefit analysis, safety lessons from 'the challenger' , Case study: Power plants, Collegiality and loyalty, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, whistle blowing, Intellectual property rights, professional rights.

TEXT BOOKS:

- **A Text book on Professional Ethics and Human Values by R.S Naagarazan- New Age International Publishers.**

- **" Engineering Ethics includes Human Values" by M. Govindarajan, S. Natarajan and V. S. Senthil Kumar- PHI Learning Pvt. Ltd-2009**

REFERENCE BOOKS:

"Professional Ethics and Human Values" by A. Alavudeen, R. Kalil Rahman and M. Jayakumaran- Laxmi Publications.

E-RESOURCES:

- **www.onlineethics.org**
- **www.nspe.org**
- **www.globalethics.org**
- **www.ethics.org**

B.TECH CE
II YEAR-II SEMESTER

18A2200201-
COURSE NAME-EM-IV-PROBABILITY AND STATISTICS

Lecture – Tutorial:	L-T Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites:

Course Objectives:

1.To familiarize the techniques in central tendency, curve fitting ,correlation and regression.
2. To familiarize the techniques in probability and random variables.
3. To familiarize the techniques in probability distribution.
4. To familiarize the techniques in large and small sample tests.
5.To equip the students to solve problems in their disciplines.

Course Outcomes:

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

CO1	Student will be able to ➢ **Find the measures of central tendency and relation between them.(L1)**
CO2	Student will be able to ➢ **Evaluate the correlation coefficient, rank coefficient and regression.(L5)**
CO3	Students will be able to ➢ **Understand probabilities of events and expectationsof random variables for elementary problems.(L2)**
CO4	Students will be able to ➢ **Solve problems related to binomial and passion distribution.(L3)**
CO5	Student will be able to ➢ Compare situations in which it is appropriate to consider the relevance of the Normal distribution.(L4)
CO6	Student will be able to ➢ Construct hypothesis and carryout appropriate tests to checks its acceptability.(L3)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	--	--	--	--	--	--	--	--
CO2	3	3	2	2	--	--	--	--	--	--	--	--
CO3	3	3	2	2	--	--	--	--	--	--	--	--
CO4	3	3	2	2	--	--	--	--	--	--	-	--
CO5	3	3	2	2	--	--	--	--	--	--	-	--
CO6	3	3	2	2	--	--	--	--	--	--	--	--

UNIT I

Descriptive statistics and methods for data science

(Pre-requisite:Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent

Categorical and Continuous variables, Data visualization.---No Question selects from the above part)

Measures of Central tendency: Arithmetic Mean – Median – Mode - Geometric Mean- Harmonic Mean and Relations between them- Merits and Demerits.

Measures of Dispersion: Range – Quartile Deviation – Variance, Standard Deviation –Skewness- Kurtosis.

Curve Fitting and Principles of Least Squares.

Correlation- correlation coefficient - rank correlation - Regression coefficients - Regression lines.

UNIT II

Probability

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT III

Distributions

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties.

UNIT IV

Estimation and Testing of hypothesis:Large sample tests Small sample tests

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test.

Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

Small Sample Tests: Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

TEXT BOOKS:

1. Miller and Freund, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

REFERENCE BOOKS:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
   W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

E-RESOURCES:

1.nptel

18A2201401- CONCRETE TECHNOLOGY

Lecture – Tutorial:	2-1 Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites: Building Materials, Building Construction Practice

Course Objectives:
1. To learn the concepts of Concrete production and its behaviour in various Environments.
2. To learn the test procedures for the determination of properties of concrete.
3. To understand durability properties of concrete in various environments.

