Note: Minimum two tests should be conducted for each theory subject and average of best two tests should be considered.
Part-I
1) Engineering Mathematics – III

Teaching Scheme
Lectures : 4 hrs/week

Examination Scheme
Theory Exam: 80 marks
Class Test: 20 marks

UNIT - I  Linear Differential equations of Higher order – I     8
Hrs
1.1 Introduction to L.D.E. with constant coefficients
1.2 General solution of f(D)y = X, shortcut methods
1.3 Non-Homogeneous linear equations: i) Solution by Method of variation
    of parameters
    ii) Solution by Method of undetermined coefficients
1.4 Equations Reducible to L.D.E. with constant coefficients i.e.
    i) Cauchy’s Homogeneous linear equation
    ii) Legendre’ Linear equations

UNIT – II  Linear Differential equations of Higher order - II    6
Hrs
2.1 Simultaneous L.D.E. with constant coefficient
2.2 Symmetrical simultaneous equations
\[ \frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R} \] by i) Method of Grouping ii) Method of Multipliers.
2.3 Applications of L.D.E. : Free Oscillations, Damping free vibrations, Forced
    Oscillations with resistance and without resistance, beams and columns, whirling
    of shafts.

UNIT – III  Vector Differential Calculus         7
Hrs
3.1 Vector and Scalar functions, fields, derivatives
3.2 Gradient of Scalar field, Directional derivative and Geometrical meaning
    of gradient (Gradd \( \phi \))
3.3 Divergence and curl of a vector fields
3.4 Solenoidal and Irrotational vectors
3.5 Second order diff operator and vector identifies

UNIT – IV  Vector Integral Calculus       7
Hrs
4.1 Line integral, Line integral independent of path, Line Integral in parametric form
4.2 Circulation of a vector [Work done]
4.3 Green’s Theorem [without proof] its verification and applications
4.4 Surface Integral, Stoke’s Theorem [without proof] and its applications
4.5 Gauss Divergence Theorem [without proof] and its applications to Engineering
    problems
UNIT – V  Statistics  6
Hrs
5.1 Corelation: Scatter diagram,Types of correlations
5.2 Karl Pearson’s coefficient of correlation
5.3 Regression: Lines of regressions, Lines of regression of Bivariate data
5.4 Curve fitting: Fitting of curves by Least Square Method

UNIT – VI  Probability  6
Hrs
6.1 Introduction, Random variable
6.2 Discrete and continuous Probability Distributions
6.3 Binomical Distribution
6.4 Poisson Distribution
6.5 Normal Distribution

Text Books

1. Advanced Engineering Mathematics by Erwin Kreyszing (Wiley Eastern Ltd.)


Reference Books:

1. Applied Mathematics (Volumes I & II) by P. N. Wartikar and J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).


PART-I
2) COMMUNICATION SKILLS

Teaching Scheme

Theory: 2 Hrs/week

Examination scheme

Theory: 40 Marks
Unit Test: 10 Marks

The objective of this course is to assist the students of engineering to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the students will be able to develop comprehension, improve Vocabulary, grammatical ability, enhance writing skills, correspond with others and enhance skills in spoken English.

Unit 1 Basics of Communication:

3 Hrs.

Definition; Elements of Communication; Cycle of Communication and Feedback.
Types of Communication: Verbal and Nonverbal (Oral, Written, Graphic Language and Body Language) Upward and Downward; Formal and Informal.
Media of communication: verbal non-verbal and audio-visual
Principles of Effective Communication.
Barriers of Communication.

Unit 2. Listening Skills:

3 Hrs.

Active Listening: Basic Principles
Listening and Note Making
Listening to Conversations from IELTS: Book 1

Unit 3. Reading Skills:

2 Hrs.

Active Reading: Types: Skimming, Browsing, etc.
Reading and Note Making.
Comprehension

Unit 4 Speaking Skills:

4 Hrs.

Basics of Presentation Techniques.
Group Discussions.
Interview Techniques
Public Speaking and Seminars.
Pronunciation: Basics.

Unit 5 Writing Skills:

4 Hrs.

Business Correspondence:
Business Letters
Job Application
Resume
Paragraph (Technical, Business or General current issues)
Reports.
Unit 6. English Grammar and Vocabulary: 4 Hrs.
Tenses
Common Errors in English
Synonyms
Antonyms
One Word Substitution.

Recommended Books:

Developing Communication Skills Mohan, Krishna.Meera Banerji, New Delhi Macmillan
Communication Skills for Engineers, Sunita Mishra and C. Muralikrishna, Pearson Education
Technical Communication, Meenakshi Raman and Sangeeta Sharma, Oxford University Press.
Basic Communication Skills, Rutherford A. Person Education, New Delhi.
Communication Skills, B.V. Pathak, Nirali Publication.
Organizational Behavior, Fred Luthans, McGraw Hill.
Spoken English for India, R.K. Bansal.
English Grammar and Composition, Pal and Suri, Sultan Chand & Son, Educational Publishers.


