THIRD SEMESTER
(Detailed Syllabus)

'CIVIL
&
ENVIRONMENTAL ENGINEERING'

FLUID MECHANICS

Course Code:	023006
Course Title	Fluid Mechanics
No. of Credits	6 (TH:4,T:0,P:4)

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

1. Understand fluid mechanics concepts like Real and ideal fluids, hydrostatics, hydrodynamics, and hydraulics.
2. Understand the various properties of fluids: Mass density, specific weight, specific gravity, viscosity, surface tension, cohesion, adhesion, capillarity, vapor pressure, and compressibility.
3. Explain hydrostatic pressure principles: Pressure, Pascal's law, total pressure, resultant pressure, and center of pressure on various surfaces.
4. Use pressure measurement techniques: Piezometer, manometer, Bourdon gauge, & dead weight pressure gauge.
5. Analyze fluid flow fundamentals: Steady & unsteady flow, laminar & turbulent flow, continuity equation, potential energy, kinetic energy, pressure energy, hydraulic gradient line, total energy line & Bernoulli's theorem.
6. Understand flow measurement devices: Venturimeter, pitot tube, orifice meter, current meters, & notches/weirs.

DETAILED CONTENTS

1. Introduction:

1.1 Fluids: Real and ideal fluids

1.2 Fluid Mechanics, Hydrostatics, Hydrodynamics, Hydraulics

2. Properties of Fluids (Definition Only) (6 periods)

2.1 Mass density, specific weight, specific gravity, viscosity, surface tension - Cohesion, adhesion and, capillarity, vapour pressure and compre-ssibility.

2.2 Units of measurement and their conversion

3. Hydrostatic Pressure:

3.1 Pressure, intensity of pressure, pressure head, Pascal's law and its applications.

3.2 Total pressure, resultant pressure, and centre of pressure.

3.3 Total pressure and centre of pressure on horizontal, vertical and inclined plane surfaces of rectangular, triangular, trapezoidal shapes and circular. (No derivation)

4. Measurement of Pressure:

4.1 Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure.

4.2 Piezometer, simple manometer and differential manometer, Bourdon gauge and dead weight pressure gauge.

5. Fundamentals of Fluid Flow:

5.1 Types of Flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow

5.2 Discharge and continuity equation (flow equation) {No derivation}

5.3 Types of hydraulic energy: Potential energy, kinetic energy, pressure energy. Hydraulic gradient line and total energy line.

5.4 Bernoulli's theorem; statement and description (without proof of theorem) and simple numerical problems.

6. Flow Measurements (Brief description with simple numerical problems)

6.1 Venturimeter and mouthpiece

6.2 Pitot tube

6.3 Orifice and Orifice meter

6.4 Current meters

6.5 Notches and weirs (simple numerical problems)

7. Flow through Pipes:

7.1 Definition of pipe flow; Reynolds number, laminar and turbulent flow - explained through Reynolds's experiment

7.2 Critical velocity and velocity distributions in a pipe for laminar flow

7.3 Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (No derivation of formula)

7.4 Flow from one reservoir to another through a long pipe of uniform cross section (simple problems)

7.5 Pipes in series and parallel

7.6 Water hammer phenomenon and its effects (only definition and description)

8. Flow Through Open Channels:

8.1 Definition of an open channel, uniform flow and non-uniform flow

8.2 Discharge through channels using

i) Chezy's formula (no derivation)

ii) Manning's formula (no derivation)

iii) Simple Numerical Problems

8.3 Most economical channel sections (no derivation)

i) Rectangular

ii) Trapezoidal

iii) Simple Numerical Problems

8.4 Head loss in open channel due to friction

9. Hydraulic Pumps and Turbines:

Hydraulic pump, reciprocating pump, centrifugal pumps, overview of different types of turbines. (No numerical and derivations) (May be demonstrated with the help of working models)

Note: Visit to Hydraulic research station is must to explain the various concepts.

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

1. Verify Bernoulli's Theorem experimentally.
2. Determine the coefficient of a Venturimeter.
3. Calculate and verify coefficients of velocity, discharge, and contraction for an orifice.
4. Perform Reynolds's experiment to observe laminar and turbulent flow transition.
5. Measure and validate loss of head in pipe flow due to sudden enlargement, contraction, and bend.
6. Demonstrate the use of current meters and Pitot tubes.

