DR. A P J ABDUL KALAM UNIVERSITY, INDORE

SYLLABUS

of

BACHELOR OF ENGINEERING

(Second Year, III AND IV SEM Grading System)

College of Engineering

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for Bachelor of Engineering

List of Subject (Second Year, Grading System)

III Sem

IV Sem

Unit I Introduction of material

Introduction to Material Science and Engineering: Type of Materials- Metallic Materials, Polymeric Materials, Ceramic Materials, Composite Materials, Electronic Materials, Magnetic Materials, Photonic/Optical Materials, Construction Materials, Recent advances in Materials Science- Smart Materials, Nano-Materials, Selection of Materials Atomic Structure and Bonding: Structure of Atoms, Atomic Numbers and Atomic Masses, Electronic structure of Atoms, Quantum Numbers of Electrons of Atoms, Crystal and Amorphous Structure in Materials –Crystalline and Amorphous Materials. Type of Atomic Bonds- Metallic Bonds, Covalent Bonds, Ionic Bonds, Vander Walls Bond, Primary and Secondary Bonds.

Unit II Properties and Failure of Materials

Mechanical Properties of Materials, Thermal properties of Materials, Electrical and Magnetic Properties of Materials, Failure of Materials –Fracture, Fatigue and Creep, Corrosion and Wear.

Unit III Stone, Timber, Brick & Tiles

Stones: Occurrence, varieties, characteristics and their testing, uses, quarrying and Dressing of stones.

Timber: Important timbers, their engineering properties and uses, defects in Timber, seasoning and treatment, need for wood substitutes, alternate materials for shuttering Doors/windows, partitions and structural members etc.

Brick And Tiles: Manufacturing, Characteristics, classification and uses, improved brick from inferior soils, hand molding brick Table, clay-fly ash brick table, flooring tiles and other tiles and their characteristics.

Unit IV Lime, Cement & Aggregate

Lime: Properties of lime, Preparation of lime mortar

Cement: Ingredients, Manufacturing process, Types and Grades, Properties of cement and Cement mortar, Hydration , Compressive strength, Tensile strength, Fineness, Soundness and consistency, Setting time, Industrial byproducts, Fly ash

Aggregates: Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading – Sand Bulking.

Unit V Steel, Wood & Polymers

Steel: Structural Steel, Reinforcing Steel-Grades and Types, Properties of Reinforcing Steel

Wood: Structural Wood, Physical Properties of Wood, Wood Products, Plywood, Particle Board.

Polymers: Fibre Board, Polymers-Thermoplastics, Thermosets, Elastomers, General Properties of Polymers, Common Polymers and their Properties, Modified Polymers, Uses of Polymers.

References

1. DR Askeland, K Balani, The science and Engineering of Materials, Cengage Learning
2. Somayaji S., Civil Engineering Materials, 2nd ed Pearson
3. Sahu G.C, Jena J.; Building materials and Construction, Mc Graw hills, new Delhi.
4. Smith William,Hashmi J, Prakash R; Material Science & Engineering; 5ed Mc-Graw Hill.
5. S K Duggal, Building Materials, New Age International.
6. P C Vaghese, Building Materials, PHI Learning.
7. S.C. Rangwala, Engineering Materials, Charotar.
8. R. Balasubramaniam, Material Science & Engineering, Wiley India
9. Purushattam Raj, Building materials and Techniques, Pearson
10. Mamlouk MS, Building materials and Construction Engineering 3rd, pearsons.
11. Gambhir & Jamwal, Building Materials, Mc Graw Hill.
12. SS Bhavikatti, Concrete Technology, IK International

Unit I Drawing of Building Elements

Drawing of Building Elements- Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of door, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc.

Unit II Building Planning

Building Planning- Classification of buildings, Provisions of National Building Codes and Rules, Building bye-laws, open area, Setbacks, FAR terminology, Design and drawing of Building, Design concepts and philosophies, Preparing sketch plans and working drawings of various types of buildings like residential building, institutional buildings and commercial buildings, site plans, presentation techniques, pictorial drawings, perspective and rendering, model making, introduction to computer aided design and drafting, Applying of principle of architectural composition (i.e. unity, contrast, etc.), Principles of planning, orientation in detailed drawings.