PART-I

3) STRENGTH OF MATERIALS

Teaching Scheme :  
Lectures : 4 Hrs/Week

Examination Scheme:  
Theory paper : 80Marks
Class test : 20 Marks

Unit I :  1. Shear force and Bending moment :

Relation between rate of loading, shear force & bending moment. Shear force and bending moment diagrams for statically determinate beams subjected to point loads, uniformly distributed loads, uniformly varying loads and couples.

2. Simple Stresses and strains :

Stress, Strain, Hooke’s law, modulus of elasticity, Simple Stresses and strains due to tension, compression and shear, modulus of rigidity.  
(06 Hrs.)

Unit II :  1. Simple Stresses and Strains :  

Bars of varying sections, composite sections, temperature stresses, stress-strain diagrams for brittle and ductile materials, working stress, factor of safety, linear strain, lateral strain and Poisson’s ratio, normal stress and volumetric Strain, Bulk modulus, Relationship between elastic constants.

2. Strain energy due to various types of axial loads.  
(06 Hrs.)

Unit III :  1. Bending stresses in beams :

Theory of simple bending, section modulus, distribution of bending stresses for various sections, filched beams.

2. Shear stresses in beams :

Distribution of shear stresses in beams of various commonly used section such as rectangular, circular, triangular, channel, T-section, I–section, & L–sections.  
(08 Hrs.)
Unit IV: 1. Principal stresses and strains:

Normal and shear stresses on any oblique planes, concept of Principal planes, derivation of expression for Principal stresses and maximum shear stress, Positions of principal planes and planes of maximum shear, Graphical solutions using Mohr’s circle of stresses.

2. Direct and bending stresses:

Direct and bending stresses for eccentrically loaded short struts, distribution of pressure at the bases of chimneys and dams, Core of a rectangular, square and circular section. (08 Hrs.)

Unit V: 1. Theory of torsion:

Theory of pure torsion, Polar modulus, Stresses in solid and hollow circular shaft, Power transmitted by shaft, close coiled helical springs with axial load.

2. Columns and struts:

Euler’s theory of long columns, buckling load for different end conditions, limitation of Euler’s theory, Rankine’s formula. (8 Hrs)

Unit VI: 1. Thin cylinders:

Thin cylinders subjected to internal pressures, change in length, diameter & volume.

2. Deflection of beams:

Slope and deflection in statically determinate beams subjected to point loads, uniformly distributed loads and couples by.

   a) Macaulay’s method.
   
   b) Moment area method.
   
   c) Conjugate beam method. (6 Hrs)

Reference Books: 1) Strength of materials. S. Ramamrutham
   
   2) Strength of materials. B.C. Punmia.
   
   
   4) Elements of Strength of materials. Timoshenko & Young.
   

***
PART-I

4) FLUID MECHANICS-I

Teaching Scheme
Theory – 4 hours/Week

Examination Scheme
Theory Paper - 80 Marks
Unit Test - 20 Marks

UNIT 1:

1.1 INTRODUCTION
States of matter; fluid description; fluid forms; fluid properties; mass density; specific weight; specific gravity; specific volume; viscosity; compressibility; bulk modulus; surface tension; capillarity.

1.2 FLUID STATICS
Pressure; pressure intensity; pressure forms (atmospheric, absolute, gauge, vacuum, barometric).

Pressure measurement; reference datums; pressure diagrams & properties; various forms of manometers & pressure gauges; their construction, function & equations.

Hydrostatic pressure; characteristics of pressure forces on plane surfaces & curved surfaces.

(08 hrs)

UNIT 2:

2.1 BUOYANCY & FLOATATION:
Archemedes’ principle; law of floatation; positions of C.G. & C.B.; meta centric parameters; stability of floating bodies; determination of meta centric height (theoretical & experimental methods) & applications.

2.2 FLUID KINAMETICS
Fluid domain (stream line, streak line, path line & stream tube); fluid flow & forms (steady & unsteady, uniform & non-uniform, laminar & turbulent, rotational & irrotational, dimensional, compressible & incompressible); fluid particle velocity & acceleration, components, forms; velocity potential & stream function; flow net, construction, properties & applications.

(10 hrs)

UNIT 3:

FLUID DYNAMICS
Fluid flow, dominant forces & combinations; equations of motion; Euler’s equation of motion; force potential; Bernoulli’s theorem, equation & practical applications; study of Pitot tube, Venturimeter, Orificemeter (construction, function & equations); free & forced vortex flow; radial flow.

(05 hrs)
UNIT 4:

FLOW MEASUREMENT

ORIFICES : classification; hydraulic coefficients & relationship; determination of \( C_v \); large orifices; study of submerged orifices;

MOUTH PIECES : classification; hydraulic coefficients & relationship; determination of \( C_v \); internal & external mouthpieces; absolute pressure at vena contracta; convergent & divergent mouthpieces; range for values of \( C_d \).

