DEPARTMENT OF CIVIL ENGINEERING

Subject Name: Computer Aided Drawing & Graphics

Regulation Year: 2024 (1ST/2ND SEM)

Course Code: CE171 **Credit: 02**

Course Category: PC (P)

Contact hours: 03HRS/WEEK

Recommended Pre-requisite: Basic Computer Skills Basic Mathematics and Introduction to Engineering Drawing.

COURSE OUTCOMES:
After going through this course the student will be able to
CO1: Demonstrate proficiency in using CAD software for drafting and modelling.

CO2: Create and edit simple and complex geometric figures.

CO3: Design and incorporate title blocks with necessary annotations.

CO4: Draw and manipulate curves using Spline and Cubic Spline tools.

CO5: Accurately draw and dimension simple solids like prisms, pyramids, cylinders, and cones.

CO6: Integrate various drafting elements into comprehensive CAD drawings.

Course Content:
1: Introduction to CAD Software
Overview of CAD software features and interface. Understanding the coordinate system used in CAD.

2: Simple Figure Creation
Practice creating simple geometric figures such as polygons and general multiline figures. Introduction to basic drawing and editing tools.

3: Title Block Creation
Drawing and designing a title block. Adding necessary text, projection symbols, and other standard annotations.

4: Drawing Curves
Introduction to drawing curves using Spline and Cubic Spline tools. Practice creating parabolas, spirals, and involutes.

5: Drawing Solids
Drawing front and top views of simple solids like prisms, pyramids, cylinders, and cones. Introduction to dimensioning techniques for these solids.

Text Books:
T1: Engineering Drawing and Graphics Using AutoCAD by T. Jayapoovan

T2: Engineering Drawing by N.D. Bhatt

T3: A Textbook of Engineering Drawing by R.K. Dhawan

Reference Books:

R1: Engineering Graphics with AutoCAD by James D. Bethune

R2: Fundamentals of Engineering Drawing by Luzadder and Duff

R3: Engineering Drawing by P.S. Gill

R4: AutoCAD 2021: A Power Guide for Beginners and Intermediate Users by CADArtifex

Open Sources: (From NPTEL/ swayam plus portal/ ocw.mit.edu/courses/ myopencourses.com/)

CO-PO Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		2					3				
CO2		1			2	3						
CO3	1			2							3	
CO4		1					2	3				
CO5			1			2				3		
CO6					1		2					3

Guideline for Defining CO

(Don't Include this Guideline in the Syllabus)

1. Statements of observable student actions that serve as evidence of the Knowledge, Skills and Attitudes acquired in a course.
2. Each course is designed to meet (about 6) Course Outcomes
3. The Course Outcomes are stated in such a way that they can be actually measured.
4. Course Outcome statement may be broken down into two main components:
    a. **An action word** that identifies the performance to be demonstrated;
    b. **Learning statement** that specifies what learning will be demonstrated in the performance;
5. Examples of good action words to include in course outcome statements:

    Compile, identify, create, plan, revise, analyze, design, select, utilize, apply, demonstrate, prepare, use, compute, discuss, predict, assess, compare, rate, critique, outline, or evaluate

6. Each CO can be identified to address a subset of POs
7. Based on the number of COs and the sessions dedicated to them it is possible to identify the strength of mapping (1, 2 or 3) to POs
8. Based on these strengths of selected POs a CO matrix can be established.

DEPARTMENT OF CIVIL ENGINEERING

Subject Name: SOLID MECHANICS

Regulation Year: 2024 (3RD SEM)

Course Code: CE211 **Credit: 04**

Course Category: PC

Contact hours: 4HRS/WEEK

Recommended Pre-requisite: This requires the familiarity with the vocabulary of the subject, skill of drawing free body diagrams and the understanding of the material behaviour under loads

COURSE OUTCOMES:
After going through this course the student will be able to

CO1: Understand the concepts of forces, stress, strain and their resolutions.

CO2: Explain concept of compound stress and strain and principles of failure theories.

CO3: Apply the concepts of Shear Force and Bending Moment for Determinate Beams as well as deflection.

CO4: Analyse the differential equation of the elastic line to determine the slope and deflection no of beams.

CO5: Judge the performance and stress distribution in composite beams made of two different materials under bending loads.

CO6: Develop strategies for enhancing the strength and torsional resistance of solid and hollow circular shafts.

Course Details:

Unit 1: Simple Stress and Strain : (10 Hrs)

Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy intension and compression, Resilience, Impact loads, Analysis of Axially Loaded Members, Composite basin tension and compression, temperature stresses in composite rods, Statically indeterminate problems, Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

Unit 2: Compound Stress and strain: (14 Hrs)

Stresses in thin cylinders, thin spherical shells under internal pressure, wire winding of thin cylinders. Analysis of Biaxial Stress. Plane stress, Principal stress, Principal plane, Mohr's Circle for Biaxial Stress, Two dimensional state of strain, Mohr's circle for strain, Principal

strains and principal axes of strain, strain measurements, Calculation of principal stresses from principal strains.