Course Outcomes:

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

CO1	Understand the basic concepts of concrete.
CO2	Realize the importance of quality of concrete
CO3	Familiarize the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.
CO4	Test the fresh concrete properties and the hardened concrete properties.
CO5	Evaluate the ingredients of concrete through lab test results. design the concrete mix
CO6	familiarize the basic concepts of special concrete and their production and Applications. Understand the behavior of concrete in various environments.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	2	3	2	-	-	-	2	-	-	-	-
CO2	-	2	3	2	-	-	-	2	-	-	-	-
CO3	-	2	3	2	-	-	-	2	-	-	-	-
CO4	-	2	3	2	-	-	-	2	-	-	-	-
CO5	-	1	-	1	-	-	-	2	-	-	-	-
CO6	-	1	-	1	-	-	-	2	-	-	-	-

UNIT I

Cement General, Manufacture of Portland cement by dry process, Approximate oxide composition limits of OPC, Bogue's compounds, Hydration of cement, heat of hydration, structure of hydrated cement. Types Of Cements. Tests on cement-Soundness test, Setting times test, Compressive strength test and Fineness test by air permeability apparatus.

Aggregates And Testing Of Aggregates Classification of aggregates –size, shape and texture, Mechanical properties of aggregates. Tests for aggregates-strength, bulking of fine aggregate, Fineness modulus and Zoning of fine aggregate, Fineness modulus of coarse aggregate. Water Tolerable concentrations of impurities in mixing water, Use of sea water for mixing concrete.

UNIT II

Fresh Concrete Workability, factors affecting workability, Segregation and Bleeding in concrete, measurement of workability using slump cone test, Kelly ball test, Vee-Bee test, compaction factor test.

Hardened Concrete Factors affecting compressive strength of concrete, Cube compression test, split tensile strength test, flexural strength of concrete. Durability of concrete, factors affecting durability of concrete.

UNIT III

Production Of Concrete Batching of materials, mixing, transportation, placing, compaction and finishing of concrete. Curing of concrete and methods of curing.

Concrete Mix Design Basic considerations for concrete mix design, factors influencing the choice of mix proportions, Indian standard method of concrete mix design .ACI method of concrete mix design. Ready Mixed Concrete (RMC)

UNIT IV

Chemical And Mineral Admixtures Functions of admixtures, accelerators, retarders, air entraining admixtures, plasticizers and super plasticizers, water proofers, fly ash, silica fume, ground granulated blast furnace slag.

Special Materials In Construction And Concreting Techniques Ferro-cement, self-compacting concrete, fiber reinforced concrete, high strength concrete. Shortcrete or guniting. Future Trends In Concrete Technology polymer concrete-properties, green building, maintenance, need for green buildings.

TEXT BOOKS:

1. Concrete technology by A.R.Santhakumar, Oxford University Press
2. Concrete technology by M.S.Shetty, S.Chand& Company Pvt. Ltd., New Delhi

REFERENCE BOOKS:

1. Properties of concrete by A.M.Neville, Longman Publishers
2. Concrete technology by M.L.Gambhir, Tata McGraw-Hill Publishing company Ltd., New Delhi

E-RESOURCES:

18A2201402- HYDRAULIC ENGINEERING

Lecture – Tutorial:	2-1 Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites: Mathematical Methods , Fluid Mechanics

Course Objectives:
1) Introduce concepts of laminar and turbulent flows
2) To teach principles of uniform and non-uniform flows through open channel.
3) To impart knowledge on design of turbines.
4) To impart knowledge on design of pumps.

Course Outcomes:

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

CO1	Understand characteristics of laminar and turbulent flows.
CO2	Analyze characteristics for uniform flows in open channels.
CO3	Analyze characteristics for non-uniform flows in open channels.
CO4	Design different types of turbines
CO5	Design of centrifugal and multi stage pumps.
CO6	Design of reciprocating pump

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	1	-	-	2	2	-	-	-	-
CO3	3	-	-	1	-	-	2	2	-	-	-	-
CO4	2	-	-	3	-	-	1	2	-	-	-	-
CO5	2	-	-	3	-	-	1	2	-	-	-	-
CO6	2	-	-	3	-	-	1	2	-	-	-	-

UNIT I

Laminar & Turbulent flow in pipes:

Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Measurement of viscosity.

Turbulent Flow- Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, scale and intensity. Reynolds stresses semi-empirical theories of turbulence. Resistance to flow of fluid in smooth and rough pipes-Moody's diagram.

