

Choice Based Course Structure
Under Graduate Degree Program in Civil Engineering
(B. Tech. - Civil) Semester IV



Department of Civil Engineering

Dr. Babasaheb Ambedkar Technological University
Lonere, Dist. Raigad, Maharashtra, INDIA, Pin 402 103

**Department of Civil Engineering
Semester- IV**

Dr. Babasaheb Ambedkar Technological University, Lonere - 402 103				
B.Tech. Civil Engineering				
Semester IV				
Code	Course of Study	L	P	C
CV 401	Hydraulic Engineering II	4	-	8
CV 402	Structural Mechanics	4	-	8
CV 403	Surveying - II	4	-	8
CV 404	Water Resources Engineering I	4	-	8
CV 405	Elective - I	3		6
ID 406	History of Science & Technology (Self Study course (objective: University level common exam))	-	-	4
CV 405	Hydraulic Engineering Lab	-	2	2
CV 406	Solid Mechanics Lab	-	2	2
CV 407	Surveying Lab I	-	3	4
	Total	20	07	50
	Total	27		50

* **Elective – I** (courses): a) Engineering Management
b) Systems Engineering

CV401: HYDRAULIC ENGINEERING II

Teaching Schemes: Lectures: 4 Hours/Week

Course Contents

Unit 1: Uniform Flow in Open Channel

Introduction, Difference between pipe flow and open channel flow. Types of open channels, Types of flows in open channel, Geometric elements, Velocity distribution, Measurement of velocity- (Pitot tube, current meter) Weir & Spillway : Sharp, broad & round crested weirs, calibration of weir, time of emptying tank with weir, Profile of Ogee spillway, Flow below gates.

Unit 2: Steady & Uniform Flow

Chezy's & Manning's formula, Roughness coefficient, Uniform Flow computations, Hydraulically efficient section (Rectangular, Triangular, Trapezoidal)

Unit 3: Depth Energy Relationship in Open Channel Flow

Specific energy: definition & diagram, Critical, Sub-critical, Super-critical flow, Specific force, Specific discharge- (definition & diagram),

Unit 4: Varied Flow

Gradually (G.V.F.): Definition, Classification of channel Slopes, Dynamic equation of G.V.F. (Assumption and derivation), Classification of G.V.F. profiles-examples, Direct step method of Computation of G.V.F. profiles

Rapidly varied flow (R.V.F.): Definition, examples, Hydraulic jump- Phenomenon, relation of conjugate depths, Parameters, Uses, Types of Hydraulic jump.

Unit 5: Impact of Jet:

Impulse momentum principle, Impact of jet on Vanes-flat, curved (stationary and moving), Inlet & outlet velocity triangles, Series of flat, curved vanes mounted on wheel.

Unit 6: Hydraulic Machines

Turbines: Importance of hydro-power, Classification of turbines, description, Typical dimensions and working principle of Pelton, Francis & Kaplan turbine (Detailed design need not to be dealt with), Unit quantities, Specific speed, Performance Characteristics, Selection of type of turbine, description & function of Draft tube, Thoma's cavitation number.

Pumps: Classification, Component parts, Working of centrifugal pump, Performance Characteristics, Selection of pump, Common pump troubles & remedies, Introduction to different types of pumps such as reciprocating, multi-stage, Jet, Air lift, Submersible pump.

Text Books

- 1) Modi, Seth, "Fluid Mechanics – Hydraulic & Hydraulic Mechanics" Standard Book House,
- 2) Bansal R.K., "Fluid Mechanics", Luxmi Publications
- 3) R. J. Garde, "Fluid Mechanics through Problems", New Age Publications
- 4) Jain A. K., "Fluid Mechanics", Khanna Publications, Delhi
- 5) Kumar K. L., "Fluid Mechanics", Eurasia Publication House, Delhi
- 6) Rangaraju, "Open Channel flow", Tata McGraw-Hill Pub. Co., Delhi
- 7) Subramanyam K., "Fluid Mechanics through Problems" Tata McGraw-Hill Pub. Co., Delhi
- 8) Subramanyam K., "Flow in Open Channel", Tata McGraw-Hill Pub. Co., Delhi

Reference Books

- 1) Streeter, "Fluid Mechanics" McGraw-Hill International Book Co., Auckland
- 2) Shames, "Mechanics of Fluids", Mc Graw Hill
- 3) Chaw V. T., "Flow in Open Channel", McGraw-Hill International Book Co., Auckland
- 4) Hughes & Brighton, "Fluid Mechanics", Tata Mc Graw Hill.



CV402: STRUCTURAL MECHANICS

Teaching Schemes: Lectures: 4 hours/week

Course Contents

Unit 1: Introduction

Different Structural Systems, Concept of Analysis, Basic Assumptions, Indeterminacy, Choice of Unknowns, Castigliano's Theorems.