Theories of failure:

Maximum principal stress theory, maximum shear stress theory, maximums train theory, total strain energy theory, maximum distortion theory, octahedral shear stress theory graphical representation and comparison of theories of failure.

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Unit3: **(14 Hrs)**

Shear Force and Bending Moment for Determinate Beams:

Types of load and support. Support reactions, Shear force and bending moment, Relationship between bending moment and shear force, Point of inflection, Shear Force and Bending Moment diagrams cantilever ,simply supported and overhanging beams subjected to point load ,uniform and varying loads.

Deflection of Beams :

Differential equation of the elastic line, Slope and deflection of beams by integration method and area- moment method, Consistent deformation method, conjugate beam method.

Unit4: **(10 Hrs)**

Simple Bending of Beams:

Theory of simple bending of initially Straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress ,beams of two materials ,Composite beams.
Unsymmetrical Bending of Beams Properties of beam cross selection, slope of neutral axis, stresses and deflection in unsymmetrical bending, shear centre.

Unit5: **(08 Hrs)**

Theory of Columns:

Eccentric loading of a short strut, Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio

Torsion in solid and hollow circular shafts:

Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Stresses due to combined bending and torsion, Strength of shafts in combined bending and twisting.

Text Books:

T1: Elements of Strength of Materials by S.P. Timoshenko and D.H. Young, Affiliated East-West Press.
T2: Strength of Materials by G.H. Ryder, Macmillan Press.

Reference Books:

R1. Strength of Materials by James M. Gere and Barry J. Goodno, Cengage Learning.
R2. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill.
R3 Mechanics of Materials by R.C. Hibbeler, Pearson Education.

R4 Mechanics of Materials by William F. Riley, Leroy D. Sturges and Don H. Morris, Wiley Student Edition.
R5 Mechanics of Materials by James M. Gere, Thomson Learning.
R6 Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall of India.
R7 Strength of Materials by S.S. Rattan, Tata McGraw Hill.
R8 Strength of Materials by R. Subramaniam, Oxford University Press.

Open Sources: (From NPTEL/ swayam plus portal/ ocw.mit.edu/courses/ myopencourses.com/)

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CO1	3	2	2		1	2	3	3				
CO2	3	3	1	2		1	3	2		2		
CO3	3	3	3	2	2	3	2	1		2		1
CO4	3	2	3	3	3	2	1	2		1	1	2
CO5	2	3	3	2						2		
CO6	3	2	2	1			1	2		2		

Guideline for Defining CO

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    a. **An action word** that identifies the performance to be demonstrated;
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14. Each CO can be identified to address a subset of POs
15. Based on the number of COs and the sessions dedicated to them it is possible to identify the strength of mapping (1, 2 or 3) to POs
16. Based on these strengths of selected POs a CO matrix can be established.

DEPARTMENT OF CIVIL ENGINEERING

Subject Name: CIVIL ENGINEERING MATERIALS AND CONSTRUCTION

Regulation Year: 2024 (3RD SEM)

Course Code: CE213 **Credit: 03**

Course Category: PCC

Contact hours: 3HRS/WEEK

Recommended Pre-requisite: Ability to identify different materials and a general understanding of basic materials.

COURSE OUTCOMES:

After going through this course the student will be able to

CO1: Identify the classifications and physical and mechanical properties of materials.

CO2: Explain the factors affecting the properties of concrete, including fresh, mechanical, and durability aspects.

CO3: Utilize various materials in construction projects based on their characteristics and applications.

CO4: Analyze the suitability of different types of structures and soil conditions.

CO5: Assess the structural integrity and aesthetic impact of cavity wall, arch, door and windows and classifications in architectural design.

CO6: Design innovative staircases, develop advanced damp-proofing techniques, and formulate new fire-resistant construction approaches.

Course Details:

Unit 1: **(10 Hrs)**

Aggregate: Classification, Physical and mechanical properties, soundness, alkali-aggregate reaction, thermal properties of aggregate.

Bricks and Masonry Blocks: Types, properties and field and laboratory tests to evaluate quality, AAC Block, FAL-G brick, manufacturing of bricks.

Lime and Cement: Classification, properties and types, Portland cement, chemical composition of raw material, bogue compounds, hydration of cement, role of water in hydration, testing of cement, Manufacturing process of cement.

Fly Ash: Properties and use.

Mortar: Types and tests on mortars.

Unit 2: **(12 Hrs)**

Concrete: Production, mix proportions and grades of concrete, fresh, mechanical and durability properties of concrete, factors affecting properties of concrete, tests on

concrete, admixtures. Building stone: classifications, properties and structural requirements.

Wood and Wood products: Introduction to wood macrostructure, sapwood and heartwood, defects and decay of timber, seasoning and preservation of timber, fire resisting treatment, introduction to wood products- veneers, plywood, fibre board, particle board, block board, batten boards.