Unit III Building Services

Building Services- Introduction of Building Services like water supply, sewerage and drainage systems, sanitary fittings and fixtures, plumbing systems, principles of internal & external drainage systems, principles of electrification of buildings, intelligent buildings, elevators escalators their standards and uses, air-conditioning systems, fire fighting systems, building safety and security systems, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.

Unit IV Principles of architectural design

Principles of architectural design – Definition of architecture, factors influencing architectural development, characteristics features of style, historic examples, creative principles. Principles of architectural composition – Unity, balance, proportion, scale, rhythm, harmony, Accentuation and contrast. Organizing principles in architecture- Symmetry, hierarchy, axis linear, concentric, radial, and asymmetric grouping, primary and secondary masses, Role of colour, texture, shapes/forms in architecture. Architectural space and mass, visual and emotional effects of geometric forms, space activity and tolerance space. Forms related to materials and structural systems.

Unit V Elements of architecture

Elements of architecture: Functions – Pragmatic utility, circulatory function, symbolic function, physiological function. Structure– Physical structure, Perceptual structures. Space in architecture–Positive and negative space. Aesthetics: Visual perception. Protective: Protection from climate and other elements, architecture a part of the environment. Comfort factors. Perspective Drawing and Town Planning- Elements of perspective drawing involving simple problems, one point and two point perspectives, energy efficient buildings. Concepts of master plan, structure plan, detailed town planning scheme and action plan, estimating future needs - planning standards for different land use, allocation for commerce, industries, public amenities, open areas etc., planning standards for density distributions, density zones, planning standards for traffic network,

standard of roads and paths, provision for urban growth, growth models, plan implementation, town planning legislation and municipal acts, panning of control development schemes, urban financing, land acquisition, slum clearance schemes, pollution control aspects

References
1. Shah, Kale &Patki; Building Design and Drawing; TMH
2. Malik &Meo; Building Design and Drawing
3. W B Mckay,Orient Blackswan Building Construction Vol 1 -4, Pearson
4. Gurucharan Singh and Jagdish Singh, Building Planning, Designing and Scheduling, Standard Publishers Distributors.
5. Layal JS, Dongre A, Building Design and Drawing, Satya Prakashan
6. Ghose D.N., Civil Engineering Design and Drawing, CBS publisher
7. Das B M, Principles of Foundation Engineering, Cengage Learning.
8. Agrawal S. C., Architecture and Town Planning, Dhanpat Rai & Co.
9. S.C. Rangwala, Town Planning, Charotar Publishing House.
10. Lewis Keeble, Principles and Practice of Town and Country Planning.
11. Rame Gouda, Principles & Practices of Town Planning, University of Mysore, Manasa Gangotri.

List of Experiments
1. Sketches of various building components.
1. Drawing of various building components containing doors, windows ventilators, lintels and arches stairs foundations etc.
2. Drawings for services and interiors of buildings.
3. Drawings containing detailed planning of one/two bed room residential building (common to all student)
4. Drawing of residential and institutional building (Each student performs a different drawing).
5. Use of Auto CAD for preparation of drawings.

Unit I Simple Stress and Strains

Simple Stress and Strains: Concept of Elastic body stress and Strain, Hooke's law, Various types of stress and strains, Elastic constants, Stresses in compound bars, composite and tapering bars, Temperature stresses. Complex Stress and Strains- Two dimensional and three dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and Strains, Mohr's circle of stresses.

Unit II Shear force & Bending moment

Beams and Bending- Types of loads, supports – Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load.

Unit III Bending & Shearing Stresses

Bending and Shearing Stresses: Theory of simple bending, Concept of pure bending and bending stress, Equation of bending, Neutral axis, Section-Modulus, Differential equation of the elastic curve, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to point load and uniformly distributed loading, Bending stress distribution across a section of beam, Shearing Stress distribution across a section in Beams.

