

SEMESTER IV

SUBJECT CODE	COURSE TITLE	L	P	M
THEORY				
3420426	Numerical Methods	3	0	100
3420427	Building Science - II	3	0	100
3420428	Strength of Materials	3	0	100
3420429	Concrete and Construction Technology	3	0	100
3420430	Applied Hydraulic Engineering	3	0	100
3420431	Surveying II	3	0	100
PRACTICALS				
34102LB30	Hydraulic Engineering Lab	0	3	100
34102LB31	Survey Practical II	0	3	100

SEMESTER IV

NUMERICAL METHODS

(Common to IV sem EEE, Mech and Civil)

UNIT -1 SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS

9

Method of false position, Newton-Raphson method for single variable, Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss-Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by Power Method.

UNIT -2 INTERPOLATION AND APPROXIMATION

9

Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, central difference.

UNIT -3 NUMERICAL DIFFERENTIATION AND INTEGRATION

9

Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's (both $1/3^{\text{rd}}$ and $3/8^{\text{th}}$) rules. Romberg's rule, two and three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson's rule.

UNIT -4 INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

9

Single Step Methods - Taylor Series, Euler and Modified Euler, Runge-Kutta method of fourth order first and second order differential equations. Multistep Methods - Milne and Adam's-Bashforth predictor and corrector methods.

UNIT -5 BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

9

Finite difference solution for the second order ordinary differential equations, Finite difference solution for one dimensional heat equation (both implicit and explicit). One dimensional wave equation and two dimensional Laplace and Poisson equations.

Total hours: 45

TEXT BOOKS:

1. Sastry, S.S., "Introductory Methods of Numerical Analysis (Third Edition)", Prentice Hall of India, New Delhi, 1998.

REFERENCES:

1. Kandasamy, P., Thilakavathy, K. and Gunavathy, K., "Numerical Methods", S. Chand & Co., New Delhi, 1998.
2. Grewal, B.S. and Grewal, J.S., Numerical Methods in Engineering and Science Khanna

- Publishers, New Delhi, 1999.
3. Jain M.K., Iyengar, S.R.K. and Jain, R.K., " Numerical Methods for Engineering Scientific and computations (Third Edition) ", Wiley Eastern Ltd, New Delhi, 1987.
 4. Gerald, C.F., and Wheatley, P.O., " Applied Numerical Analysis (Fifth Edition) ", Addison Wesley, Singapore, 1998.
 5. Narayanan, S., Manicavachagam Pillai, T.K. and Ramanaiah, G., " Advanced Mathematics for Engineering Students - Volume-III ", S.Viswanathan Pvt., Ltd., 1987.

SEMESTER IV STRENGTH OF MATERIALS

UNIT - 1 ENERGY PRINCIPLES

9

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 INDETERMINATE BEAMS

9

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.

UNIT - 3 COLUMNS

9

Eccentrically loaded short columns middle third rule - core of section - Columns of unsymmetrical sections - Euler's theory of long columns - Critical loads for prismatic columns with different end conditions Rankine - Gordon Formula eccentrically loaded long columns.

UNIT - 4 STATE OF STRESS IN THREE DIMENSIONS

9

Spherical and deviatoric components of stress tensor - Determination of Principal stresses and principle planes - Volumetric strains - Dilatation and distortion - theories of failure - Principal stress, principal strain, shear stress, strain energy and distortion energy theories - application in analysis of stress, load carrying capacity and design of members - Interaction problems and interaction curves.

UNIT - 5 ADVANCED TOPICS IN BENDING OF BEAMS

9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections - curved beams - Winkler Bach Formula -Shear center - Thick Cylinders - Compound Cylinders.

Total
Hours = 45

Text Books:

1. Egor P. Popov, "Engineering Mechanics of Solids ", Prentice Hall of India, New Delhi, 1997.
2. Srinath N., "Advanced Mechanics of Solid ", Tata McGraw Hill Publishing Company, NeDelhi, 1994.
3. Prakash Rao B.S., "Strength of Materials, a Practical Approach ", University Press (India) Ltd., 1999.

References:

1. Junarkar S.B., "Mechanics of Structures ", Vol.1, 21st Edition, Charotar Publishing House, Anand, India, 1995.
2. Kazimi S.M.A. "Solid Mechanics ", Tata McGraw Hill Publishing Company, New Delhi, 1991.
3. Laudner T.J. and Archer R.R., "Mechanical of Solids in Introduction ", McGraw Hill International Editions, 1994.

SEMESTER IV

BUILDING SCIENCE II

UNIT - 1 PRELIMINARY INVESTIGATION

9

Principles of Planning - Planning regulations and bye-laws - Site works and setting out - Excavations and Timbering - Sub soil drainage - Electricity Lighting on Building sites - Winter building - Preparation of layout - site Plan - Orientation of buildings.