Energy Principles: Strain energy and strain energy density - Strain energy in traction, shear, flexure and torsion - Castigliano's and Engesser's energy theorems - Principle of virtual work - application of energy theorems for computing deflections in beams and trusses - Maxwell's reciprocal theorem - Williot Mohr diagrams.

Unit 2: Method of Consistent Deformation:

Indeterminate Beams: Analysis of indeterminate beams: Propped Cantilever and Fixed Beams - Fixed end moments and Reactions for standard cases of loading – slopes and deflections in fixed beams - Continuous beams - Theorem of three moments - Analysis of continuous beams - S.F. and B.M. diagrams for continuous beams, Settlement Effects.

Frames upto Three Degree of Indeterminacy:, Analysis of Pin Jointed Trusses, Externally and Internally Redundant Trusses, Effects of Settlement and pre-strains.

Unit 3:

Slope deflection method: analysis of continuous beams, analysis of rigid frames, frames with sloping legs, gabled frames, frames without sway and with sway, settlement effects.

Moment distribution method: Analysis of beams and frames.

Kani's method: Analysis of beams and simple frames.

Unit 4: Cables, Suspension Bridges and Arches

Analysis of forces in cables, suspension bridges with three hinged and two hinged stiffening girders, theory of arches, Eddy's theorem, Circular, parabolic and geometric arches, concept of radial shear force and axial thrust, analysis of three hinged and two hinged arches, Effect of yielding of supports, rib shortening and temperature changes, tied arches. ILD for 3 hinged arches and suspension bridges.

Unit 5: Moving Loads and Influence Lines

Introduction to moving loads, concept of equivalent UDL, absolute maximum bending moment and shear force, concept of influence lines, influence lines for reaction, shear force, bending and deflection of determinate beams, Influence line diagram (ILD) for forces in determinate frames and trusses, analysis for different types of moving loads, single concentrated load, several concentrated loads, uniformly distributed load shorter and longer than span, Application of Muller Breslau Principle for determinate structures.

Unit 6: Thin Cylinders

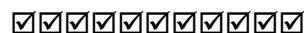
Thin cylinders subjected to internal fluid pressure, wire wound thin cylinders. Thin cylindrical shells, circumferential and hoop stresses, longitudinal stresses, Maximum shear stress.

Text Books

- 1) Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill.
- 2) Vazirani and Ratwani, "Theory of Structures", Standard Publishers
- 3) Khurmi R.S., "Theory of Structures",
- 4) Punmia B.C., "Structural Analysis", Luxmi Publications.
- 5) Wang C.K., "Statically Indeterminate Structures", Mc Graw Hill

Reference Books

- 1) Norris C. H. and Wilbur J. B., "Elementary Structural Analysis", Mc Graw Hill
- 2) Timoshenko and Young, "Theory of structures", Mc Graw Hill
- 3) Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH.
- 4) Hibbler R. C., "Structural Analysis", Pearson Publications.
- 5) Schodek, "Structures", Pearson Education.



CV403: SURVEYING – II

Teaching Schemes: Lectures: 4 hours / Week

Course Contents

Unit 1: Tacheometry: Significance & Systems, Principle, constants. Basic Formulae and Field Work Stadia method, Auto reduction Tachometer, Tangential system.

EDM: Importance, Principles of Electronic Distance measuring instruments, Classification of EDM's based on carrier waves used. Study and use of Total Station

Unit 2: Triangulation: Principle & Classification, system, Selection of station, Base line Measurement, correction and use of subtense bar, signals, satellite station, reduction to center, spherical excess, angular observations, trilateration.

Triangulation Adjustments: Theory of errors, laws of weights, concept of most probable value

Unit 3: Field Astronomy: Terms, co-ordinate systems, determination of latitude and true bearing by observation on the sun and pole star

Unit 4: Curves: - Horizontal and vertical curves - Simple Curves - setting with chain and tapes, tangential angles by theodolite, double theodolite - Compound and reverse curves - Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves – Sight distance requirements

Unit 5: Photogrammetry: Terms, Types, vertical photographs, scale, ground coordinates, relief displacement, Flight planning Photomaps and Mosaics, Stereoscopy and photo interpretation.