Unit IV Slope and deflection

Determination of Slope and Deflection of beams by Double Integration Method, Macaulay's Method, Area Moment Method, Conjugate Beam Method.

Unit V Torsion of Shafts:

Torsion of Shafts: Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Torsion of solid and hollow circular shafts, Analyses of problems based on combined Bending and Torsion.

Reference

1. Punmia B.C., Mechanics of Materials, , Laxmi Publications (P) Ltd.
2. S.S Bhavikaati, Strength of Materials, Vikas Publisher, new Delhi
3. Rajput R. K., Strength of Materials, S. Chand.
4. S. Ramamrutham, R. Narayanan, Strength of Materials, Dhanpat Rai Publications.
5. R. Subramaniam, Strength of Materials, Oxford University Press.
6. Sadhu Singh , Strength of Material , Khanna Publishers
7. Mubeen A , Mechanics of solids , Pearsons
8. D.S Prakash Rao, Strength of Material , University Press , Hyderabad
9. Debrath Nag, Strength of Material , Wiley
10. Jindal , Strength of Material , Pearsons.
11. Bansal R.K, Strength of Materials, Laxmi Publisher, New Delhi.
12. Nash, W.A., Strength of Materials, Mcgraw hills, New Delhi.
13. Chandramouli, Strength of Materials, PHI learning
14. Dongre A.P., Strength of Materials, Scitech, Chennai
15. Negi L. S ,Strength of Materials, McGraw Hill Professional.

List of Practicals
1. Study of Universal testing Machine
2. To determine the Compressive and Tensile Strength of Materials.
3. To determine the Brinell Hardness of Materials.
4. To determine the Rockwell Hardness of Materials
5. To determine the Toughness of the materials.
6. To determine the stiffness of the spring.

Unit I Compass & Plane Table Surveying
Compass Surveying: Basic principles - Types - Bearing - Systems and conversions- Sources of errors - Local attraction - Magnetic declination-Dip-Traversing - Plotting - Adjustment of closing error – applications.
Plane Table Surveying: Plane table and its accessories - Merits and demerits - Radiation - Intersection - Resection – Traversing- sources of errors – applications. Computation of Area & Volumes

Unit II Levelling & its applications, Trigonometric levelling
Levelling: Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of levelling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling – Sources of Errors in levelling- Precise levelling - Types of instruments - Adjustments - Field procedure
Levelling applications: Longitudinal and Cross-section-Plotting - Contouring - Methods - Characteristics and uses of contours – Plotting – Methods of interpolating contours – Computations of cross sectional areas and volumes - Earthwork calculations - Capacity of reservoirs - Mass haul diagrams
Trigonometric leveling: single and reciprocal observations, traversing – Gale's table.

Unit III Theodolite & Total Station Surveying
Theodolite: Types, Description, Horizontal and vertical angles, Temporary and permanent adjustments, Heights and distances, Tangential and Stadia Tacheometry – Subtense method - Stadia constants - Anallactic lens.
Total Station Surveying: Basic Principle – Classifications -Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments. Modern positioning systems – Traversing and Trilateration.

Unit IV Control Surveying & Survey adjustment
Control Surveying: Horizontal and vertical control, Methods, specifications, triangulation, baseline, instruments and accessories, corrections, satellite stations, reduction to centre,
Survey adjustment: Errors Sources- precautions and corrections – classification of errors – true and most probable values- weighed observations, method of equal shifts, principle of least squares, normal equation, correlates, level nets, adjustment of simple triangulation networks.

Unit V Remote Sensing, GIS & GPS:

Remote Sensing & GIS: Principle, components, classification, remote sensing data acquisition process, different types of remote sensing satellite imagery with special relevance to Indian Remote Sensing Satellites (IRS) and applications.

GIS: Definition, components and advantages.

GPS: Introduction & components of GPS, Space segment, control segment and user segment, Elements of Satellite based surveys-Map datums, GPS receivers, GPS observation methods and their advantages over conventional methods.