UNIT -2 FOUNDATION & FLOORING

9

Bearing capacity of soils - Soil investigations - Plate load Test - Methods of Improving bearing capacity - Shallow Foundation - Deep Foundations - Machine Foundations.

Ground floors - Components - Types - suspended flooring - Upper floors - Types - Methods of laying.

UNIT -3 SUPER STRUCTURE & ROOFS

9

Stone and Brick masonry - Composite masonry Load bearing walls - Cavity Walls - Partition walls - Reinforced Brick masonry. Types of roofs -Types of Pitched roof - Shell roofs - Folded Plate roofs - Constructional Practices - Roof covering details

UNIT - 4 STAIRCASES

9

Requirement of a good staircase - Types of staircase calculation for geometry - Ramps, Escalators, Lifts, Types Handling Capacity.

UNIT - 5 BUILDING SERVICES

9

Water Supply - Drainage - Ventilation - Damp proofing - Acoustic Treatment - Thermal Insulation Termite Proofing - Fire Protection.

Total Hours: 45

Text Books:

1. Arora S.P. and Bindra S.P., " Building Construction Planning Techniques and method of Construction " , Dhanpat Rai and Sons, New Delhi, 1997.
2. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, "Building Construction " , Laxmi Publications Pvt.Ltd., New Delhi, 1997.

References:

1. Chudley.R., "Construction Technology " , Vol.1, 2, 3,4. ELBS Publisher, 1997.
2. " National Building Code of India " , Parts III, IV,VII and IX, 1983.

SEMESTER IV

CONCRETE AND CONSTRUCTION TECHNOLOGY

UNIT -1 CONCRETE AND CONSTRUCTION TECHNOLOGY

9

High grade cements - High strength Concrete - Advances in manufacture of cements - testing of fresh and hardened Concrete - Non destructive testing - Concrete chemicals and application- Concepts of mix design - Statistical quality control of concrete - Mix design as per IS and other methods of mix design.

UNIT - 2 SITE PREPARATION AND TEMPORARY STRUCTURES

9

Specifications, details and sequence of activity and construction co-ordination - site clearance - Marking - Earthwork - shoring - Dewatering - pipe lines - Building foundations - Basements - Temporary shed - centering and shuttering sheet piles - slip and moving forms - scaffoldings - Deshuttering forms - Launching girders bridge decks, offshore platforms etc. - special forms for shells.

UNIT -3. SUPER STRUCTURE

9

Fabrication and erection of steel trusses - Frames - Braced domes - Laying brick - Masonry - stone masonry - Concrete - Concrete hollow block masonry - flooring- Damp proof courses construction joints - Movement and expansion joints - Precast Pavements - weather and water proof roof finishing. Air conditioning, Accosting and fire protection.

UNIT - 4 REPAIR AND REHABILITATION WORKS

9

Study on causes for building damage and deterioration - assessment of materials and methods of repair and restoration.

UNIT - 5 CONSTRUCTION EQUIPMENT

9

Selection of equipment for earth work, concreting, Material handling and erection of structures - Dewatering and pumping equipment.

Total Hours = 45

Text Books:

1. Shetty M.S., "Concrete Technology ", S.Chand and Company, 1992.
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Methods of construction ", Dhanpat Rai and sons, 1997.
3. Pewifoy R.L., "Formwork for Concrete Structures ", McGraw Hill Book Co., 1999.
4. Jha J and Sinha S.K., "Construction and Foundation Engineering ", Khanna Publishers, 1993.

SEMESTER IV
APPLIED HYDRAULIC ENGINEERING

UNIT -1 OPEN CHANNEL FLOW

9

Open channel flow - types and regime of flow - Velocity distribution in open channel - wide open channel - specific energy - critical flow and its computation.

UNIT -2 UNIFORM FLOW

9

Uniform flow - Velocity measurement - Manning's and Chezy's formula - determination of roughness coefficients - determination of normal depth and velocity - most economical sections - minimum permissible velocity determination - non-erodible channels.

UNIT -3 VARIED FLOW

9

Dynamic equation of gradually varied flow - assumptions - characteristics of flow profiles - drawdown and backwater curves - profile determination - graphical integration, direct step, standard step method-hydraulic jump - types - energy dissipation - surges - surge through channel transitions.

UNIT -4 TURBINES

9

Impact of jets on plane and curved plates - turbines - classification - radial flow turbines - draft tube - axial flow turbines - performance of turbines - similarity laws - centrifugal pump - minimum speed to start the pump - multistage pumps – cavitations.

