



**DR. A P J ABDUL KALAM UNIVERSITY,  
INDORE**

## **SYLLABUS**

*of*

**BACHELOR OF ENGINEERING  
(First Year, 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 (First Year, Grading System)**

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**Unit 1: Diode and its Circuits:**

Introduction to Semiconductor theory: Classification of materials- Insulators, conductors and semiconductors and their Energy Bands, Types of semiconductors- Intrinsic, Extrinsic. PN Junction Diode: Biasing and operation of PN Diode, V-I characteristics, Limiting Values of PN Diode, Breakdown in PN Diode, Applications of PN Diode. Zener Diode: V-I Characteristics, Applications of Zener Diode. Rectifier Circuits: PN Diode as a Rectifier, Half Wave Rectifier, Full Wave Rectifier, Full Wave Bridge Rectifier, Clipping Circuits, Clamper Circuits.

**Unit 2: Number Systems:**

Introduction, Binary Number System, Octal Number System, Decimal Number System, Hexadecimal System, Conversions: Binary to Decimal conversion and vice-versa, Octal to Decimal Conversion and vice versa, Hexadecimal to Decimal Conversion and vice-versa, Binary to Hexadecimal Conversion and vice-versa, Octal to Decimal and vice-versa, Octal to Hexadecimal and vice versa. Complements: One's Complement, Two's Complement, Nine's Complement, Ten's Complement. Binary Arithmetic (addition, subtraction, multiplication, division), Octal Arithmetic, Hexadecimal Arithmetic, Signed Numbers, Floating Numbers, Codes.

**Unit 3: Boolean Algebra and Logic Gates:**

Introduction, Definitions, Principle of Duality, Basic Theorems, Applications of Boolean Algebra, Boolean Functions, Complement of Boolean Function. Logic Gates (Symbol, Truth Table, Logic Diagram): And, OR, NOT, NAND, NOR, XOR, XNOR. Universal Gates: NAND Gate and NOR Gate implementation, Realization of other Logic Operations using NAND/NOR. Buffer, Negative and Positive Logic, Mixed Logic.

**Unit 4: Signals:**

Introduction, Representation of Discrete-time Signals: Graphical Representation, Functional Representation, Tabular Representation, Sequence Representation. Elementary Signals: Unit Step Function, Unit Ramp Function, Unit Parabolic Function, Unit Impulse Function, Sinusoidal Signal, Real Exponential Signal, Complex Exponential Signal, Rectangular Pulse Function, Triangular Pulse Function, Signum Function, Sinc Function, Gaussian Function. Basic Operations on Signals: Time Shifting, Time Reversal, Amplitude Scaling, Time Scaling, Signal Addition, Signal Multiplication. Classification of Signals: Deterministic and Random Signals, Periodic and Non-periodic Signals, Energy and Power Signals, Causal and Non-causal Signals, Even and Odd Signals.

## **Unit 5: Communications Systems:**

Introduction to Communication Systems, Elements of Communication Systems: Transmitter, Channel, Receiver, Noise. IEEE Frequency Spectrum Used in Communication Systems: Frequency Bands, Units of Measurement and Abbreviations, Bandwidth and other Parameters, Spectrum Assignment and Regulation. Need of Modulation, Amplitude Modulation, Frequency Modulation, Communication Media and its Classification: Guided and Unguided Propagation.

### **References**

- [1] Hwei P. Hsu, Schaum's Outline of Signals and Systems, McGraw-Hill.
- [2] A. V. Oppenheim, A. S. Willsky, S Hamid Nawab, Signals and Systems, PHI.
- [3] A. Anand Kumar, Signals and Systems, PHI.
- [4] Basics of Electronics Engineering, Wiley India Pvt. Ltd.

### **List of Practicals:**

1. Study of different electronic components and instruments like resistor, capacitor, inductor, multimeter, power supply, and function generator.
2. Study of different parts of (CRO) cathode ray oscilloscope.
3. Study of P-N junction diode V-I characteristics.
4. Study of Zener diode V-I characteristics.
5. Study and Verify the truth table of Basic logic gates.
6. Study and Verify the truth table of Exclusive gates.
7. Study and Verify the truth table of Universal gates.
8. To verify the truth of half adder & full adder.
9. Study of Half wave rectifier.
10. Study of Full wave rectifier.

**Unit 1: Molecular Structure & Bonding:**

VSEPR Model, Valance-Bond Theory, Molecular Orbital Theory, Molecular Orbital of Polyatomic Molecules. Electrochemistry: Arrhenius theory of electrolytic dissociation, Transport Number, Kohlrausch's Law, Solubility Product, Redox Reaction, Electrochemical & Concentration Cells.

**Unit 2: Chemical & Phase Equilibria:**

Phase Diagram for single component system (Water), Phase diagram for Binary Eutectic System (Copper-Silver), Corrosion of metals in acids, Corrosion by Oxygen, Corrosion by Metal Contact. Reaction Dynamics: Order, Molecularity, Rate Law, Methods of determining order of reaction (1st & 2nd Order).

**Unit 3: Polymers & Polymerization:**

Monomers, Polymers, their classification, thermoplastics & thermosetting with examples, Bio-Polymerization, Bio-Degradable Polymerization, Preparation, Properties & Technical Applications of PVC, PVA, Teflon, Nylon6, & Nylon6:6, Polyester, Phenol-Formaldehyde, Urea- Formaldehyde, Natural & Synthetic Rubber, Vulcanization of Rubber.

**Unit 4: Photochemistry:**

Photo-excitation of organic molecules, Jablonski Diagram, Laws of Photochemistry and quantum yield, some examples of photochemical reactions, chemistry of vision and other applications of photochemistry

**Unit 5: Thermochemistry:**

Fundamental concept of first law, work, heat, energy and enthalpies, relation between  $C_v$  &  $C_p$ . Second Law: Entropy, Free Energy, (The Helmholtz and Gibbs) and chemical potential. Numerical problems based on water analysis and water softening process. Determination of hardness by complexometry, Alkalinity and its determination and their relevant numerical problems, testing of lubricating oils, viscosity and viscosity index, flash & fire point, cloud & pour point, Aniline Point, Carbon Residue, Steam-emulsion number, Neutralization number, Saponification number.

## References

- [1] Lee, J. D, Author, Concise Inorganic Chemistry, Oxford University Press
- [2] Alberty, R. A., Physical Chemistry, John Wiley and Sons
- [3] N. Krishnamurthy, P. Vallinayagam, Engineering Chemistry, PHI Learning Pvt. Ltd.
- [4] Kuriacose J.C. and Rajaram J., Chemistry in Engineering and Technology, Tata McGraw Hill.

## List of Practicals:

1. To prepare urea formaldehyde resin.
2. Determine the percentage of moisture content in the given coal sample.
3. Determine the change of viscosity of a given lubricating oil with Change in temperature by Redwood viscometer No.1
4. Determine the flash fire point given lubricating oil by Able's closed cup apparatus.
5. To determine the aniline mixed aniline point of petroleum products and hydrocarbon solvents.
6. Determination of cloud point and pour point of crude oil.
7. To determine flash point and fire point of the given lubricating oil using Pensky Marten's apparatus.
8. Determine the type extent of alkalinity of given sample of water by N/20 HCl (hydrochloric acid).
9. To determine the total hardness of given sample by complexometric titration.
10. To determine the strength (in g/L) of the given unknown strength sodium thiosulphate (hypo) solution by a known strength (5.00 g/L) N/40 standard copper sulfate solution.
11. To determine the strength (in g/L) of ferrous ammonium sulfate ( $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ ) by titrating it against standard (1.0 g/L) potassium dichromate ( $\text{K}_2\text{Cr}_2\text{O}_7$ ) solution.
12. Determination of iron content in an iron ore by titrating it against standard N/20  $\text{K}_2\text{Cr}_2\text{O}_7$  solution using potassium ferricyanide  $[\text{K}_3\text{Fe}(\text{CN})_6] \cdot \text{H}_2\text{SO}_4$ ,  $\text{FeSO}_4$  as an external indicator.

**Unit-I:**

Grammar – Applied Grammar and usage, Parts of Speech, Articles, Tenses, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure, Punctuations.

**Unit-II:**

Vocabulary Development – Using Dictionaries and Thesaurus, Synonyms, Antonyms, Homophones, One Word Substitution, Affixation: Prefixes & Suffixes, Derivation from root words, Jargon, Scientific Jargon.

**Unit-III:**

Developing Reading Skills – Reading Comprehension, Process, Active & Passive Reading, Reading Speed Strategies, Benefits of effective reading, note-making, note-taking, Reading comprehension of technical material and SQ3R reading technique

**Unit-IV:**

Developing Writing Skills – Planning, Drafting & Editing, Writing with style, right-words selection, writing effective sentences, developing logical paragraphs, art of condensation, précis, essay, technical definition and technical description

**Unit-V:**

Business Correspondence – Business Letters, Parts & Layouts of Business Letters, Writing Resume/Application Calling/ Sending Quotations/ Orders/ Complaints and E-mails

**Text Book:**

**Sanyukta Shah Neb, English, Tech-Max Publication, Pune.**

**References:**

- (1) A.J. Thomson and A.V. Martinet, A Practical English Grammar, Oxford IBH Pub.
- (2) Sanjay Kumarm Pushp Lata, English for Effective Communication, Oxford.

**Topics for the Laboratory:**

1. Basic Grammar & Vocabulary Practice (Synonyms, Antonyms, Analogies, Sentence Completion, Correctly Spelt Words, Idioms, Proverbs, Common Errors.
2. Phonetic Symbols, Pronunciations
3. Listening Skills – Including Listening Comprehension
4. Extempore and JAM (Just a Minute Session)
5. Role Play – I
6. Role play – II
7. Body Language
8. Debate
9. Oral Presentation – Preparation & Delivery using Audio – Visual Aids with stress on body language and voice modulations.

**Unit 1: Introduction to Engineering Mechanics:**

Definitions and Classification of Engineering Mechanics, Statics: fundamental laws of statics. Different system of forces. Dynamics: Equation of motion, Kinematics and Kinetics.

**Unit 2: Resolution and Composition of Forces:**

Force, Pressure and Stress, Free Body Diagram , Bow's Notation, Characteristics and Effects of a Force, System of Forces, Resolution of a Force, Composition of Forces, Resultant/ Equilibrant Force, Law of Parallelogram of Forces, Law of Triangle of Forces, Polygon Law of Forces, Lami's Theorem, Equilibrium of a Body Under Two / Three/More Than Three Forces. Law of Superposition of Forces.

**Unit 3: Coplanar Non Concurrent Forces:**

Moment of a Force, Principle of Moments/ Varignon's Theorem, Parallel Forces : Resultant of Parallel Forces, Couple: Moment of a Couple, Resolution of Force into a Couple. Coplanar Non Concurrent Forces: Resultant of Coplanar Non Con-Current Forces.

**Unit 4: Beams and Trusses**

Types of Beams: Simply Supported Beam, Overhanging Beam, Cantilever Beam. Types of Supports of a Beam or Frame. Load on the Beam or Frame: Different Types of Loading. Support Reaction of a Beam or Frame: Analytical Method. Truss Analysis: Method of Joints, Sections and Graphical methods.

**Unit 5: Centre of Gravity and Moment of Inertia**

Centroid, Centre of Gravity, Determination of Centroid of Simple Figures, Centroid of Composite Sections. Centre of Gravity of Solid Bodies. Area Moment of Inertia: Basic Concept of Inertia, Definition of Moment of Inertia, Theorems of Moment of Inertia, Radius of Gyration, Polar Moment of Inertia of Standard Sections, Moment of Inertia of Composite Section, Principal Moment of Inertia , Mass Moment of Inertia.

**Evaluation:**

Evaluation will be continuous an integral part of the class as well through external assessment.

**References**

- [1] Engineering Mechanics by I. H. Shames.
- [2] Engineering Mechanics by R. K. Rajput.
- [3] Applied Mechanics by I. B. Prasad.
- [4] Engineering Mechanics by H. I. Shah.
- [5] Engineering Mechanics by Gujral.

**Unit 1: Projections of Points, Straight Lines and Planes:**

Types and use of Lines, Lettering & Dimensioning, Various types of projection System, Projection of Points in different quadrants, projections of lines and planes for parallel, perpendicular & inclined to horizontal and vertical reference planes.

**Unit 2: Projections Solids and Development of Surfaces:**

Cylinder, Cone, Pyramid, & Sphere with axes parallel, perpendicular & inclined to both reference planes. Development of surfaces of various solids. Sections of Solids Section planes, Sectional views, True shape of Sections for Prism, Cylinder, Pyramid, and Cone & Sphere. Orthographic Projections of Simple objects and Machine Components like Bolts and Screw.

**Unit 3: Isometric projections:**

Isometric scales, isometric views of Simple objects.

**Unit 4: Introduction to computer-aided drafting (CAD):**

Cartesian and Polar Co-ordinate system, Absolute and Relative Co-ordinates systems; Basic drawing commands: Line, Point, Rectangle, Polygon, Circle, Arc, Ellipse, Polyline; Basic editing Commands: Basic Object Selection Methods, Window and Crossing Window, Erase, Move, Copy, Offset, Fillet, Chamfer, Trim, Extend, Mirror. Display Commands: Zoom, Pan, Redraw, and Regenerate; Simple dimensioning and text, Simple exercises.

**Unit 5: Solid modelling:**

Basics of 2-D solid modelling.

**Laboratory**

Drawing for topics covered in the theory as suggested by the course coordinator.

**Evaluation**

Evaluation will be continuous an integral part of the class as well through external assessment.

**References**

- [1] N.D. Bhatt and V.M.Panchal, Engineering Drawing Plane and Solid Geometry, Charotar Publishing House.
- [2] James leach, AutoCAD 2015 Instructor, SDC Publications.

**List of Practicals:**

- [1] Sketching and drawing of projection of points.
- [2] Sketching and drawing of projection Straight line and planes.
- [3] Draw projection of solids on a drawing sheet.
- [4] Draw development of surfaces on a drawing.
- [5] To learn isometric scale in a lab.
- [6] Draw isometric projectins and isometric view of simple object.
- [7] To learn true shape of sections for prism,cylinder,pyramid and cone.
- [8] Draw orthographic projection of simple object.
- [9] Draw orthographic projection of machine component like bolts and screw.
- [10] Draw ellips, hyperbola and parabola on sheet.

**Unit 1: Introduction:**

Domestic and Global Environmental concerns, principles of sustainable development, Sustainable agriculture, organic farming, bio-fuels, Threats for sustainability  
Energy- Sources of Energy: Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.