Metals: Important properties and uses of Iron (Cast iron, wrought iron and steel), Important tests on steel rebar, aluminium and copper.

Glass: types and uses.

Gypsum: source, properties, uses.

Paint: Types, distemper, varnish, Adhesive, Bitumen.

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Unit3: (6 Hrs)

Foundation: Purpose, types of foundation- shallow, deep, pile, raft, grillage foundation.

Brick Masonry: Types of bonds, relative merits and demerits of English, Single Flemish and Double Flemish bond.

Stone Masonry: General principles, classification of stone masonry and their relative merits and demerits.

Unit4: (8 Hrs)

Cavity wall: Components and construction.

Arches: Terminology and classifications.

Doors and Windows: Types, materials used. Lintels.

Wall Finishes: Plastering, pointing, distempering and painting: Purpose, methods, defects and their solutions.

Unit5: (6Hrs)

Stairs: Terminology, requirements of good staircase, classification; ramps, lifts and escalators.

Damp proofing: Causes, effects, prevention and treatments.

Fire resistant construction: Fire resistant properties of common building materials, requirements for various building components.

Text Books:

T1: Engineering Materials by S.C. Rangwala et al., Charotar Publishing House.
T2: Material of Construction by D.N. Ghose, TMH Publishing Company Ltd.

Reference Books:

R1. Building Construction by Dr B C Punmia, Er A K Jain and Arun Kumar Jain, Laxmi Publication.
R2. A text book of Building Construction by S.K. Sharma and B.K. Kaul, S. Chand & Company Limited.
R3. A text book of Building Construction by S.K. Sharma and B.K. Kaul, S. Chand & Company Limited.
R4 Properties of concrete by A.M. Neville, Low Price Edition.

R5 Building Construction by S.P. Arora.
R6 Building materials by S.K. Duggal, TMH Publication.
R7 Handbook of mix design – BIS.
R8 American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000).

Open Sources: (From NPTEL/ swayam plus portal/ ocw.mit.edu/courses/ myopencourses.com/)

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- http://www.myopencourses.com/discipline

CO-PO Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	3	3		3			1		2
CO2	3		3			1	3			1	2	3
CO3	3		3	2	3	3	2	3			2	2
CO4	2	1	3		3			2	2		3	2
CO5	3		3	3	3	2			2		3	2
CO6	2		3	2	3	1	2				2	2

Guideline for Defining CO

(Don't Include this Guideline in the Syllabus)

17. Statements of observable student actions that serve as evidence of the Knowledge, Skills and Attitudes acquired in a course.
18. Each course is designed to meet (about 6) Course Outcomes
19. The Course Outcomes are stated in such a way that they can be actually measured.
20. Course Outcome statement may be broken down into two main components:
    a. **An action word** that identifies the performance to be demonstrated;
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21. Examples of good action words to include in course outcome statements:

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22. Each CO can be identified to address a subset of POs
23. Based on the number of COs and the sessions dedicated to them it is possible to identify the strength of mapping (1, 2 or 3) to POs
24. Based on these strengths of selected POs a CO matrix can be established.

DEPARTMENT OF CIVIL ENGINEERING

Subject Name: Civil Engineering Computer added Drawing

Regulation Year: 2024 (3RD SEM)

Course Code: CE281 **Credit: 02**

Course Category: PCC

Contact hours: 03HRS/WEEK

Recommended Pre-requisite: Introduction to Civil Engineering, Engineering Drawing and Basic Computer Skills.

COURSE OUTCOMES:

After going through this course, the student will be able to

CO1: Demonstrate proficiency in using CAD software for architectural and structural drawings.

CO2: Understand and accurately draw various building components like masonry walls, RCC columns, and staircases.

CO3: Create detailed structural drawings with reinforcement details for RCC structures and steel trusses.

CO4: Incorporate electrical, plumbing, and sanitary services into building plans.

CO5: Design functional systems such as pavements, septic tanks, and rainwater harvesting systems.

CO6: Develop comprehensive building plans, including plans, elevations, and sectional elevations, integrating all components and services.

Course Content:

1: Introduction to CAD Software

Overview of CAD software and its importance in civil engineering. Basic commands and drawing tools. Practice drawing simple shapes and lines.

2: Cross Section of Masonry Wall Foundation and RCC Columns

Drawing cross sections of masonry wall foundations. Isolated and combined footings for RCC columns.

3: Brick Masonry Bonds

Different types of bonds in brick masonry (e.g., stretcher bond, header bond, English bond, Flemish bond). Practice drawing each type of bond.

4: Staircases

Different types of staircases (e.g., straight flight, dog-legged, quarter turn, spiral). Drawing plans, elevations, and sections of various staircases.

5: Lintel and Chajja

Drawing details of lintels and chajjas. Understanding their structural role and placement in buildings.

6: RCC Slabs and Beams

Drawing cross sections of RCC slabs and beams. Detailing reinforcement.

7: Pavement Cross Section

Drawing cross sections of pavements. Understanding different layers (e.g., subgrade, sub-base, base, wearing course).