UNIT II

Uniform flow in Open Channels:

Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Computation of Normal depth.

Non-Uniform flow in Open Channels:

Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Broad Crested Weir. Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

UNIT III
Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - velocity triangles at inlet and outlet - Work done and efficiency **Hydraulic Turbines**: Classification of turbines; pelton wheel and its design. Francis turbine and its design - Kaplan turbine and its design – efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

UNIT IV
Centrifugal pumps: Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies. **Reciprocating pumps**: Working principles of a Reciprocating pump, work done; heads, losses and efficiencies;
TEXT BOOKS:
1. 1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 2. D. S. Kumar Fluid Mechanics & Fluid Power Engineering, Kataria & Sons.
REFERENCE BOOKS:
1. 1. Rajput, Fluid mechanics and fluid machines , S. Chand & Co 2. K. Subramanya, Open channel Flow, Tata McGraw Hill. 3. Srinivasan, Open channel flow by, Oxford University Press 4. Banga & Sharma, Hydraulic Machines, Khanna Publishers.
E-RESOURCES:

18A2201403- ENGINEERING GEOLOGY

Lecture – Tutorial:	2-0 Hours	Internal Marks:	40
Credits:	2	External Marks:	60

Prerequisites: None

Course Objectives:

1) To understand weathering process and mass movement
2) To distinguish geological formations
3) To identify geological structures and process of rock mass quality.
4) To identify subsurface information and groundwater potential sites through geophysical investigations
5) To apply geological principles of mitigation of natural hazards and select sites for dams and tunnels

Course Outcomes:

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

CO1	Gain basic knowledge on characteristics of rocks and minerals.
CO2	Identify and differentiate rocks using geological classification.
CO3	Apply concepts of structural geology for civil engineering structures.
CO4	Understand the seismic zones of India.
CO5	Understanding about Geophysical investigation methods & Carryout geo physical investigations using various methods
CO6	Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	3	-	1	-	-	-	-	-	-	-
CO2	2	3	3	-	2	-	-	-	-	-	2	-
CO3	2	3	3	-	3	-	-	-	-	-	2	-
CO4	-	2	3	-	3	-	-	-	-	-	2	2
CO5	3	-	3	-	2	-	-	-	-	-	2	1
CO6	-	-	3	-	3	-	-	-	-	-	-	-

UNIT I

Earth Science

Application of Earth Science in Civil Engineering Practices, Understanding the earth, internal structure and composition. Weathering, erosion and denudations process on earth material and natural agencies, Geological work of wind, river underground water and glaciers Mineralogy: Mineral properties, composition and their use in the manufacture of construction materials – Quartz Group; Feldspar Group; Kaolin; Asbestos; Carbonate Group ; Gypsum; Mica Group; Ore minerals - Iron ores; pyrite; Chlorite

LO: 1. Explain the formation of earth and its internal structure

2. Understand weathering and formation of natural minerals

3. Explain composition of minerals and their utilization in construction industry.

UNIT II

Definition of rock - Rock forming processes - Geological classification of rocks - Dykes and sills, common structures and textures - Megascopic study, Chemical and Mineralogical Composition of rock (Granite, Gabbro, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Tuff, Felsite, Gneiss, Schist, Quartzite, Breccia, Marble, Porphyries, Charnockite and Slate).

Structural Geology:

Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints – their important types. Their importance insitu and drift soils, common types of soils, their origin and occurrence in India

LO: 1. Understand classification of rocks

2. Demonstrate chemical composition

3. Identify mineral composition of rock

4. Explain formation of folds strike and dip of geological structures

5. Assess importance of soils

6. Locate origin of different types of rocks and soils and their origin India

UNIT III

Geomorphology, hydrogeology and seismology:

Ground water, Water table - ground water exploration. Site selection for dams and tunnels – analysis of failures in dams and tunnels - Seismic zones of India - Earth quakes, their causes and effects. Seismic waves, Richter scale. Landslides - causes and effects; Tsunami – causes and effects.

