COURSE STRUCTURE AND DETAILED SYLLABUS

for

II B.TECH

CIVIL ENGINEERING

(Applicable for the batches admitted from 2018-19)

GURU NANAK INSTITUTIONS
TECHNICAL CAMPUS
(An Autonomous Institution)
Campus: Ibrahimpatnam, R.R. District - 501506 (T.S).

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

CONTENTS

II YEAR I SEMESTER

II YEAR II SEMESTER

COURSE STRUCTURE
II B.Tech- Civil Engineering

II Year I SEMESTER (CE)

Subject Code	Group	Subject	L	T	P	Credits
18PC0CE01	PC	Surveying & Geomatics	3	0	0	3
18PC0CE02	PC	Engineering Geology	2	0	0	2
18PC0CE03	PC	Strength of Materials – I	3	1	0	4
18ES0CE01	ES	Engineering Mechanics	3	1	0	4
18PC0CE04	PC	Fluid Mechanics	3	1	0	4
18PC0CE05	PC	Computer Aided Civil Engineering Drawing	0	0	3	1.5
18PC0CE06	PC	Strength of Materials Laboratory	0	0	3	1.5
18PC0CE07	PC	Engineering Geology Laboratory	0	0	2	1
		Total Credits				21

II Year II SEMESTER (CE)

Subject Code	Group	Subject	L	T	P	Credits
18BS0MA05	BS	Probability & Statistics	3	1	0	4
18ES0ME04	ES	Basics of Mechanical Engineering	2	0	0	2
18PC0CE08	PC	Building Materials, Construction and Planning	3	0	0	3
18PC0CE09	PC	Strength of Materials-II	3	0	0	3
18PC0CE10	PC	Hydraulics and Hydraulic Machinery	3	0	0	3
18PC0CE11	PC	Structural Analysis –I	3	0	0	3
18PC0CE12	PC	Surveying Laboratory	0	0	3	1.5
18PC0CE13	PC	Hydraulics & Hydraulic Machinery Lab	0	0	3	1.5
		Total Credits				21

II Year B. Tech. Civil. I-Sem

L	T	P	C
3	0	0	3

(18PC0CE01) SURVEYING AND GEOMATICS

Course Objectives:

The objective of the course is to make the students

Know the principles and methods of surveying, measuring horizontal and vertical distances, angles, recording observations accurately, perform calculations based on the observation, identification of source of errors and rectification methods, apply surveying principles to determine areas and volumes and setting out curves and use modern surveying equipment's for accurate results.

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances - Approximate methods, Direct Methods - Chains- Tapes, ranging, Tape corrections.

Prismatic Compass - Bearings, included angles, Local Attraction, Magnetic Declination, and dip.

UNIT - II

Levelling- Types of levels and levelling staves, temporary adjustments, methods of levelling, booking and determination of levels, effect of curvature of earth and refraction.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas - Determination of areas consisting of irregular boundary and regular boundary.

Volumes - Determination of volume of earthwork in cutting and embankments for level section, volume of borrow pits, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of theodolites, fundamental lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration methods, measurement of vertical angle, trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of traversing traverse computations and adjustments, omitted measurements.

UNIT - IV

Curves: Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves.

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry,

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Field Procedure for total station survey, Errors in Total Station Survey, Global Positioning System- Principle and Applications.

UNIT - V

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 stereoplotting instruments, mosaics, map substitutes.

Course Outcomes: Course will enable the student to:

- Apply the knowledge to calculate angles, distances and levels
- Identify data collection methods and prepare field notes
- Understand the working principles of survey instruments, measurement errors and corrective measures
- Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies

TEXT BOOKS:

1. Chandra A M, “Plane Surveying and Higher Surveying”, New age International Pvt. Ltd., Publishers, New Delhi.
2. Duggal S K, “Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.4 th edition, 2013.
3. Surveying (volume 1, 2 and 3) by B.C Punmia, 17th Edition, 2016.