8: Septic Tank and Sedimentation Tank

Drawing detailed sections of septic tanks and sedimentation tanks. Understanding their functions and components.

9: Rain Water Recharging and Harvesting System

Layout plan of rainwater recharging and harvesting system. Drawing components like recharge pits, storage tanks, and piping systems.

10: Cross Sectional Details of a Residential Road

Drawing cross sections of roads for residential areas. Incorporating provisions for services like drainage, water supply, electricity, and communication lines**.**

11: Steel Truss

Drawing different types of steel trusses. Understanding load distribution and structural integrity.

12: Integrated Building Planning

Drawing the plan, elevation, and sectional elevation of a building. Incorporating electrical, plumbing, and sanitary services. Final project submission and presentation.

Text Books:

T1: Engineering Drawing and Graphics Using AutoCAD by T. Jayapoovan

T2: Civil Engineering Drawing and House Planning by B.P. Verma

T3: Civil Engineering Drawing by M. Chakraborti

T4: Building Planning and Drawing by V.B. Sikka

Reference Books:

R1: Reinforced Concrete Design by S. Unnikrishna Pillai and Devdas Menon

R2: Brickwork and Bricklaying by Jon Collinson

R3: Steel Structures Design: ASD/LRFD by Alan Williams

R4: Principles of Foundation Engineering by Braja M. Das

R5: AutoCAD 2021: A Power Guide for Beginners and Intermediate Users by CADArtifex

Open Sources: (From NPTEL/ swayam plus portal/ ocw.mit.edu/courses/ myopencourses.com/)

CO-PO Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1				2							
CO2		1		2			3					
CO3	1				2				3			
CO4			1				3					2
CO5		1					2					3
CO6				1				2	3			

Guideline for Defining CO

(Don't Include this Guideline in the Syllabus)

25. Statements of observable student actions that serve as evidence of the Knowledge, Skills and Attitudes acquired in a course.
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30. Each CO can be identified to address a subset of POs
31. Based on the number of COs and the sessions dedicated to them it is possible to identify the strength of mapping (1, 2 or 3) to POs
32. Based on these strengths of selected POs a CO matrix can be established.

DEPARTMENT OF CIVIL ENGINEERING

Subject Name: MATERIAL TESTING LAB

Regulation Year: 2024

Course Code: CE273 **Credit: 02**

Course Category: PCC

Contact hours: 03HRS/WEEK

Recommended Pre-requisite: Ability to identify different materials and a general understanding of basic materials.

COURSE OUTCOMES:

After going through this course the student will be able to

CO1: Identify the tests for evaluating the shape, size, water absorption, and compressive strength of bricks.

CO2: Explain the principles behind cement testing methods such as fineness, soundness, specific gravity, and setting times, and their importance in construction.

CO3: Utilize testing procedures to measure the fineness modulus and crushing value of aggregates.

CO4: Interpret the results of aggregate tests to determine their impact on concrete performance.

CO5: Judge the suitability of various construction materials based on test results, ensuring they meet the required standards for specific applications.

CO6: Develop detailed reports that document test procedures, results, and interpretations for quality control and material selection in construction engineering.

COURSE CONTENT:

(Any 8 Experiment)

Brick:

(a) Shape and size test for brick,
(b) Water absorption test for brick
(c) Compressive strength of brick

Cement:

(a) Fineness of cement
(b) Soundness of cement by Le-chattelier test
(c) Specific gravity of cement
(d) Standard consistency of a given sample by Vicat test
(e) Initial and final setting time of cement
(f) Fineness modulus of fine and coarse aggregate
(g) Aggregate crushing value of coarse aggregate
(h) Compressive strength of cement mortar

Steel:

a) Compression test of cast iron
b) Rigidity modulus of cast iron
c) Fatigue test of steel (cyclic loading)

d) Tensile strength of steel
e) Torsion of shaft

REFERENCES:

1. Material Testing Laboratory Manual for Quality Control by C.B Kukreja, K Kishore, Ravi Chawla. Standard publishers distributor.
2. Brick: IS 1077, 1993
3. Cement: IS 4031, 1988

Open Sources: (From NPTEL/ swayam plus portal/ ocw.mit.edu/courses/ myopencourses.com/)

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CO-PO Mapping Table

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CO1	2	3	1	3	3		3			1		2
CO2	3		3			1	3			1	2	3
CO3	3		3	2	3	3	2	3			2	2
CO4	2	1	3		3			2	2		3	2
CO5	3		3	3	3	2			2		3	2
CO6	2		3	2	3	1	2				2	2

Guideline for Defining CO

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DEPARTMENT OF CIVIL ENGINEERING

Subject Name: FLUID MECHANICS AND HYDRAULICS

Regulation Year: 2024 (4TH SEM)

Course Code: CE250 **Credit: 03**

Course Category: PCC

Contact hours: 04HRS/WEEK

Recommended Pre-requisite: Basic knowledge about differential equations, mechanics and science.