NOTCHES : classification; discharge measurements through rectangular, triangular & trapezoidal notches; time of emptying of reservoirs through notches; measurements of errors in head & discharge. 

(08 hrs)

UNIT 5:

5.1 FLOW MEASUREMENT

WEIRS : classification; discharge measurements through rectangular, triangular & trapezoidal weirs; approach velocity, end contraction & corrections; Cipoletti weir; measurements of errors in head & discharge; other forms of weirs (narrow crested, broad crested, ogee & submerged weirs).

5.2 FLOW THROUGH PIPES
Head losses (various minor losses, major losses); laws of fluid friction (for turbulent flow); Darcy-Weisbach equation; representation of datum, C.B.L., pipe centre line, H.G.L. & T.E.L.; pipe systems (long, parallel, series, equivalent); siphon system.

(10 hrs)

UNIT 6:

ALLIED STUDIES
Power (forms, equations, units) & various efficiencies; computation of machine power; bore-well yield measurement; other practical forms of flow rate & inter conversion; sources, sinks, their forms & equations; power transmission, water hammer & surge tanks.

(05 hrs)

REFERENCE BOOKS :

1. Hydraulics & Fluid Mechanics …………..-- Dr. P. N. Modi & Dr. S. M. Seth.
2. Fluid Mechanics & Hydraulic Machines – Dr. R. K. Bansal.
3. Fluid Mechanics …………………………-- Dr. S. Ramamrutham.
4. Fluid Mechanics …………………………-- Dr. Jagdish Lal.
5. Fluid Mechanics …………………………-- Dr. K. Subramanya.
6. Fluid Mechanics …………………………-- Dr. K. L. Kumar.
PART-I

5) SURVEYING – I

Teaching Scheme:
Lectures: 4 Hrs / Week

Examination Scheme:
Theory Exam: 80 marks
Unit Test: 20 marks

CONTENTS

UNIT - I
b) Mesurement of Horizontal distances: Chain & types, Tape & types, EDM devices, Ranging of lines - Direct & Indirect, Chain & Tape corrections - Numericals.
c) Chain surveying: Minor instruments for setting out right angle. selection of station, offsets for locating details, use of optical square, cross staff, Prism Square, Obstacles in chain surveying. Errors in chain survey & precautions to be taken.

06 hrs

UNIT - II
a) Instrument for measurment of angles prismatic compass & surveyor’s compass, their use & adjustments, bearings - types, Whole circle bearing, reduced bearings, Dip & declination, Local attraction.
b) Computation of bearings of closed traverse, computation of included angles from bearings of a traverse - Numericals.
c) Open & Closed traverse. Adjustments of closed traverse - Bowditch’s graphical method.

06 hrs

UNIT – III
a) Instruments for measurment of elevation, Dumpy levels, Tilting & Automatic levels. Temporary & Permanent adjustments of Dumpy level.

b) Levelling - Definition, Various terms, levelling methods, levelling staves, Booking & reduction of field notes.

c) Running a level line, L- Section, Cross - section. Difficulties in levelling work, corrections & Precautions to be taken in levelling work. Errors in levelling.

d) Contouring: Definition, Characteristics & uses, methods of contouring, Interpolation techniques

08 hrs

b) Two point problems & its solution by graphical method. Three point problems & its solution by Bessels graphical method. Errors in P.T. surveying.

c) Construction & uses of minor instruments such as Abney level, Box sextant, planimeter, Ghat tracer & Tangent clinometer.  

08 hrs

UNIT - V  a) Planimeter - Types including digital planimeter, areas of zero circle, uses of planimeter.

b) Types of cross sections, derivation of equations for areas of cross sections for level, two level, three level, side hill two level & multilevel sections, Prismoidal & Trapezoidal formula.

c) Volume of cut & fills with special reference to road, canal, railway,. Haulage, lift, lead & mass daigram for economic gradeline, use of earthwork table.

08 hrs

UNIT -VI  Survey for Engineering projects - Reconnaissance, Preliminary & detailed setting out a building, route surveys for highways, railways & waterways. Tunnels - correlation of under ground & surface surveys, shafts & Adits.

04hrs

Text Books  
1) Surveying & Levelling, Vol - I & II, T.K. Kanitkar & S.V. Kulkarni  
2) Surveying Vol - I & II, B.C. Punmia  
3) Surveying & Levelling, N.M. Basak

Reference Books

1) Surveying David Clerk  
2) Surveying Vol - I & II, Dr. K.R. Arora  
3) Surveying Vol - I & II, S.K. Duggal  
5) Fundamentals of Surveying S.K. Roy  
6) Surveying Norman Thomes  
7) Surveying & Levelling, Husain & Nagaraj

***
UNIT I:
Introduction / Foundation

Introduction:

1. Classification of structure & their relative Advantage and Disadvantages i.e. Load bearing, framed, composite structure.
2. Load bearing wall, Partition wall, Cavity wall, composite wall etc.