REFERENCES:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi, 2012.
3. Arora K R “Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 14th Edition, 2010.
4. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi, 17th Edition, 2016.

II Year B. Tech. Civil. I-Sem

L	T	P	C
2	0	0	2

(18PC0CE02) ENGINEERING GEOLOGY

Course Objectives: The objective of this Course is to give basic knowledge of Geology, geological hazards, environmental impacts and site characterization that is required for planning and construction of various Civil Engineering Structures.

UNIT - I

Introduction: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological drawbacks. 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 - II

Mineralogy: Definition of mineral, importance of study of minerals, different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartiz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chrorite, Galena, Pyrolusite, Graphite, Magnesite and Bauxite.

Petrology: Definition of rock: Geological classification of rocks into igneous, sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous, sedimentary and metamorphic rocks. Their distinguishing features, megascopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT - III

Structural Geology: Outcrop, strike and dip study of common geological structures associating with the rocks such as folds, faults, unconformities and joints. Their important types and case studies. Importance of insitu and drift soils, common types of soils, their origin and occurrence in India, Stabilisation of soils. Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

UNIT - IV

Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides their causes and effect; measures to be taken to prevent their occurrence.

Importance of Geophysical Studies: Principles of geophysical study by gravity methods, magnetic methods, electrical methods, seismic methods, radio metric methods and geothermal method. Special importance of electrical resistivity methods and seismic refraction methods. Improvement of competence of sites by grouting etc. Fundamental aspects of rock mechanics and environmental geology.

UNIT - V

Geology of Dams, Reservoirs, and Tunnels: Types of dams and bearing of geology of site in their selection, geological considerations in the selection of a dam site. Analysis of dam failures of the past and factors contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs. Purposes of tunneling and effects of tunneling on the ground. Role of geological considerations (i.e. Lithological, structural and ground water) in tunneling, over break and lining in tunnels.

Course Outcomes: At the end of the course, the student will be able to:

- To carry out site characterization, collect, analyze, and report geologic data using standards in engineering practice.
- To understand fundamentals of the engineering properties of earth materials and fluids.
- Characterize rock mass and the mechanics of planar rockslides and topples.
- Understand the fundamentals of geological structural aspects, ground water impacts and imply their rectifications for improved constructions.
- Understand the causes of earthquakes, landslides for designing of earthquake resistant structures and geophysical studies to analyze bedrock studies for construction activities.

TEXT BOOKS:

1. Engineering Geology by N. Chennakesavulu, Laxmi publications, 2nd Edition, 2016.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing House Pvt. Ltd., 2017.
3. Engineering Geology by S K Duggal, H K Pandey, N Rawal, Mc. Graw Hill Education Pvt. Ltd. 2016 (Second reprint).
4. Principles of Engineering Geology by K.V.G.K. Gokhale, B.S Publications, 2015.

REFERENCES:

1. F.G. Bell, Fundamentals of Engineering Geology, Butterworth-Heinemann, Kindle Edition, 2016.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution, 2018.
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press, 2013.
4. Engineering Geology for Civil Engineers – P.C. Varghese PHI, 2012.

II Year B. Tech. Civil. I-Sem

L	T	P	C
3	1	0	4

(18PC0CE03) STRENGTH OF MATERAILS - I

Pre Requisites: Engineer Mechanics

Course Objectives: Objective of the course is to calculate stresses and deflections developed in beams due to different types of loads and understand different failure theories adopted in the design of structural members

UNIT – I

SIMPLE STRESSES AND STRAINS:

Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram - Elasticity and plasticity – 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, Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses .

STRAIN ENERGY – Resilience – Gradual, sudden, and impact loadings – simple applications.

UNIT – II

SHEAR FORCE AND BENDING MOMENT:

Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

FLEXURAL STRESSES:

Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

SHEAR STRESSES:

Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T, angle and channel sections.

UNIT – IV

DEFLECTION OF BEAMS:

Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L,

Uniformly varying load and couple -Mohr's theorems – Moment area method – Application to simple cases.