COURSE OUTCOMES:

After going through this course the student will be able to

CO1: Identify the differences between fluids, gases, and solids, and fluid properties.

CO2: Describe fluid flow concepts, including acceleration of fluid particles, the continuity equation as well as the principles of the momentum equation and vortex flow.

CO3: Utilize the Hydraulic Gradient Line (HGL) and Total Energy Line (TEL) in pipe flow scenarios and calculate power transmission.

CO4: **Examine** the transition from laminar to turbulent flow, identifying causes, scale, and intensity of turbulence and their influence on pipe performance.

CO5: Assess the accuracy of methods for calculating specific energy and critical flow conditions in non-uniform channels and their implications for channel design.

CO6: Develop models to simulate and analyze hydraulic jumps, incorporating principles of gradually varied flow and channel surface profiles.

Course Details:

Unit 1: **(10 Hrs)**

Basic Concepts and Definitions:

Distinction between a fluid, a gas and a solid. Fluid properties: 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, Pascal's law, and pressure variation with temperature, density and altitude. Manometer: classification, description and use. Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

Unit 2: **(10 Hrs)**

Fluid kinematics:

Introduction, description of fluid flow, classification of fluid flow. Reynolds number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity, Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net.

Fluid dynamics:

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.

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Unit3: **(14 Hrs)**

Flow through pipe:

Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel.

Laminar Flow:

Laminar flow through: circular pipes, annulus and parallel plates. Stoke'law, Measurement of viscosity.

Turbulent Flow:

Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes.

Unit4: **(14 Hrs)**

Introduction to 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. Factors affecting Manning's Roughness Coefficient, Most economical section of channel. Computation of Uniform flow, Normal depth.

Non-Uniform Flow:

Specific energy, Specific energy curve, critical flow, discharge curve Specific force, Specific depth, and Critical depth. Channel Transitions.

Unit5: **(8 Hrs)**

Measurement of Discharge and Velocity:

Current meter, Floats, Hot-wire anemometer. Gradually Varied Flow Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile.

Hydraulic Jump:
Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump.

Text Books:

T1: Fluid Mechanics by A.K. Jain, Khanna Publishers.
T2: Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
T3 Open-Channel Flow by M. Hanif Chaudhry .
T4 Open-Channel Hydraulics by VenTe Chow, McGraw Hill.

Reference Books:

R1. Engineering Fluid Mechanics by K.L. Kumar, S. Chand & Co.
R2 Hydraulics and Fluid Mechanics including Hydraulic Machines by P.N. Modi and S.M. Seth, Standard Book House.
R3 Fluid Mechanics and Fluid Machines, Som& Biswas, McGraw Hill.
R4 A Text Book of Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Publications.
R5 Problems in Fluid Mechanics, Subramanyam, McGraw Hill.

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CO4	3	3	3	2	2	2			1		1	2
CO5	3	3	3	2	2		2					2
CO6	3	3	3	2	2	2						2

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DEPARTMENT OF CIVIL ENGINEERING

Subject Name: GEOTECHNICAL ENGINEERING

Regulation Year: 2024 (4TH SEM)

Course Code: CE222 **Credit: 03**

Course Category: PCC

Contact hours: 04HRS/WEEK

Recommended Pre-requisite: Basic knowledge about differential equations, mechanics and science.

COURSE OUTCOMES:

After going through this course the student will be able to

CO1: **Identify** the origin, formation processes and classification soils.

CO2: Discuss the concept of seepage analysis and its importance in geotechnical engineering.

CO3: Apply standard and modified Proctor compaction tests to determine the optimal moisture content and maximum dry density of soils.

CO4: Analyze the effects of compaction on soil properties, including implications for soil stability and strength.

CO5: Assess the accuracy of earth pressure calculations using Rankine's and Coulomb's theories, and evaluate the impact on retaining wall design.

CO6: Design foundation systems using bearing capacity analyses to address specific site conditions and requirements.

Course Details:

Unit 1: **(12 Hrs)**

Introduction:

Origin of soils, formation of soils, clay mineralogy and soil structure, basic terminology and their relations, index properties of soils.

Soil classification: Particle size distribution, use of particle size distribution curve, Particle size classification, textural classification, HRB classification, Unified classification system, Indian standard soil classification system, Field identification of soils.

Soil moisture:

Types of soil water, capillary tension, capillary siphoning. Stress conditions in soil: Total stress, pore pressure and effective stress.

Unit 2: **(8 Hrs)**

Permeability:

Darcy's law, permeability, factors affecting permeability, determination of permeability (laboratory and field methods), and permeability of stratified soil deposits.

Seepage analysis: Seepage pressure, quick condition, Laplace equation for two dimensional flow, flow net, properties and methods of construction of flow net, application of flow net, seepage through anisotropic soil and non-homogenous soil, seepage through earth dam. .

Unit3: **(12 Hrs)**

Soil compaction:

Compaction mechanism, factors affecting compaction, effect of compaction on soil properties, density moisture content relationship in compaction test, standard and modified proctor compaction tests, field compaction methods, relative compaction, compaction control.