Foundation:

1. Preliminary Investigation of Soil, Bearing Capacity of Soil. Filed Methods of improving SBC, SBC values based on I.S. code.
2. Classification of foundation – Shallow and deep foundation.
3. Introduction to shallow and Deep Foundation types.
   i.e. spread footing, combined, strap, Grillage, Raft foundation & Pile Foundation – Pre cast, cast-in-situ, undreaned pile, Friction pile, End bearing pile, compaction pile etc.

UNIT – 02

Doors

1. Purpose, Different classification of Doors. Type panelled Door, Glazed, Collapsible, Rolling Shutter, Louvered Door, Sliding & wing Door etc.
2. Type of material used.
3. Thumb rule for size of Doors / window.
5. Fixtures and fastening for Doors and windows.

Windows :

1. Purpose, Classification of window i.e. casement, Glazed, Bay, Dormer, Corner, Louvered, Pivoted window.
2. Ventilators : Types and their suitability.
Lintel:
1. Terms used in Lintel, Types and their suitability.
2. Details of RCC Lintes with Chajja.
4. R.C.C. boot Lintel.

Arches:
Technical terms, classification, Material used for construction i.e. brick, Stone, Concrete Arch, Flat Arches, Segmental and relieving Arch.

UNIT – 03
Roofs & Flooring

Roofs:
1. Technical terms, classification of roofs i.e. pitched, curved and flat roofs.
2. Types of pitched roof – i.e. Lean to roof, King post, Queen Post, Steel trusses, Roof Covering Material used for pitched roofs.
3. Details of fixing of roof covering.
4. Flat roof: Types, Advantages and Disadvantages
5. Comparison between flat and pitched roof.
6. Advantages of steel trusses Vs Timber trusses.

Flooring:
1. Definition and classification.
2. Types of wearing surfaces.
3. Floor finish its suitability etc.
4. I.P.S., Mosaic Tiles, Ceramic Tiles, Terrazzo Floorings, its construction.
5. Manufacture of cement Tiles etc.

UNIT - 04
Stairs:
1. Technical Terms.
2. requirement of good stairs.
3. Thumb rule.
4. Classification of stairs.
5. Types of Steps.
6. Planning and Layout of stair (Design)
7. Suitability of lifts, ramps and escalators.

BUILDING FINISHES:

Plastering:
1. Objectives, Purpose, Mortar and Tools used for plastering.
3. Use of Lath in plastering.
4. Stucco plastering.
5. Detects in plastering work and its remedies.

Pointing:
Objectives, Mortar used for pointing, types of pointing.

7 Hrs.
7 Hrs.
6 Hrs.
UNIT – 05
Painting and colouring :
1) Necessity, types, Process of painting and colouring.
2. Types of paints and their uses.
3. Application and paints to new and old surface.
4. White washing, colour washing, Distempering.

UNIT – 06
1. Shoring, under pinning, scaffolding types and uses.
   Damp Proof Construction.

REFERENCE BOOKS :
1) B.C. - B.C. Punmia - (Laxmi Publication)
3) B.C. - By S.G. Rangwala.
4) B.C. - Sushil Kumar.
5) Advanced building material and construction.
   - by Mohan Rai & Raising.
   (BRI publication Roorkee)

***
PART-I
7) Communication skill laboratory

Term Work: 25 Marks
Practical: 25 Marks

Minimum Practical 8 out of 11 to be conducted and reported as Term Work

1. Draw a communication cycle showing all the elements.
2. Convert the verbal and numerical data into the suitable nonverbal form.
3. Listen to the presentation by the faculty or student and make running notes.
4. Listen to the pre-recorded conversation and answer the questions based on it.
   (Ref. IELTS: Book 1: CD: 1 and 2.)
5. Read the given passage and answer the questions following it.
   (Ref. Books for CAT or IELTS)
6. Introducing Yourself (3 to 5 minutes)
7. Presentation for minimum 5 minutes on the given topic.
   (Current Issues or Technical Topics)
8. Situational English (Dialogues and Role-plays)
10. Mock-interview: Demo by expert panel.

Note: Use of Language Lab and audio-visual modes of communication is strongly recommended, where necessary.
PART-I
8) STRENGTH OF MATERIALS LABORATORY

Practical : 2 Hrs/Week/Batch
Term work : 25 Marks
Practical/oral: 25 Marks

-----------------------------------------------------------------------------------------------------

Term Work :

Term work shall consist of eight laboratory experiments to conducted from the list given below:

List of Experiments :

1) Tension test on mild steel bar to study stress-strain characteristics.
2) Tension test on tor steel bar.
3) Flexural test on beam (central point load) (plotting of load – deflection curve and finding value of E)
4) Flexural test on beam (two point load) (plotting of load – deflection curve and finding value of E)
5) Impact test on metals. (Charpy and Izod)
6) Brinell and Rockwell hardness test on metals.
7) Punching shear test using Hounsfield Tensometer.
8) Absorption and crushing test on bricks.
9) Absorption and transverse test on cement / mosaic floor tiles.
10) Strain measurements in beam using mechanical extensometer.
11) At least three computer programs based on above syllabus.