CONJUGATE BEAM METHOD: Introduction – Concept of conjugate beam method - Difference between a real beam and a conjugate beam - Deflections of determinate beams with constant and different moments of inertia.

UNIT – V

PRINCIPAL STRESSES:

Introduction – Stresses on an oblique plane of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear –Principal stresses – Mohr's circle of stresses – ellipse of stress - Analytical and graphical solutions.

THEORIES OF FAILURE: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum shear stress theory- Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

Course Outcome:

On completion of the course, the student will be able to:

- Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, related to the strength of structured and mechanical components.
- Recognize various types of loads applied on structural components of simple framing geometries and understand the nature of internal stresses that will develop within the components.
- To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading
- Analyze various situations involving structural members subjected to plane stresses by application of Mohr's circle of stress;
- Frame an idea to design a system, component, or process.

TEXT BOOKS:

1) Strength of Materials by R.K Rajput, S. Chand & Company Ltd, 6th Revised Edition, 2015.
2) Mechanics of Materials by Dr. B. C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain, First Edition, 2016.
3) Strength of Materials by R. Subramanian, Oxford University Press, 3rd Edition, 2016.

REFERENCES:

1) Mechanics of Material by R. C. Hibbeler, Printice Hall publications,10th edition, 2016.
2) Engineering Mechanics of Solids by Egor P. Popov, Printice Hall publications, 2nd edition, 2015.
3) Strength of Materials by T. D. Gunneswara Rao and M. Andal, Cambridge Publishers, 2nd Edition, October 2018.
4) Strength of Materials by R. K. Bansal, Lakshmi Publications House Pvt. Ltd, Revised 4th edition, January 2012.

5) Strength of Materials by B. S. Basavarajaiah and P. Mahadevappa, 3rd Edition, CRC Press, November-2010.

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II Year B. Tech. Civil. I-Sem

L	T	P	C
3	1	0	4

(18ES0CE01) ENGINEERING MECHANICS

(Common to all branches)

Prerequisites: Nil

Objectives: This course helps to solve mechanics problems associated with friction forces and enhance the knowledge of mechanics studied in physics and apply it to the engineering problems. This enables the students to take up further courses in their respective branches.

UNIT – I

INTRODUCTION OF ENGINEERING: MECHANICS – Basic concepts System of Forces- Coplanar Forces – Components in Space – Resultant- Moment of Forces and its Application – Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams-Direction of Force Equations of Equilibrium of Coplanar Systems and Spatial Systems – Vector cross product- Support reactions different beams for different types of loading – concentrated, uniformly distributed and uniformly varying loading .

UNIT – II

FRICTION: Types of friction – Limiting friction – Laws of Friction – Static and Dynamic Frictions – Angle of Friction –Cone of limiting friction– Friction of wedge, block and Ladder, connected bodies**.**

UNIT – III

CENTROID AND CENTER OF GRAVITY: Centroids of simple and composite figures – Center of gravity of flat plate, thin bent bar and wire, composite bodies - Pappus-Guldinus theorems

UNIT – IV

MOMENT OF INERTIA: Moment of Inertia of areas and masses for standard shapes and composite bodies – Perpendicular axis theorem, Parallel axis theorem, Radius of gyration, Transfer Formula

UNIT –V

KINEMATICS: Introduction – Rectilinear motion – Motion with uniform and variable acceleration – Curvilinear motion – Components of motion – Circular motion – Projectiles- Instantaneous centre.

KINETICS: Kinetics of a particle – D'Alembert's principle – Motion in a curved path – work, energy and power. Principle of conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work-energy – Impulse-momentum.

Course Outcomes:

- Student familiarizes with resolving of forces and moments in a given system

- Analyzes the friction of moving bodies
- Understands kinematics and kinetics of rigid bodies
- Carries out experimental mechanics of materials
- Students have the knowledge of material and structures and they integrate the science, engineering and mathematical concepts.