**Unit 2: Environmental Ethics & Legislations:**

Enforcement of Environment laws in India – The water act, The Air (Prevention and Control of Pollution) Act, 1981, The Environment (Protection) Act, 1986, Environmental Auditing

**Unit 3: Environmental Pollution:**

Air Pollution – sources, types of air pollutants, National Ambient Air Quality Standards, Controlling Air Pollution. Water pollution – sources, types of water pollutants, water quality indicators, and water quality standards. Soil Pollution: Types of soil pollutants: industrial wastes, pesticides, fertilizers and manures, salination of soil, Controlling Soil Pollution.

**Unit 4: Environmental Challenges:**

Local Challenges - Solid Waste – Impact of solid waste on natural resources, Deforestation; Global Challenges - climate change and global warming, Kyoto Protocol, Greenhouse Gases, Ways to reduce Greenhouse gases emissions, Carbon Footprint, ways to reduce carbon footprint, Carbon Trading.

**Unit 5: Sustainable habitat, industrialization and urbanization:**

Concept of Green Building, Volatile Organic Compounds (VOC), GRIHA Rating, LEED Rating, HVAC, Hybrid Car Technology, Industrial ecology, India's renewable energy capacity. Green Technology & Green Business: Green Business, Green Computing, E-waste management.

**References**

- [1] R. Rajagopalan, Environmental Studies, Oxford IBH Pub, 2011.
- [2] Kogent Learning Solutions Inc., Energy, Environment, Ecology and Society, Dreamtech, 2012.
- [3] Rag, R. L, Ramesh, Lekshmi Dinachandran, Introduction to sustainable engineering

**Unit 1:**

Overview of Civil Engineering, types of Infrastructures, Effect of infrastructure facilities on economy and environment, Role of Civil Engineers in the infrastructural Development Introduction to sub-domains of Civil Engineering, Size of Infrastructure Industry, emerging trends in infra spending through public and public-private partnership (PPP), talent shortage, and global trends in workforce mobility and skill- demands.

**Unit 2:**

Stages in the life of construction: Design, Construction, Maintenance, Repair, Demolition/Recycling; an overview of Indian Standards, units and conversion factors for Lengths, Areas, Volumes and Weights; Opportunities and challenge of India's Infrastructure, Interdisciplinary nature of Civil Engineering Projects.

**Unit 3:**

Roads: Types of Roads, Nagpur Road Plan, Components of Road and their function; Bridges: Important parts of bridges, classification of bridges; Types of Dams.

**Unit 4:**

Properties and classification of common building materials – Stones, Bricks, Sand, Limes, Cement, Mortar, Concrete, Steel.

**Unit 5:**

Overview of Indian Road Congress, National Highway Authority of India (NHAI) and American Society of Civil Engineers (ASCE), Emerging areas and new technologies in the field of civil engineering.

**References**

- [1] Elements of Civil Engineering by MD Saikia, B Mohan Das, MM Das, PHI Learning Private Limited, 2015
- [2] Prakash M.N. Shesha, Ganesh B., A Textbook on Elements of Civil Engineering, PHI Learning Pvt. Ltd. Study material provided by the instructor

**Unit 1:**

Basic definitions of terms related to Thermodynamics, First and Second law of Thermodynamics, Properties of Steam, Introduction to Boilers, Terminology of IC Engines, Two and Four Stroke Petrol and Diesel Cycle.

**Unit 2:**

Introduction to mechanical properties, basic manufacturing processes, pattern, type and its use in metal casting, Introduction of welding, brazing and soldering processes

**Unit 3:**

Case study on any topic from Manufacturing Engineering Magazine Published by Society of Manufacturing Engineers (USA), Machinist Magazine, Technorama published by Institution of Engineers (India) and Manufacturing Today and any other magazine related to mechanical engineering.

**Unit 4:**

Overview of American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Society of Automotive Engineers, American Society of Mechanical Engineers (ASME); Indian Society of Mechanical Engineers (ISME) etc.

**Unit 5:**

Emerging areas and new technologies in the field of mechanical engineering (3D Printing)

**References**

- [1] Jonathan Wickert, Kemper Lewis, An Introduction to Mechanical Engineering, CENGAGE Learning. Michael Clifford, Kathy Simmons, Philip Shipway, An Introduction to Mechanical Engineering: Part 1 and Part 2, Taylor and Francis

**Unit 1: Optics:**

Interference, fresnel's biprism, Interference in thin film (due to reflected and transmitted light), thin film interference, Newton Ring Experiment and its application. Diffraction: types of diffraction, single slit, n-slit diffraction (diffraction grating), Resolving power of grating, Polarization.

**Unit 2: Quantum Mechanics:**

Group and particle velocity & their relationship. Uncertainty principle with elementary proof and their applications. Compton scattering, wave function and its properties, energy and momentum operators, time dependent and time independent Schrödinger wave equation. Particle in a box.

**Unit 3: Nuclear Physics:**

Nuclear composition, mass defect, binding energy, nuclear force, liquid drop model (semi empirical mass formula). Linear Particle Accelerator. Geiger -Muller Counter.

**Unit 4: Semiconductors:**

Crystalline and Amorphous solids, Band theory of solids, mobility and carrier concentrations, properties of P-N junction, Energy bands, Hall effect, V-I characteristics of photodiode, Zener diode and photovoltaic cell.

**Unit 5: Lasers and Fibre Optics:**

Laser: Introduction, characteristics and applications of laser. Stimulated and spontaneous processes, Einstein's A and B coefficients. Concepts of population inversion and metastable level. Laser component: Active medium, optical resonators and pumping. Principles and working of various lasers: Ruby, Nd:YAG and He-Ne.

Fiber Optics: Introduction, advantages and application of optical fiber. Light guidance mechanism, types of fibre, acceptance angle and cone, numerical aperture and V-Number. Fibre dispersion and losses and block diagram of fibre optic communication system.

**Laboratory**

Experiments as suggested by the course coordinator from the list as enclosed.

**Evaluation**

Evaluation will be continuous an integral part of the class as well through external assessment.

## References

- [1] A Bezier, Concepts of Modern Physics, McGraw Hills
- [2] Ghatak, Optics, McGraw Hills

## List of practicals:

1. To draw a V-I Characteristics of PN Diode.
2. To draw a V-I Characteristics of Zener Diode.
3. To draw a V-I Characteristics of LED Diode.
4. To Study of Solar cell.
5. Draw a Characteristics Curve of NPN transistor in CE mode.
6. Draw a Characteristics Curve of NPN transistor in CB mode.
7. Draw a Characteristics Curve of PNP transistor in CE mode.
8. Draw a Characteristics Curve of PNP transistor in CB mode.
9. Determination of wavelength of He-Ne laser with the help of diffraction grating.
10. To plot the Curve between reverse saturation current and  $10^3/T$  and Find out the approximate value of energy band gap between of P-N junction Diode
11. To study of G-M Counter.
12. To determine the specific rotation of sugar solution using Lorentz half shade polarimeter.
13. To study of Hall Effect.
14. To determine the radius of plan-convex lance with the help of N-R method.
15. Determination of wavelength of Na lamp with the help of diffraction grating using spectrometer.
16. To determine the Resolving power of Telescope.
17. To determine the wavelength of Na light by Michelson's Interferometer.

**Unit 1:**

An overview of electrical engineering, generation, transmission and distribution, distributed generation, national power grids, smart grid.

**Unit 2:**

Various electrical equipments viz Transformer, Induction motor, synchronous machine, Circuit Breakers etc, Relays, substation components, Product specification, application

**Unit 3:**

Leading manufacturers of Electrical equipments and components, Electrical Engineering research organization, PSUs and utilities

**Unit 4:**

General Introduction to Power Electronics, Power System, Electrical Machines, Control System, Automation.

**Unit 5:**

Role of Electrical Engineer in Industry, R&D, Electrical Utilities, Placement scenario, future trends.

**Evaluation**

Evaluation will be continuous an integral part of the class only through internal assessment.

**References**

- [1] D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.
- [2] M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press,2012

**Unit 1: Introduction:**

What is electronics, An introduction to Electronic devices & circuits, Analog and digital electronics, Analog communication, Digital communication, Microwave engineering, Micro processor & controllers, Antenna, Signals & systems.

**Unit 2: Scope and Applications-I:**

Wireless communication, Satellite Communication, Internet Telephony, Nanotechnology, Teleconferencing, Embedded System, Wireless Sensor Networks, Optical Computing, Electrocardiograph, Display Technology, Advanced Optical Networks, Brain Computer Interfaces, Thin Film Technology, Global positioning system, Fiber Optics, Micro electro mechanical systems, Robotics, Radar, Speaker Recognition, Microwave Communication, Earthquake Monitoring, Remote Sensing, Direct to Home TV systems.

**Unit 3: Scope and Applications-II:**

Wireless Communication (mobile phones, geographical navigation, satellite communication, Wi-Fi etc.) Some of the Govt. sector / private sector electronics Labs/Division/Companies: CSIR LABS, CSIO, DRDO, BSNL , BEL, BHEL, C-DAC, DOORDARSHAN, ISRO, TBRL, IIT'S, Environment Monitoring Divisions PANASONIC, SAMSUNG, SONY, PHILIPS, TOSHIBA, SANSUI, VIDEOCON, ONIDA, HAIER, LG ELECTRONICS, PIONEER, LLYOD HITACHI, APPLE, WIPRO ,ELICO, HP.

**Unit 4: Telecom Companies:**

Top companies of VLSI, Fabrication units in India and abroad

**Unit 5: Career Options:**

Telecommunication, Software Development, Consumer Electronics, Semiconductor, Embedded Systems etc. Product Based Company – Building their own product and selling it in market, Service Based Company – Building product, application or part of them, for other companies and their clients Telecom equipment R&D, EDA Company Electronic Exchanges, Department of Telecommunications, BSNL, Railways, Electricity Board, Medical equipments manufacturing

## **COURSE OUTCOMES**

To prepare the students according to the requirements of industry for highly skilled engineers and contribute to the next generation technology by their innovation.

## **EVALUATION**

Evaluation will be continuous an integral part of the class.

## **References**

Study material provided by the instructor

**Unit 1:**

Relevance & Importance of each subject, Specialization Flow Diagram, Pre-requisite Flow Diagram, Scope of the Branch and Future Avenues and career aspects

**Unit 2:**

Review of Computer Engineering Fundamentals: Definition, Evolution, Classification, Number System.

**Unit 3:**

Organization i.e. CPU, register, Bus Architecture, Instruction Set, Memory & Storage Systems, I/O Devices & Application Software.

**Unit 4:**

Computer Science & Engineering Application in: Data Processing, Information Systems, Communication, Interworking, World Wide Web, e-Business, Bio-Informatics, Health Care, Remote Sensing & GIS, Meteorology and Climatology, Computer Gaming, Multimedia and Animation etc, Defence.

**Unit 5:**

Introduction to flowchart, Algorithm, Categories of Programming Languages, Program Design, What are data structures, Introduction to Programming, Basic Computer networking concepts, Types of networks, Security Threats: Viruses, Worms, Malware, Trojans, Spyware, and anti-spyware software, firewall, internet fraud. Major Computer Science & Engineering Journals.

**References**

- [1] Subhasis Banerjee, S. Arun Kumar, D. Dubhashi, Introduction to Computer Science,
- [2] Peter Norton, Computing Fundamentals, McGraw Hill India Peter Norton,
- [3] Introduction to Computers, TMH Silakari & Rajesh K Shukla,
- [4] Basic Computer Engineering, Wiley India Kenneth Hoganson,
- [5] Concepts in Computing , Jones & Bartlett RJ Dromey, How to solve it by computer, Prentice Hall India Series

**Unit 1:**

Data and Information: Introduction, Type of data, Simple model of computer. Data processing using a computer: Introduction to Operating System, Data storage Media, High capacity network storage media. Introduction to Database Management System; Database modelling; Relational model; Distributed DBMS; Data warehouse, Data mining; Classification of Language and Applications

**Unit 2:**

IT Application in Communication: Network services-telephone services, Cellular telephone services, Radio and TV broadcasting, Audio-Visual conferencing, Video-on-demand. Internet Technology: Introduction, Working of internet, Introduction to network protocol and topologies, Types of network: LAN, WAN, Web browser. Internet Services: E-mail, Telnet, FTP, WWW, HTML, URL..

**Unit 3:**

IT Application in Multimedia: Introduction, Components of multimedia and challenges, Video compression, Video coding technology: JPEG, MPEG, And JBIG. Introduction to cloud computing: Types, Services, Models, Characteristics, Benefits and Challenges, Application, Limitations..

**Unit 4:**

IT Application in E-Commerce and E-Governance: Introduction, Different Types of E-Commerce with examples, Advantages and disadvantages, E-Commerce in India, E-Services, E-Commerce security, Internet security and ethics, Technology issues, Social issues, Introduction to E-Governance, Challenges, Application, advantages, Case study of MP-online and IRCTC.

**Unit 5:**

Social impact of information technology: Introduction, Social Uses of World Wide Web, Social networking Services, Privacy, security and integrity of Information, Disaster recovery Intellectual property rights, IT Enabled Services and careers, Career in information technology, Case study of NPTEL.

**References**

- [1] V.Rajaraman, Introduction to Information Technology; PHI
- [2] E Balagurusamy, Fundamentals of Computers, TMH
- [3] Santiram Kal Basic Electronics, PHI
- [4] M.N. Rao Cloud Computing, PHI

**Unit 1: Recapitulation of Mathematics:**

Basics of Differentiation, Rolle's and Lagranges Theorem, Tangents and Normals, Indefinite Integral (Substitution, Integration using Trigonometric Identity & Integration by Parts & Definite Integral).

**Unit 2: Ordinary Derivatives & Applications:**

Expansion of functions by Maclaurin's & Taylor's Theorem (One Variable), Maxima and Minima of functions of two variables, Curvature (Radius, Center & Circle of Curvature for Cartesian Coordinates), Curve Tracing.

**Unit 3: Partial Derivatives & Applications:**

Definition, Euler's Theorem for Homogeneous Functions, Differentiation of Implicit Functions, Total Differential Coefficient, Transformations of Independent Variables, Jacobians, Approximation of Errors.

**Unit 4: Integral Calculus:**

Definite Integrals as a Limit of Sum, Application in Summation of series, Beta and Gamma functions (Definitions, Relation between Beta and Gamma functions, Duplication formula, Applications of Beta & Gama Functions).

**Unit 5: Applications of Integral Calculus:**

Multiple Integral (Double & Triple Integrals), Change of Variables, Change the Order of Integration, Applications of Multiple Integral in Area, Volume, Surfaces & Volume of Solid of Revolution about X-Axis & Y-Axis.