LO: 1. Understand geomorphology

2. Identify procedures for site selection of important structures

3. Contrast seismic Zonation of India in stages

4. Understanding about Geophysical investigation methods

5. Carryout geo physical investigations using various methods.

UNIT IV

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

TEXT BOOKS:

1. N. Chenna Kesavulu, Text Book of Engineering Geology, 2nd Edition (2009), Macmillan Publishers India.

2. Vasudev Kanithi, Engineering Geology, Universities Press Pvt Ltd, Hyderabad. 2012.

REFERENCE BOOKS:

1. Parbin Singh, Engineering and General Geology, 8th Edition (2010), S K Kataria & Sons.
2. J. C. Harvey, Geology for Geotechnical Engineers, Cambridge University Press (1982).
3. Richard E. Goodman, Engineering Geology, Rock in Engineering Construction by John Wiley & Sons, Inc. 1993.
4. Billings, M. P., Structural Geology, Prentice-Hall India, 1974, New Delhi

E-RESOURCES:

18A2201404- STRUCTURAL ANALYSIS

Lecture – Tutorial:	2-1 Hours	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites: Engineering Mechanics, Strength of Materials

Course Objectives:

1) To impart knowledge on Columns & Struts
2) To teach procedure for analysis of fixed beams.
3) To teach procedure for analysis of continuous beams.
4) To enable the student undergo analysis procedure of moving loads & their influence.

Course Outcomes:

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

CO1	Apply Rankine's & Euler's theories for analysis of columns & struts
CO2	Analyze indeterminate propped cantilever beams
CO3	Analyze fixed beams using compatibility method
CO4	Analyze continuous beams using Clapeyron's theorem of three moments Analysis
CO5	Analyze continuous beams using slope deflection equation
CO6	Identify the behavior of structures due to the expected loads, including the moving loads, acting on the structure. Estimate the bending moment and shear forces in beams for different fixity conditions

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	1	-	-	-	-
CO3	3	-	-	-	-	-	-	1	-	-	-	-
CO4	3	-	-	-	-	-	-	1	-	-	-	-
CO5	3	-	-	-	-	-	-	1	-	-	-	-
CO6	2	2	-	-	-	-	-	1	-	-	-	-

UNIT I

Columns and Struts:

Introduction – classification of columns – Axially loaded compression members – Euler's crippling load theory – derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – eccentric loading and Secant formula – Prof. Perry's formula.

LO: 1. Classify columns
2. Understand Euler's theory on columns and assess crippling loads
3. Analyze compression members using different theories
4. Assess load carrying capacity using different formulae

Propped Cantilevers: Analysis of propped cantilevers-shear force and bending moment diagrams-Deflection of propped cantilevers.

LO: 1. Classify Propped Cantilevers
2. Analyze the beams subjected to loads

3. Study effect of sinking of supports of performance
UNIT II
Fixed Beams – Introduction to statically indeterminate beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Deflection of fixed beams including effect of sinking of support, effect of rotation of a support. *LO. 1. Categorize fixed beams and their performance* *2. Analyze the beams subjected to loads* *3. Study effect of sinking of supports of performance*
UNIT III

Continuous Beams: Introduction-Clapeyron's theorem of three moments Analysis of continuous beams with constant moment of inertia with one or both ends fixed continuous beams with overhang, continuous beams with different moment of inertia for different spans-Effects of sinking of supports-shear force and bending moment diagrams.
LO. 1. Categorize continuous beams and their performance
2. Analyze the beams subjected to loads
3. Study effect of sinking of supports of performance
Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports.
      LO. 1. Develop slope deflection expressions
        2. Analyze structures with and without support sinking