TEXT BOOKS:

1. Engineering Mechanics (Statics and Dynamics) by NH Dubey, Mcgraw Hill, reprint , July 2017.
2. Engineering Mechanics by Fedrinand L. Singer / Harper International 53rd edition 2010.

REFERENCES:

1. Engineering Mechanics (Statics and Dynamics) by Hibbler; Pearson Education, 14th Edition, 2015.
2. Engineering Mechanics by A. K. Tayal, Umesh Publication, 2010.
3. Engineering Mechanics – G. S. Sawhney, Printice Hall of India, 2010.
4. A text book of engineering mechanics by R. K. Bansal; Laxmi publications, 2015.

II Year, B. Tech, Civil Engg. I-Sem

L	T	P	C
3	1	0	4

(18PC0CE04) FLUID MECHANICS

Course Objectives: The objective of the course is to introduce the concepts of fluid mechanics useful in Civil Engineering applications, provide exposure to the students on fluid statics, kinematics and dynamics.

UNIT – I

Properties of Fluid

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, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Fluid Statics

Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube manometer, single column manometer, U-Tube differential manometer, Micromanometers, pressure gauges. Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT - II

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.

Fluid Dynamics

Surface and body forces - Euler's and Bernoulli's equation; Energy correction factor; Momentum equation. Vortex flow – Free and Forced. Bernoulli's equation to real fluid flows.

UNIT - III

Flow Measurement in Pipes

Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend.

Flow Over Notches & Weirs

Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.

UNIT – IV

Flow through Pipes

Reynolds experiment, Reynolds number**,** loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy line, hydraulic grade line, pipes in series, equivalent pipes, pipes in parallel, siphon, branching of pipes, three reservoir problem, power transmission through pipes. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures,

UNIT - V

Laminar & Turbulent Flow

Laminar flow through: circular pipes, annulus and parallel plates.

Boundary Layer Concepts

Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Definition of drag and lift and types of drag, magnus effect.

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Course Outcomes (COs): Upon completion of this course, students should be able to:

- Understand the broad principles of fluid statics, kinematics and dynamics.
- Understand definitions of the basic terms used in fluid mechanics, characteristics of fluids and its flow.
- Understand classifications of fluid flow
- Be able to apply the continuity, momentum and energy principles.
- Students will understand basics of viscous and boundary layer flows

Text Books

1. Fluid Mechanics by Modi and Seth, Standard Book House, 20th edition 2018.
2. Fluid Mechanics and Hydraulic Machines by Manish Kumar Goyal, PHI learning Private Limited, 2015,Kindle edition 2015.
3. Fluid Mechanics by R.C.Hibbeler, Pearson India Education Services Pvt. Ltd, 2nd edition 2016.

Reference Books

1. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill,1993, First edition.
2. Introduction to Fluid Mechanics and Fluid Machines by S K Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited, 3rd Edition, 2016.
3. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli,
4. Oxford University Press, 2010, First edition.
5. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai & Co, 9th edition 2015.
6. Fluid Mechanics and Hydraulilc Machines, R.K. Bansal, Laxmi Publication Pvt Ltd. 9th edition 2016.

II Year, B. Tech, Civil Engg. I - Sem

L	T	P	C
0	0	3	1.5

(18PC0CE05) COMPUTER AIDED CIVIL ENGINEERING DRAWING

Course Objectives: The objective of this lab is to teach the student usage of Auto cad and basic drawing fundamentals in various civil engineering applications, specially in building drawing.

1) Introduction to computer aided drafting and different coordinate system
2) Drawing of Regular shapes using Editor mode
3) Introduction to graphical user interface and drawing of regular shapes using graphical user interface
4) Exercise on Draw tools
5) Exercise on Modify tools
6) Exercise on other tools (Layers, dimensions, texting etc.)
7) Drawing of building components like walls, lintels, Doors, and Windows using CAD software
8) Drawing a plan of building and dimensioning
9) Drawing a plan of a residential building using layers
10) Developing a 3-D plan from a given 2-D plan
11) Developing sections and elevations for given a) Single storied buildings b) multi storied buildings
12) Auto CAD applications in surveying, mechanics etc.