**References:**

1. Michael Greenberg, Advanced Engineering Mathematics, Second Edition, Pearson Education, 2002 (Indian Edition).
2. B.V. Rammana, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company, 2007.
3. Potter, Goldberg & Edward, Advanced Engineering Mathematics, Oxford University Press.
4. S. S. Shastry, Engineering Mathematics, PHI Learning
5. C.B. Gupta, Engineering Mathematics I & II, McGraw Hill India, 2015

**Exercises to be performed by students:**

- Reading text selection from the list given below
- To write a book-review

**Evaluation:**

Evaluation will be continuous an integral part of the class. Assessment will be based on assignments, presentations, and interview of each candidate.

**Unit 1: Ordinary Differential Equations:**

First-order differential equations (Separable, Exact, Homogeneous, Linear), Linear differential Equations with constant coefficients.

**Unit 2: Ordinary Differential Equations:**

Homogeneous linear differential equations, Simultaneous linear differential equations Second-Order Linear Differential Equations with Variable Coefficients Removal of First Derivative, Change of Independent Variable and Variation of Parameters.

**Unit 3: Partial Differential Equations-I:**

Definition, Formulation, Solution of PDE ( By Direct Integration Method & Lagranges Method Charpit's General Method of Solution Partial Differential equations

**Unit 4: Partial Differential Equations-II**

Partial Differential Equations with Constant Coefficients(Second and Higher Orders Homogeneous and Non- Homogeneous equations), Partial differential Equations Reducible to equations with constant coefficients

**Unit 5: Algebra of Logic:**

Boolean Algebra, Principle of Duality, Basic Theorems, Boolean Expressions and Functions. Elementary Concept of Fuzzy Logic Graph Theory: Graphs, Subgraphs, Degree and Distance, Tree, cycles and Network, Vector Spaces: Definition and examples, linear dependence and independence, dual spaces, inner product spaces

**References:**

- [1] Dean G. Duffy, Advanced Engineering Mathematics with MATLAB, CRC Press, 2013.
- [2] Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc.
- [3] Michael Greenberg, Advanced Engineering Mathematics, Second Edition, Pearson
- [4] Education, 2002 (Indian Edition).
- [5] B.V. Rammana, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company,
- [6] 2007. Shanti Narayan, A Course of Mathematical Analysis. S. Chand & Co. Delhi.
- [7] Marwaha, Introduction to Linear Algebra, PHI Learning.

**Unit 1: D.C. Circuits:**

Units and dimensions, Ohm's Law, Kirchhoff's Law, Superposition theorem, Thevenin's theorem and their application for analysis of series and parallel resistive circuits excited by independent voltage sources, Power & Energy in such circuits. Mesh & nodal analysis, Star Delta circuits.

**Unit 2: 1- phase AC Circuits:**

Generation of sinusoidal AC voltage, definition of average value, R.M.S. value, form factor and peak factor of AC quantity, Concept of phasor, Concept of Power factor, Concept of impedance and admittance, Active, reactive and apparent power, analysis of R-L, R-C, R-L-C series & parallel circuit.

**Unit 3: 3-phase AC Circuits:**

Necessity and advantages of three phase systems, Meaning of Phase sequence, balanced and unbalanced supply and loads. Relationship between line and phase values for balanced star and delta connections. Power in balanced & unbalanced three-phase system and their measurements.

**Unit 4: Magnetic Circuits:**

Basic definitions, magnetization characteristics of Ferro magnetic materials, self inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, AC excitation in magnetic circuits, magnetic field produced by current carrying conductor, Force on a current carrying conductor. Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F. single phase transformer- general construction, working principle, e.m.f. equation, open circuit and short circuit test.

**Unit 5: Electrical Machines:**

D.C. Motor & D.C. Generator, Three phase Induction motor and Synchronous Machines, their general construction, working principle, emf equation and applications. Types of losses occurring in electrical machines.

**COURSE OUTCOMES:**

The final outcome of the subject will result into an enhancement in understanding the basic concepts of Core Electrical Engineering subjects. The topics covered under this subject will help to enhance the basic understanding of Electrical machines and power systems.

**EVALUATION:**

Evaluation will be continuous an integral part of the class followed by final examination.

**Reference:**

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.
2. S.N. Singh, Basic Electrical Engineering, P.H.I.,2013
3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall,2014
4. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press,2012
5. C.L. Wadhwa, Basic Electrical Engineering. New Age International.

### List of Practicals:

1. Verifications of Thevenin's theorem.
2. Verifications of Superposition theorem.
3. Study of Transformer, name plate rating, determination of ratio and polarity.
4. Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and
5. Estimation of voltage regulation and efficiency at various loading conditions and verification by load test.
6. Separation of resistance and inductance of choke coil.
7. Measurement of various line & phase quantities for a 3-phase circuit.
8. Identification of different Electronics components.
9. To study of Power Factor Meter.
10. To study of Ammeter, Voltmeter and Wattmeter.
11. To Study of Rheostate.

**Unit 1:**

Introduction to engineering Design process: Its importance, types of designs, various ways to think about design like visualization, photography etc, simplified iteration model, design versus scientific method, a problem solving methodology

**Unit 2:**

Considerations of a good design Achievement of performance requirements, Total life cycle, Regulatory and social issues in Indian context.

**Unit 3:**

Description of Design Process Conceptual Design, Embodiment Design, Detail Design, Planning for Manufacture, Planning for distribution, Planning for Use, Planning for the retirement of the product

**Unit 4:**

Product Design Cycle, Identification of customer needs and market research essentials, concept generation, technology and market assessment

**Unit 5:**

An exposure to various aspects of design including visual, creative and user-centric design (Visual merchandising, trends, materials, technology and techniques). Evolution in Transportation and Communication Technology, Bullock Cart to Lear Jets, Personal messengers to Cell Phones, Fighter planes

**Evaluation:**

Evaluation will be continuous an integral part of the class as well through external assessment.

**References:**

- [1] George E. Dieter and Linda C. Schmidt, Engineering Design, McGraw Hill Education (India) Pvt. Ltd. Arvid Eide, Introduction to Engineering Design, McGraw Hill.
- [2] Otto. K and Wood, K, Product Design, Pearson Education

**Unit 1: Fitting:**

Tools & Equipments – Practice in filing. Making Vee Joints, Square, Dovetail joints and Key making - plumbing. Suggested Mini project – Assembly of simple I.C. engines

**Unit 2: Carpentry:**

Tools and Equipments- Planning practice. Making Half Lap, Dovetail, Mortise & Tenon joints. Suggested Mini project - model of a single door window frame.

**Unit 3: Sheet Metal:**

Tools and equipments– practice. Making rectangular tray, hopper, scoop, etc. Suggested Mini project - Fabrication of a small cabinet, dust bin, etc. Tools and equipments - Arc welding of butt joint, Lap joint, Tee fillet. Demonstration of gas welding, TIG & MIG welding.

**Unit 4: Smithy:**

Tools and Equipments – Making simple parts like hexagonal headed bolt, chisel.

**Unit 5: Foundry:**

Tools and Equipments, Mould making, conducting casting operation of a job

**Evaluation:**

Evaluation will be continuous an integral part of the class as well through external assessment.

**References:**

- [1] S K Hazara Choudhary, Gopal.T.V, Kumar.T, and Murali.G, “A first course on workshop practice – Theory, Practice and Work Book”, Suma Publications, Chennai, 2005.
- [2] Kannaiah.P and Narayanan.K.C, “Manual on Workshop Practice”, Scitech Publications Venkatachalapathy.V.S,“First year Engineering Workshop Practice”, Ramalinga Publications

**Unit 1: Introduction:**

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

**Unit 2: C Programming Basics:**

Problem formulation – Problem Solving - Introduction to ‘ C’ programming –fundamentals – structure of a ‘C’ program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

**Unit 3: Arrays And Strings:**

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

**Unit 4: Functions and Pointers:**

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

**Unit 5: Structures And Unions:**

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

**References:**

- [1] Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill, 2006. 2. Dromey R.G., “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007.
- [2] Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 200.

### **List of Practicals:**

- [1] Write C Program for hello word.
- [2] Write C Program for print integer.
- [3] Write C Program to add two numbers repeatedly.
- [4] Write C Program to check odd or even number.
- [5] Write C program to perform addition, subtraction, multiplication and division.
- [6] Write C Program to check whether input alphabet is a vowel or not.
- [7] Write C Program to check leap year.
- [8] Write C Program to Add digits of number.
- [9] Write C Program for Factorial.
- [10] Write C Program to find HCF and LCM.
- [11] Write C Program for Decimal to binary conversion.
- [12] Write C Program to add n numbers.
- [13] Write C Program for reverse a number.
- [14] Write C Program for Palindrome Numbers.
- [15] Write C Program to print patterns of numbers and stars.
- [16] Write C Program to print diamond pattern.
- [17] Write C Program for prime number.
- [18] Write C Program to generate and print Armstrong numbers.
- [19] Write C Program for Fibonacci series.
- [20] Write C Program for Linear search.
- [21] Write C Program for binary search.

The main objective of introducing this course is to sensitize students about the socio-cultural aspects of the rural areas parochial to their colleges. Students are expected to observe, investigate and learn about the following aspects of the rural region:

1. Demographics, Literacy, Geographical parameters of the Village
  2. Schemes of government of India and State of Madhya Pradesh in operation in the villages
  3. Social/ Cultural aspects ranging from popular dance forms, music and customs of the concerned village
- There will be **NO EXAMINATION** in **HU112 Rural Outreach**. The grades earmarked will be awarded on the basis of internal Assessment.
  - This course shall be done by the students in a self-study mode. Study methodology shall comprise of combining field visits, case studies, analyzing policy documents from different government departments, discussions with field officers, active NGO's and so on.
  - The course will not be listed in the time-table and its activities shall be performed by the students at any time convenient to them.
  - The faculty associated with the course shall evaluate the candidate and grade him.
  - For evaluation purpose, students are expected to submit a hand-written summary on the government schemes and policies for the socio-cultural development of the concerned village. This shall be followed by final submission of two case studies covering broad spectrum of socio-cultural issues ranging from life in slums, infant mortality, watershed management, potability of water, animal welfare etc. These case studies (handwritten) shall be submitted to the mentor for the final evaluation of the coursework.

**Unit 1: Introduction to Surveying:**

Overview of Surveying, branches of surveying, principles of Surveying. Instruments Used for various measurements, Electronic Distance Measurement (EDM), Various EDM Instruments, Survey Maps, Conventional Symbols of Objects in the Map, Introduction to GIS, GPS, remote sensing and Digital Terrain Models (DTMS), applications of Remote Sensing.

**Unit 2: Linear Measurements:**

Methods and terminologies of linear measurements, linear measurements using chain surveying, various operations in carrying out the chain surveying, various accessories for chaining, different type of chains and tapes, testing of chains. Running Survey Lines: Ranging, chaining and laying offsets, linear Measurements with chain on level ground /on sloping ground, Errors in chaining: Errors in Measurements with Incorrect Chain Length, Linear Measurements with Tape on Smooth Level or Sloping Ground / on Rough Ground, Tape Corrections, Setting out Right Angle on / From a Chain Line, Offsets – Limiting Length of Offset, Effect of Error in Laying out Direction, Effect of Error in Direction and Length Both. Obstacles in Chain Survey: Obstacles to Ranging, Obstacles to Chaining, Obstacles to Ranging and Chaining both. Numerical Problems.

**Unit 3: Angular measurements:**

Overview and terminologies, Principle of Compass, Types of Compass, Compass Surveying, Traversing, Traversing with Chain and Compass, Designation of Bearings, Calculation of Included Angle from Bearings, Calculation of Bearing From Included Angles Errors and Precautions in Compass Surveying, Local attraction, Correction to Measured Bearing for Local Attraction, Adjustment of Closing Error. Magnetic Declination, Dip, Introduction Plane Table Surveying, Methods of Plane Table Surveying- Radiation Method and Intersection Method. Introduction to Theodolite. Numerical Problems.

**Unit 4: Vertical Measurements:**

Overview and terminologies, Leveling Instruments-Different Types of Levels, Leveling Staff. Temporary and Permanent Adjustments of a Level. Leveling: Classification Based on Purpose of Leveling –Simple leveling, Differential or Compound or Continuous Leveling, Fly Leveling, Profile or Longitudinal Leveling, Cross-Section Leveling, Reciprocal Leveling, Precise Leveling, Booking and Reducing Levels. Height of Collimation or Height of Instruments Method. Rise and Fall Method, Errors and Precautions in leveling, Balancing Back Sight and Foresight, Error Due to Earth's Curvature and Refraction, Field Problems or Difficulties in Leveling, Numerical Problems.

## **Unit 5: Measurement of Areas and Volumes:**

Introduction, Areas: Areas from Field Measurements –Area Consisting of Irregular Boundary, Area from Plan –Graphical Method, Measurement of Area by Planimeter Errors & Precautions in Computation of Area. Volumes: Measurement of Volume. –from Cross Sections, from Spot Levels , from Contours, Area of Sections, Capacity of a Reservoir, Elevation - Capacity Curve, Earthwork, Mass Diagram. Numerical Problems.

### **References:**

- [1] Surveying volume-1 3/e by S.K. Duggal Publisher Tata McGraw Hill Education
- [2] Surveying, by Mimidas Saikia BM Das, MM Das Publisher PHI Learning
- [3] Surveying & Leveling by N. N. Basak Publisher MC.Graw Hill Education
- [4] Plane Surveying by A.M. Chandra New Age International Publisher
- [5] Surveying Vol.1 by B.C. Punmia Publisher Luxmi Publications
- [6] Fundamentals of Surveying by S.K. Roy PHI Learning
- [7] Remote Sensing and Image Interpretation 6/e by Lillesand Kiefer Chipman Willey India Pvt ltd.
- [8] Surveying 7/e by A. Bannister, Stanley Raymond, Raymond Bakesr Publisher Pearson Education.

### **List of Practicals:**

- [1] To perform the chain survey of a small area.
- [2] To study the different types of compass used in survey.
- [3] To perform plane table surveying by radiation method .
- [4] To perform plane table surveying by intersection method.
- [5] To measure the horizontal and vertical angles by using theodolite.
- [6] To measure the included angles by using theodolite.
- [7] Plotting and calculation of area by chain surveying.
- [8] To perform leveling by height of instrument method.
- [9] To perform leveling by rise and fall method.
- [10] To know the process of leveling staff

**Unit 1: Manufacturing Processes:**

Sheet Metal Work processes (applications, advantages/ disadvantages). Welding: Types— Equipments – Tools and accessories – Techniques employed - applications, advantages/ disadvantages – Gas cutting – Brazing and soldering. Lathe Practice: Types - Description of main components – Cutting tools – Work holding devices – Basic operations. Simple Problems. Drilling Practice: Introduction – Types – Description – Tools. Simple Problems.