References
1. B.C Punmia , Surveying Vol-II & III ,Laxmi Publication.
2. S.K. Duggal, Surveying Vol. II McGraw Hill Publishing Company Ltd.
3. Saikia MD, Das BM, Das MM, Surveying, McGraw hill
4. T.P. Kanetkar and S.V. Kulkarini Surveying and Leveling-Part-I & II , Pune
1. Vidyarthi Griha Prakashan, Pune.
5. Gopi A, Satikumar R- Advance surveying, Pearson
6. Remote Sensing and image interpretation by Lillesand T.M. and Kiefer R.W.
7. R.Agor, Advance Surveying ,Khanna Publisher
8. Chandra AM, Higher Surveying, New Age International, new Dwlhi
9. Bhavikatti SS, Surveying and Levelling Vol. II, I.K International
10. Venkatramaiah, Surveying, University Press, Mumbai
11. Bhatta Basudeb, , Remote Sensing and GIS, Oxford, New Delhi.

List of Practical
1. Measurement of Distance by Chaining and Ranging.
2. Locating Various Objects by Chain or Cross-Staff Surveying.
3. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
4. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.
5. Fixing bench mark with respect to temporary bench mark with dumpy level by fly levelling and check levelling.
6. Measurement of vertical angles with theodolite.
7. Determination of horizontal distance between two inaccessible points with theodolite.
8. Locating given building by theodolite traversing.

Unit I Introduction and Physical Geology

Introduction and Physical Geology- Objects and scope of geology. The crust and the interior of the earth, origin and age of the earth, sub-aerial land, sub-terrain weathering, denudation and deposition, wind, river, glacial and marine erosion, volcanoes, soil, formation of soil profile ,geological classification of soil and concept of earthquake, Plate-tectonics.

Unit II Mineralogy and Crystallography

Mineralogy and Crystallography- Fundamentals of mineralogy, study of common rock forming minerals, ores and minerals of economic importance to civil engineering. elements of crystallography and introduction to crystal systems.

Unit III Petrology

Petrology: Composition of earth's crust, study of igneous, sedimentary and Metamorphic rocks and their formation, characteristics classification, Rocks of civil engineering importance.

Geology of India: Physical features of India, Brief geological history of India, occurrence of important ores and minerals in India.

Unit IV Structural Geology

Structural Geology: Structures related to rocks, Dip, Strike and outcrops, Classification and detailed studies of geological structures i.e. folds, Faults, Joints, Unconformity and their importance in Civil Engineering.

Applied Geology: Introduction to applied geology and its use in civil engineering, properties of rocks, selection of sites for roads, bridges, dams, reservoirs and tunnels. Prevention of Engineering structures from seismic shocks, stability of hill sides, water bearing strata, artesian wells, Use of remote-sensing techniques in selection of above sites.

Unit V Application of Geological Investigations

Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings – Hydro-geological investigations and mining - Coastal protection structures. Investigation of Landslides, causes and mitigation.

Reference

1. Parbin Singh – "Engineering and General Geology"
2. S.K. Garg – " A text Book of Physical and Engineering Geology"
3. Varghese P.C., Engineering Geology for civil engineering, PHI
4. A. Parthasarthy- Engineering Geology, Wiley
5. Duggal, Pandey and Rawal- Engineering Geology, Macgra Hill
6. Duggal SK, pandey, Rawal, Engineering Geology, Mc Graw Hills
7. Kamith Vasudev, Engineering Geology, University Press
8. Alam MM. Engineering Geology and Geo- Engineering, Axiom Books

9. Gangopadhay S., Engineering Geology, Oxford
10. Gulati ; Geotechnical Engineering; TMH
11. P.K. Mukerjee – " A text Book of Geology"
12. Das and Sobhan, Principles of Geo-technical Engineering, Cengage Learning
12. Kueffer and Lillesand, Remote sensing and Image interpretation Understanding GIS, ISRI Publications.
14. Valdiya K. S., Environmental Geology in Indian Context –Tata Mc Graw Hill

List of Experiment
1. Identification of simple rock-forming minerals
2. Identification of important ores.
3. Identification of rocks.
4. Simple map Exercises.
5. Field Visit / Geological Excursion.