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh – Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.

Course Outcomes: At the end of the course, the student will be able to:

- Use the Autocad commands for drawing 2D & 3D building drawings required for different Civil Engineering applications.
- Plan and draw Civil Engineering buildings as per aspect and orientation.
- Presenting drawings as per user requirements and preparation of technical report

II Year B. Tech. Civil. I-Sem

L	T	P	C
0	0	3	1.5

(18PC0CE06) STRENGTH OF MATERIALS LABORATORY

Course Objectives: Familiarize students with measurement of strains, stress and elastic properties of materials used in Civil Engineering and expose them to a variety of established material testing and techniques.

List of Experiments:

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

Course Outcomes:

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

- Configure & operate a data acquisition system using various testing machines of solid materials.
- Compute and Analyze engineering values (e.g. stress or strain) from laboratory measurements.
- Write a technical laboratory report

II Year, B. Tech, Civil Engg. I - Sem

L	T	P	C
0	0	2	1

(18PC0CE07) ENGINEERING GEOLOGY LABORATORY

Pre Requisites: Engineering Geology Theory

Course Objectives: The objective of this lab is to provide practical knowledge about physical properties of minerals, rocks, drawing of geological maps, showing faults and uniformities.

List of Experiments

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. Identification of minerals:
Silica group: Quartz, Amethyst, Opal;
Feldspar group: Orthoclase, Plagioclase;
Cryptocrystalline group: Jasper;
Carbonate group: Calcite;
Element group: Graphite;
Pyroxene group: Talc;
Mica group: Muscovite;
Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5. Identification of rocks (Igneous Petrology):
Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff.
Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, laterite, limestone and its varieties, shales and its varieties.
7. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8. Study of topographical features from Geological maps. Identification of symbols in maps.
9. Simple structural Geology Problems (Folds, Faults & Unconformities)

Course Outcomes: At the end of the course, the student will be able to:

- Understand the method and ways of investigations required for Civil Engineering projects.

- Identify various rocks, minerals depending on geological classifications
- Will able to learn to couple geologic expertise with the engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects and the quantification of processes such as rock slides and settlement.
- Write a technical laboratory report

LAB EXAMINATION PATTERN:

1. Description and identification of six minerals
2. Description and identification of six rock specimens (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.
5. Microscopic identification of rocks.

II Year B. Tech. Civil. II-Sem

L	T	P	C
3	0	0	3

(18PC0CE08) BUILDING MATERIALS, CONSTRUCTION AND PLANNING

Course Objectives: Make students understand basic construction materials, uses, manufacturing process, building components and their functions. Understand the requirements and importance in building construction.

UNIT - I

Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing.
Bricks – Composition of brick earth – manufacture and structural requirements, fly ash, Ceramics.
Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fibre – reinforced glass bricks, steel & aluminum, Plastics.

UNIT - II

Cement & Admixtures: Ingredients of cement – manufacture – chemical composition – hydration - field & lab tests.
Admixtures – Mineral & chemical admixtures – uses.

UNIT - III

Building Components : Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed; foundations – types; damp proof course ; joinery – doors – windows – materials – types.
Building Services: Plumbing Services: water distribution, sanitary – lines & fittings; ventilations: functional requirements systems of ventilations. Air-conditioning - Essentials and types; Acoustics – characteristic – absorption – acoustic design; Fire protection – Fire Harzards – Classification of fire resistant materials and constructions

UNIT - IV

Mortars, Masonry and Finishings
Mortars: Lime and Cement Mortars
Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick.
Finishers: Plastering, pointing, painting, claddings – types – tiles – ACP.
Form work: Types: Requirements – standards – scaffolding – design; shoring, underpinning.