**Unit 2: Power Generation:**

External and internal combustion engines Auto diesel & dual cycles, comparative study– Hydro, thermal and nuclear power plants (layouts, element/component description, advantages, disadvantages, applications). Simple Problems. Introduction to Steam water and gas turbines, basics of Rankine & Joule cycle, centrifugal pumps.

**Unit 3: Machine Elements:**

Springs: Helical and leaf springs – Springs in series and parallel. Cams: Types of cams and followers – Cam profile Power Transmission: Gears (terminology, spur, helical and bevel gears, gear trains). Belt drives (types). Chain drives. Simple problems. Introduction to mechanisms, four bar chain , inversions .

**Unit 4: Thermal Engineering:**

Basic concepts of thermodynamics , Concept of system ,Introduction to Zeroth , first & second law of thermodynamics , salient features of steam boilers , accessories & mountings ,High pressure boilers Basic modes of heat transfer Fourier's law , Stefan Boltzmann's law ,Newton's law . Concept of refrigeration & air conditioning, ton of refrigeration, COP. working of domestic refrigerator & air conditioner

**Unit 5: Mechanical Properties And Deformation Mechanisms:**

Mechanisms of plastic deformation, slip and twinning – Types of fracture –mechanical Properties of materials , Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test Izod and charpy, fatigue and creep failure mechanisms. Ferrous & non ferrous materials, non metallic materials, Alloys & phase diagram.

**Laboratory:**

Experiments as suggested by the course coordinator.

**References:**

- [1] Jonathan Wickert, Kemper Lewis, An Introduction to Mechanical Engineering, CENGAGE Learning.
- [2] Michael Clifford, Kathy Simmons, Philip Shipway, An Introduction to Mechanical Engineering: Part 1 and Part 2, Taylor and Francis

**List of Practicals:**

- [1] Study of different manufacturing process.
- [2] Experiments on bernoulli's theorem.
- [3] Study of hardness testing machine of a specimen.
- [4] Study of linear and angular measurement using, vernier, micrometer, slip gauge, dial gauge and sine-bar.
- [5] Study of different types of boilers and mountings.
- [6] Study of cams and follower mechanism.
- [7] To find cop of a refrigeration unit.
- [8] Study of different ic engines & measurement of b.h.p. using rope/belt dynamometer.
- [9] Study of different types of drives.
- [10] Study of different types of power plant.

**Unit 1: Diode and Its Circuits:**

Introduction to Semiconductor theory: Classification of materials- Insulators, conductors and semiconductors and their Energy Bands, Types of semiconductors- Intrinsic, Extrinsic. PN Junction Diode: Biasing and operation of PN Diode, V-I characteristics, Limiting Values of PN Diode, Breakdown in PN Diode, Applications of PN Diode. Zener Diode: V-I Characteristics, Applications of Zener Diode. Rectifier Circuits: PN Diode as a Rectifier, Half Wave Rectifier, Full Wave Rectifier, Full Wave Bridge Rectifier, Clipping Circuits, Clamper Circuits.

**Unit 2: Number Systems:**

Introduction, Binary Number System, Octal Number System, Decimal Number System, Hexadecimal System, Conversions: Binary to Decimal conversion and vice-versa, Octal to Decimal Conversion and vice versa, Hexadecimal to Decimal Conversion and vice-versa, Binary to Hexadecimal Conversion and vice-versa, Octal to Decimal and vice-versa, Octal to Hexadecimal and vice versa. Complements: One's Complement, Two's Complement, Nine's Complement, Ten's Complement. Binary Arithmetic (addition, subtraction, multiplication, division), Octal Arithmetic, Hexadecimal Arithmetic, Signed Numbers, Floating Numbers, Codes.

**Unit 3: Boolean Algebra and Logic Gates:**

Introduction, Definitions, Principle of Duality, Basic Theorems, Applications of Boolean Algebra, Boolean Functions, Complement of Boolean Function. Logic Gates (Symbol, Truth Table, Logic Diagram): And, OR, NOT, NAND, NOR, XOR, XNOR. Universal Gates: NAND Gate and NOR Gate implementation, Realization of other Logic Operations using NAND/NOR. Buffer, Negative and Positive Logic, Mixed Logic.

**Unit 4: Signals:**

Introduction, Representation of Discrete-time Signals: Graphical Representation, Functional Representation, Tabular Representation, Sequence Representation. Elementary Signals: Unit Step Function, Unit Ramp Function, Unit Parabolic Function, Unit Impulse Function, Sinusoidal Signal, Real Exponential Signal, Complex Exponential Signal, Rectangular Pulse Function, Triangular Pulse Function, Signum Function, Sinc Function, Gaussian Function. Basic Operations on Signals: Time Shifting, Time Reversal, Amplitude Scaling, Time Scaling, Signal Addition, Signal Multiplication. Classification of Signals: Deterministic and Random Signals, Periodic and Non-periodic Signals, Energy and Power Signals, Causal and Non-causal Signals, Even and Odd Signals

## **Unit 5: Fourier Series Representation of Periodic Signals:**

Introduction, Representation of Fourier Series, Existence of Fourier Series, Trigonometric Form of Fourier Series: Evaluation of Fourier Coefficients of the Trigonometric Fourier Series, Cosine Representation (Alternate Form of the Trigonometric Representation), Wave Symmetry: Even or Mirror Symmetry, Odd or Rotation Symmetry, Half Wave Symmetry, Quarter Wave Symmetry. Exponential Fourier Series: Determination of the Coefficients of Exponential Fourier Series, Trigonometric Fourier Series from Exponential Fourier Series, Exponential Fourier Series from Trigonometric Fourier Series, Cosine Fourier Series from Exponential Fourier Series. Properties of Continuous-Time Fourier Series: Linearity Property, Time Shifting Property, Time Reversal Property, Time Scaling Property, Time Differentiation Property and Time Integration Property.

### **References**

- [1] Hwei P. Hsu, Schaum's Outline of Signals and Systems, McGraw-Hill.
- [2] A. V. Oppenheim, A. S. Willsky, S Hamid Nawab, Signals and Systems, PHI.
- [3] A. Anand Kumar, Signals and Systems, PHI.
- [4] Basics of Electronics Engineering, Wiley India Pvt. Ltd.

### **List of Practicals:**

1. Study of different electronic components and instruments like resistor, capacitor, inductor, multimeter, power supply, and function generator.
2. Study of different parts of (CRO) cathode ray oscilloscope.
3. Study of P-N junction diode V-I characteristics.
4. Study of Zener diode V-I characteristics.
5. Study and Verify the truth table of Basic logic gates.
6. Study and Verify the truth table of Exclusive gates.
7. Study and Verify the truth table of Universal gates.
8. To verify the truth of half adder & full adder.
9. Study of Half wave rectifier.
10. Study of Full wave rectifier.

**Unit 1: Computer:**

Definition, classification, Organization i.e. CPU, register, Bus Architecture, Instruction Set, Memory & Storage Systems, I/O Devices, and System and Application Software, Computer Application in e-Business, Bio-Informatics, Health Care, Remote Sensing & GIS, Meteorology and Climatology, Computer Gaming, Multimedia and Animation etc.

Operating System: Definition, Function, Types, Management of File, Process & Memory. Introduction to MS Word, MS Power Point, MS Excel Introduction to algorithm, Complexities and Flowchart,

**Unit 2: Introduction to Programming:**

Categories of Programming Languages, Program Design, Programming Paradigms, Characteristics or Concepts of OOP, Procedure Oriented Programming VS Object Oriented Programming, Introduction to C++: Character Set, Tokens, Precedence and Associativity, Program Structure, Data Types, Variables, Operators, Expressions, Statements and Control Structures, I/O Operations, Array, Functions. Object & Classes, Scope Resolution Operator, Constructors & Destructors, Friend Functions, Inheritance, Polymorphism, Overloading Functions & Operators, Types of Inheritance, Virtual Functions, Introduction to Data Structures

**Unit 3: Computer Networking:**

Introduction, Goals, ISO-OSI Model, Functions of different layers. Internetworking concepts, Devices, TCP/IP Model, Introduction to Internet, World Wide Web, E-Commerce.

**Unit 4: Computer Security Basics:**

Introduction to Viruses, Worms, Malware, Trojans, Spyware, and Anti-Spyware Software, Different types of attacks like Money Laundering, Information Theft, Email Spoofing, Denial of Services (DoS), Cyber Stalking, Logic Bombs, Hacking, Spamming, Cyber Defamation, Pharming Security Measures Firewall, Computer Ethics & Good Practices, Introduction to Cyber Laws about internet fraud, Good Computer Security Habits.

**Unit 5: Database Management System:**

Introduction, File Oriented Approach and Database approach, Data Models, Architecture of Database System, Data Independence, Data Dictionary, DBA, Primary Key, Data Definition Language and Manipulation Languages.

Cloud Computing: Definition, Cloud Infrastructure, Cloud Segments or service delivery models (IaaS, PaaS, SaaS), Cloud deployment models/ types of cloud (public, private, community and hybrid cloud), Pros and Cons of Cloud Computing.

**References:**

- [1] E Balaguruswamy, Fundamentals of Computers, TMH
- [2] Silakari and Shukla, Basic Computer Engineering, Wiley India
- [3] V Rajaraman, Fundamentals of Computers, PHI Ajoy Kumar Ray & Tinku Acharya, Information Technology Principles and Application Peter Norton, Introduction to Computers, TMH

**List of practicals:**

- [1] GUI Operating System: Mouse Practice, Starting, Login, Shutdown, Exploring.
- [2] Directories, Resizing, Moving, Minimizing, closing of software windows.
- [3] Familiarization with file icons, Launching Applications, Deleting, Renaming files.
- [4] Managing Directories, Searching for files, Using Accessories.
- [5] Study of various components of computer like CPU, keyboard, mouse, monitor, printer, CVT and storage devices.
- [6] Study of MS-word – opening and saving of documents, formatting, editing and spell check, find and replace, printing, merging. Creating Table, Charts and Graphics.
- [7] Study of Spreadsheet – creating, saving, editing and printing. Entering data, selecting cells, formatting text, applying border shades and backgrounds, creating formulas, creating charts.
- [8] Study of Power Point – creating, opening, editing and saving of slides. Adding and formatting text, creating animations, working with images and special effects. Printing presentation.
- [9] Study of MS Access– creating, saving, editing and printing of tables. Managing relationships, writing queries e.g. SELECT, UPDATE, DELETE, INSERT. Forms designing and report printing.
- [10] Study of Web Browser and mailing programs.

**Unit 1: Principles of programming:**

System Life Cycle - Performance Analysis and Measurements- Time and Space complexity- Complexity calculation of simple algorithms. Hashing:- Static Hashing-Hash Tables- Different Hash Functions-Mid Square- Division-Folding-Digit Analysis, Collision-Collision Resolution Techniques.

**Unit 2: Study of basic data structures and its types:**

Arrays- Structures-Sparse matrix – Stacks – Queues-Circular queues- Priority queues - Dqueues. Evaluation of expressions – Polynomial representation using arrays.

**Unit 3: Linked Lists :**

Linked stacks and queues - Doubly linked lists – Polynomial representation using linked lists, Garbage collection and Compaction.

**Unit 4: Trees - Binary Trees:**

Tree Traversal – Inorder - Preorder and Postorder, Search trees - AVL Trees, height balanced trees, Multiway search Trees- B Trees-B+ Trees. Graphs – Depth first and breadth first search.

**Unit 5: Sorting methods:**

Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort, External sorting methods. Searching Techniques-DFS, BFS.

**Reference:**

- [1] Horowitz ,Sahni & Anderson Freed, Fundamentals of Data Structures in C, 2nd ed., Universities Press, Hyderabad, 2009
- [2] Rajesh K Shukla, Data Structures Using C & C++ ,Wiley India, New Delhi, 2009
- [3] G. S Baluja, Data Structures Through C, Dhanpat Rai & Co. , New Delhi, 2009
- [4] Sartaj Sahni , Data Structures, Algorithms and Applications in C++ , 2nd ed., Universities Press, Hyderabad, 2009
- [5] 13. Seymour Lipschutz, Data Structures with C, Schaum's Outlines, McGraw Hill , New Delhi, 2010

**List of practicals:**

- [1] Write a program to search an element in a two dimensional array.
- [2] Using iteration and recursion concepts write programs for finding the element in the array using the Binary search method.
- [3] Write a program to perform following operations on table using functions only-Addition, Subtraction, Multiplication, Transpose.
- [4] Write a program using iteration and recursion concepts for quick sort..
- [5] Write a program to implement various operations on strings.
- [6] Write a program for swapping two numbers using call by value and call by reference strategies.
- [7] Write a program to implement Binary search tree.
- [8] Write a program to create Linked List and perform operation such as insert, delete, update and reverse.
- [9] Write a program to simulate various sorting and searching algorithms.
- [10] Write a program to simulate various Graph traversing techniques.
- [11] Write a program to simulate various tree traversal techniques.

**Unit 1: Principles of programming:**

System Life Cycle - Performance Analysis and Measurements- Time and Space complexity- Complexity calculation of simple algorithms. Hashing:- Static Hashing-Hash Tables- Different Hash Functions-Mid Square- Division-Folding-Digit Analysis, Collision-Collision Resolution Techniques.

**Unit 2: Study of basic data structures and its types:**

Arrays- Structures-Sparse matrix – Stacks – Queues-Circular queues- Priority queues - Dqueues. Evaluation of expressions – Polynomial representation using arrays.

**Unit 3: Linked Lists :**

Linked stacks and queues - Doubly linked lists – Polynomial representation using linked lists, Garbage collection and Compaction.

**Unit 4: Trees - Binary Trees:**

Tree Traversal – Inorder - Preorder and Postorder, Search trees - AVL Trees, height balanced trees, Multiway search Trees- B Trees-B+ Trees. Graphs – Depth first and breadth first search.

**Unit 5: Sorting methods:**

Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort, External sorting methods. Searching Techniques-DFS, BFS.

**Reference:**

- [1] Horowitz ,Sahni & Anderson Freed, Fundamentals of Data Structures in C, 2nd ed., Universities Press, Hyderabad, 2009.
- [2] Rajesh K Shukla, Data Structures Using C & C++ ,Wiley India, New Delhi, 2009.
- [3] G. S Baluja, Data Structures Through C, Dhanpat Rai & Co. , New Delhi, 2009.
- [4] Sartaj Sahni , Data Structures, Algorithms and Applications in C++ , 2nd ed., Universities Press, Hyderabad, 2009.
- [5] Seymour Lipschutz, Data Structures with C, Schaum's Outlines, McGraw Hill , New Delhi, 2010.