List of Practicals:

i) To verify Bernoulli's Theorem

ii) To find out venturimeter coefficient

iii) To determine coefficient of velocity (Cv), Coefficient of discharge (Cd) Coefficient of contraction (Cc) of an orifice and verify the relation between them

iv) To perform Reynolds's experiment

v) To verify loss of head in pipe flow due to

   a) Sudden enlargement

   b) Sudden contraction

   c) Sudden bend

vi) Demonstration of use of current meter and pitot tube

vii) To determine coefficient of discharge of a rectangular notch/triangular notch.

Recommended Books:

1. Jagdish Lal, "Fluid Mechanics and Hyraulics" Delhi

Metropolitan Book Co. Pvt Ltd.

3. Modi, PN, and Seth, SM; "Hydraulics and Fluid Mechanics", Standard Publishers Distributors, Delhi.Khurmi RS, "Hydraulics and Hydraulics Machines", S Chand and Co., Delhi
4. Likhi SK., Laboratory Manual in Hydraulics, Delhi Wiley Eastern.
5. Birinder Singh , “Fluid Mechanics”, Kaptian Publishing, New Delhi.
6. Sarao A.S., “Fluid Mechanics”, Tech. India Publication, New Delhi

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MECHANICS OF MATERIALS

Course Code:	443001
Course Title	Mechanics of Materials
No. of Credits	6 (TH:4,T:0,P:4)

COURSE OUTCOMES- After completion of the course the Student will be able to:

1. Understand the various physical properties of materials that can be used in practical applications.
2. Grasp the concept of simple stresses and strains and their consideration in real life problems.
3. Learn about shear force and bending moment. Analyze bending moments and shear forces in various beam types under different loading conditions.
4. Recognize the necessity of determining slope and deflection in structures.
5. Differentiate between perfect, redundant, and deficient frames.

DETAILED CONTENTS

3.2 Types of loads (dead load, live load, snow load, wind load seismic load as per IS Codes etc) and types of loading (point, uniformly distributed and uniformly varying loads)

3.3 Concept of bending moment and shear force, sign conventions

3.4 Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrated, uniformly distributed

3.5 Relationship between load, shear force and bending moment, point of maximum Bending moment and point of contra flexure.

4. Slope and Deflection

4.1 Necessity for determination of slope and deflection

4.2 Moment area theorem (no derivation, numerical problems)

5. Analysis of Trusses

5.1 Concept of perfect, redundant and deficient frames

5.2 Calculate support reactions for trusses subjected to point loads at joints

5.3 Assumptions and analysis of trusses by:

i) Method of joints

ii) Method of sections

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

1. Understand the mechanical properties of materials, such as yield stress, ultimate stress, percentage elongation, and modulus of elasticity.
2. Conduct experiments to determine the mechanical properties of different materials, including mild steel and HYSD steel.
3. Analyze stress-strain behavior and plot stress-strain diagrams for materials under various loading conditions.
4. Calculate and interpret the values of Young's modulus for different materials.
5. Perform tests and experiments to determine other important parameters, such as modulus of rupture for concrete beams.
6. Gain practical experience in testing methods and apparatus, and develop skills in data analysis and interpretation.

List of Practicals :

1. Determination of yield stress, ultimate stress, percentage elongation and plot the stress strain diagram and compute the value of young's modulus on mild steel.
2. Testing of HYSD Steel.
3. Determination of Young's modulus of elasticity for steel wire with searl's apparatus.
4. Determination of modulus of rupture of a concrete beam.
5. Determination of maximum deflection and young's modulus of elasticity in simply supported beam with load at middle third point.
6. Verification of forces in a framed structure

Recommended Books:

1. Mechanics & Material by Kirpal Singh, Standard Publication, New Delhi
2. Ramamrutham, S., "Strength of Materials", Dhanpat Rai and Sons., New Delhi
3. Ram Chandra, "Applied Mechanics and Strength of Materials", Standard Publishers. Delhi:
4. Punmia, BC., "Strength of Materials", Standard Publishers, Delhi,
5. Prasad VS " Structural mechanics Galgotia publications Pvt Ltd, Delhi
6. Sadhu Singh "Strengths of Materials" Standard Publishers, New Delhi
7. Singh Birinder "Structural Mechanics" Kaption Publishers, Ludhiana
8. Singh Harbhajan, " Structural Mechanics" ., Abhishek Publishers, Chandigarh
9. Singh Harbhajan, "Design of Masonry and Timber Structures" Abhishek Publishers, Chandigarh.
10. SOM by C.M.Verma, J.P.N. Publication