Practical examination : Practical based oral examination.
PART-I
9) FLUID MECHANICS-I LABORATORY

Practical: 2 Hrs/Week/Batch
Term work: 25 Marks
Practical/oral: 25 Marks

The term work based on practical shall consist (at least Six) of the following experiments:

1. Study of pressure measuring devices.
2. Determination of meta centric height
3. Verification of Bernoulli’s principle
5. Determination of hydraulic coefficients of circular orifice.
6. Determination of hydraulic coefficients of external cylindrical mouthpiece
7. Calibration of rectangular notch.

NOTE: The practical based oral examination shall be conducted on the term work performed.
PART-I

10) SURVEYING – I LABORATORY

Practical: 2 Hrs/Week /Batch  Term work : 25 Marks
Practical/oral: 25 Marks

Practicals - Any 07 from the following:
1) To set out perpendiculars at various points on a given line using cross staff, optical square & tape.
2) To set out rectangles, pentagon, Hexagon using compass, tape or chain.
3) Measurement of bearing of sides of a closed traverse & adjustment of closing error by Bowdich method.
4) To locate points using radiation & intersection method of plane tabling.
5) Two point problem by graphical method / three point problem by Bessel's graphical solution.
6) Determine difference in level between two distant points by fly levelling technique & to conduct fly back levelling.
7) To determine difference in elevation between two points using reciprocal levelling & determine collimation error.
8) Measurement of area of an irregular figure by a planimeter/ digital planimeter.
9) Study & use of minor instruments.
10) Three computer Programs based on above syllabus.

Project work: (Any three)
1) Chain & Compass traverse
2) Block contouring.
3) Plane Table traversing.
4) Highway Project.

Practical examination:
It consist of practical based oral exam based on above field exercises & project work drawings.
PART-I

11) BUILDING CONSTRUCTION LABORATORY

Drawing: 2 hours /Week/Batch

Term work: 25 marks
Practical/Oral: 25 marks

TERM WORK:

1) Sketches on quarter size sheet – Each unit minimum 2 sketches.

2) One Sheet: Measured drawing of a RB.

3) Practical on mark out of measured Drawing.

4) Field visit to building under construction & its report writing including material of construction, construction process, Human resources required, construction details etc.
PART-II

1) Engineering Mathematics – IV

Teaching Scheme
Lectures : 4 hrs/week

Examination Scheme
Theory Exam: 80 marks
Class Test: 20 marks

UNIT - I  Laplace Transforms  8
Hrs
1.1 Definition, Existence of L.T.
1.2 Properties with proof: Linearity, Change of scale, First shifting, Second shifting, Multiplication by t, Division by t, L.T. of derivative and Integral
1.3 Inverse L.T., Methods of obtaining inverse L.T., Convolution Theorem
1.4 L.T. of special functions
   i) Unit (Heaviside) step function
   ii) Unit Impulse function (Dirac delta function)
   iii) Periodic functions

UNIT – II  Application of L.T.  5
Hrs
Applications of L.T. to i) Initial value problems
   ii) Simultaneous Linear equations
   iii) L.T. Method for the solution of partial differential equations

UNIT – III  Series solutions of differential equations & Special functions  9
Hrs
2.1 Power Series Method, Theory of Power Series Method
2.2 Legendre’s Equations, Legendre’s Polynomials $P_n(x)$
2.3 Bessel’s Equation. Bessel Functions $J_\nu(x)$, Bessel Functions of the Second Kind $Y_\nu(x)$
2.4 Sturm-Liouville problems.

UNIT – IV  Fourier Series  6
Hrs
3.1 Fourier series: Definition, Dirichlet’s conditions, Euler’s formulae
3.2 Fourier series over (0, 2\pi), Functions having points of discontinuity
3.3 Change of interval
3.4 Expansions of Even and Odd functions, Half range series
UNIT – V  Partial Differential Equations

4.1 Solution of first order Linear equations (Lagrange’s equation)
4.2 Non-Linear first order equations
4.3 Method separation of variables

UNIT – VI  Applications of P.D.E

Applications of P.D.E. to
i) Wave equation
ii) One dimensional heat flow equation
iii) Two dimensional heat flow equation (Laplace’s Equation)

Text Books
1. Advanced Engineering Mathematics by Erwin Kreyszing (Wiley Eastern Ltd.)

Reference Books:
1. Applied Mathematics (Volumes I & II) by P. N. Wartikar and J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).