Soil consolidation:

Introduction, spring analogy, one dimensional consolidation, Terzaghi's theory of one dimensional consolidation, consolidation test, determination of coefficient of consolidation.

Shear strength of soils:

Mohr's stress circle, theory of failure for soils, determination of shear strength (direct shear test, tri-axial compression test, unconfined compression test, van shear test), shear characteristics of cohesion less soils and cohesive soils.

Unit4: **(12 Hrs)**

Stability of Slopes: Terminology, stability of finite and infinite slopes, Swedish slip circle method and friction circle method of analysis of slopes, Taylor stability Number and stability curves, Bishops method.

Earth Pressure and Retaining Walls: Effect of wall movement on earth pressure, Earth pressure at rest, Rankine's theory of earth pressure, Coulomb's theory of earth pressure, Coulomb's equation for c = 0 back fills, Passive earth Pressures-Friction circle method, Design considerations retaining walls.

Unit5: **(12 Hrs)**

Bearing Capacity: Definitions, Rankine's analysis, Types of failures: General and local shear failure,Terzaghi's Analysis, Meyerhof's analysis, Effect of water table on bearing capacity, IS code method for computing bearing capacity and different test.

Deep foundations: Dynamic and static formulae, Axial load capacity of piles in sands and clays, pile load test, pile under lateral loading, pile group efficiency, negative skin friction.

Text Books:

T1 Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning.
T2 Soil Mechanics and Foundation Engineering by B.C. Punmia et al., LaxmiPublicationsPvt Ltd.
T3 "Soil Mechanics and Foundation Engineering",Murthy, V.N.S., CBS Publishers and
T4 Distributers Ltd., New Delhi, 2015.
T5 "Basic and Applied soil mechanics",Gopal Ranjan and Rao A.S.R. New Age International (P) Ltd, New Delhi,2006.

Reference Books:

R1. Geotechnical Engineering, C. Venkatramaiah, New Age International publishers.
R2. Soil Mechanics, T.W. Lambe& Whiteman, Wiley Eastern Ltd, New Delhi.
R3. Basic and applied soil mechanics, New Age International Publishers.
R4. Geotechnical Engineering, T.N. Ramamurthy & T.G. Sitharam, S. Chand & Co.
R5. Geotechnical Engineering, S.K. Gulati and M. Datta, McGrow Hill.

R6. Principles of Foundation Engineering" Das, B.M. (Eighth edition), Thompson Asia Pvt. Ltd.,Singapore, 2013.

Open Sources: (From NPTEL/ swayam plus portal/ ocw.mit.edu/courses/ myopencourses.com/)

- http://nptel.ac.in
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CO-PO Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		1	2	2	3					
CO2	3	3	2	3	1	1	2			1		
CO3	3	3	2	2	1	3	2			2	1	2
CO4	3	3	3	1	2	2	3			3	1	2
CO5	3	3	2	3	1	2	3	1	1	2		
CO6	3	3	3	3	2	2	2	2	1	2	1	

Guideline for Defining CO

(Don't Include this Guideline in the Syllabus)

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6. Each CO can be identified to address a subset of POs
7. Based on the number of COs and the sessions dedicated to them it is possible to identify the strength of mapping (1, 2 or 3) to POs
8. Based on these strengths of selected POs a CO matrix can be established.

DEPARTMENT OF CIVIL ENGINEERING

Subject Name: SURVEYING AND GEOMATICS

Regulation Year: 2024(4TH SEM)

Course Code: CE264 **Credit: 03**

Course Category: PCC

Contact hours: 03HRS/WEEK

Recommended Pre-requisite: Student should have knowledge about measurement and mathematical knowledge

COURSE OUTCOMES:
After going through this course the student will be able to

CO1: Definitions, classifications, and scales used in surveying, and recall key concepts of Chain and Compass traversing.
CO2: Explain the principles and various process of Plane Table Surveying, Levelling and Contouring.
CO3: Utilization theodolites for measuring angles, performing traverses, and plotting results, including balancing a traverse and calculating closing errors.

CO4: Examine the effectiveness of different Tacheometric methods and their applications in various surveying scenarios.
CO5: Evaluate the accuracy and suitability of various methods for designing and setting out Curves in surveying projects.
CO6: Design a surveying project incorporating total stations and EDM instruments, ensuring accurate measurement procedures and error management.

Course Details:

Unit 1: **(10 Hrs)**

Linear measurements and chain surveying: Definition of surveying, classification of surveys, scales, types of chains and tapes, chaining and ranging, principles of chain survey, instruments, applications, errors and corrections, obstacles in chaining.

Compass Traversing: Measurement of bearing, computation of angles from bearings, designation of bearings, fore bearing and back bearing, prismatic compass, principles of compass survey, local attraction and corrections, compass traverse and adjustments.

Unit 2: **(12 Hrs)**

Plane Table Surveying: Instruments, working operations, different methods, advantages and disadvantages, two and three-point problems.