Unit I Introduction:
Introduction: Communication, definition and role of communication,

Unit II Process of communication
Process of communication, Importance of professional communication,

Unit III Levels of communication
Levels of communication, Types of communication, Challenges in communication.

Unit IV Non –verbal communication
Non –verbal communication – Body language, personal appearance, posture, gesture and hand movement, eye contact, facial expressions,

Unit V Paralinguistic features
paralinguistic features - proxemics, haptics, chronemics. Oral presentations. Case studies.

Books recommended:
1. Business Communication, Mc Graw Hill Education, Matthukutty M. Monippally.
2. Effective Business Communication , Mc Graw Hill Education, Neera Jain, Shoma Mukherji.
3. Technical Communication , Cengage , P. Subba Rao, B. Anita Kumar, C. Hima Bindu.
4. Business Correspondence & Report Writing , Mc graw Hills. , R.C. Sharma & Krishna Mohan .
5. Technical Communication – Principles & Practice , Oxford , Meenakshi Raman.
6. Business Communication- Mc graw Hills , Peter Cordom.
7. Communication Skills , Oxford , Sanjay Kumar & Pushpa TMH.
8. Effective Technical Communication , M. Ashraf Rizvi ,Mc Graw Hill Education.

Language Lab II

1. Module 1 : Reading comprehension
2. Module 2 : Role plays
3. Module 3 : Debate
4. Module 4 : Group discussion
5. Module 5 : Resume writing
6. Module 6 : Interview skills
7. Module 7 : Body language
8. Module 8 : Oral presentations

Unit I Introduction & Classification

properties, grades, advantage & disadvantages of concrete, Ingredients of concrete, types of cement, aggregates, water, admixtures, Inspection & testing of materials as per Indian Standard Specifications.

Unit II Properties of Fresh and Hardened Concrete

Introduction, Workability, Testing of concrete, Factors affecting, Rheology of concrete, Compressive & Tensile strength, Stress and strain characteristics, Shrinkage and temperature effects. Creep of concrete, Permeability, durability, thermal properties & micro-cracking of concrete.

Unit III Design of Concrete Mix

Various classical methods of concrete mix design, I.S. code method, basic considerations and factors influencing the choice of mix design, acceptance criteria for concrete, concrete mixes with Surkhi and other Pozzolanic materials, design of plastic concrete mix, computer aided design of concrete mix.

Unit IV Production and Quality Control of Concrete

Production of crushed stone aggregate, batching equipments for production and concreting, curing at different temperatures, Concreting underwater, hot & cold weather condition, statistical quality control, field control, non-destructive testing, repair technology for concrete structures, Inspection & Testing of Concrete.

Unit V Special Concretes

Light weight concrete, Ready mix concrete, Vacuum concrete, Ferrocement, Fiber reinforced concrete, Polymer concrete composites, Shotcrete, Guniting, Rubble concrete, Resin concrete, Prestressed concrete, Heat resistant concrete, Mass concrete, Temperature control of mass concrete.

References
1. *M S Shetty, Concrete Technology. S. Chand Technical*
2. *M L Gambhir,Concrete Technology Theory and Practice, McGraw-Hill Education.*
3. *J Thomas, Concrete Technology, Cengage Learning.*
4. *AM Neville, Concrete Technology, Pearson Education India.*
5. *Santhakumar ,Concrete Technology., Oxford University Press*
6. *SS Bhavikatti, Concrete Technology, IK International*
7. *Sinha, S N Reinforced Concrete Design, Tata McGraw Hill Education Private Limited.*
8. *Rai Mohan, M.P. Jai Singh, Advances in Building Materials & Construction.*
9. *Jackson N, R K Dhir, Civil Engineering materials, Macmillan*

List Of Experiment:
  A) Testing of materials for Concrete:
  1. To determine the normal consistency of cement.
  2. To determine the initial and final setting time of cement.
  3. To determine compressive strength of cement.
  4. To determine the soundness of cement.
  5. To determine the fineness modulus of fine aggregate & coarse aggregate.
  6. To determine impact value for coarse aggregate.
  7. Water absorption test of aggregate.
  8. To determine crushing strength of aggregate.
  9. To determine flakiness & elongation index of aggregate.