***
PART-II
2) FLUID MECHANICS - II

Teaching Scheme:
Theory - 4 hours/Week

Examination Scheme:
Theory Paper - 80 Marks
Unit Test - 20 Marks

UNIT 1:
DIMENSIONAL ANALYSIS AND MODELS:

Dynamical Similarity and Dimensional Homogeneity Model Experiment, Geometric, Kinematic and Dynamic similarity, Reynolds’s, Froude’s, Weber’s, Euler and Mach numbers. Distorted river models and undistorted models, proper choice of scale ratios, scale effects. Principle of dimensional analysis Rayliegh method, Buckingham theorem, applications of dimensional analysis to pipe friction problems, resistance to motion of partially and fully submerged bodies and other simple problems, ship model experiments. (07 hrs)

UNIT 2:

2.1 LAMINAR FLOW:

Relations between shear and pressure gradient. Flow between plates and equation for velocity distribution, pressure difference.

2.2 TURBULENT FLOW IN PIPES

Theories of Turbulence, Nikuradse’s Experiments. Hydro dynamically smooth and rough boundaries. Laminar, sub layer, Equations of velocity distribution and friction coefficient. Stanton diagram, Moody’s diagram. (08 hrs)

UNIT 3:

BOUNDARY LAYER THEORY

Concept, boundary layer along thin plate – characteristic, laminar, turbulent boundary layer, laminar sub layer, various thickness – Normal displacement, moment Energy, Hydraulically smooth and rough boundaries. Separation of boundary control of seperation, Introduction to drag and lift on submerged bodies. (like flat plates, sphere, cylinder, aerofoil), stokes law, Drag and lift coefficients. (07 hrs)
UNIT 4:

FLOW THROUGH CHANNELS:


(7 Hrs.)

UNIT 5:

5.1 RAPIDLY VARIED FLOW:

Hydraulic jump or standing wave in rectangular channels. Conjugate or sequent depths. Losses in jump, location of jump. Board crested weirs for channel flow: Measurement, velocity distribution in open channels, pars hall flume.

5.2 IMPACT OF FREE JETS: Impact of a jet on a flat or a curved vane, moving and stationary vane, flow over radial vanes.

(8 Hrs.)

UNIT 6:

CENTRIFUGAL AND RECIPROCATING PUMPS AND TURBINES


(7 Hrs.)

Recommended Books:


***
PART-II

3) SURVEYING – II

Teaching Scheme :
Lectures : 4 Hrs / Week

Evaluation
Theory : 80
Test : 20

CONTENTS

UNIT - I
08 hrs

UNIT - II
Tacheometric Surveying : Basic principle, Types of Tacheometric Surveying, Tacheometric equation for horizontal & Inclined line of sight in fixed hair method. Anallatic lens in external focusing telescopes, Reducing Tacheometric constants in internal telescope, Moving hair & tangential method, substance bar Beaman stadia arc.
06 hrs

UNIT - III
Trigonometrical Levelling : Determination of elevation of objects, when the base of object is accessible & inaccessible by single plane & double plane method. Distance & difference in elevation between two inaccessible objects by double plane method. Salient features of Total station, Advantages of Total station over conventional instruments. Application of Total station.
06 hrs

UNIT - IV
06 hrs.
Transition curves : Ideal transition curves. characteristics methods of determination of length. Elements of different types & methods of setting out.
05 hrs.

UNIT - V
04 hrs

UNIT - VI
Modern surveying instruments
a) Electronics in surveying. general principles used in the instruments.
b) Auto levels, self-compensating instrument.

c) Electronics distance measurement (EDM) - types, principles, applications in surveying. Corrections for field observations.

d) Electronics digital theodolite - types, uses & application, concept of Total Station

e) Use of computer in survey work for level computation & plotting contour plan.

f) Introduction of GPS.

05 hrs

Text Books
1) Surveying & Levelling, Vol - I & II, T.K. Kanitkar & S.V. Kulkarni
2) Surveying Vol - I & II, B.C. Punmia
3) Surveying & Levelling, N.M. Basak

Reference Books
1) Surveying David Clerk
2) Surveying Vol - I, II & III, Dr. K.R. Arora
3) Surveying Vol - I & II, S.K. Duggal
4) Surveying Bannister, Raymond & Baker, Pearson Education

6) Surveying Norman Thomas
7) Surveying & Levelling, Vol - II, Husain & Nagaraj
PART-II
4) THEORY OF STRUCTURES - I

Teaching Scheme:
Lectures: 4 hours per week

Examination Scheme:
Theory Paper: 80 marks
Unit Test: 20 marks

UNIT – I : Fixed Beams
Analysis of fixed beams for shear force and bending moment, Effect of sinking of supports (4 hrs)

UNIT – II : Continuous Beams
Clayperon’s theorem of three moments, Analysis of continuous beam for shear force and bending moment, Effect of sinking of supports. (6 hrs.)

UNIT – III :
1. Moving Load
Maximum Bending moment and shear force diagram for simply supported spans, Transverse by single point load, two concentrated loads and uniformly distributed loads, Enveloping parabola, Equivalent uniformly distributed load. (4 hrs.)