UNIT - 5 PUMPS

9

Positive displacement pumps -reciprocating pump - negative slip - flow separation conditions - air vessels - indicator diagram and its variation - savings in work done - rotary pumps.

Total
Hours = 45

Text Books:

1. Subramanya K., " Flow in Open channels ", Tata McGraw Hill Publishing Company, 1994.
2. Kumar K.L., " Engineering Fluid Mechanics ", Eurasia Publishing House (P) Ltd., New Delhi, (7th Edition), 1995.
3. Jain A.K., " Fluid Mechanics (including Hydraulic Machines) ", Khanna Publishers, 8th

edition, 1995.

References:

1. Ven Te Chow, "Open-Channel Hydraulics ", McGraw - H:Q Book company, 1996.
2. Ramamirtham S., "Fluid Mechanics, Hydraulics and Fluid Mechines ", Dhanpat Rai & Sons, Delhi, 1998.
3. John A. Roberson, "Hydraulic Engineering ", Jaico Publishing House, 1998.

**SEMESTER IV
SURVEYING II**

UNIT -1 TACHEOMETRIC SURVEYING

9

Tacheometric systems - Tangential, Stadia and sub tense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants - Anallactic lens - Subtense bar.

UNIT -2 CONTROL SURVEYING

9

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line - Instruments and accessories - Corrections - Satellite station - Reduction to centre - Trigonometric leveling – Single and reciprocal observations - Modern trends.

UNIT -3 SURVEY ADJUSTMENTS

9

Errors - Sources, precautions and corrections - Classification of errors - True and most probable values - weighted observations - Method of Equal shifts - Principle of least squares - Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks.

UNIT -4 ASTRONOMICAL SURVEYING

9

Celestial sphere - Astronomical terms and definitions - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Different time systems - Nautical almanac - Star constellations - Practical astronomy - Field observations and calculations for azimuth.

UNIT -5 MISCELLANY

9

Photogrammetry - Introduction - Terrestrial and aerial Photographs - Stereoscopy - Parallax - Electromagnetic distance measurement - Carrier waves - Principles - Instruments - Trilateration - Hydrographic Surveying – Tides - MSL - Sounding and methods - Location of soundings and methods - Three point problem - Strength of fix - Sextants and station pointer - River surveys - Measurement of current and discharge - Cartography - Cartographic concepts and techniques - Cadastral surveying - Definition - Uses - Legal values - Scales and accuracies.

Total Hours = 45

Text Books:

1. Bannister A. and Raymond S., “Surveying”, ELBS, Sixth Edition, 1992.
2. Heribert Kahmen and Wolfgang Faig, " Surveying " , Walter de Gruyter, 1995.
3. Kanetkar T.P., “Surveying and Levelling ” , Vols. I and II, United Book Corporation, Pune, 1994.
4. Punmia B.C., “Surveying ”, Vols. I, II and III, Laxmi Publications, 1999.

References:

1. Clark D., “Plane and Geodetic Surveying” , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, sixth Edition, 1971.
2. James M. Anderson and Edward M. Mikhail, “Introduction to Surveying ”, McGraw Hill Book Company, 1985.
3. Wolf P.R. “Elements of Photogrammetry”, McGraw Hill Book Company, Second Edition, 1986.
4. Robinson A.H., Sale R.D. Morrison J.L. and Muehrche P.C., “Elements of Cartography ”, John Wiley and Sons, New York, Fifth Edition, 1984.

SEMESTER IV
HYDRAULICS ENGINEERING LABORATORY

1. FLOW MEASUREMENT

Calibration of Flow Measuring Instruments

2. LOSSES IN PIPES

Estimation of major and minor losses

3. PUMPS

Performance of Characteristics of Pumps

4. TURBINES

Performance of Characteristics of turbines

5. WATER MANAGEMENT PARAMETERS

Meteorological data collection and recording – Estimation of water Management parameters such as soil water, Field capacity, Infiltration capacity.

SEMESTER IV
SURVEY PRACTICAL II

1. Tacheometry

Tangential system (using theodolite, leveling staff)
Stadia system (using theodolite, leveling staff)
Subtense system (using theodolite, tape, cross staff, leveling staff)

2. Setting out works

Foundation marking (using theodolite, tape, ranging rods)
Simple curve - right / left handed (using theodolite, tape, ranging rods)
Transition curve (using theodolite, tape, ranging rods)

3. Field astronomy

Field observation for the calculation of azimuth (using theodolite, tape)

4. Electronic surveying (Using Photogrammetry accessories / instruments)

Practicing fusion of stereo pairs of charts and photographs to get 3D
Use of pocket stereoscope and parallax bars
Determination of personal stereoscopic acuity in laboratory
Work on stereo test charts to assess stereoscopic ability

Total Hours : 45