  B) **Testing of Concrete:**
  1. Mix design of concrete by IS code Method.
  2. slump test for determining workability of concrete.
  3. Determination of workability by compacting factor apparatus.
  4. Determination of workability by vee bee consistometer.
  5. Compressing strength of concrete cube.
  6. To determine the flexure strength of concrete.
  7. Demonstration of non destructive testing using Rebound hammer & Ultrasonic Pulse Velocity.

IS CODES:
  1. *New Building Materials* B.M.T.P.C., New Delhi
  2. *Hand books on Materials & Technology*. BMTPC & HUDCO

Unit I Water Resources
Estimation of ground and surface water resources. Quality of water from different sources, demand & quantity of water, fire demand, water requirement for various uses, fluctuations in demand, forecast of population.

Unit II Impurities of water
Impurities of water and their significance, water-borne diseases, physical, chemical and bacteriological analysis of water, water standards for different uses. Intake structure, conveyance of water, pipe materials, pumps - operation & pumping stations.

Unit III Layout of Water supply schemes
Layout and hydraulics of different distribution systems, pipe fittings, valves and appurtenances, analysis of distribution system.Hardy cross method, leak detection, maintenance of distribution systems, service reservoir capacity and height of reservoir.

Unit IV Sewerage schemes
Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.

Unit V Characteristics and analysis of waste water
Characteristics and analysis of waste water, recycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self-purification capacity of stream, Oxygen sag analysis.

References:
1. Water Supply Engineering- B. C. Punmia - Laxmi Publications (P) Ltd. New Delhi
2. Water Supply & Sanitary Engineering- G.S. Birdi - Dhanpat Rai Publications (P) Ltd. New Delhi
3. Water & Waste Water Technology - Mark J.Hammer-Prentice-Hall of India, New Delhi.
4. Environmental Engineering-H. S. Peavy &D. R. Rowe- Mc-Graw Hill Book Company, New Delhi.

List of Experiments
1. To study the various standards for water and waste water.
2. To study of sampling techniques for water and waste water.
3. Measurement of turbidity of water and waste water.
4. To deter mine the coagulant dose required to treat the given turbid water sample
5. To deter mine the concentration of chlorides in a given water samples
6. Determination of hardness of the given sample
7. Determination of residual chlorine
8. Determination of Alkalinity in a water samples
9. Determination of Acidity in a water samples
10. Determination of Dissolved Oxygen (DO) in the water sample.

Unit I Indeterminate Structures:
Static and Kinematics indeterminacy, Degree of static and kinematic indeterminacies for plane frames - analysis of indeterminate pin-jointed frames - rigid frames (Degree of statical indeterminacy up to two) Method of least work and consistent deformation

Unit II Slope deflection method
Continuous beams and rigid frames (with and without sway), Symmetry and anti-symmetry, Simplification for hinged end, Support displacements

Unit III Moment Distribution Method
Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway

Unit IV Arches
Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

Unit V Moving Loads & Influence Lines
Influence lines for reactions in statically determinate structures – influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads. Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames – Indirect model analysis for influence lines of indeterminate structures.

Reference
   1. Rammamurtham, Theory of Structures, Dhanpat Rai .
   2. Bhavikatti S.S. Analysis of Structures (I&II) Vikas Publication
   3. B C Punmia, Theory of Structures, Firewall Media.
   4. A Kassimali, Structural Analysis, Cengage Learning.
   5. A Ghali, A Neville, T G Brown, Structural Analysis: CRC Press.
   6. Hibbler, Structure Analysis -1, Pearson Education India
   7. C S Reddy, Basic Structural Analysis, Tata McGraw Hill Publishing Company.
   8. Pandit and Gupta, Theory of Structures – I, McGraw Hills
   9. West HH, Fundamental of Structural Analysis, Wiley India
   10. Das MM, Structural Analysis, PHI
   11. Thandavamurthy TS, Structural Analysis, Oxford
   12. Muthuku, Azmi I, Basic Structural Analysis, IK International Publisher
   13. C KWang, Intermediate Structural Analysis, McGraw Hill
   14. J Kinney Sterling, Indeterminate structural Analysis, Addison-Wesley
   15. RR Mamuther S Theoty of Structures Dhanpat Rai
   16. Jain O.P.-Jain B.K. Theory& Analysis of Structures (I&II) Nem Chand