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BASIC SURVEYING

Course Code:	023002
Course Title	Basic Surveying
No. of Credits	6 (TH:4,T:0,P:4)

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

1. Understand the fundamentals of surveying, including its definitions, classifications, basic principles, and concepts of linear and angular measurements.
2. Learn about chain surveying, its purpose, principles, advantages and disadvantages. Gain knowledge of obstacles, ranging, offsets, field note recording, and error corrections in chain surveying.
3. Grasp the concepts of compass surveying, including the use of prismatic compass, meridian, bearings, magnetic dip, local attraction, and magnetic declination. Solve problems related to compass traverse.
4. Develop skills in leveling, including understanding level surfaces, instruments like Dumpy level and Auto level, line of collimation, levelling staff, adjustment methods, reduction of levels, and computations of areas. Solve numerical problems related to leveling and area computation.
5. Gain practical experience in using surveying instruments, recording field notes and performing computations for various surveying tasks.

DETAILED CONTENTS

4. Levelling:

4.1 Purpose of levelling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and bench marks

4.2 Identification of various parts of Dumpy level and use of Dumpy level, Engineer‟ level, Auto level: advantages and disadvantages, use of auto level.

4.3 Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis

4.4 Levelling staff: single piece, folding, invar precision staff, telescopic

4.5 Temporary adjustment and permanent adjustment of dumpy level by two peg method.

4.6 Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels

4.7 Level book and reduction of levels by

4.7.1 Height of collimation method and

4.7.2 Rise and fall method

4.8 Arithmetic checks, problem on reduction of levels, fly levelling, check levelling and profile levelling (L-section & X-section), errors in levelling, permissible limits, reciprocal levelling. Numerical problems.

4.9 Computations of Areas of regular figures and irregular figures. Simpson's rule: prismatic formula and graphical method use of planimeter for computation of areas, numerical problems

5. Minor Instruments:

5.1 Introduction & use of minor instruments like ceylon ghat tracer, clinometers, pantograph, abney level etc.

5.2 Use of planimeter for computing areas.

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

1. Develop proficiency in chain surveying techniques, including ranging, chaining, taking offsets, and setting out right angles.
2. Gain practical skills in dealing with obstacles during chain surveying and performing surveying of small areas.
3. Understand the principles and usage of a prismatic compass in compass surveying, including angle measurements.
4. Acquire knowledge and practical experience in leveling, including the use of the dumpy level, levelling staff, and performing temporary adjustments.
5. Perform levelling tasks such as determining differences in level between distant points, longitudinal and cross-sectioning of roads/railways/canals, and setting gradients.
6. Demonstrate proficiency in using minor surveying instruments like Ceylon Ghat Tracer, Tangent Clinometers, Pantograph, Abney level, and planimeter for area computations.

List of Practicals:

1. Chain surveying:

i) a) Ranging a line

b) Chaining a line and recording in the field book

c) Taking offsets - perpendicular and oblique (with a tape only)

d) Setting out right angle with a tape

ii) Chaining of a line involving reciprocal ranging

iii) Chaining a line involving obstacles to ranging

iv) Chain Survey of a small area.

2. Compass Surveying:

i) a) Study of prismatic compass

b) Setting the compass and taking observations

c) Measuring angles between the lines meeting at a point

3. Levelling:

(i) a) Study of dumpy level and levelling staff

b) Temporary adjustments of various levels

c) Taking staff readings on different stations from the single setting and finding differences of level between them

(ii) To find out difference of level between two distant points by shifting the instrument

(iii)Longitudinal and cross sectioning of a road/ railway/canal

iv) Setting a gradient by dumpy and auto-level

4. Minor Instruments:

i) Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometers, Pantograph, Abney level etc.

ii) Use of planimeter for computing areas.