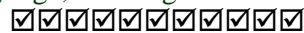
Unit 6: Remote sensing: Introduction, Classification and principles, electromagnetic energy and its interaction with matter, Idealized systems, sensors, platforms, and application in civil engineering. G.P.S & G.I.S. as surveying techniques – Overview, uses and applications

Text Books

- Bannister A. and Raymond S., J.N. Wartikar and P.N. Wartikar, “Surveying”, ELBS, Sixth Edition, 1992
- Heribert Kahmen and Wolfgang Faig, “Surveying”, Walter de Gruyter, 1995.
- Kanetkar T.P., "Surveying and Leveling", Vols. I, II and III, Vidyarthi Gruh Prakashan, Pune.
- Punmia B.C., “Surveying”, Vols. I, II and III, Laxmi Publications

Reference Books

- James M. Anderson and Edward M. Mikhail, “Introduction to Surveying”, McGraw Hill Book Company.
- Clark D., “Plane and Geodetic Surveying”, Vol. I and II, C.B.S. Publishers and Distributors, New Delhi, Sixth Edition.
- Agor, “Advanced Surveying”, Khanna Publications, Delhi.
- Arora K. L., “Surveying”, Vol.1 & 2
- Basak, “Surveying and Levelling”
- S. K. Duggal, “Surveying”, Vol 1 & 2, Tata Mcgraw Hill Publications, New Delhi.
- S. Gopi, R. Satikumar and N. Madhu, “Advanced Surveying”, Pearson Education
- Chandra A. M., “Higher Surveying”, New Age International Publication.



CV404: Water Resources Engineering - I

Teaching Schemes: Lectures: 4 hours/Week

Course Contents

Unit 1: Introduction, Definition, Scope, Necessity, Advantages, Types of Irrigation Systems, Development of irrigation in India,

Unit 2: Water Requirement of Crops, Soil moisture, Consumptive Use, Irrigation frequency, Irrigation Methods, Crops Season, Crop Pattern in relation weather, Important crops

Unit 3: Canal Irrigation, Classification, Parts of a canal system, Route Surveys, Commanded areas, Assessment of water requirement, Channel losses, Kennedy’s Theory, Lacey’s Theory, Longitudinal section, Schedule of area statistics and channel dimension cross- section of irrigation channel, Water-Logging, Effects, Causes and Anti-water logging measure, Sections of lined channel. Drainage of Water logged land,

Unit 4: Irrigation Outlets, Definition, Requirements, Classification, Selection, Regulation and Control of Canal System: Regulation, Measurement of discharge, Assessment of canal Revenue, Efficient Management of irrigation water

Unit 5: Hydrology, Definition, Hydrologic cycle, Application to Engineering Problem, Measurement of rainfall, Peak flow, Flood Frequency, Catchment Area Formulae, Flood hydrograph, Rainfall Analysis, Infiltration, Run off, Unit Hydrograph and its determination, Estimation of Runoff

Unit 6: Wells and Tube Wells, Introduction, Specific yield, Deep and shallow wells, Comparative advantage of well and canal irrigation, Duty of well water, Types of Tube wells, Boring methods.

Text Books

- 1) Varshney R. S., Gupta & Gupta, "Theory and Design of Irrigation Structures", Vol. I & II.
- 2) Punamia B. C. Pandey B. B. and Lal, "Irrigation and Water Power Engineering", Standard Publishers, New Delhi
- 3) Garg S. K. , "Irrigation Engineering" Khanna Publications, New Delhi
- 4) Priyani, "Irrigation and Water Power", Charotar Publishing House, Anand
- 5) Bharat Singh, "Irrigation", NEW CHAND & Brothers, Roorkee
- 6) Subramanya K., "Engineering Hydrology", Tata Mc-Graw Hill Company Limited, N. Delhi

References

- 6) U. S. B. R., "Design of Small Dam", OXFORD & IBH, Publishing Company
- 7) Justinn, "Engineering for Dam" Vol. I, II, III, Creager and Hinds
- 8) Leliavsky "Design of Hydraulic Structures" Vol. I & II,
- 9) C B I & P "River Behaviour, Management and Training"
- 10) Circular of Government of Maharashtra, 18 February 1995, "Design of Canals"



CV405: HYDRAULIC ENGINEERING LABORATORY

Practical: 2 hours / week

Term work: 50 marks

Practical Work consists of at least four performances from (A), and three each from (B) and (c), lists below and detailed reporting in form of journal. Practical examination shall be based on above.

Group (A)

- a) Measurement of discharge - Calibration of measuring tank, measurement of pressure (Piezometer, manometers, Pressure gauges) Use of hook or point gauge.
- b) At least three experiments from the following.
 - 1) Verification of Bernoulli's Theorem
 - 2) Determination of metacentric height.
 - 3) Calibration of an orifice / mouthpiece / venturimeter / orificemeter
 - 4) Study of factors affecting coefficient of friction for pipe flow (at least for two different materials and two different diameters)
 - 5) Determination of loss of head due to Pipe Fittings

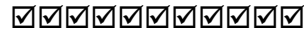
Group (B)

- 1) Calibration of V notch / Rectangular notch.
- 2) Calibration of Ogee Weir.
- 3) Study of hydraulic jump
 - a) Verification of sequent depths,
 - b) Determination of loss in jump.
 - c) Study of parameters with respect to Froud Number: i) Y_2/Y_1 ; ii) Length; iii) Energy loss
- 4) Study of flow below gates – Discharge v/s head relation, Equation of flow, Determination of contraction in fluid in downstream of gate.
- 5) Velocity distribution in open channel in transverse direction of flow.