UNIT IV
Moving Loads : Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load, U. D load longer than the span, U. D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length. *LO. 1. Categorize different types of moving loads and their performance* *2. Analyze the beams subjected to loads*
TEXT BOOKS:
1.   Ramamurtham S., Theory of Structures, Dhanpat Rai Publishing Company (p) Ltd, 2009 2.   C. S. Reddy, Basic Structural Analysis, Tata McGraw Hill
REFERENCE BOOKS:
1. Timoshenko & Young, Theory of Structures, Tata McGraw Hill 2. Junarkar S. B., Structural Mechanics Vol I & II, Charotar Publishers 3. C. K. Wang, Intermediate Structural Analysis, McGraw Hill
E-RESOURCES:

18A2201491- FLUID MECHANICS & HYDRAULIC MACHINES LAB

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites: Fluid mechanics, Fluid mechanics & hydraulic machines

Course Objectives:

1. To impart the experimental skills in flow measurement and real fluid flow problems
2. To impart experimental skills to verify the performance characteristics of pumps and turbines

Course Outcomes:

1. Student will be able to utilize the knowledge in the design of water supply pipe networks and measure the rate of flow in pipes and channels.
2. Students will have confidence in the hydraulic design of turbines and should be able to identify suitable pumps and turbines for different working conditions.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	2	3	2	-	-	-	1	-	-	-	-
CO2	1	2	3	3	-	-	-	1	-	-	-	-

LIST OF EXPERIMENTS

1. Calibration of Venturimeter & 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 contracted 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. Reynold's Experiment
8. Impact of jet on vanes
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Performance test on Kaplan turbine
12. Efficiency test on centrifugal pump.
13. Efficiency test on reciprocating pump.

18A2201492- ENGINEERING GEOLOGY LAB

Practical	2 Hours	Internal Marks:	40
Credits:	1	External Marks:	60

Prerequisites: Engineering geology

Course Objectives:

Course Outcomes:
1. Identify minerals and rocks
2. Measure strike and dip of the bedding planes
3. Interpret geological maps

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	2	3	3	2	1	1	1	-	-	-	-
CO2	2	3	2	2	2	1	2	2	-	-	-	-
CO3	1	3	2	2	2	-	1	1	-	-	-	-

LIST OF EXPERIMENTS

1. Physical properties of minerals: Mega-scopic identification of
   a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…
   b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc…

2. Megascopic description and identification of rocks.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc…
   b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc…
   c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc…

3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.

4. Simple Structural Geology problems.

5. Bore hole problems

18A2201493- ADVANCED SURVEYING LAB

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites: Surveying

Course Objectives:

To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

Course Outcomes:

1. Conduct survey and collect field data.
2. Prepare field notes from survey data
3. Interpret survey data and compute areas and volumes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	-	1	1	-	-	-	-	-	-	2
CO2	2	1	-	1	1	-	-	-	-	-	-	-
CO3	3	3	-	2	1	-	-	-	-	-	-	2

LIST OF EXPERIMENTS

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of Repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. Tachometric Survey: Heights and distance problems using tachometric principles.
5. One Exercise on Curve setting.
6. One Exercise on contours.
7. Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallax error.
8. Total Station: Determination of area using total station.
9. Total Station: Traversing
10. Total Station: Contouring
11. Total Station: Determination of Remote height.
12. Total Station: distance between two inaccessible points.

18A2201494- SURVEY CAMP

Practical	3 Hours	Internal Marks:	40
Credits:	2	External Marks:	60

Prerequisites: Surveying

Course Objectives:

To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

Course Outcomes:

1. Conduct survey and collect field data.
2. Prepare field notes from survey data
3. Interpret survey data and compute areas and volumes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	-	1	1	-	-	-	-	-	-	2
CO2	2	1	-	1	1	-	-	-	-	-	-	-
CO3	3	3	-	2	1	-	-	-	-	-	-	2

Surveying camp will be conducted for a **week schedule** to carryout survey in nearby villages using survey equipments (Dumpy/Auto level, Total Station).

➢ **Levelling, Contouring**

18A2200801-IPR & Patents

Lecture – Tutorial:	2-0 Hours	Internal Marks:	40
Credits:	0	External Marks:	00

Prerequisites: Professional Ethics

Course Objectives:

1) To impart knowledge on innovations and creations.
2) To encourage students on developing Entrepreneurship Skills
3) To teach procedure for registrations of various intellectual property rights.
4) To bring awareness on cybercrimes.