Recommended Books:

1. Hussain, SK and Nagraj, MS; "Text Book of Surveying"; New Delhi, S Chand and Co Ltd. New Delhi
2. Deshpande, RS; "A Text Book Surveying and Levelling"; Poona, United Book Corporation, New Delhi
3. Kocher, CL; "A Text Book of Surveying"; Ludhiana, Katson Publishing House, New Delhi
4. Kanetkar,TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan, New Delhi
5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling" Poona, AVG Prakashan, Delhi
6. Mahajan, Sanjay “Surveying -I”, Tech. Publication, Delhi
7. Punmia, BC; "Surveying and Leveling", Delhi Standard Publishers Distributors, Delhi
8. Shahai, PB; "A Text Book of Surveying", Oxford and IBH Publishing Co. New Delhi

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BUILDING MATERIAL & CONSTRUCTION

Course Code:	023004
Course Title	Building Material & Construction
No. of Credits	6 (TH:4,T:0,P:4)

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

1. Gain comprehensive knowledge about the various materials and components like Stone, Brick, Tiles, Cement, Lime, Timber, Foundations, Wall, Arch etc. used in construction.
2. Effectively supervise the various types of structures used in construction essential for a fault free service.
3. Understand the constructional details along with preventive and corrective remedies like damp and water proofing in order to remove the constructional faults.
4. Gain a knowledge about finishing materials like Paint, Distemper etc. and various methods used in constructed building.

COURSE CONTENTS

1. Building Stones:

1.1 Classification of Rocks: (General Review)

1.1.1 Geological classification: Igneous, sedimentary and metamorphic rocks

1.1.2 Chemical classification; Calcareous, argillaceous and siliceous rocks

1.1.3 Physical classification: Unstratified, stratified and foliated rocks

1.2 General characteristics of stones–Marble, Kota stone, Granite, Sand, Trap, Basalt stone, Lime stone & Slate

1.3 Requirements of good building stones

1.4 Identification of common building stones

1.5 Various uses of stones in construction

1.6 Quarrying of stones by blasting & its effect on environment

2. Bricks and Tiles:

2.1 Introduction to bricks

2.2 Raw materials for brick manufacturing and properties of good brick making earth

2.3 Manufacturing of bricks

2.3.1 Preparation of clay (manual/mechanically)

2.3.2 Moulding: hand moulding and machine moulding brick table; drying of bricks, burning of bricks, types of kilns (Bull's Trench Kiln and Hoffman's Kiln), process of burning, size and weight of standard brick; traditional brick, refractory brick, clay-fly ash bricks, sun dried bricks, only line diagram of kilns

2.4 Classification & specifications of bricks as per BIS: 1077

2.5 Testing of common building bricks as per BIS: 3495 Compressive strength, water absorption–hot & cold water test, effloresence, Dimensional tolerance, soundness

2.6 Tiles

2.6.1 Building tiles; Types of tiles-wall, ceiling, roofing and flooring tiles

2.6.2 Ceramic, terrazzo and PVC tiles, : their properties and uses,

2.6.3 Vitrified tiles, Paver blocks.

2.7 Stacking of bricks and tiles at site.

3. Cement:

3.1 Introduction, raw materials, flow diagram of manufacturing of cement

3.2 Various types of Cements, their uses and testing: Ordinary Portland cement, rapid hardening cement, low heat cement, high alumina cement, blast furnace slag cement, white & coloured cement, Portland pozzolana cement, super sulphate cement, Tests of cement–fineness, soundness, initial & final setting time etc. as per B.I.S. Code.

3.3 Properties of cement

4. Lime:

4.1 Introduction: Lime as one of the cementing materials

4.2 Classification and types of lime as per BIS Code

4.3 Calcinations and slaking of lime

5. Timber and Wood Based Products:

5.1 Identification and uses of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail, Chir, Fir, Hollock, Champ

5.2 Market forms of converted timber as per BIS Code

5.3 Seasoning of timber: Purpose, methods of seasoning as per BIS Code

5.4 Properties of timber & specifications of structural timber

5.5 Defects in timber, decay in timber

5.6 Preservation of timber and methods of treatment as per BIS

5.7 Other wood based products, their brief description of manufacture and uses: laminated board, block board, fibre board, hard board, sun mica, plywood, veneers, nu-wood and study of the brand name and cost of the wood based products available in the market, Cement Panel Board, Moulded Door.