UNIT – V

Building Planning: Principles of building planning, Classification of buildings and building by laws.

Course Outcomes

- Define the basic terminology that is used in the industry
- Categorize different building materials, properties and their uses
- Understand the prevention of damage measures and good workmanship
- Explain different building services
- Understand the principles of building planning and building by laws

TEXT BOOKS:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications, 2010.
2. Building Materials and Construction by G C Sahu, Joygopal Jena, McGraw hill pvt. ltd. 2015, kindle edition, 2017.
3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi, kindle edition, 2008.

REFERENCES:

1. Building Materials by Duggal, New Age International, 4th Edition, 2012.
2. Building Materials by P. C. Varghese, PHI, 2nd Edition, 2010.
3. Building Construction by P C Varghese, PHI. 2nd Edition, 2017.
4. Construction Technology – Vol – I & II by R. Chubby, Longman UK. 2nd Edition, 1997.
5. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications, 2004.
6. Building Construction, Rangwala, Charotar Publishing house.
7. Engineering Material, Rangwala, Charotar Publishing house.

II Year B. Tech. Civil. II-Sem

L	T	P	C
3	0	0	3

(18PC0CE09) STRENGTH OF MATERIALS – II

Pre Requisites: Strength of Materials -I

Course Objectives: Objective of this course is to make students analyze structural members subjected to tension, compression, torsion, bending, unsymmetrical bending and combined stress.

UNIT – I

TORSION OF CIRCULAR SHAFTS:
Theory of pure torsion – Derivation of Torsion equation - Assumptions made in the theory of pure torsion – Polar section modulus – Power transmitted by shafts – Combined bending and torsion – Design of shafts according to theories of failure.

SPRINGS
Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

UNIT – II

COLUMNS AND STRUTS:
Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns-assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Long columns subjected to eccentric loading – Secant formula – Empirical formulae –– Rankine – Gordon formula- Straight line formula – Prof. Perry's formula.
BEAM COLUMNS: Laterally loaded struts – subjected to uniformly distributed and concentrated loads.

UNIT - III

DIRECT AND BENDING STRESSES:
Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of retaining walls, chimneys and dams – conditions for stability - overturning and sliding – stresses due to direct loading and bending moment about both axis.

UNIT – IV

THIN CYLINDERS:
Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter and volume of thin cylinders – thin spherical shells.
THICK CYLINDERS:
Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage.

UNIT – V

UNSYMETRICAL BENDING:

Introduction – Centroidal principal axes of section – moments of inertia referred to any set of rectangular axes – stresses in beams subjected to unsymmetrical bending – principal axes – resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis.

SHEAR CENTRE: Introduction – Shear centres for symmetrical and unsymmetrical sections, channel, I, T and L

Course Outcome:

On completion of the course, the student will be able to:

- Describe the concepts and principles, understand the theory of elasticity, and perform calculations, relative to the strength of structures and mechanical components in particular to torsion and direct compression.
- To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
- Analyze strength and stability of structural members subjected to direct, direct and bending stresses;
- Understand and evaluate the shear center and unsymmetrical bending.
- Frame an idea to design a system, component, or process

Text Books:

1) Strength of Materials by R.K Rajput, S.Chand & Company Ltd., 2006.
2) Mechanics of Materials by Dr. B. C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain, Revised edition, 2016.
3) Strength of Materials by R. Subramanian, Oxford University Press, 2 nd Edition, 2010.

References:

1) Mechanics of Materials by R.C. Hibbeler, Pearson Education,10th Edition, 2018.
2) Engineering Mechanics of Solids by Popov E. P. Printice Hall Ltd., 2nd Edition, 2010.
3) Strength of Materials by T.D.Gunneswara Rao and M. Andal, Cambridge Publishers 1st Edition, 2018.
4) Strength of Materials by R. K. Bansal, Lakshmi Publications House Pvt. Ltd, Revised 4th Edition, 2010.
5) Fundamentals of Solid Mechancis by M. L. Gambhir, PHI Learning Pvt. Ltd.,1st Edition, 2009.