Course Outcomes:

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

CO1	Understand the need for Intellectual Property Rights and its importance
CO2	Study of Information Technology Act 2000 and classification of Cybercrimes
CO3	Study of Copyrights Act and its registrations process
CO4	Study of Patents Act and it's infringement
CO5	Study of Trademarks Act and it's registration formalities
CO6	Understand the importance of Trade secrets and maintaining trade secrets

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	-	-	-	-	-	3	-	-	-	-
CO2	3	-	-	-	-	-	-	3	-	2	-	-
CO3	2	-	2	-	-	-	-	3	-	-	-	-
CO4	2	-	-	2	-	-	-	3	-	-	-	-
CO5	2	-	2	-	-	-	-	3	-	-	-	-
CO6	2		-	-	-	-	-	3	2	2	-	-

UNIT I

Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO –Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR – Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

LO: 1. Classify intellectual property rights
2.Understand the importance of IPR

Cyber Law and Cyber Crime

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions -E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

LO: 1. Classification of cyber crimes
2. Awareness and preventive measures of cyber crimes

UNIT II

Copyrights and Neighboring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

LO. 1. Categorize subject matters of copyrights

2. Understand the registration process of copyrights

3. Study effect of Infringement under Copyright Act

UNIT III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations – Ownership and Transfer –– Revocation of Patent – Patent Appellate Board - Infringement of Patent – Double Patenting –Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

LO. 1.Analyze Patent requirements and its registration formalities

    2.Study the effect of Infringement under Patent Act

UNIT IV

Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership –Trademarks Claims and Infringement – Remedies – Passing Off Action.

LO. 1.Analyze functions of Trademark and its registration formalities

2.Study the effect of Infringement under Trademark Act

Trade Secrets

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret –Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

LO. 1. Understand the importance of Tradesecrets

2. Understand how to maintain Tradesecrets

TEXT BOOKS:

1. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
2. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi

REFERENCE BOOKS:

1 Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2 R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
3 M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

E-RESOURCES:

- https://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf
- https://www.icsi.edu/media/webmodules/publications/9.4%20Intellectual%20Property%20Rights.pdf
- https://lecturenotes.in/notes/20883-note-for-intellectual-property-rights-ipr-by-gyan-prakash

18A2201601- ELEMENTS OF CIVIL ENGINEERING

Lecture – Tutorial:	2-0 Hours	Internal Marks:	40
Credits:	2	External Marks:	60

Prerequisites: Engineering Mechanics, Strength of Materials

Course Objectives:

➢ To inculcate the essentials of civil engineering field to the students of all branches

➢ To provide the students an illustration of the significance of the civil engineering profession satisfying societal needs.

Course Outcomes:

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

CO1	Attain basic knowledge on simple stress & strains and civil engineering materials.
CO2	Attain basic knowledge on sub-structure and super structure of a building.
CO3	Attain basic knowledge on principles of surveying, various types of surveying.
CO4	Attain basic knowledge on various types of transportation systems.
CO5	Attain basic knowledge on various types of bridges
CO6	Attain basic knowledge on purpose, components and various types of dams.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	2	-	2	-	-	-	-
CO2	3	-	-	-	-	1	-	1	-	-	-	-
CO3	3	2	-	-	-	1	-	1	-	-	-	-
CO4	3	-	-	-	-	1	-	1	-	-	-	-
CO5	3	2	-	-	-	-	-	1	-	-	-	-
CO6	3	2	-	-	-	2	-	1	-	-	-	-

UNIT I

SIMPLE STRESS AND STRAINS:

Definition of Mechanics- External and Internal forces-Stress and Strain-Elasticity and Hooke's Law- Relations between elastic constants.

CIVIL ENGINEERING MATERIALS:

Classification of bricks, Manufacture of bricks, Laboratory and field tests on bricks, stones; Grades of Steel and Cement Concrete.