6. Paints and Varnishes:

6.1 Introduction, purpose and use of paints

6.2 Types, ingredients, properties and uses of oil paints, water paints and cement paints

6.3 Covering capacity of various paints

6.4 Types, properties and uses of varnishes

6.5 Trade name of different products.

7. Foundations:

7.1 Concept of foundation and its purpose

7.2 Types of foundation-shallow and deep

7.2.1 Shallow foundation - constructional details of: Spread foundations for walls, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation, masonry pillars and concrete columns

7.3 Earthwork

7.3.1 Layout/setting out for surface excavation, cutting and filling

7.3.2 Excavation of foundation, trenches, shoring, timbering and de- watering

8. Walls:

8.1 Purpose of walls

8.2 Classification of walls - load bearing, non-load bearing, dwarf wall, retaining wall breast walls, partition walls & cavity walls.

8.3 Mortars & Scaffolding (brief description).

9. *Masonry:

9.1 Brick Masonry: Definition of terms like header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and plasters.

9.1.1 Bond – meaning and necessity; English, Flemish bond and other types of bonds.

9.2 Stone Masonry: Glossary of terms – natural bed, bedding planes, string course, corbel, cornice, block in course grouting, moulding, templates, corner stone, bond stone, throating, through stone, parapet, coping, pilasters and buttress.

9.2.1 Types of stone masonry: Rubble & Ashlars masonry.

10. Arches and Lintels:

10.1 Meaning and use of arches and lintels:

10.2 Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoiers, Springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span

10.3 Arches:

10.3.1 Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving

10.3.2 Stone arches and their construction

10.3.3 Brick arches and their construction

10.4 Lintels

10.4.1 Purpose of lintel

10.4.2 Materials used for lintels

10.4.3 Cast-in-situ and pre-cast lintels

10.4.4 Lintel along with sun-shade or chhajja

11. Doors, Windows and Ventilators:

11.1 Glossary of terms with neat sketches

11.2 Different type of doors- panel door, flush door, flazed door, rolling shutter, steel door, sliding door, plastic and aluminium doors

11.3 Window – Panel window, glazed windows (fixed and openable) ventilators, sky Light window, Louvers shutters, plastic and aluminium windows.

11.4 Door and window frames – materials and sections, door closures, hold fasts

12. Damp Proofing and Water Proofing:

Dampness and its ill effects on bricks, plaster, wooden fixtures, sources and causes of dampness, damp proofing materials, damp proofing of : basement, ground floor, plinth and walls, special damp proofing arrangements in bathrooms, WC and kitchen, damp proofing for roofs and window sills.

13. Floors:

13.1 Glossary of terms-floor finish, topping, under layer, base course, rubble filling and their purpose

13.2 Types of floor finishes - cast-in-situ, concrete flooring (monolithic, bonded) Terrazzo tile flooring, stone (marble and kota) flooring, PVC flooring, Terrazzo Flooring, glazed tiles flooring, Timber flooring, description with sketches. The methods of construction of concrete, terrazzo and timber floors and their BIS specifications

14. Roofs:

14.1 Types of roofs, concept of flat, pitched & arched roofs

14.2 Glossary of terms for pitched roofs - batten, eaves, facia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts

15. Stairs

15.1 Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing

15.2 Planning and layout of stair case: Relation between riser and tread, determination of width of stair, landing etc.

15.3 Various types of layout - straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair

16. *Surface Finishes

16.1 Plastering- classification according to use and finishes like plain plaster, grit finish, rough cast pebbledashed, concrete and stone cladding etc., dubbing, proportion of mortars used for different plasters, techniques of plastering and curing

16.2 Pointing-different types of pointing and their methods

16.3 Application of white washing, colour washing and distempering, polishing, application of cement and plastic paints

16.4 Importance of preparation of surfaces such as hacking, grooving etc before application of surface finishes

NOTE: * A field visit may be planned to explain and show the relevant things

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

1. Determine the strength of various construction materials.
2. Assess the water absorption and identify efflorescence in bricks.
3. Perform sieve analysis to determine the fineness of cement.
4. Conduct field tests on cement to evaluate its quality.
5. Determine the normal consistency and setting times of cement.
6. Assess the soundness and compressive strength of cement.