Levelling and contouring: Principle, levelling instruments, dumpy level, classification of levelling, booking and reducing levels, profile and reciprocal levelling, curvature and refraction corrections, bubble tube and its sensitiveness, levelling difficulties, definition of contouring, contour interval,

characteristics of contours, direct and indirect methods of contouring, interpolation of contours, contour gradient, uses of contour maps.

Unit3: (8 Hrs)

Theodolite and Tacheometric Surveying : Types of theodolites, temporary and permanent adjustments, measurement of horizontal and vertical angles, theodolite traversing, included angles from bearings, fundamental lines and desired relations, errors in theodolite work, electronic theodolite, plotting a traverse, latitude and departure of lines, consecutive and independent coordinates, closing error, balancing a traverse, Gale's traverse table, omitted measurements, calculation of area. Trigonometrical Surveying, Tacheometry, principle of tachometry, methods of tacheometry, tacheometry as applied to sub tense measurement.

Unit4: (6 Hrs)

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.

Introduction to Photogrammetry Surveying, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements.

Unit5: (06 Hrs)

Advance Surveying:.

Principle of Electronic Distance Measurement, Modulation, and 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. Introduction to Remote Sensing and GIS.

Text Books:

T1: Surveying and Levelling Vol. I and II by S.S. Bhavikatti, I.K. International,2010.

T2: Geomatics Engineering By Surbhi Jain, Mukesh Rai, Booksclinic Publishing,2020.

Reference Books:

R1. Surveying- Vol-1 and 2 by B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain.

R2 Surveying and Levelling Vol-1, T.P. Kanetkar and S. V. Kulkarni.

R3 Surveying and Levelling by N. N. Basak.

R4 Geomatics Engineering by Manoj K. Arora and Badjatia, Nem Chand &Bros,2011.

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CO2	3	3		1	2				2	1	2	
CO3	2	3	1	1	3				2		1	1
CO4	3	2	2	1	3				1		1	2
CO5	1	1	2		3				2		2	
CO6	2	2	2		3	2					2	1

Guideline for Defining CO

(Don't Include this Guideline in the Syllabus)

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    Compile, identify, create, plan, revise, analyze, design, select, utilize, apply, demonstrate, prepare, use, compute, discuss, predict, assess, compare, rate, critique, outline, or evaluate

6. Each CO can be identified to address a subset of POs
7. Based on the number of COs and the sessions dedicated to them it is possible to identify the strength of mapping (1, 2 or 3) to POs
8. Based on these strengths of selected POs a CO matrix can be established.

DEPARTMENT OF CIVIL ENGINEERING

Subject Name: GEOTECHNICAL ENGINEERING LAB

Regulation Year: 2024(4TH SEM)

Course Code: CE270 **Credit: 02**

Course Category: PCC

Contact hours: 03HRS/WEEK

Recommended Pre-requisite: Know the basic characteristics of different types of soil**.**

COURSE OUTCOMES:
After going through this course the student will be able to

CO1: Identify the methods for determining specific gravity, grain size distribution, Atterberg Limits, and shear strength parameters of soil.
CO2: Explain the principles behind soil compaction methods, Proctor tests, and their importance in geotechnical engineering.
CO3: Utilize core cutter and sand replacement methods to measure soil compaction in the field.
CO4: Analyze grain size distribution data from sieve and hydrometer tests to classify soil and predict its behaviour.
CO5: Assess the reliability of shear strength parameters obtained from different tests and their implications for soil stability.
CO6: Develop a comprehensive plan for field and laboratory tests to measure soil compaction, relative density, shear strength, consolidation characteristics, and permeability.

COURSE CONTENT:

(Any 8 Experiment)

1. Determination of specific gravity of soil grains.
2. Determination of grain size distribution of soil (a) Sieve test (b) Hydrometer.
3. Determination of Atterberg limits of soil (a) Liquid limit (b) plastic limit (c) shrinkage limit.
4. Measurement of soil compaction in the field using (a) Core cutter method (b) Sand replacement method.
5. Determination of OMC-MDD of soil (i)Proctor compaction test (ii) Modified Proctor compaction test (iii)) Use of Proctor penetration needle.
6. Determination of relative density of granular soil.

7. Determination of shear strength parameters of soil (a) Shear Box test (b) Tri-axial compression test (c) Unconfined compression test.
8. Determination of consolidation characteristics of soil using fixed ring Odometer.
9. Determination of California Bearing Ratio (CBR) of soaked and un-soaked soil specimens.
10. Determination of coefficient of permeability of soil (a) Constant head permeameter (b) Falling head permeameter..