**List of practicals:**

- [1] Write a program to search an element in a two dimensional array.
- [2] Using iteration and recursion concepts write programs for finding the element in the array using the Binary search method.
- [3] Write a program to perform following operations on table using functions only-Addition, Subtraction, Multiplication, Transpose.
- [4] Write a program using iteration and recursion concepts for quick sort..
- [5] Write a program to implement various operations on strings.
- [6] Write a program for swapping two numbers using call by value and call by reference strategies.
- [7] Write a program to implement Binary search tree.
- [8] Write a program to create Linked List and perform operation such as insert, delete, update and reverse.
- [9] Write a program to simulate various sorting and searching algorithms.
- [10] Write a program to simulate various Graph traversing techniques.
- [11] Write a program to simulate various tree traversal techniques.



**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**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject name</b>	<b>Page No.</b>
1	ES-220	Material Science	3
2	CE-301	Building planning and architecture	5
3	CE-302	Strength of Materials	7
4	CE-303	Advance Surveying & Remote Sensing	9
5	CE-304	Geology	11
6	HU-220	Communication Skills	13
7	HU-221	Idea Generation	-
8	HU-222	Learning Through Experts	-
9	HU-223	NSS/NCC	-

#### **IV Sem**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject name</b>	<b>Page No.</b>
1	CE-401	Concrete Technology	14
2	CE-402	Water Supply & Waste Water Engineering-I	16
3	CE-403	Structural Analysis-I	17
4	CE-404	Structural Mechanics	19
5	CE-405	Fluid Mechanics	20
6	MA-220	Mathematics-III	22
7	CE-607	Seminar / Group Discussion (Internal Assessment)	-
8	HU-223	NSS/NCC	-

**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. Mamlook 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. Loyal 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. Kulkarni 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. Gangopadhyay 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 determine the coagulant dose required to treat the given turbid water sample
5. To determine 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 static 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 and valves, 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.

## REFERENCES

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 Mechanics– Wiley India, New Delhi.
10. Narsimhan S Fluid Mechanics –. – University Press, Mumbai.
11. Ratnam Chanamala kothapalli A.V. Fluid Mechanics & Machinery — 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 Bernoulli's equation.
2. To verify Impulse Momentum equation.
3. To find out the terminal velocity of a spherical body in water.
4. Calibration and study of Venturimeter.
5. Determination of  $C_c$ ,  $C_v$ ,  $C_d$  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



**DR. A P J ABDUL KALAM UNIVERSITY,  
INDORE**

## **SYLLABUS**

*of*

**BACHELOR OF ENGINEERING**

**(Third Year, V AND VI 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 (Third Year, Grading System)**

#### **V Sem**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject name</b>	<b>Page No.</b>
1	CE-501	Quantity Surveying & Costing	3
2	CE-502	Construction Materials & Techniques	4
3	CE-503	Structural Analysis-II	6
4	CE-504	Water resources & Irrigation	7
5	CE-505	Dynamics of structures	9
6	CE-506	Computer aided drawing	10
7	CE-507	Soft Skill –I	11
8	CE-508	Seminar / Group Discussion	-
9	HU-223	NSS/NCC	-

#### **VI Sem**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject name</b>	<b>Page No.</b>
1	CE-601	Water Supply & Waste Water Engineering-II	12
2	CE-602	Geotechnical Engineering-I	14
3	CE-603	Transportation Engineering-I	16
4	CE-604	Structural Design –I (RCC)	18
5	CE-605	Construction Planning & Management	19
6	CE-606	Soft Skill –II	20
7	CE-607	Seminar / Group Discussion (Internal Assessment)	-
8	HU-223	NSS/NCC	-

**Unit I Introduction**

Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

**Unit II Rate Analysis**

Task for average artisan, various factors involved in the rate of an item, material and labour requirement for various trades; preparation for rates of important items of work. Current schedule of rates(C.S.R.).

**Unit III Detailed Estimates**

Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts Services for building such as water supply, drainage and electrification.

**Unit IV Cost of Works**

Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building. Preparation of DPR.

**Unit V Valuation**

Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings..

**List of Experiments:-**

1. Preparation of detailed estimate.
2. Detailed estimate for services of plumbing and water supply or Electrification work.
3. Detailed estimate for earth work for the road construction or arched culvert.
4. Rate analysis for at least 8 items of construction.
5. Preparation of DPR of Civil Engineering Project..

**REFERENCES**

1. Quantity Surveying & Costing – B.N. Datta
2. Estimating & Costing for Civil Engg. – G.S. Birdi
3. Quantity surveying & costing – Chakraborty
4. Estimating & Costing – S.C. Rangawala

**A) Construction Materials:****Unit I Bituminous Materials and Mixtures**

Bitumen, Tar, Pitch and Asphalt, Asphalt Cement, Cut back Asphalt, Emulsified and Blown Asphalt, Properties of Asphalts, Consistency, Rate of Curing, Resistance to Action of Water, Ductility and Adhesion etc., Grades of Asphalt, Viscosity and Penetration Grading, Performance based Grading, Cut back Asphalt Grades, Asphalts Concrete, Asphalt Pavement, Applications of Asphalt.

**Unit II Advance Construction Materials**

Use of fly ash in mortars, concrete, fly ash bricks, Stabilized mud blocks, non-erodible mud plinth, d.p.c. materials, building materials made by Industrial & agricultural waste, clay products p.v.c. materials, advance materials for flooring, Doors & windows, facia material, interiors materials for plumbing, sanitation & electrification.

**(B) Construction Techniques of different Building elements:****Unit III Foundation**

Type of soils, bearing capacity, soil stabilization and improvement of Bearing capacity, settlement and safe limits. Spread foundations, wall footings, grillage, Foundations well foundation, causes of failure and remedial measures; under reamed piles, Foundation on shrinkable soils, black cotton soil, timbering for trenches, dewatering of Foundations. Hyperbolic paraboloid footing, brick arch foundation. Simple methods of foundation Design, damp proof courses, repairs techniques for foundations.

**Unit IV Masonry and Walls**

Brick masonry, bonds, jointing, stone masonry, casting and Laying, masonry construction, brick cavity walls, code provisions regarding load bearing and non Load bearing walls. Common defects in construction and their effect on strength and Performance of walls, designed brick masonry, precast stone masonry block, hollow concrete Block, plastering and pointing, white and color washing, distempering, dampness and its Protection, design of hollow block masonry walls. Doors, windows and ventilators: types Based on material etc., size location, fittings, construction sunshades, sills and jambs, RCC Doors/windows frames. Stairs types, rule of proportionality etc., repairs techniques for masonry, Walls, doors & windows.

**Unit V Floors & Roofs**

Types, minimum thickness, construction, floor finishes, flat roofs, RCC jack arch, reinforced brick concrete, solid slab and timber roofs, pitched roofs, false ceiling, Roof coverings, channel unit, cored unit, waffle unit, plank and joist, brick panel, l-panel, Ferro cement roofing units, water proofing .services : water supply & drainage, electrification, Fire protection, thermal insulation, air conditioning, acoustics & sound insulation, repairs to Damaged & cracked buildings, techniques and materials for low cost housing., repairs Techniques for floors & roofs.

**List of experiments:**

1. Nondestructive testing of concrete by rebound hammer test
2. Nondestructive testing of concrete by ultrasonic method.
3. Test for the effect of admixtures on the concrete compressive strength
4. Testing of micro-concrete
5. Design of concrete mix.
6. Drawing of different types of building elements.

**References:**

1. Mohan rai & m.p. jai singh; advance in building materials & construction,.
2. S.c. rangwala; engineering materials
3. Sushil kumar; building construction,
4. B.c. punmia; building construction ,.
5. Building construction, metchell
6. Construction technology, chudley r.
7. Civil engineering materials, n. Jackson.
8. Engineering materials, surendra singh.

**Unit I Kani's method**

Continuous beams and rigid frames (with and without sway), Symmetry and anti-symmetry, Simplification for hinged end, Support displacements.

**Unit II Column analogy method**

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

**Unit III Matrix method of structural analysis:**

Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two)

**Unit IV Plastic Analysis & Analysis of Tall Frames**

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

**Analysis of tall frames:** wind and earthquake loads, codal provisions for lateral loads  
Approximate analysis of multistory frames for vertical and lateral loads.

**Unit V Suspension Cables**

Analysis of Space trusses using method of tension coefficients – Beams curved in plan  
Suspension cables – suspension bridges with two and three hinged stiffening girders

**References**

1. Wang c.k. intermediate structural analysis, mcgraw hill, new york.
2. Kinney streling j. Indeterminate structural analysis, addison wesley.
3. Reddy c.s., basic structural analysis, tata mcgraw hill publishing company, new delhi.
4. Norris c.h., wilbur j.b. and utkys. Elementary structural analysis, mcgraw hill International, tokyo.
5. Weaver w & gere jm, matrix methods of framed structures, cbs publishers & distributors, Delhi.

**Unit I Hydrology**

Hydrological cycle, precipitation and its measurement, recording and non recording rain gauges, estimating missing rainfall data, rain gauge net works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, curve hydrograph, synthetic unit hydrograph.

**Unit II Floods and Ground water**

Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control, confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries. Ground water recharge necessity and methods of improving ground water storage. Water logging-causes, effects and its prevention. Salt efflorescence-causes and effects. Reclamation of water logged and salt affected lands.

**Unit III Water resources planning and management**

Planning of water resources projects, data Requirements, economic analysis of water resources projects appraisal of multipurpose projects, Optimal operation of projects, introduction to linear programming and its application to water Resources projects. Role of water in the environment, rain water harvesting, impact assessment of Water resources development and managerial measures..

**Unit IV Irrigation water requirement and soil-water-crop relationship**

Irrigation, definition, Necessity, advantages and disadvantages, types and methods. Irrigation development. Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field Capacity, optimum water supply, consumptive use and its determination. Irrigation methods surface and subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and Methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal Crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

**Unit V**

**Canal irrigation:** Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, linings-objectives, materials used, Economics. Canal falls & cross drainage works, - description and design, head and cross Regulators. Escapes and outlets, canal transitions.

**Well irrigation:** Types of wells, well construction, yield tests, specific capacity level and Specific yield, hydraulic design of open wells and tube wells, methods of raising well water, Characteristics of pumps and their selection, interference of wells, well losses, advantages and Disadvantages of well irrigation.

### **List Of Experiments**

1. To determine precipitation for a given period using rain guage.
2. To determine evaporation by evaporimeter.
3. To determine infiltration index.
4. To design a canal section.
5. to analysis flood data & draw a flood hydrograph.

### **References**

1. Engg. Hydrology - J.NEMEC - Prentice Hall
2. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
3. Engg. Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
4. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers
5. Engg. Hydrology by H.M. Raghunath

**Unit I**

**Overview of structural dynamics:** Fundamental objective of structural dynamic analysis - types of prescribed loadings - essential characteristics of a dynamic problem - method of discretization: lumped mass procedure - generalized displacements - the finite-element concept

**Single degree of freedom systems:** Components of the basic dynamic system formulation of the equations of motion - direct equilibration using D'Alembert's principle - principle of virtual displacements - generalized SDOF systems - rigid body assemblage.

**Unit II**

**Free vibration response:** Solution of the equation of motion - undamped free vibrations - damped free vibrations - critical damping - underdamped systems - overdamped systems - negative damping.

**Response to harmonic loading:** Undamped system complementary solution - particular solution - general solution - response ratio - damped system - resonant response.

**Unit III**

**Response to periodic loading:** Fourier series expression of the loading - response to the fourier series loading - exponential form of fourier series solution

**Response to impulsive loads:** General nature of impulsive loads - sine-wave impulse - rectangular impulse - triangular impulse - shock load.

**Unit IV**

**Response to general dynamic loading:** Duhamel integral for an undamped system - numerical evaluation of the duhamel integral for an undamped system - response of damped systems - response analysis through the frequency domain.

**Multi degree of freedom systems:** Formulation of the MDOF equations of motion - selection of the degrees of freedom - orthogonality conditions - normal co-ordinates - uncoupled equations of motion - undamped & damped - mode superposition procedure

**Unit V**

**Continuous parameter systems:** Vibration analysis by Rayleigh's method - basis of the method - approximate analysis of a general system - selection of the vibration shape - improved Rayleigh method

**Practical vibration analysis:** Preliminary comments - stodola method - fundamental mode analysis – proof of convergence - analysis of second mode - analysis of third and higher modes-analysis of highest mode - Rayleigh's method in discrete co-ordinate systems.

**References:**

1. Clough R.W. & Penzien J., Dynamics of Structures, McGraw Hill
2. Weaver W., Jr. Timoshenko S.P., Young D.H, Vibration Problem in Engineering, John Wiley
3. Meivovitch L., Elements of Vibration Analysis, McGraw Hill
4. Seto W.W., Mechanical Vibrations, Schaum's Outline Series, McGraw Hill
5. Srinivasan P., Mechanical Vibration Analysis, Tata McGraw Hill

**CAD Software :** Meaning, various CAD software available in the market AutoCAD, Felix Cad, Auto Civil, 3D Max ; etc.) Starting up of CAD, CAD Window, Tool bar, Drop down menu, Command window, Saving the drawing. Introduction of Graphic screen.

**CAD Commands :** WCS icon, UCS icon, co-ordinates, drawing limits, grid, snap, ortho features. Drawing commands, line, circle, polyline, multiline, ellipse, polygon etc. Editing commands – Copy, move, offset, fillet, chamfer, trim, lengthen, mirror, rotate, array etc. Working with hatches, fills, dimensioning, text etc.

**Submission / Working Drawing :** Generation of line plan, Detailed Plan, elevation, section, site plan, Area statement, Generation of 3D view and print commands, Introduction to Auto Civil , 3D Max. Note:

**Above theoretical aspects should be covered in the practical periods**

### **List of Experiments**

**A) Building Drawing :** Following exercises shall be completed with CAD software and Print of all the drawings should be prepared on A3 / A4 size paper :

- 1) Preparation of line plan of a residential building.
- 2) Preparation of line plan of a Public building.
- 3) Preparation of detailed plan of a small residential building
- 4) Preparation of submission drawing of residential building – showing Plan, Elevation, Section, Schedule of openings, Site Plan and Area Statement

**B) Civil Engineering Drawing :** Preparation of Drawings with CAD software for the following exercises (Any Three) and Print of all the drawings should be prepared on A3 /A4 size paper.

- 1) Plan, Cross Section and Longitudinal section of a Culvert (Pipe culvert/Box Culvert).
- 2) Section of an Earthen Dam.
- 3) Plan and Section of K. T. Weir.
- 4) Cross Section of Retaining wall.
- 5) Bonds in brickwork – Plan and Elevation for English bond and Flemish bond for one brick thick wall.
- 6) Cross Section of ESR (Over Head Tank).
- 7) Cross Section of Clarri - flocculator

**Objective:** To develop conversation skills, group skills, persuasion skills, presentation skills, critical and creative thinking, emotional skills, positive thinking and vocational skills.