Group (B)

- 1) Impact of jet.
- 2) Study of Turbines (Demonstration).
- 3) Tests on Centrifugal Pump.
- 4) Study of Charts for Selection of Pumps

Use of computer programs such as MS Excel is desirable for post-processing of results.



CV406: Solid Mechanics Lab

Practical: 2 hours / Week

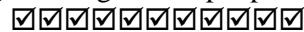
Term-Work: 50 Marks

Practical Work consists of performance of at least seven experiments from the list below Detailed report shall constitute the term-work.

List of Experiments

1. Tension test on ferrous and non-ferrous alloys (mild steel / cast iron /aluminum etc.)
2. Compression test on mild steel, aluminum, concrete, and wood
3. Shear test on mild steel and aluminum (single and double shear tests)
4. Torsion test on mild steel and cast iron solid bars and pipes
5. Flexure test on timber and cast iron beams
6. Deflection test on mild steel and wooden beam specimens
7. Graphical solution method for principal stress problems
8. Impact test on mild steel, brass, Aluminum, and cast iron specimens
9. Experimental on thermal stresses
10. Strain measurement involving strain gauges / rosettes

Assignment involving computer programming for simple problems of stress, strain computations.



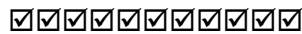
CV407: Surveying Lab - I

Practical: 4 hours / week

Term work: 50 marks

Practical Work consists of at least Ten performances among the list below and detailed reporting in form of field book, journal and drawing sheets. Practical examination shall be based on above practical course.

- 1) Use of Dumpy Level, Auto Level and Tilting Level.
- 2) Reciprocal Levelling.
- 3) Sensitivity of Bubble Tube using Dumpy Level.
- 4) Illustration of Permanent adjustment of Dumpy Level.
- 5) Evaluation of constant of Planimeter.
- 6) Use of Digital Planimeter for measurement of areas.
- 7) Study of Theodolite.
- 8) Measurement of Horizontal Angle by Various Methods
- 9) Measurement of Magnetic Bearing and Vertical Angle by Theodolite
- 10) Study and use of Minor Instruments
- 11) Methods of Plane Table Survey
- 12) Two Point and Three Point Problems



CV408: Engineering Management

Teaching Schemes: Lectures: 4 hours/week

Course Contents

Unit 1: Evolution of Management Thought: Scientific, Human Behaviour, System approach Introduction to elements of systems – input, output, process restriction, feedback, Contingency Approach, Contributions by Taylor, Frank and Lillion, Gilbreth, Henry Fayol, Elton Mayo, McGregor (Theory X and Theory Y), H.L.Gantt, Maslow.

Unit 2: Functions of Management: Planning – Nature and Purpose of Planning, Strategies and Policies, Management by Objectives, Formal and informal organization, Centralization, Decentralization, Line, Line and Staff, Functional organization, Principles of site layout. Leading and directing, controlling and coordination (Brief introduction only) Communication process, Motivation

Unit 3:

Importance of Decision Making, steps in decision making, analysis of decision, decision under certainty, uncertainty and decision under risk, criterion of optimism and regret, sensitivity of criteria and decision under conflict, expected monetary value, decision tree, Theory of games (dominance pure and mixed strategy).

Unit 4: Operations Research: Linear Programming, Simple L-P model, Simplex method - Duality, Sensitivity analysis. Application of Linear Programming in Transportation and Assignment models

Unit 5: Simulation Studies: Monte-Carlo simulation, Queuing or Waiting Line Theory (simple problems), Dynamic programming, Introduction to Emerging Optimization Techniques

Unit 6:

Material Management – Purchasing principles, stores, coding system function, Responsibilities, record and accounting. Inventory control – An introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks.

Text Books

- 1) Deshpande S. H., “Operation Research”
- 2) Deshpande A. S., “A Text book of Management”
- 3) Gopal Krishnan, “Material Management”, Sdushman
- 4) Taha, “Operation Research”
- 5) Banga and Sharma, “Engineering Management”

References

- 1) Stoner, “Engineering Management”
- 2) Davar, “Principles of Management”
- 3) Koontz, Dounell and Weigrick, “Essentials of Management”
- 4) Kast and Rosinweig, “Management and Organization”, Tata McGraw Hill Publication.
- 5) Wagner, “Operation Research”, Wiley Eastern Ltd., New Delhi
- 6) Zhamb L.C., “Quantitative Techniques in Management”, Vol. I,
- 7) Miller and Stars, “Executive Decisions & Operation Research”, Prentice Hall of India