List of Practicals :

1. To determine the crushing strength of bricks
2. To determine the water absorption of bricks and efflorescence of bricks
3. To determine fineness (by sieve analysis) of cement
4. To conduct field test of cement.
5. To determine normal consistency of cement
6. To determine initial and final setting times of cement
7. To determine soundness of cement
8. To determine compressive strength of cement
9. Demonstration of tools and plants used in building construction.
10. To prepare Layout of a building: two rooms building with front verandah

11. To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction
12. Demonstration of following items of work at construction site by:
    1- Timbering of excavated trenching
    2- Damp proof courses laying
    3- Construction of masonry walls
    4- Laying of flooring on an already prepared lime concrete base
    5- Plastering and pointing exercise
    6- Constructing RCC work
    7- Pre-construction and post construction termite treatment of building and woodwork

Recommended Books:

1. Gupta, Sushil Kumar, Singla, DR, and Juneja BM; "A Text Book of Building Construction"; Ludhiana, Katson Publishing House.
2. Deshpande, RS and Vartak, GV; "A Text Book of Building Construction"; Poona, United Book Corporation.
3. Rangwala, SC: "Building Construction"; Anand, Charotar Book Stall
4. Kulkarni, GJ; "A Text Book of Building Construction"; Ahmedabad Book Depot
5. Arora, SP and Bindra, SP; "A Text Book of Building Construction"; New Delhi Dhanpt Rai and Sons.
6. Sharma,SK and Kaul, BK; "A Text Book of Building Construction"; Delhi, S Chand and Co.
7. Sushil Kumar; "Building Construction"; Standard Publishers Distributors, Delhi
8. Moorthy, NKR; "A Text Book of Building Construction"; Poona, Engineering Book Publishing Co.
9. SP – 62 Hand Book of BIS
10. B.I.S. – 6313 Part 1, 2, 3
11. National Building Code
12. Handbook of Civil Engineering by PN Khanna
13. Video films on Damp proofing, water proofing, surface finishes

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THEORY OF STRUCTURES

Course Code:	443002
Course Title	Theory of Structures
No. of Credits	6 (TH:4,T:0,P:4)

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

1. Understand the concept of bending stresses in beams and their application to different cross-sections.
2. Analyze combined direct and bending stresses in beams with eccentric loads, including the effect of eccentricity on section stresses.
3. Gain knowledge of shear stresses in beams and their distribution in different cross-sections.
4. Study compression members, including short and long columns, Euler's theory, effective length, and limitations of Euler's formula.
5. Learn about the analysis and stability of masonry dams, including the determination of minimum bottom width for dam sections.
6. Apply the principles and formulas learned to solve numerical problems related to bending stresses, combined stresses, shear stresses, column design, and masonry dam analysis.

DETAILED CONTENTS

1. Bending Stresses in Beams:

1.1 Concept of pure/simple bending

1.2 Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only

1.3 Moment of resistance

1.4 Calculations of bending stresses in simply supported beam

2. Combined Direct and Bending Stresses:

2.1 Concentric & eccentric loads single axis eccentricity only

2.2 Effect of eccentric load on the section stresses due to eccentric loads, numerical in the case of short columns.

3. Shear Stresses in Beams

3.1 Concept of shear stresses in beams

3.2 Shear stress distribution in rectangular, circular I, T, L sections **(Formula to be stated, No derivation)**

4. Columns:

4.1 Introduction – Axially loaded Compression members – Short and Long Columns

4.2 Euler's theory of Long Columns, Effective length of a column, Limitations of Euler's formula **(No derivation)**

4.3 Rankine formula **(No derivation)**

5. Masonry Dams

5.1 Analysis of Masonry Dam – Stability of a Dam

5.2 Minimum bottom width required for a dam section **(No derivation)**

PRACTICAL OUTCOMES: By the end of this lab course, the student will be able to:

1. Apply theoretical knowledge of bending stresses, shear stresses, and column behavior to practical experiments.
2. Measure deflection, strain, and other parameters in different structural elements.
3. Analyze experimental data to calculate stresses and determine the behavior of structural members under different loads.
4. Understand the limitations of theoretical formulas and compare experimental results with theoretical predictions.
5. Perform stability analysis for masonry dams and calculate critical parameters for their design.

List of Practicals:

1. **Bending Stresses in Beams:** Experimental study of the following:
   - 1.1 Measurement of deflection in simply supported beams under varying loads.
   - 1.2 Calculation of bending stresses in beams using experimental data.
   - 1.3 Comparison of experimental results with theoretical calculations.