2. Influence Lines
Influence line for reaction, shear force and bending moment in simply supported beam, Influence lines for force in member of statically determinate trusses. (6 hrs.)

UNIT – IV :
1. Strain Energy
Resilience of beams in bending, Deflection of beams from strain energy. Castiglianos theorem and its application to beams and pin jointed trusses. (6 hrs.)

2. Columns
Long columns subject to eccentric and lateral loads, Column with initial curvature. (03 hrs)

UNIT – V : Three Hinged Arches
Action of an arch, Eddys theorem determination of horizontal thrust bending moment normal thrust and radial shear for parabolic and segmental arches. Influence lines temperature effects. (06 hrs)

UNIT – VI : Three Hinged Suspension Bridges
Forces in loaded cables and hanging chains, length of cables, different support conditions. Simple suspension bridge with three hinged stiffening girder. Bending moment and shear force diagrams. Influence line diagrams for Bending moment and shear force.

Text Books: Theory of Structures by S. Ramamrutham
Analysis of Structures by C.S. Reddy.

(06 hrs)
PART-II
5) CONCRETE TECHNOLOGY

Teaching Scheme:
Lectures: 4 hours per week

Examination Scheme:
Theory Paper: 80 marks
Unit Test: 20 marks.

UNIT – I
1. Introduction
Classification, properties, grades, advantages and disadvantages of concrete of concept of quality of control. (01hrs)

2. Cement
Basic properties of cement compound, manufacturing process, hydration of cement, physical property of Portland cement, chemical properties of cement, types of cement. (05 hrs)

UNIT – II
Aggregates
Classification of aggregate, properties of aggregate, strength, toughness, hardness, particle shape and texture, specific gravity, bulk density, voids porosity and absorption, bulking of sand, deleterious substances, alkali, aggregate reaction, fineness modulus, maximum size of aggregate grading and surfaces area, gap graded aggregate and grading limit. (08 hrs)

UNIT – III
1. Water
Quality of mixing water, impurities in water and its effect. (02 hrs)

2. Admixtures.
Retarders acceleror, plasticisers, super plasticizers, air entering agent, water proofing agent. (03 hrs)

UNIT – IV
Fresh Concrete
Manufacturing Process of Concrete, Workability, measurement, factors affecting workability, effect of time and temperature on workability. Requirements of workability, segregation and bleeding, ready mixed concrete, pumped concrete. (10 Hrs)

UNIT – V
Properties Of Hardened Concrete
Strength of concrete, Types, factors influencing strength, Stress –Strain characteristics of concrete. Shrinkage and temperature effects. Creep Permeability and Durability of
UNIT – VI
1. Special Concretes
Light weight concrete, high density concrete, Fero cement, fiber reinforced concrete, Polymer concrete.

2. Concrete Mix Design
Concept of mix design, variables in proportion statistical quality control of concrete
Common terms. Different methods Trial and error, ACI method and IS code method.

Text Books: 1) Concrete Technology by M.S. Shettey
2) Concrete Technology by M.L. Gambhir

***
PART-II
6) BUILDING PLANNING AND DRAWING

Teaching Scheme:  
Lectures: 4 hours per week

Examination Scheme:  
Theory Paper: 80 marks  
Unit Test : 20 marks.

UNIT 1: BUILDING PLANNING

OWNER, ARCHITECT, CONTRACTOR
Relative function of owner, Architect, Structural engineer and Contractor. (02 hrs)

BUILDING BYE LAWS:
Objectives of bye-laws, Regulation regarding: means of access, lines of building
tfrontage, covered area, floor area ratio, open space around buildings, height & sizes of
rooms, plinth regulation and sanitation provisions. (04 hrs)

PRINCIPLES OF PLANNING:
Orientation, aspect, grouping, functional relations of different unit, roominess, flexibility,
privacy space utilisation, sanitation, ventilation, strength and stability of living area,
sleeping, service area, circulations. (04 hrs)

UNIT 2 : SUBMISSION AND WORKING DRAWING

PREPARATION OF SUBMISSION AND WORKING DRAWING:
Line plans and workings and submission plans to sanctioning authorities, check list for
planning a building project, site plan, utilities and services, legal documents, budget
restrictions. (04 hrs)

UNIT 3 : FUNCTIONAL DESIGN AND ACCOMMODATION REQUIREMENTS:

(A) Residential Building: Activities and their spatial requirements; Area planning, living
room, sleeping area; Bubble diagram showing sequence of arrangement of area, plan,
elevation, sectional elevation.

(B) Non Residential Building: School buildings, Rest House, Primary health centers, Post
office, Bank, College Library, cinema theatres. (10 hrs)

UNIT 4 : LOW COST HOUSING:
Materials, Introduction to methods, maintenance, Repairs, Introduction to Rehabilitation of
structures. (04 hrs)

UNIT 5: BUILDING SERVICES
(A) **Fire Resistance:** Fire Protection precautions, confining of fire, fire hazards, characteristics of fire resisting materials, building materials and their resistance to fire.