### **Unit I Development of Proficiency in English**

- Practice on Oral and spoken communication skill & testing –
- voice & accent, voice clarity, voice modulation & intonation, word stress etc.
- Feedback and questioning Technique
- Objectiveness in Argument
- Development etiquettes and manners
- Study of different pictorial expression of non-verbal communication and its analysis

### **Unit II Microsoft office**

- Microsoft word,
- Microsoft power point, Microsoft Excel,
- use of skype,
- use of internet

### **Unit III Communication skills**

- Visual, nonverbal and aural communication,
- Understanding the communicative environment,
- Understanding the communicative environment,
- What to listen for and why,
- When to speak and how,
- Starting and sustaining a conversation

### **Unit IV Communication skills Visual, nonverbal and aural communication**

- The world of visual culture
- Visual perception
- The aural: Its relevance and impact
- The body and the way it communicates
- The face, its expressions and what it says

### **Unit V Concept of 4 method for presentation**

- Preparation & introduction
- Presentation
- Evaluation / feedback
- Summarization / Conclusion
- Presentation Skill practice
- Preparing in presentation
- Delivery of presentation

### **References**

1. E.H. Mc Grath: S.J.:Basic Managerial Skills for All (Published by Phi)
2. Allen Pease:Body Language(published by agreement and Pease international)
3. Joan Lambert: Microsoft Office 2016 Step by Step (Step By Step (Microsoft)

**Unit I Water supply & Sewage collection**

Rural water supply schemes, financing and management of water supply project, water pollution control act, conservancy & water carriage system, sanitary appliance and their operation, building drainage system of plumbing

**Unit II Water Treatment methods**

Theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.

**Unit III Preliminary treatment of Sewage**

Unit operations for waste water treatment, preliminary treatment such as screens, grit chamber, floatation tank, sedimentation and chemical clarification, role of micro-organism in biological treatment, Sewage filtration- theory & design.

**Unit IV Biological treatment of Sewage & Sludge treatment**

Methods of Biological Treatment (Theory & Design) - Activated Sludge process, Oxidation ditch, stabilization ponds, aerated lagoon, anaerobic lagoons, septic tank & imhoff tank, sources & treatment of sludge, sludge thickening and digestion sludge drying beds, sludge disposal.

**Unit V Advanced Waste Water treatment**

Diatomaceous earth filters, ultrafiltration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico chemical waste water treatment, Solid waste disposal - classification, composition, collection, & disposal methods. Rural sanitation - collection & disposal of refuse, sullage & night soil

**List of Experiment**

1. To study the various standards for waste water
2. To study the sampling techniques for waste water
3. To determine the alkalinity in water sample
4. To determine the acidity in water sample
5. Determination of Dissolved Oxygen in the water and waste water sample
6. Determination of Biological Oxygen demand of a waste water sample
7. Determination of Chemical Oxygen demand of a waste water sample
8. Determination of various types of solids in the waste water sample
9. Determination of bacterial number by membrane filter Technique
10. Determination of bacterial colonies by standard plat count method

## Reference

1. Water Supply & Sanitary Engg. - G.S. Birdie - Dhanpat Rai Publishing Company, (P) Ltd. New Delhi
2. Waste Water Engg. by B.C. Punmia - Laxmi Publication (P) Ltd. New Delhi
3. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company
4. Chemistry for Environmental Engg. - Sawyer & Mc Carty - Mc Graw Hill Book Company New Delhi
5. Water & Waste Water Technology - Mark J Hammer - Prentice - Hall of India, New Delhi
6. Waste Water Engineering - Metcalf & Eddy - Mc Graw Hill Book Company New Delhi
- 7.

**Unit I Introduction & classification of soil**

Definition of soil and soil mechanics, common soil mechanics problems in Civil Engineering. Principal types of soils. Important properties of very fine soil. Characteristics of main Clay mineral groups. Weight volume relationship and determination of specific gravity from pycnometer test. Field density from sand replacement method and other methods.

**Unit II Index properties of soil**

Grain size analysis. Stokes's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterberg Limits, Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse and fine grained soils as per Indian Standard.

**Unit III Seepage analysis of soil**

Concept of effective stress principal, seepage pressure, critical hydraulic gradient and quick sand condition. Capillary phenomenon in soil. Darcy's Law and its validity, seepage velocity, co-efficient of permeability (k) and its determination in the laboratory. Average permeability of stratified soil mass, factors affecting 'k' and brief discussion

**Unit IV Compaction & Consolidation**

**Compaction:** Definition and object of compaction and concept of OMC and zero Air Void Line. Modified proctor Test. Factors affecting compaction Effect of compaction on soil properties and their discussion. Field compaction methods- their comparison of performance and relative suitability. Field compactive effort, Field control of compaction by proctor.

**Consolidation:** compressibility & consolidation of soil, terzaghi's one dimensional consolidation theory, pressure void ratio relationship, primary & secondary consolidation.

**Unit V Shear strength & stability of slopes**

**Shear strength:** Stress analysis of a two dimensional stress system by Mohr circle. Concept of pole. Coulomb's law of shear strength coulomb - Mohr strength theory. Relation between principal stresses at failure. Direct, triaxial and unconfined shear strength tests. Triaxial shear tests based on drainage conditions typical strength envelopes for clay obtained from these tests. Derivation of skempton's pore pressure parameters. Stress strain and volume change characteristics of sands.

**Slope Stability:** Slope failure mechanisms – Types - infinite slopes – finite slopes – Total stress analysis for saturated clay – Fellenius method - Friction circle method – Use of stability number - slope protection measures.

### **List of Experiment**

1. Determination of hygroscopic moisture content of soil
2. determination of specific gravity of soil.
3. Determination of field density by sand replacement method.
4. Determination of field density by core cutter method
5. Grain size analysis of soil by :
  - a) Sieve analysis
  - b) Sedimentation analysis
6. Determination of Liquid limit of soil by Casagrande method.
7. Determination of Liquid limit of soil by Cone penetrometer.
8. Determination of Plastic limit of soil
9. Determination of Shrinkage limit of soil
10. Determination of free swell of soil.

### **Reference**

1. Soil Mech. & Foundation Engg, by K.R.Arora Standard Publishers Distributors
2. Geotechnical Engineering, by P. Purshotama Raj Tata McGraw Hill
3. Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS Publishers & Distributors.
4. Principle of Geotechnical Engineering by B.M.Das Cengage Publisher
5. Basic and applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao New Age International Publishers.
6. Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
7. Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers.

**Unit I Highway**

Classification of roads, road patterns, brief history of road development around the world, road development plans of India, present status of roads in India, alignment design, requirement & controlling factors, use of aerial photography & remote sensing, other surveys.

**Unit II Geometric Design (Highway)**

Typical cross sections in urban & rural roads, various cross section elements, width of carriageway, shoulders, medians, width of roadways, right of way, camber, design speed, sight distance, stopping sight distance, passing sight distance, sight distance at intersection, passing zones, super elevations, setback, extra widening on horizontal curve, transition curve, design of horizontal & vertical alignment, combinations of horizontal & vertical alignment.

**Unit III Traffic Engineering**

Definition, road user & vehicle, traffic studies- speed, volume, origin & destination, capacity, parking & accidents, traffic signs, traffic markings, traffic signals-types, signal systems, warrants & design, traffic management, intersection types- at grade & grade separations, rotary design, street lighting.

**Unit IV Docks and Harbours**

Types - Layout and planning principles- breakwaters - docks- wharves and quays - Transit sheds- warehouses- navigation aids. Urban transportation systems - Bus transit - Mass Rapid Transit System - Light Rail Transit. Transport economics and Financing - Intelligent Transportation Systems (ITS)

**Unit V Airport Engineering**

Aircraft characteristics - Airport obstructions and zoning - Runway - taxiways and aprons- Terminal area planning

**List of Experiment**

1. To determine spot velocity of a vehical
2. Study & analysis of signal.
3. To determine capacity of a rotary.
4. Study & analysis of a parking
5. To determine the traffic volume at a road section.

## Reference

1. Highway Engineering by Gurucharan Singh
2. Principles of Pavement Design by E.J. Yoder & M.W. Witzech
3. Highway Engineering by O'Fleherly
4. Highway Engineering by S.K. Khanna & C.E.G. Justo
5. Airport Planning & Design by S.K. Khanna & M. G. arora
6. Foresch, Charles "Airport Planning"
7. Horonjeff Robert "The Planning & Design of Airports"
8. Sharma & Sharma, Principles and Practice of Highway Engg.
9. Haung, Analysis and Design of Pavements
10. Relevant IRC & IS codes
11. Laboratory Mannual by Dr. S.K. Khanna
12. Highway Engg. By Hews & Oglesby
13. Highway Material by Walker

**Unit I Basic Principles of Structural Design**

Assumptions, Mechanism of load transfer, Various Properties of concrete and reinforcing steel, Introduction to working stress method and limit state Methods of design, partial safety factor for load and material. Calculation of various loads for Structural design of singly reinforced beam, Partial load factors.

**Unit II Design of Beams**

Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply Supported and continuous beams, Beams with compression reinforcement: Redistribution of Moments in continuous beams, Circular girders: Deep beams. Design of beam for shear and Bond.

**Unit III Design of Slabs**

Slabs spanning in one direction. Cantilever, Simply supported and Continuous Slabs, Slabs spanning in two directions, Yield line theory, Circular slabs.

**Unit IV Columns & Footings**

**Columns:** Effective length of columns, Short and long columns- Square, Rectangular and Circular columns, Columns Subjected to axial loads and bending moments (sections with no tension),

**Footings:** Isolated and combined footings, Strap footing Raft foundation.

**Unit V Staircases:**

Staircases with waist slab having equal and unequal flights with different support Conditions, Slabless tread-riser staircase.

NOTE :- All the designs for strength and serviceability should strictly be as per the latest version Of IS:456. Use of SP-16 (Design aids)

**List of Practicals**

1. To design a beam section for given load.
2. To design a column section & footing for given load.
3. To design a one way slab.
4. To design a two way slab.
5. To design a dog-legged staircase.

**Reference**

1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata mcgraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
5. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
6. Plain & reinforced concrete - Rammuttham
7. Plain & reinforced concrete – B.C. Punnia
8. Structural Design & Drawing by N.K.Raju.

**Unit I Preliminary and detailed investigation methods**

Methods of construction, form work and centering. Schedule of construction, job layout, principles of construction management, modern management techniques like CPM/PERT with network analysis.

**Unit II Construction equipments**

Factors affecting selection, investment and operating cost, output of various equipments, brief study of equipments required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

**Unit III Tenders & Contracts**

Different types of Tenders & Contracts, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction..

**Unit IV Specifications & Public Works Accounts**

Importance, types of specifications, specifications for various trades of engineering works. Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various types of running bills, secured advance, final bill.

**Unit V Site Organization & Systems Approach to Planning**

Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering. Problem of equipment management, assignment model, transportation model and waiting line modals with their applications, shovel truck performance with waiting line method.

**References**

1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

**Objectives:** To make students well versed with at the business communication skills.

**Unit I Essential and vocational skills: survival strategies**

- i. Managing time
- ii. Managing stress
- iii. Resilience
- iv. Work-life balance
- v. Applying soft-skills to workplace

**Unit II Written Communication Skill Practice for:**

- i. Correction of errors
- ii. Making of Sentences
- iii. Paragraph Writing
- iv. Leave Application and simple letter writing

**Unit III Team Building / Coordination Skills**

- i. Team Building Practices through group exercises , team task / role play
- ii. Ability to mixing & accommodation
- iii. Ability to work together

**Unit IV Self Management**

- i. Self Evaluation
- ii. Self Discipline
- iii Self Criticism
- iv. Recognition of one's own limits and deficiencies
- v. Independency etc.
- vi. Thoughtful & Responsible
- vii. Self Awareness

**Unit V Team Management Technique**

- i. Practice by game play & other
- ii. learning methodology for achieving
- iii targets and getting of right first time

**References**

1. Soft skills Training – A workbook to develop skills for employment by Fredrick H. Wentz
2. Personality Development and Soft skills , Oxford University Press by Barun K. Mitra
- 3.The Time Trap : the Classic book on Time Management by R. Alec Mackenzi



**DR. A P J ABDUL KALAM UNIVERSITY,  
INDORE**

## **SYLLABUS**

*of*

**BACHELOR OF ENGINEERING**

**(Fourth Year, VII AND VIII 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 (Fourth Year, Grading System)**

#### **VII Sem**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject name</b>	<b>Page No.</b>
1	CE-701	Transportation Engineering- II	3
2	CE-702	Geotechnical Engineering-II	5
3	CE-703	Structural Design –II (Steel)	7
4	CE-704	Elective-I	8
5	CE-705	Minor Project	13
6	CE-706	Seminar /Group Discussion	-
7	CE-707	Industrial Training (4 Weeks)	-
8	HU-224	Yoga	14

#### **VIII Sem**

<b>S. No.</b>	<b>Subject Code</b>	<b>Subject name</b>	<b>Page No.</b>
1	CE-801	Design of Hydraulic Structure	15
2	CE-802	Transportation Bridges & Tunnels	16
3	CE-803	Structural Design –III	18
4	CE-804	Elective-II	19
5	CE-805	Major Project	24
6	CE-806	Seminar / Group Discussion	-

**Unit I Highway Material**

Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials.

**Unit II Design Factors For Pavement**

Design wheel load – contact pressure – ESWL concept – Determination of ESWL by equivalent deflection criteria – Stress criteria – EWL concept.

**Unit III Design of Flexible Pavement**

Assumptions – McLeod Method – Kansas method – Tri-axial method - CBR method – IRC Method (old) - CSA Method using IRC 37-2001, problems on above

**Unit IV Design of Rigid Pavement**

Principle – Factors - wheel load and its repetition – properties of sub grade - properties of concrete. External conditions – joints – Reinforcement – Analysis of stresses – Assumptions – Westergaard's Analysis – Modified Westergaard equations – Critical stresses – Wheel load stresses, Warping stress – Frictional stress – combined stresses (using chart / equations) - problems on above. Design of C.C. Pavement by IRC: 38 – 2002 for dual and Tandem axle load – Reinforcement in slabs – Requirements of joints – Types of joints – Expansion joint – contraction joint – warping joint – construction joint – longitudinal joint, Design of joints, Design of Dowel bars, Design of Tie bars – problems of the above

**Unit V Highway Maintainance**

Types of failures, causes, remedial/ maintainance measures in flexible pavements – Functional Evaluation by visual inspection and unevenness measurements - Structural Evaluation by Benkelman Beam Deflection Method, Falling weight deflectometer, GPR Method. Design factors for Runway Pavements - Design methods for Airfield pavements and problems on above.