2. **Combined Direct and Bending Stresses:** Experimental study of the following:
   - 2.1 Calculation of combined stresses at different points in the column.
   - 2.2 Study of the effect of eccentric load on the behavior of columns.

3. Shear Stresses in Beams:

3.1 Experimental setup for studying shear stresses in beams.

3.2 Measurement of shear stress distribution in different cross-sectional shapes (rectangular, circular, I, T, L sections).

4. Columns:

4.1 Experimental setup for testing compression members (short and long columns).

4.2 Measurement of buckling load and deflection in columns.

4.3 Verification of Euler's formula for long columns (experimental comparison with theory).

4.4 Verification of Rankine formula for short columns (experimental comparison with theory).

5. Masonry Dams:

5.1 Study of different types of masonry dam sections and their stability analysis.

5.2 Calculation of the minimum bottom width required for a masonry dam section (experimental and theoretical comparison).

References:

1. "Experimental Stress Analysis" by James F. Doyle
2. "Mechanics of Materials Lab Manual" by Timoshenko and Gere
3. "Structural Analysis Lab Manual" by R.S. Jangid and R. Shrivastava

Suggested/Learning/ Resources:

1. Ramamrutham.S, Theory of structures, Dhanpat rai & Sons.
2. Khurmi,R.S.,Theory of Structures, S.Chand and Co., New Delhi.
3. Bhavikatti, S S, Structural Analysis Vol-1,,Vikas Publishing House Pvt Ltd. New Delhi.
4. Junnarkar, S. B.,Mechanics of structures, Volume-I and II Charotar Publishing House, Anand.
5. Pandit,G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
6. Agor R, Structural Analysis, Khanna Publishing House, Delhi.

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FUNDAMENTAL OF IRRIGATION ENGINEERING

Course Code:	443003
Course Title	Fundamental of Irrigation Engineering
No. of Credits	4 (TH:4,T:0,P:0)

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

1. Understand the concept and necessity of irrigation, major irrigation projects, and water requirements of crops.
2. Comprehend the hydrological cycle, catchment area, runoff, and unit hydrograph.
3. Gain knowledge of different methods of irrigation, including flow, lift, sprinkler and drip irrigation.
4. Study canals, canal lining, breaches, and maintenance techniques.
5. Understand tube well irrigation, water harvesting techniques, and the installation and maintenance of tube wells.
6. Learn about dams, canal head works, regulatory works, cross drainage works, hydraulic structures, river training methods, and water logging management.

DETAILED CONTENTS

1. **Introduction:**
   - 1.1 Definition of irrigation
   - 1.2 Necessity of irrigation
   - 1.3 History of development of irrigation projects in India

2. **Water Requirement of Crops**
   - 2.1 Principal crops in India and their water requirements
   - 2.2 Crop seasons.
   - 2.3 Soil water, soil crop and water relationships, duty, delta and base period, evapotranspiration
   - 2.4 Gross commanded area (GCA), culturable commanded area (CCA), intensity of irrigation, irrigable area

3. **Hydrological Cycle, Catchment Area and Run-off**
   Definition of rainfall, type of rain-gauges, Brief introduction of methods of estimating average rainfall, catchment area runoff, factors affecting runoff, basic concept of unit hydrograph.

4. **Methods of Irrigation**
   - 4.1 Flow irrigation - its advantages and limitations
   - 4.2 Lift Irrigation – Tube well and open well irrigation, their advantages and disadvantages
   - 4.3 Sprinkler irrigation system – classification and component parts.
   - 4.4 Drip irrigation, layout, component parts, advantages

5. Canals

5.1 Classification, appurtenances of a canal and their functions, sketches of different canal cross-sections (unlined).

5.2 Various types of canal lining - their related advantages and disadvantages.

5.3 Breaches and their control.

5.4 Maintenance of lined and unlined canals.

6. Tube Well Irrigation

6.1 Introduction, occurrence of ground water, location and command, advantages and disadvantages, comparison with canal irrigation.

6.2 Tube wells, explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers. Yield of a well and methods of determining yield of well.

6.3 Types of tube wells.

6.4 Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance.

6.5 Water Harvesting Techniques: Need & requirement of various methods, Run-off from roof top and ground surface, techniques for ground water recharge, construction of recharge pits and recharge wells and their maintenance.