List of Experiments

1. To determine the deflection in simply supported beam & verify it from theoretical values.
2. To determine the deflection in cantilever beam verify it from theoretical values.
3. To determine deflection in portal frame.
4. To determine deflection in three hinged arch.
5. To determine deflection in two hinged arch.
6. To draw the ILD for various parameters in simply supported beam.
7. To draw the ILD for various parameters in cantilever beam.
8. To draw the ILD for various parameters in three hinged arch.
9. To draw the ILD for various parameters in two hinged arch.
10. To draw the ILD for various parameters in portal frame.
11. To verify the Maxwell reciprocal theorem.

Unit I Column & Struts
Theory of columns, Slenderness ratio**,** Direct and bending stresses in short columns, Kern of a section. Buckling and stability, Euler's buckling/crippling load for columns with different end conditions, Rankin's formula, Eccentric loads and the Secant formula-Imperfections in columns.

Unit II Unsymmetrical Bending
Principal moment of Inertia, Product of Inertia, Bending of a beam in a plane which is not a plane of, symmetry. Shear center; Curved beams: Pure bending of curved beams of rectangular, circular and trapezoidal sections, Stress distribution and position of neutral axis.

Unit III Spring & Pressure Vessels
Spring: Close coiled and open coiled helical springs, stresses in the spring material, stiffness of springs, springs subjected to axial loads and couples, grouping of springs.
Pressure Vessels: Thin & thick Pressure Vessels, cylinders and spheres, Stress due to internal pressure, Change in diameter and volume.

Unit IV Deflection & Theories of failure
Deflection: Determination of Slope and Deflection in beams, frames and trusses by Strain Energy Method, Castiglione's Method, and Unit Load Method.
Theories of failure: Maximum principal stress theory, Maximum shear stress theory, Maximum normal strain theory, Total strain energy theory, Shear strain energy theory.

Unit V Fixed & Continuous Beams
Fixed Beams: Introduction to fixed beam – sagging & hogging bending moments – Determination of fixing moments by area moment method – standard cases – Fixed beams subjected to symmetrical & unsymmetrical concentrated loads and UDL – SF & BM diagrams for supports at the same level & effect of settlement of supports.
Continuous Beams: Introduction – Definition of indeterminate structures – General methods of analysis of indeterminate structures – Clapeyron's theorem of three moments - statement – Application of Clapeyron's theorem of three moments for the following cases – Problems on two span – simply supported ends – one end fixed and the other simply supported – simply supported with one end overhanging – Propped cantilever – sketching of SFD & BMD for the above cases.

Reference
1. Punmia B.C., Mechanics of Materials, , Laxmi Publications (P) Ltd.
2. S.S Bhavikaati, Strength of Materials, Vikas Publisher, new Delhi
3. Rajput R. K., Strength of Materials, S. Chand.
4. S. Ramamrutham, R. Narayanan, Strength of Materials, Dhanpat Rai Publications.
5. R. Subramaniam, Strength of Materials, Oxford University Press.
6. Sadhu Singh , Strength of Material , Khanna Publishers
7. Mubeen A , Mechanics of solids , Pearsons
8. D.S Prakash Rao, Strength of Material , University Press , Hyderabad
9. Debrath Nag, Strength of Material , Wiley
10. Jindal , Strength of Material , Pearsons.
11. Bansal R.K, Strength of Materials, Laxmi Publisher, New Delhi.
12. Nash, W.A., Strength of Materials, Mcgraw hills, New Delhi.

Unit I Fundamental Fluid Properties

Engineering units of measurement, mass, density, specific weight, specific volume, specific gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapour pressure.