Types of failures, causes, remedial/maintainance measures in rigid pavements – Functional Evaluation by visual inspection and unevenness measurements

**List Of Experiments**

1. Aggregate Crushing Value Test
2. Determination of aggregate impact value
3. Determination of Los Angeles Abrasion value
4. Determination of California Bearing Ratio values
5. Determination of penetration value of Bitumen
6. Determination of Viscosity of Bituminous Material
7. Determination of softening point of bituminous material
8. Determination of ductility of the bitumen
9. Determination of flash point and fire point of bituminous material
10. Determination of Bitumen content by centrifuge extractor
11. Determination of stripping value of road aggregate
12. Determination of Marshall stability value for Bituminous mix
13. Determination of shape tests on aggregate

## References

1. Highway Engineering by Gurucharan Singh
2. Principles of Pavement Design by E.J. Yoder & M.W. Witzech
3. Highway Engineering by O'Fleherty
4. Highway Engineering by S.K. Khanna & C.E.G. Justo
5. Airport Planning & Design by S.K. Khanna & M. G. arora
6. Foresch, Charles "Airport Planning"
7. Horonjeff Robert "The Planning & Design of Airports"
8. Sharma & Sharma, Principles and Practice of Highway Engg.
9. Haung, Analysis and Design of Pavements
10. Relevant IRC & IS codes
11. Laboratory Mannual by Dr. S.K. Khanna
12. Highway Engg. By Hews & Oglesby
13. Highway Material by Walker

**UNIT I Earth Pressure:**

Plastic equilibrium in soils – active and passive states – Rankine's theory – cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Rebhoh's & Culmann Graphical method – pressure on the wall due to line load – Stability analysis of retaining walls.

**UNIT II Stress Distribution And Settlement**

Stress distribution - soil media, Boussinesq theory, Use of Newmarks influence chart, Components of settlement, immediate and consolidation settlement, Terzaghi's one dimensional consolidation theory, computation of rate of settlement. -  $\sqrt{t}$  and  $\log t$  methods – e-log p relationship - Factors influencing compression behaviour of soils.

**UNIT III Shallow Foundations:**

Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

**UNIT IV Deep Foundation:**

Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

**UNIT V**

**Soil Improvement Techniques :** Compaction, Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness.

**Soil stabilization :** Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilization and stabilization by grouting. Geo-synthetics, types, functions, materials and uses.

**Soil Exploration and Foundations on Expansive and Collapsible soils :** Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them. Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

### **List of Experiment**

1. Indian Standard Light Compaction Test/Std. Proctor Test
2. Indian Standard Heavy Compaction Test/Modified Proctor Test
3. To perform unconfined Compression Test
4. To perform Triaxial compressive strength test
5. To perform Vane Shear test
6. To perform CBR Test
7. To perform direct shear test
8. To perform consolidation test
9. Demonstration of undisturbed sampling
10. Demonstration of Plate Load Test
11. Demonstration of SPT & DCPT

### **Reference Books :-**

1. Soil Mechanics & Foundation Engg. by Dr. K.R. Arora - Std. Publishers Delhi
2. Soil Mechanics & Foundation Engg. by B.C. Punmia - Laxmi Publications Delhi
3. Modern Geotech. Engg. by Dr. Alam Singh-IBT Publishers Delhi.
4. Geotech. Engg. by C.Venkatramaiah-New AGE International Publishers, Delhi
5. Found. Engg. by GALEonards McGraw Hill Book Co. Inc.
6. Relevant IS Code

**Unit I Connection**

Various loads and mechanism of the load transfer, partial load factors, structural properties of steel, Design of structural connections - Bolted, Riveted and Welded connections.

**Unit II Compression member**

Design of compression members, Effective length of columns, Design of columns-simple and compound, Lacing & battens. Design of footings for steel structures, Grillage foundation. Roof Trusses - Angular & Tubular, Lattice Girders.

**Unit III Tension member & Girder**

Tension members Design of simple beams, Built-up beams, Plate girders and gantry girders.

**Unit IV Frames**

Design of Industrial building frames, multistory frames, Bracings for high rise structures, Design of transmission towers.

**Unit V Method of Plastic Analysis**

lower bound & upper bound theorems, Statical method, Mechanism method, combined mechanism, analysis & design of beam, Frames, Collapse mode & possible moment distribution.

**NOTE:** - All the designs for strength and serviceability should strictly be as per the latest version of IS:800.

**References**

1. Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee
- ii) Design of steel structures by P.Dayaratnam
- iii) Design of steel structures Vol. I & II by Ramchandra
- iv) Design of steel structures by L.S. Negi
- v) Design of steel structures by Ramammutham
- iv) Design of steel structures by Punmia

**List of Experiments:-**

1. Design & drawing of various connections.
2. Design & drawing of tension member.
3. Design & drawing of compression member.
4. Design & drawing of grillage foundation.
5. Design & drawing of lacing & bracing.

**(CE- 7041 Computational Methods in Structural Engineering)****Unit I Matrix formulation**

Matrix formulation for the principle of virtual work and energy principles, principle of contragradience, stiffness and flexibility matrices, Degree of Freedom. Axial, bending, shear and torsional deformations. Local and Global Element stiffness matrices for bar, beam, shaft, grid, shear wall, beam column, beam with rigid ends, beam on elastic foundation and elements with special boundary conditions. Non-prismatic and curved elements, forces and displacements in general coordinate axes, structure stiffness matrix.

**Unit II Direct Stiffness Method**

Basics of the Direct Stiffness method - Analysis of pinjointed frames, rigid jointed structures, plane grids and composite structures for different loads including temperature, shrinkage, prestressing forces. Elastic stability analysis of 2-D rigid jointed frames, (Sway & Nonsway)

**Unit III Bandwidth, Symmetry & Imposition of Constraints**

Concepts of Bandwidth, various storage schemes & equation solvers; Reduction in order of stiffness matrix - use of substructures, static condensation method, Exploiting symmetry, skew symmetry and cyclic symmetry in structures, Imposition of Constraints – Lagrange Multiplier and Penalty Methods.

**Unit IV Analysis of continuum structures**

Fundamental equations of theory of elasticity (2D), basic concepts of Finite Element Analysis, derivation of generalized element stiffness matrix and load vectors, convergence requirements, stiffness matrices for various elements using shape functions, Triangular and Rectangular elements. (PSPS)

**Unit V Two Dimensional elements**

Two Dimensional Iso parametric elements, shape functions for Simplex. Lagrangian and Serendipity family elements in natural coordinates, computation of stiffness matrix for Isoparametric elements, degrading of elements, plate bending elements. Finite difference & finite element method, comparison of analysis between Finite difference & finite element method.

**Reference**

1. Ghali A & Neville M., Structural Analysis - A Unified Classical and Matrix Approach, Chapman and Hall, New York.
2. Weaver William & Gere James M., Matrix Analysis of Framed structures, CBS Publishers and Distributors, New Delhi.
3. Cook R.D., Concepts and Applications of Finite Element Analysis, Wiley, New York.
4. Gallagher R., Finite Element Analysis Fundamentals, Prentice-Hall, Englewood Cliffs, NJ.
5. Rubenstein M.F., Matrix Computer Analysis of structures, Prentice Hall, Englewood Cliffs, N.J.
6. Zeinkiewicz O.C & Taylor R.L., The Finite Element Method, McGraw Hill, London

## **(CE- 7042 Traffic Engineering)**

### **Unit I Traffic Characteristics**

- (i) Road user's characteristics - general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory.
- (ii) Vehicular characteristics: Characteristics affecting road design-width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.

### **Unit II Traffic Studies**

- (i) Spot Speed Studies and Volume Studies. (ii) Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies. (iii) Origin and destination Studies (O & D) : Various methods, collection and interpretation of data, planning and sampling. (iv) Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service. (v) Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

### **Unit III Traffic Operations and Control**

- (i) Traffic regulations and various means of control. (ii) One way streets- advantages and limitations. (iii) Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

### **Unit IV Street Lighting**

- (i) Methods of light distribution. (ii) Design of street lighting system. (iii) Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors. (iv) Different types of light sources used for street lighting. (v) Fundamental factors of night vision.

### **Unit V Accident Studies & Mass Transportation**

- (i) Accident Studies : Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

### **Reference**

1. Traffic Engineering and Transport Planning by L.R. Kadiyali, Khanna Publishers, Delhi
2. Traffic Engineering by Matson, W.S. Smith & F.W. Hurd
3. G.J. Pingnataro, Principles of Traffic Engineering
4. D.R. Drew, Traffic Flow Theory
5. W.R. Mcshane and R.P. Roess "Traffic Engg"
6. Wohl & Martin, Traffic System Analysis for Engineering & Planners

## (CE- 7043 Industrial Waste Treatment)

### **Unit I Problem of Water Pollution**

Effects of wastes on streams and sewage treatment plant. Natural purification of streams. oxygen sag curve. allowable organic load on streams classification of stream, stream standards and effluent standards. requirement of water for different purposes.

### **Unit II Measurement of Waste Water Volume**

Sampling of waste waters, grab and composite samples. analysis of waste water. biochemical oxygen demand. chemical oxygen demand and pH value of waste, toxicity of waste by bioassay method. Pretreatment of Wastes: Volume and strength reduction, salvage of materials, recovery of by products, reuse of waste water.

### **Unit III Conventional Methods of Treatment of Waste Water**

Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge disposal, advance methods of treatment, such as reverse osmosis, ion exchange, electro-dialysis, algal harvesting etc. low cost treatment plants. common effluent treatment plant, design and operation.

### **Unit IV Combined Treatment of Waste Water Sewage**

Energy requirement optimization and budget, municipal regulation, sewer rental charge, instrumentation in waste water treatment plants, collection of data, operation and maintenance of plants, water pollution control board.

### **Unit V Treatment of Industrial Waste**

Brief study of industrial processes and treatment methods of waste water from common industries, such as textile, dairy, paper and pulp, tannery, distillery. Hazardous wastes- Impact handling and disposal.

### **Reference**

1. "Liquid Waste of Industries - Theories, Practice and Treatment" - N.L. Nemerow, Wesley Publishing Co.
2. Treatment of Industrial Waste - E.B. Besselièvre & Max Schwartz - Mc Graw Hill Book Company
3. "Waste Water Engg. - Treatment Disposal & Reuse" - Metcalf & Eddy - Tata Mc Graw Will, New Delhi
4. Waste Water Treatment - Arceivala - Tata Mc Graw Will, New Delhi
5. Industrial Pollution Control, hand book - Lund H.F. Tata Mc Graw Will, New Delhi

## **(CE- 7044 Cost Effective & ECO-Friendly Construction)**

### **Unit I Concepts of energy efficient & environment friendly materials**

**Cost effective materials :-** Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer.

**Energy Efficient & Environment friendly building material products :-** Walls - Stabilised and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferrocement partitions.

Roofs - Precast R.C. Plank & Joists roof, Precast channel roof, Precast L-panel roof, Precast Funicular shells, Ferrocement shells, Filler Slab, Seasal Fibre roof, Improved country tiles, Thatch roof, M.C.R. tile.

### **Unit II Cost effective construction techniques and equipments**

(a) Techniques :- Rat trap bond construction, Energy Efficient roofings, Ferrocement technique, Mud Technology.

(b) Equipments :- Brick moulding machine, Stabilised soil block making machine and plants for the manufacturing of concrete blocks, M.C.R. tile making machine, Ferrocement wall panel & Roofing channel making machine, R.C.C. Chaukhat making m/c.

### **Unit III Cost effective sanitation**

(a) Waste water disposal system

(b) Cost effective sanitation for rural and urban areas

(c) Ferrocement Drains

### **Unit IV Low Cost Road Construction**

Cost effective road materials, stabilization, construction techniques tests, equipment used for construction, drainage, maintenance.

### **Unit V Cost analysis and comparison**

(a) All experimental materials

(b) All experimental techniques

## **(CE- 7045 Environmental Impact Assessment)**

### **Unit I Concept of EIA**

Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA, Environmental Inventory, Environmental Impact Statement (EIS)

### **Unit II Methods of Impact Identification**

Environmental Indices and indicators for describing the affected environment, matrix methodologies, network, checklist, and other method.

### **Unit III Impact analysis**

Framework, statement predication and assessment of impact of air, water, noise and socio-economic environment.

### **Unit IV Preparation of written documentation**

Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort.

### **Unit V Public Participation in Environmental Decision making**

Basic definitions, Regulatory requirements, Advantages & disadvantages of Public Participation, Selection of Public participation techniques, Practical considerations for implementation.

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

**OR**

Shall submit a detailed report of experimental work/ software package on any specific problem of importance

**Objective:** To develop physical fitness and mental peace among students

#### **UNIT I**

YOG & PRANAYAM::Introduction, benefits of pranayam, Asan

#### **UNIT II**

Meditation – Agnai, Asanas, Kiriya, Bandas, Muthras, benefits of Agnai Meditation

#### **UNIT III**

Benefits of santhi Meditation Kayakalpa Yoga Asanas, Kiriya, Bandas, Muthras  
Meditation Santhi

#### **UNIT IV**

Meditation Thuriyam Kayakalpa Asanas, Kiriya, Bandas, Muthras Benefits of  
Thuriyam

#### **UNIT V**

Meditation Thuriyam Kayakalpa Asanas, Kiriya, Bandas, Importance of Arutkappy &  
muhurtas Meditation Santhi Kayakalpa Asanas, Kiriya, Bandas, Muthras

#### **UNIT VI NATIONAL SPORTS ORGANISATION (NSO)**

Each student must select two of the following games and practice for two hours per week. An attendance of 80% is compulsory to earn the credits specified in the curriculum. List of games:

- Basket Ball
- Football
- Volley Ball
- Badminton
- Cricket
- Throw ball

#### **References**

1. Prāṇāyāma Rahasya Book by Ramdev
2. Sampooran Yog Vidhya by Rajiv Jain Trilok
3. Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority by B.K.S. Iyengar

**Unit I**

**Reservoir Planning:** Investigations, Capacities, Zones of storage, Mass Inflow and Mass Demand curves, Life of Reservoir.

**Earth Dams:** Types, causes of failure and design criteria, soils suitability for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.

**Unit II Gravity dams:**

Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, practical profile, evaluation of profile by method of zoning, foundation treatment, construction joints, galleries in gravity dams..