7. Dams

7.1 Classification of dams; earthen dams - types, causes of failure; cross-section of zoned earthen dams, method of construction, gravity dams – types, cross-sections of a dam, method of construction

7.2 Concept of small and micro dams

7.3 Concept of spillways and energy dissipaters

7.4 Types and applications of Coffer dams

8. Canal Head Works and Regulatory Works

Definition, object, general layout, functions of different parts of head works. Difference between weir and barrage.

9. Cross Drainage Works

9.1 Functions and necessity of the following types: aqueduct, super passage, level crossing, inlet and outlet, pipe crossing

9.2 Sketches of the above cross drainage works

10. Hydraulic Structures with Sketches

10.1 Falls

10.2 Cross and head regulators

10.3 Outlets

10.4 Canal Escapes

11. River Training Works

Methods of river training, guide banks, retired (levees) embankments, groynes and spurs, pitched island, cut-off

12. Water Logging and Drainage

12.1 Definition of water logging – its causes and effects, detection, prevention and Remedies

12.2 Reclamation of soil

12.3 Surface and sub-surface drains and their layout

Recommended Books:

1. Bharat Singh, `Fundamentals of Irrigation Engineering', , Nem Chand and Bros, Roorkee
2. Garg, Santosh Kumar, `Irrigation Engineering and Hydraulics Structures', Khanna Publishers, Delhi,
3. Punmia, BC; and Pande Brij Bansi Lal, `Irrigation and Water Power Engineering', Delhi, Standard Publishers Distributors, Delhi,
4. Sharma, RK; `Text Book of Irrigation Engineering and Hydraulics Structures', , Oxford and IBH Publishing Company, New Delhi
5. Sharma, SK; `Principles and Practice of Irrigation Engineering', Prentice Hall of India Pvt. Ltd., New Delhi,
6. Varshney RS, Gupta SC, Gupta RL at all. "Theory and Design of Irrigation Structures",Vol. I and II,
7. Saharsabudhe SR, "Irrigation Engineering and Hydraulic Structures"
8. Priyani BB, „The Fundamental Principles of Irrigtion and Water Power
9. BIS Codes
10. Wan. E. Houk, "Irrigation Engineering" Vol. I and II
11. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.

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SUMMER INTERNSHIP-I

Course Code:	AS301
Course Title	Summer Internship - I
No. of Credits	2 (TH:0,T:0,P:0)

Summer Internship provides an invaluable opportunity for students pursuing their Diploma in Engineering to gain real-world experience and exposure to various industrial production units and commercial activities related to their field of study. This program aims to bridge the gap between theoretical knowledge and practical application, equipping students with the necessary skills and expertise to thrive in the branch related industry.

At the end of the **Second semester**, students will undertake a minimum 3 to 4-week Summer Internship, scheduled during the semester break following the Second Semester examinations. The respective Heads of Departments (HoDs) and experienced faculty members will guide and assist students in securing suitable training opportunities that align with their specialization. Each student will have a personalized training schedule developed in collaboration with the training providers, ensuring a comprehensive and enriching learning experience.

Before starting their training, students will receive a comprehensive briefing about the organizational setup, product range, manufacturing processes, and significant machinery and materials used in the training organization. This preliminary understanding will enhance their engagement and productivity during the internship.

To ensure a fruitful learning experience, faculty members will supervise students during their training in the industry or field organization. Each faculty member will mentor a small group of 4-5 students, providing personalized attention and guidance. Students will be encouraged to maintain daily reports in their diaries, which will assist them in composing their final training report and presentation.

The evaluation process for the Summer Internship will include both internal and external assessments, as per the study and evaluation scheme of the **Third Semester**. During the viva - voce / presentation examination, students' understanding of materials, industrial processes, practices in the industry, and problem-solving abilities will be assessed. The evaluation will also focus on their application of knowledge and skills in real-life situations.

The components of evaluation will comprise:

(a) Punctuality and regularity: 15%

(b) Initiative in learning new things: 15%

(c) Relationship with peers and colleagues: 10%

(d) Summer Internship report: 25%

(e) Viva-Voce: 35%

The purpose of summer Internship program is to create a transformative experience for students, empowering them to excel in their future careers and make meaningful contributions to the Engineering industry. The collaborative efforts of experienced faculty members and industry partners will ensure that students may gain valuable insights and practical skills during this immersive learning journey.

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