II Year B. Tech. Civil. II-Sem

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(18PC0CE10) HYDRAULICS AND HYDRAULIC MACHINERY

Course Objectives: Objective of the course is to study the open channel flows and familiarize with hydraulic machinery.

UNIT-I

Open Channel Flow – I

Introduction to open channel flow - Comparison between open channel flow and pipe flow, classification of open channels, classification of open channel flows, velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient "n". Most economical sections. Computation of uniform flow and normal depth.

Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

UNIT-II

Open Channel Flow – II

Non-uniform flow – gradually varied flow - dynamic equation for G.V.F; classification of channel bottom slopes – classification and characteristics of surface profiles – Computation of water surface profiles by numerical and analytical approaches. Direct step method.

Rapidly varied flow: Elements and characteristics (Length and Height) of hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – positive and negative surges (Theory only).

UNIT-III

Dimensional Analysis and Hydraulic Similitude

Dimensional homogeneity – Rayleigh's method and Buckingham's pi methods – dimensionless groups. Similitude, model studies, types of models. Application of dimensional analysis and model studies to fluid flow problems. Distorted models.

Basics of Turbo Machinery

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency

UNIT-IV

Hydraulic Turbines – I

Elements of a typical hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – classification, functions and efficiency.

Hydraulic Turbines – II

Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

UNIT-V

Centrifugal Pumps

Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel – performance of pumps – characteristic curves – NPSH – Cavitation.

Hydropower Engineering: Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

Outcomes:

At the end of the course the student will able to

- Apply their knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
- Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions.
- Apply dimensional analysis and to differentiate the model, prototype and similitude conditions for practical problems.
- Get the knowledge on different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages.
- Apply forces on jets for practical problems

Text Books

1. Fluid Mechanics by Modi and Seth, Standard Book House, 2nd Edition 2018.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015, kindle edition.
3. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai & Co, 9th edition 2015.
4. Fluid mechanics and Hydraulics machinery by R.K Bansal, 9th edition 2016.

REFERENCES

1. Fluid Mechanics by R.C.Hibbeler, Pearson India Education Services Pvt. Ltd, second edition 2016.
2. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria & Sons Publications Pvt. Ltd.), second edition 2019.
3. Open channel flow by V. T. Chow (Mc. Graw Hill Book Company), 2017.
4. Introduction to Fluid Mechanics and Fluid Machines by S K Som, Gautam Biswas, Suman Chakraborthy, Mc. Graw Hill Education (India) Private Limited, 3rd Edition, 2016.
5. Hydraulic Machines by Banga & Sharma (Khanna Publishers), 28th Edition, 2015.

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS
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II Year B. Tech. Civil. II-Sem

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(18PC0CE11) STRCTURAL ANALYSIS – I

Pre Requisites: Strength of Materials –I

Objectives: To make the students understand the principles of analysis of structures subjected to static and moving loads by different methods and understand the energy method used for solving of Engineering problems

UNIT – I

ANALYSIS OF PERFECT FRAMES: Types of frames - Perfect, imperfect and redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT – II

ENERGY THEOREMS: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-unit load method - Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.

THREE HINGED ARCHES – Introduction – Types of Arches – Comparison between three hinged and two hinged arches - Linear arch - Eddy's theorem - Analysis of three hinged arches - Normal thrust and radial shear - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular arches having supports at different levels - Absolute maximum bending moment diagram for a three hinged arch.

UNIT-III

PROPPED CANTILEVER and FIXED BEAMS: Determination of static and kinematic indeterminacies for beams- Analysis of propped cantilever and fixed beams, including the beams with different moments of inertia - subjected to uniformly distributed load - point loads - uniformly varying load, couple and combination of loads - shear force, bending moment diagrams and elastic curve for propped cantilever and fixed beams - Deflection of propped cantilever and fixed beams - effect of sinking of support, effect of rotation of a support.