**Unit III**

**Spillways:** Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways.design of outlets and rating curves.

**Energy dissipators:** Principles of energy dissipation Energy dissipators based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles. Design of canal regulating structures, Design of Channel transitions, Design of Sarda type Falls, Design of cross drainage works viz Syphon aqueduct and Canal syphon.

**Unit IV**

**Structures on Pervious formations:** Bligh's creep theory, limitations, Khosla's theory of independent variable, Khosla's corrections, Design of Weir and Barrages :design of waterways and crest levels, design of impervious floors and protection works.

**Unit V**

**Canal Structures and Hydropower Plants:** Design of canal falls, Regulators, Cross drainage works, Introduction of Hydropower development, general features of hydro-electric schemes, selection of turbines.

**List of Experiments**

1. To prepare a drawing sheet on various types of spillway
2. Stability analysis of gravity dam
3. Design & study of earthen dam.
4. Design of ogee spillway.

**References:**

1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
2. Hydroelectric Hand Book by Creager
3. Hydraulic Structures by Varshney
4. Irrigation & Water Power Engg. by Punmia & Pandey B.B.Lal
5. Water Power Engineering by Dandekar

**Unit I Railway**

Tractive resistances & Permanent way: Principles of Transportation, transportation by Roads, railways, Airways, Waterways, their importance and limitations, Route surveys and alignment, railway track, development and gauges, Hauling capacity and tractive effort.

i) Rails: types, welding of rails, wear and tear of rails, rail creep.

ii) Sleepers: types and comparison, requirement of a good sleeper, sleeper density.

iii) Rail fastenings: types, Fish plates, fish bolts, spikes, bearing plates, chain keys, check and guard rails.

iv) Ballast: Requirement of good ballast, various materials used as ballast, quantity of ballast, different methods of plate laying, material trains, calculation of materials required, relaying of track.

**Unit II Geometric Design (Railway)**

Station & Yards; Points and Crossings & Signaling and interlocking: Formation, cross sections, Super elevation, Equilibrium, Cant and Cant deficiency, various curves, speed on curves. Types, locations, general equipments, layouts, marshalling yards, Definition, layout details, design of simple turnouts, Types of signals in stations and yards, principles of signaling and inter-locking.

**Unit III Bridge Site Investigation and Planning**

Loading Standards & Component parts: Selection of site, alignment, collection of bridge design data: essential surveys, hydraulic design, scour, depth of bridge foundation, Economical span, clearance, afflux, type of road & railway bridges. Design loads and forces, Impact factor, Indian loading standards for Railways Bridges and Highway Bridges, Bridge super structure and sub-structures, abutments, piers, wing walls, return walls, approaches, floors & flooring system, choice of super structure.

**Unit IV Substructures for bridges**

Bridge Foundations, Construction, Testing and Strengthening of Bridges : Different types of foundation: piles and wells, sinking of wells, coffer-dams. Choice of bridges and choice of materials, details of construction underwater and above water, sheet piles coffer dams, Erection of bridges, girders, equipments and plants. inspection and Data collection, strengthening of bridges, Bridge failure.

**Unit V Tunnels**

Tunnels: Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts, Construction of tunnels in soft soil, hard soil and rock, Different types of lining, methods of lining, Mucking operation, Drainage and ventilation, Examples of existing important tunnels in India and abroad.

## References

1. Chakraborty and Das; Principles of transportation engineering; PHI
2. Rangwala SC; Railway Engineering; Charotar Publication House, Anand
3. Rangwala SC; Bridge Engineering; Charotar Publication House, Anand
4. Ponnuswamy; Bridge Engineering; TMH
5. Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons
6. Railway Track by K.F. Antia
7. Principles and Practice of Bridge Engineering S.P. Bindra - Dhanpat Rai & Sons
8. Bridge Engineering - J.S. Alagia - Charotar Publication House, Anand
9. Railway, Bridges & Tunnels by Dr. S.C. Saxena
10. Harbour, Docks & Tunnel Engineering - R. Srinivasan
11. Essentials of Bridge Engg. By I.J. Victor; Relevant IS & IRS codes

**Unit I Water tanks**

Design of cylindrical & rectangular tanks with different boundary conditions using IS 3370 tables. The tank resting on ground, underground & over head tanks.

**Unit II**

**Intze tank:** Membrane analysis with mention of continuity effects. Design of staging, columns, braces & raft foundations.

**Chimneys:** design for RCC & Steel

**Unit III**

**Bunkers & Silos:** principles of design of bunkers, silos.

**Retaining walls:** General types, structural behavior. Design of cantilever retaining walls & counter fort Retaining walls.

**Unit IV Prestressed concrete**

Prestressing concepts materials, systems of prestressing & losses Introduction to working & limit State Design.

**Unit V**

**Steel tank:** Riveted, pressed & circular overhead tanks.

**Design of formwork:** Steel & timber formwork.

**List of Experiment**

1. Design & drawing of Tanks Resting on ground.
2. Design & drawing of Underground Tanks.
3. Design & drawing of Over head Tanks.
4. Design & drawing of Intze Tank.
5. Design & drawing of Bunker/silo.
6. Design & drawing of chimney (RCC).
7. Design & drawing of Retaining walls.

**Reference**

1. Design of Steel Structures – Ramammutham
2. Design of Steel Structures – Punia
3. Steel Str. by Ramchandra Vol II
4. Design of steel structures – L.S. Negi
6. Plain & reinforced concrete - Rammuttham
7. Plain & reinforced concrete – B.C. Punnia
8. Structural Design & Drawing by N.K.Raju.

**(CE -8041 Structural Dynamics & Earthquake Engineering)****Unit I Single DOF systems**

Undamped and Damped, Response to Harmonic and periodic excitations, Response to Arbitrary, Step, Ramp and Pulse Excitations.

**Unit II Multiple DOF systems**

Stiffness and Flexibility matrices for shear buildings, free and forced vibrations-undamped and damped, Modal and Response History Analysis, Systems with distributed mass & elasticity

**Unit III Numerical Evaluation of Dynamic Response**

Time stepping methods, methods based on Interpolation of Excitation, Newmark's and Wilson -  $\alpha$  method, Analysis of Nonlinear Response, Introduction to frequency domain analysis.

**Unit IV Elements of seismology**

Definitions of the basic terms related to earthquake (magnitude, intensity, epicenter, focus etc.), seismographs Earthquake Response of structures - Nature of dynamic loading resulting from earthquake, construction of Response spectrum for Elastic and Inelastic systems.

**Unit V Earthquake Resistant Design of Structures**

Earthquake Resistant Design of Structures, Design of structures for strength & serviceability, Ductility and energy absorption, Provisions of IS : 1893 and IS : 4326 for aseismic design of structures, Code for ductile detailing IS : 13920.

**Reference**

1. Chopra A.K., Dynamics of structures - Theory and Applications to Earthquake Engineering, Prentice Hall of India, New Delhi.
2. Berg G.V. Elements of Structural Dynamics, Prentice Hall of India, Englewood Cliffs, NJ
3. Paz Mario, Structural Dynamics, CBS Publishers, Delhi
4. Clough R.W. & Penzien J., Dynamics of structures McGraw Hill, New York.

## (CE- 8042 Air Quality Monitoring & Control)

### **Unit I Air pollution problem**

Economics and social aspects, historical episodes of air pollution. Sources of Air pollution, effects of air pollution on health, animal, plants and materials

### **Unit II Air Pollutants**

Role of meteorological condition, properties of typical air pollutants, air diffusion and concentration pollutants. general diseases caused by air pollutants. toxicity of various pollutants. Plums patterns and height of chimneys.

### **Unit III Secondary Pollutants**

Atmospheric chemistry, formation of secondary pollutants – PNN, PBN, Photolytic cycles, general diseases and toxicity of pollutants

### **Unit IV Sampling and Analyzing of Air Pollutants**

Instruments pollution survey, standards of air pollution. Principle of air pollution control, site selection and zoning, various control methods, process and equipment changes, design and operation of various air pollution control equipments.

### **Unit V**

**Air pollution control:** Air pollution control legislation, public education pollution standards, status of air pollution control in various countries.

**Industrial Hygiene:** Concept and importance, factory Involved in environmental hazards, industrial ventilation occupational diseases, control methods.

### **Reference**

1. "Air Pollution" - Faith W.L, John Wiley & Sons
2. "Air Pollution" - Mc Cabe L.C., Mc. Graw Hill, International
3. Air Pollution - Stern A.C., Academic Press N. York
4. Fundamentals of Air Pollutions - Raju BSN Oxford & IBH Publishing Co. Pvt. Ltd.
5. "Air Pollution" - Rao M.N. & Rao HVN - Tata Mc Graw Hill
6. Air Pollution – Wark and Warner

## **(CE- 8043 Energy Efficient & Green Building)**

### **Unit I Energy efficient Green Buildings**

The green Building concept, rating systems in India and world, GRIHA, LEED, etc. , green building rating agencies and some top green buildings in the world, sustainable practices used in the design and construction phases of Energy Efficient Green Buildings. Green Rating for Integrated Habitat Assessment (GRIHA), Energy Efficient Solar Homes & Buildings, Energy Savings in Homes, IGBC certification.

### **Unit II Energy Conscious Buildings**

Climate and buildings in india, Introduction, Factors affecting climate, Climatic zones and their characteristics, Implications of climate on building design ,Urban climate ,Microclimate, Tools for analyzing weather data, Illustrative example, References Codes: National Building Code, Energy Conservation Building Codes, Key barriers to 'building green in India, Overcoming the barriers, implementation approach, etc.

### **Unit III Principles of Energy Conscious Design Of Buildings In India**

Introduction Building Envelope, Site, Orientation, Building Configuration, Building Components, Passive Heating, Direct Gain ,Indirect Gain, Thermal storage wall, Roof top collectors, Isolated Gain, Solarium (Attached greenhouse / sunspace), Passive Cooling, Ventilation Cooling, Cross ventilation, Wind tower, Induced ventilation, Nocturnal cooling, Evaporative Cooling ,Passive downdraft evaporative cooling (PDEC) ,Roof surface evaporative cooling (RSEC) ,Direct evaporative cooling using drip-type (desert) coolers 3.4.3 Nocturnal ,Radiation Cooling, Desiccant Cooling, Earth Coupling, Earth-air pipe system, Day lighting, Basic Principles of Day lighting, Day lighting Systems, Building Materials, Embodied Energy of Building Materials, Alternative Building Materials

### **Unit IV Thermal Performance of Buildings**

Introduction, Heat Transfer, Solar Radiation, Simplified Method for Performance Estimation; Example Computer-based Tools.  
DESIGN GUIDELINES: Description of Buildings, Methodology, General Recommendations, Specific Guidelines.

### **Unit V Zero Energy Buildings**

Opportunities and challenges in designing a Net zero building, Energy efficient solar homes/buildings, Design aspects ,Climatic zones ,Passive design features and, their advantages, Orientation of building, Sunshades, Window design, Double glazed windows Building insulation, Roof treatment ,Evaporative cooling ,Landscaping ,Surface to volume ratio Passive heating ,Earth air tunnel ,Solar chimney, Wind tower, Applicable passive features for various climatic zones, Energy-efficient lighting, Indoor lighting ,Outdoor lighting ,Energy efficient air conditioners, Selecting the right size, Selecting an efficient AC ,Installing an AC, Renewable energy devices/systems, Solar water heating system Building integrated PV system, Other renewable energy devices/systems.

## (CE 8044 : Design Of Prestressed Concrete Structures)

### **Unit I Introduction**

Principles of prestressing, Different methods of prestressing – post tensioning and pre-tensioning. Prestressed concrete materials. Need for high strength concrete and High concrete tensile steel. Creep and shrinkage of concrete, relaxation of steel. Losses of pre-stress friction and anchorage of steel.

### **Unit II Flexural strength of prestressed concrete section**

Analysis of prestress, Resultant stress at a section, Line of Thrust, Load Balancing. Cracking moments. Shear strength and torsional strength of prestressed concrete section. Principle stresses and principal shear stresses, Ultimate shear resistance.

### **Unit III Stress Distribution**

Stress-pattern in anchorage zones. Transmission length. End zone reinforcement. Stress distribution in end block.

### **Unit IV Design of members for flexure**

Design of members for flexure. Code recommendations. Rectangular and I-section. Working out of section dimensions for concrete and prestressing forces for steel. Application to design of slabs and continuous beams and Bridge girders. Design for concordant table and tendon profiles.

### **Unit V Design of tension and compression members**

Design of tension and compression members, Design for combined bending and compressive, Different approaches for design, Introduction to design of transmission poles, roof truss members, purlin, railway sleepers.

### **References**

1. Lin T.Y., *Design of Prestressed Concrete Structures*.
2. Varatnam P., *Prestressed Concrete Structures*.
3. Ramarathan S., *Prestressed Concrete*.
4. Graduate I.I., *Prestressed Concrete*.
5. Krishna Raju, *Prestressed Concrete*.
6. Evans R.H. and Bennett R.S., *Prestressed Concrete*.
7. *IS-1343*.
8. Mullick S.K. and Rangaswamy R.S., *The Mechanics of Prestressed Concrete Design*.
9. Sinha and Raj, *Prestressed Concrete*.

## (CE-8045 Advance Water Resources Engg)

### **Unit I Precipitation / Flood analysis**

Optimal Rain gauge Network Design, Adjustment of Precipitation Data, Depth Area-Duration Analysis, Design Storm, Probable Maximum Precipitation, Probable Maximum Flood, Flood Frequency Analysis, Risk Analysis,

### **Unit II Flood Routing & Managements, Models in Hydrology**

Flood Management, Flood Routing through Reservoirs, Channels Routing Muskingum Method, Introduction to Stochastic Models in Hydrology like AR, ARMA, ARIMA etc. Concept of Correlogram.

### **Unit III System Analysis**

Need, Water Resources Systems, Optimisation Techniques, Linear Programming, Feasible Solutions, Graphical Method, Simplex Method, Use of of LP in Water Resources, Introduction to Reservoir Operation, Rule curves, Linear Decision Rule

### **Unit IV Dynamic Programming**

Dynamic Programming & its utility in Resource Allocation and other Decision Making Problems, Optimal Operating, Policies, Use of D. P. in Reservoir, Operation.

### **Unit V Optimality Analysis & Updating of Network**

Network Methods, Project Optimality Analysis. Updating of Network, Utility in Decision Making.

### **References**

1. Subramany K., Engg. Hydrology.
2. Philipps & Ravindran: Operations Research
3. Hire D.S. & Gupta: Operation Research
4. Loucks D.P., Stedinder I.R. & Haith D.A : Water Resources Systems Engg.
5. Kottegoda N. T., Stochastic Water Resources Technology.
6. Singh V.P. : Elementary Hydrology

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

**OR**

Shall submit a detailed report of experimental work/ software package on any specific problem of importance