(B) **Electrification:** Concealed & Open wiring, Requirements & Locations of various points, Concept of Earthing.

(C) **Ventilation and Air-conditioning:** Functional requirements of a ventilation system, systems of ventilation, essentials of ventilation, essentials of comfort air conditioning, system of air conditioning.

(D) **Thermal Insulation:** General concept, Principles, Materials, Methods.

(E) **Acoustics and Sound Insulation:** Characteristics and behavior of sound reflection, reverberation of sound-absorption of sound-acoustical defects. Acoustical design of halls, sound insulation.

(F) **Plumbing System:** Various materials for system like PVC, GI, AC, HDPE and stoneware. Various types of Taps, Fittings, Chambers, Concept of Plumbing and Drainage plan.

**UNIT 6: INTRODUCTION TO AUTO-CAD.**

(15 hrs.)

**REFERENCE BOOKS**

2. Building Planning and drawing – Y.S.Sane (Allied Book Stall , Pune)
4. SP 7-National building code Group 1 to 5 – B.I.S New Delhi.
5. Building Constructions - B. C. Punmia
## PART-II

### 7) FLUID MECHANICS – II LABORATORY

<table>
<thead>
<tr>
<th>Practical</th>
<th>Term Work</th>
<th>Practical / Oral Exam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 hours/Week</td>
<td>-</td>
<td>25 Marks</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>25 Marks</td>
</tr>
</tbody>
</table>

**TERM WORK:**

**Hydraulics Lab:**

1. To determine Mannings and chezy’s coefficient of roughness for the bed of given flume.
2. To plot characteristic curve of hydraulic Jump.
3. To plot characteristic curve of pelton wheel.
4. To plot characteristic curve of centrifugal pump.
5. Study of specific energy diagram for different discharges.
7. Study of Kaplan turbine.

**Note:**
The practical based oral examination shall be conducted on the term work performed.
PART-II

8) SURVEYING – II LABORATORY

Practicals : 2 Hrs/ Week / Batch

Term work : 25
Practical Exam : 25

Term Work :
The term work shall consist of a record of field exercise as under (Any eight)
1) Study of construction of theodolite, least count determination
3) Measurement of vertical angle using theodolite.
4) Measurement of magnetic bearing deflection angle & direct angle with theodolite
5) Determination of tacheometric constants for the theodolite.
6) Determination of horizontal distance & RL of points by tachometric observations with horizontal & inclined line of sight & vertical staff.
7) To determine elevation of object using single plane method when base is accessible & inaccessible.
8) To determine distance & difference in elevation between two inaccessible points using double plane method.
9) To set out simple curves using linear methods - Perpendicular offsets from long chord / offsets from chords produced.
10) To set out simple curves by using Rankine’s deflection angles method.
11) Three computer programs based on above syllabus.

Project work :-
1) Theodolite traverse survey.
2) Tacheometric contouring.

Practical examination :
It consist of practical based oral exam based on above field exercises & project work drawings.
PART-II

9) CONCRETE TECHNOLOGY LABORATORY

Practicals : 2 Hrs/ Week / Batch

Term work : 25 marks
Practical Exam : 25 marks

TERM WORK

Term work shall consist of a journal based on the following experiments.

1) Test on Cement:
Fineness, Standard Consistency, Setting time, Compressive strength and Soundness test. (Minimum four)

2) Test on Aggregates:
Bulk density specific gravity, finesses modulus, Aggregate impact value, flakiness index, elongation index of aggregates, Abrasion value, crushing value, silt content, bulking of sand. (Min: four)

3) Test on Fresh Concrete:
Slump, Vee – Bee, Compaction factor and flow test for fresh concrete. (Min: Three)

4) Tests on Hardened Concrete:
Split tensile strength, modulus of rupture, young’s modulus, compressive strength, Non destructive Testing, Rebound hammer and Ultrasonic pulse velocity test. (Min: four)

Practical oral
Practical based oral examination.
PART-II
10) BUILDING PLANNING & DRAWING LABORATORY

<table>
<thead>
<tr>
<th>Drawing : 2 Hrs/ Week / Batch</th>
<th>Term work : 25marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practical Exam : 25marks</td>
</tr>
</tbody>
</table>

TERM WORK :

A. One A1 size drawing sheet of residential a building with area of Statement & brief of specification.
B. One A1 size drawing (set of two sheets) public building.
C. Line plans on graph papers including planning of main enclosures reference to furniture arrangements.
   i) Two plans of Residential building
   ii) Four plans of public building
D. Project work on Planning and Design of residential building – Full set of drawings
   - Municipal submission drawing
   - Working drawing
   - Foundation/Centre line Drawing
   - Furniture Layout Plan
   - Electrification Plan
   - Water Supply & Drainage plan.
E. One residential plan in Auto-cad.

PRACTICAL / ORAL EXAMINATION
The Practical / Order examination is based of the term work mentioned above.