UNIT – IV

CONTINUOUS BEAMS: Introduction - Continuous beams - Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed - continuous beams with overhang - effect of sinking of supports.

SLOPE DEFLECTION METHOD: Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports - Determination of static and kinematic indeterminacies for frames - Analysis of single bay, single storey portal

frames by slope deflection method including side sway - Shear force and bending moment diagrams and elastic curve.

UNIT – V

MOVING LOADS and INFLUENCE LINES: Introduction maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load, uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads - Equivalent uniformly distributed load - Focal length - Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses - Equivalent uniformly distributed load -Focal length.

Outcomes:

At the end of the course the student will able to

- An ability to apply knowledge of mathematics, science, and engineering
- Analyse the statically determinate and continuous beams
- Knowing the strength behaviour of members for static and dynamic loading.
- Calculate the stiffness parameters in beams and pin jointed trusses.
- Understand the indeterminacy aspects to consider total structural system, identify, formulate and solve engineering problems with real time loading.

Text Books:

1) Structural Analysis Vol – I & II by V. N. Vazirani and M. M. Ratwani, Khanna Publishers,16th Edition, 2010.
2) Structural Analysis Vol. I & II by G. S. Pandit and S. P. Gupta, Tata McGraw Hill Education Pvt. Ltd, 1st Edition, 1999.
3) Structural analysis T.S Thandavamoorthy, Oxford university Press, 1st edition, 2011.

References:

1) Structural Analysis, Vol. I & II, R. Vaidyanathan, P. Perumal, 2nd edition, 2004
2) Structural Analysis by R. C. Hibbeler, Pearson Education, 6th Edition, 2006.
3) Basic Structural Analysis, K. U. Muthu et al., I. K. International Publishing House Pvt. Ltd, 2nd edition, 2015.
4) Mechanics of Structures, Vol – I and II, H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd, 24th Edition, 2015.
5) Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill Education Pvt. Ltd,7th edition, 1981.
6) Fundamentals of Structural Analysis, M. L. Gamhir, PHI Learning Pvt. Ltd, 1st Edition, 2011.

II Year B. Tech. Civil Engg. II - Sem

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(18PC0CE12) SURVEYING LABORATORY

Course Objectives: Impart practical knowledge in the field by measuring distances, angels, reduced levels, areas and volumes. To set out curves, stake points, traverse the area and draw plans and maps

List of Experiments

1. Surveying of an area by chain and compass (closed traverse) & plotting.
2. Determination of distance between two inaccessible points with compass
3. Radiation method, intersection methods by plane table survey.
4. Levelling – Longitudinal and cross-section and plotting
5. Measurement of Horizontal and vertical angle by theodolite
6. Trigonometric leveling using theodolite
7. Height and distances using principles of tachometric surveying
8. Determination of height, remote elevation, distance between inaccessible points using total station
9. Determination of Area using total station and drawing map
10. Traversing using total station for drawing contour map
11. Stake out using total station
12. Setting out Curve using total station

Course Outcomes: At the end of the course, the student will be able to:

- Apply the principle of surveying for civil Engineering Applications
- Calculation of areas, Drawing plans and contour maps using different measuring equipment at field level
- Write a technical laboratory report

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(18PC0CE13) HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY

Course Objective: To identify the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.

List of Experiments

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipe line
7. Determination of Energy loss in Hydraulic jump
8. Impact of jet on vanes
9. Performance Characteristics of Pelton wheel turbine
10. Performance Characteristics of a single stage centrifugal pump

Course Outcomes

Students will:

- Understand the measurement techniques of fluid mechanics and its appropriate application.
- Interpret the results obtained in the laboratory for various experiments.
- Discover the practical working of hydraulic machines, different types of turbines, pumps and other miscellaneous hydraulics machines.
- Compare the results of analytical models introduced in lecture to the actual behavior of real fluid flows.
- Write a technical laboratory report