UNIT II

MASONRY:

Bonds in Brick Masonry, Stone Masonry; Types of Flooring and Roofing.

SUB-STRUCTURE:

Soil –Types; Introduction to Foundations – Classifications; Bearing capacity of Soil - Improvement

UNIT III

SURVEYING:

Objectives, Types, Principles of Surveying; Measurement of distances and angles

TRANSPORTATION ENGINEERING:

Roads- Classification; Road Network Patterns; Cross section of roads; Traffic signs

UNIT IV

BRIDGES:

Necessity of bridges; Components; Classification; Preliminary data to be collected, selection of bridge site; Investigation for major bridges.

DAMS:

Purpose of Dams; Components; Classification; selection of site for construction.

TEXT BOOKS:

1. Palanichamy, M. S.:"Basic Civil Engineering", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.
2. Premalatha, J. and Kasir.: "Basic Civil Engineering", Coimbatore

REFERENCE BOOKS:

1. Jayagopal,L.S. and Rudramoorthy,R., Basic Civil and Mechanical Engineering ,Vikas Publishing House Pvt. Ltd., New Delhi, 1999.
2. Gopi, Satheesh, Basic Civil Engineering, New Delhi Pearson 2010.

E-RESOURCES:

- ncees.org/exmas/fe-exma/
- www.aboutcivil.com/

18A2201602-BASIC SURVEYING

Lecture – Tutorial:	2-0 Hours	Internal Marks:	40
Credits:	2	External Marks:	60

Prerequisites: -----------------

Course Objectives:

➢ To understand the importance of surveying in the field of civil engineering

➢ To study the basics of linear/angular measurement methods like chain surveying, compass surveying

➢ To understand calculations of areas and volumes of a given boundary.

Course Outcomes:

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

CO1	Understand the principles of surveying and types of scales
CO2	Understand the principles of chain surveying.
CO3	Attain basic knowledge on compass surveying and various types of compass.
CO4	Attain basic knowledge on bearings and included angles from bearings
CO5	Compute areas of a given section.
CO6	Compute volumes of a given section.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	2	-	2	-	-	-	-
CO2	3	2	-	-	-	1	-	1	-	-	-	-
CO3	3	2	-	-	-	-	-	1	-	-	-	-
CO4	3	2	-	-	-	-	-	1	-	-	-	-
CO5	3	2	-	-	-	-	-	1	-	-	-	-
CO6	3	2	-	-	-	2	-	1	-	-	-	-

UNIT I

BASICS OF SURVEYING:

Surveying: Definition; Classification; Principles of surveying; Plan and map; Scales used for Maps and plans. Accuracy, Precision, Sources of errors; Types of errors.

UNIT II

CHAIN SURVEYING:

Principles of chain surveying; Basic definitions; Different methods; Ranging out; Chaining a line on a flat ground; Chaining on an uneven or a sloping ground; Chain & Tape corrections; Degree of accuracy.

UNIT III

COMPASS SURVEYING:

Traverse Bearings (WCB&RB); Prismatic compass, Surveyor compass, Magnetic Dip and Declination; Local attraction; included angles from bearings; Limits of accuracy.

UNIT IV

AREAS& VOLUMES

Introduction; Boundaries with offsets at irregular intervals; Area of cross sections – two level sections only; Trapezoidal rule; Prismoidal formula; Capacity of a reservoir.

TEXT BOOKS:

1. Surveying Vol I & II by K R Arora, Standard Book house.

2. Plane Surveying by AM Chandra, New Age International (P) Ltd.

REFERENCE BOOKS:

1. Fundamentals of surveying by S.K. Roy 1999, Prentice- Hall of India, New Delhi.

2. Surveying Vol.1 by B.C. Punmia, Laxmi Publications.

3. Advanced Surveying, by S. Gopi, R.S. Kumar and N. Madhu, 2007, Pearson education, New Delhi.

E-RESOURCES:

- http://nptel.ac.in/courses/webcourse-contents/IIT
  ROORKEE/SURVEYING/home.htm