Fluid Statics: Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on Gravity Dams and Tainter Gates), buoyant force, stability of floating and submerged bodies, relative equilibrium.

Unit II Kinematics and Dynamics of Flow

Introduction to basic lines - Streamlines, Streaklines, Pathlines. Various types of fluid flow. Velocity potential function, Stream function, Vorticity and Circulation, Flow net. Basic equations of fluid flow like Energy equation, continuity equation and momentum equation. Bernoulli's equation and its applications.

Unit III Laminar Flow and Turbulent Flow

Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number. Velocity distribution, Laminar and turbulent boundary layers and laminar sublayer, boundary layer concept, aging of pipes. Losses due to sudden expansion and contraction, losses in pipe fittings andvalves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes. Concept of Water Hammer transmission of power.

Unit IV Open channels

Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections. Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing.

Unit V

Forces on immersed bodies: Types of drag, drag on a sphere, a flat plate, a cylinder and anaerofoil development of lift, lifting vanes, Magnus effect.

Fluid Machines: Turbines: Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton-wheel turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & setting, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation.

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1. Modi & Seth , Hydraulics & Fluid Mechanics ,Rajson's Publication Pvt Ltd
2. A K Jain, Fluid Mechanics: Including Hydraulic Machines, Khanna Publisher.
3. Subramanyam,Fluid Mechanics & hydraulic machines - - Tata McGraw-Hill
4. R.J.Garde , Engg Fluid Mechanics , SCITECH Publishers Pvt Ltd
5. Merle C. Potter, David C. Wiggert, Bassam H. Ramadan, Mechanics of Fluid, Cengage Learning.
6. John F. Douglas, J.M. Gasoriek, John Swaffield, Lynne Jack, Fluid Mechanics, Pearson Education.
7. K.R. Arora, Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers Distributors..
8. Balchandran, Engg Fluid Mechanics, PHI Learning Pvt Ltd
9. Ojha & Chandramouli , Fluid Mechanics & Machinery , Oxford University Press Fox, Mc Donald, Pritchard Fluid Mechanicas– Wiley India, New Delhi.
10. Narsimhan S Fluid Mechanics –. – University Press, Mumbai.
11. Ratnam Chanamala kothapalli A.V. Fluid Mechanics & Machniery — I.K. International, New Delhi.
12. Flow Through Open Channel -- Tata McGraw-Hill
13. S K Som, G Biswas, Suman Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education.

List of Experiments:-
1. To Verify Bernoull's equation.
2. To verify Impulse Imomentum equation.
3. To find out the terminal velocity of a spherical body in water.
4. Calibration and study of Venturimeter.
5. Determination of Cc, Cv, Cd of Orifices
6. Draw characteristics Curves of Pelton Wheel Turbine.
7. Draw characteristics Curves of Francis Turbine.
8. Draw characteristics Curves of Kaplan Turbine.
9. Calibration of Nozzle meter and Mouth Piece
10. Reynolds experiment for demonstration of stream lines & turbulent flow
11. Determination of metacentric height
12. Determination of Friction Factor of a pipe
13. Determination of coefficient of discharge for a broad crested weir & to plot water surface profile over weir.

Unit I Functions of complex variables

Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for evaluation of real integrals.

Unit II Numerical Solution of Algebraic and Transcendental Equations

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III Interpolation, Numerical differentiation & Integration

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit IV Functions of Complex Variables

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V Transformation

Fourier Transform: Definition and properties of Fourier transform, Sine and Cosine transform.

Z-transform .Testing of Hypothesis :Students t-test, Fisher's z-test, Chi-Square Method

References:
1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley India.
2. B.S. Grewal: Higher Engineering Mathematics , Khanna Publication.
3. Engineering Mathematics By Samnta Pal and Bhutia, Oxford Publication
4. Ramana: Advance Engg. Mathematics, TMH New Delhi
5. Numerical Methods for Engineers by Steven C. Chapra, McGraw Hill Education
6. Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning Pvt. Ltd.
7. Numerical Methods By Shrimanta Pal, Oxford