REFERENCES:

1. Bashir Ahmed Mir Manual of Geotechnical Laboratory Soil Testing 1st Edition - 4 October 2021 ISBN-13: 978-1032060095 ISBN-10: 1032060093
2. Laboratory Manual for civil engg. Students by M.K PANT , S.K KATARIA AND SONS PUBLICATION, 2022
3. IS 1498 ,1970Classificationand identification of soils for general engineering purposes
4. IS 2131 ,1981Methodfor standard penetration test for soils
5. IS 2720, 1987

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CO4	2	1	3		3			2	2		3	2
CO5	3		3	3	3	2			2		3	2
CO6	2		3	2	3	1	2				2	2

Guideline for Defining CO

(Don't Include this Guideline in the Syllabus)

40. Statements of observable student actions that serve as evidence of the Knowledge, Skills and Attitudes acquired in a course.
41. Each course is designed to meet (about 6) Course Outcomes
42. The Course Outcomes are stated in such a way that they can be actually measured.

43. Course Outcome statement may be broken down into two main components:
    a. **An action word** that identifies the performance to be demonstrated;
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44. Examples of good action words to include in course outcome statements:

    Compile, identify, create, plan, revise, analyze, design, select, utilize, apply, demonstrate, prepare, use, compute, discuss, predict, assess, compare, rate, critique, outline, or evaluate

45. Each CO can be identified to address a subset of POs
46. Based on the number of COs and the sessions dedicated to them it is possible to identify the strength of mapping (1, 2 or 3) to POs
47. Based on these strengths of selected POs a CO matrix can be established.

DEPARTMENT OF CIVIL ENGINEERING

Subject Name: SURVEYING AND GEOMETRICS LAB

Regulation Year: 2024(4TH SEM)

Course Code: CE272 **Credit: 02**

Course Category: PCC

Contact Hrs. 03HRS/WEEK

Recommended Pre-requisite: Student should have knowledge about measurement and mathematical knowledge.

COURSE OUTCOMES:
After going through this course the student will be able to

CO1 : **Identify** the principles and methods involved in traversing by chain, compass, plane table, dumpy level, theodolite, and total station.

CO2: **Explain** the functions and temporary adjustments of dumpy levels and theodolites, including differential and fly leveling.

CO3: **Conduct** compass traversing to determine bearings and angles, correcting for local attraction.

CO4: **Analyze** the accuracy and precision of data collected from chain and compass traversing, identifying sources of error.

CO5: **Assess** the overall accuracy of surveying data collected using traditional instruments (chain, compass, plane table, dumpy level, theodolite) versus modern instruments (total station).

CO6: **Develop** detailed reports and maps based on surveying data, including traverses, contour maps, and angle measurements, ensuring precision and accuracy for construction and engineering projects.

COURSE CONTENT:

(Any 8 Experiment)

1. Traversing by chain
2. Compass traversing
3. Plane Table Surveying
4. Study of Dumpy level, its temporary adjustment, Differential Leveling and Fly leveling.
5. Study of Theodolite, Temporary adjustment of Theodolite & measurement of horizontal and vertical angle.

6. Georeferencing toposheets and scanned maps

7. Editing and updating of spatial data in a digital map

8. Mosaicing and clipping of digital image

9. Creating contour in a digital map using QGIS software

10. Traversing by total station

REFERENCES:

1. Surveying & Field Work by Sir James Williamson,Constable,1915.
2. A Text Book Of Surveying And Levelling by R. Agor, Khanna Publishers.
3. Higher surveying by Dr. B. C. Punmia, DR. Ashok Kumar Jain, Dr. Arun Kumar Jain, Laxmi Publication LTD, 2005.

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CO4	2	1	3		3			2	2		3	2
CO5	3		3	3	3	2			2		3	2
CO6	2		3	2	3	1	2				2	2

Guideline for Defining CO

(Don't Include this Guideline in the Syllabus)

48. Statements of observable student actions that serve as evidence of the Knowledge, Skills and Attitudes acquired in a course.
49. Each course is designed to meet (about 6) Course Outcomes
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51. Course Outcome statement may be broken down into two main components:
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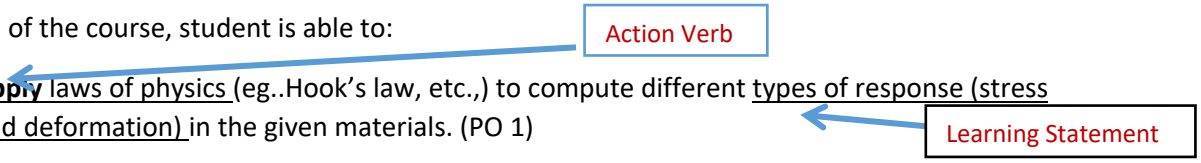
Course Outcomes: Example

Course Title: Strength of Materials

At the end of the course, student is able to:



1. **Apply** laws of physics (eg..Hook's law, etc.,) to compute different types of response (stress and deformation) in the given materials. (PO 1)
2. **Analyse** structural elements for different force systems to compute design parameters (BM and SF) (PO2)
3. **Design** compression elements using engineering principles to resist any given loads. (PO3)
4. **Conduct** experiments to validate physical behavior of materials/components. (PO4)
5. **Prepare** laboratory reports on interpretation of experimental results (P10)