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## Other university B.E./B.Tech - G CIVIL Level 2 syllabus

### Basic Electronics

#### ESC202 Basic Electronics

2 credits

##### Module 1:

Diodes and Applications covering, Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode - Operation and Applications; Opto- Electronic Devices - LEDs,

Photo Diode and Applications; Silicon Controlled Rectifier (SCR) - Operation, Construction, Characteristics, Ratings, Applications;

##### Module 2:

Transistor Characteristics covering, Bipolar Junction Transistor (BJT) - Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) - Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits;

##### Module 3:

Transistor Amplifiers and Oscillators covering, Classification, Small Signal Amplifiers - Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Feedback Amplifiers - Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers;

Oscillators – Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non- Sinusoidal type Oscillators;

#### **Module 4:**

Operational Amplifiers and Applications covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground;

#### **Text/Reference Books:**

1. David. A. Bell (2003), Laboratory Manual for Electronic Devices and Circuits, Prentice Hall, India
2. Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India
3. Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals by Pearson Education,
4. Paul B. Zbar, A.P. Malvino and M.A. Miller(2009), Basic Electronics – A Text-Lab. Manual, TMH
5. R. T. Paynter (2009), Introductory Electronic Devices & Circuits, Conventional Flow Version, Pearson

## **Computer-aided Civil Engineering Drawing**

### **ESC203 Computer-aided Civil Engineering Drawing**

**2 credits**

**Module 1:INTRODUCTION;** Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, coordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.

**Module 2:SYMBOLS AND SIGN CONVENTIONS:** Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards

**Module 3: MASONRY BONDS:**English Bond and Flemish Bond –

Corner wall and Cross walls - One brick wall and one and half brick wall

**Module 4: BUILDING DRAWING:** Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity

**Module 5: PICTORIAL VIEW:** Principles of isometrics and perspective drawing. Perspective view of building.  
Fundamentals of Building Information Modelling (BIM)

**Text/Reference Books:**

1. Subhash C Sharma & Gurucharan Singh (2005), "Civil Engineering Drawing", Standard Publishers
2. Ajeet Singh (2002), "Working with AUTOCAD 2000 with updates on AUTOCAD 2001", Tata- Mc Graw- Hill Company Limited, New Delhi
3. Sham Tickoo Swapna D (2009), "AUTOCAD for Engineers and Designers", Pearson Education,
4. Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age International Pvt. Ltd.,
5. Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades publishing KDR building, Calicut,
6. (Corresponding set of) CAD Software Theory and User Manuals.
7. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd New Asian. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria& Sons,

## **Surveying and Geomatics**

### **PCC-CE206 Surveying and Geomatics**

**3 credits**

#### **Module 1: Introduction to Surveying**

Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Levelling: Plane table surveying, Principles of levelling- booking and reducing levels;

differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes.

## **Triangulation and Trilateration**

Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods - triangulation network- Signals. Baseline - choices - instruments and accessories - extension of base lines corrections - Satellite station - reduction to centre - Intervisibility of height and distances - Trigonometric leveling - Axis single corrections.

## **Module 2: Curves**

Elements of simple and compound curves - Method of setting out- Elements of Reverse curve - Transition curve - length of curve - Elements of transition curve - Vertical curves

## **Module 3: Modern Field Survey Systems**

Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station - Parts of a Total Station - Accessories -Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

## **Module 4: Photogrammetry Surveying**

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

## **Module 5: Remote Sensing :**

Introduction -Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

## **Text/Reference Books:**

- 1 Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
- 2 Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
- 3 Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
- 4 Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
- 5 Anji Reddy, M., Remote sensing and Geographical information system, B.S.Publications, 2001.
- 6 Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.

## **Introduction to Civil Engineering**

### **HSMC251 Introduction to Civil Engineering**

#### **2 credits**

**1. Basic Understanding:** What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career

**2. History of Civil engineering:** Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers

**3. Overview of National Planning for Construction and Infrastructure Development;** Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works;

**4. Fundamentals of Architecture & Town Planning:** Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities

**5. Fundamentals of Building Materials:** Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes

**6. Basics of Construction Management & Contracts**



**Management:** Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management

**7. Environmental Engineering & Sustainability:** Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction;

**8. Geotechnical Engineering:** Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunnelling

**9. Hydraulics, Hydrology & Water Resources Engineering:** Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multipurpose reservoir projects

**10. Ocean Engineering:** Basics of Wave and Current Systems; Sediment transport systems; Ports & Harbours and other marine structures

**11. Power Plant Structures:** Chimneys, Natural & Induced Draught Colling towers, coal handling systems, ash handling systems; nuclear containment structures; hydro power projects

**12. Structural Engineering:** Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies;

**13. Surveying & Geomatics:** Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR;

**14. Traffic & Transportation Engineering:** Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and Freight Transportation; Road Safety under heterogeneous traffic; Sustainable and resilient pavement materials, design, construction and management; Case studies and examples.

**15. Repairs & Rehabilitation of Structures:** Basics of corrosion

phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; NonDestructive testing systems; Use of carbon fibre wrapping and carbon composites in repairs.

### **16. Computational Methods, IT, IoT in Civil Engineering:**

Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building Information Modelling; Highlighting typical available software systems (SAP, STAAD, ABAQUS, MATLAB, ETAB, NASTRAN, NISA, MIKE 21, MODFLOW, REVIT, TEKLA, AUTOCAD,...GEOSTUDIO, EDUSHAKE, MSP, PRIMAVERA, ArcGIS, VisSIM, ...)

**17. Industrial lectures:** Case studies of large civil engineering projects by industry professionals, covering comprehensive planning to commissioning;

**18. Basics of Professionalism:** Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement; Facilities Management; Quality & HSE Systems in Construction

### **Text/Reference Books:**

1. Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
2. The National Building Code, BIS, (2017)
3. RERA Act, (2017)
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6. Avtarsingh (2002), Law of Contract, Eastern Book Co.
7. Dutt (1994), Indian Contract Act, Eastern Law House
8. Anson W.R.(1979), Law of Contract, Oxford University Press
9. Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
10. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern Book Co.
11. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
12. P. S. Narayan (2000), Intellectual Property Rights, Gogia Law Agency

13. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
14. Bare text (2005), Right to Information Act
15. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
16. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
17. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House
18. Vee, Charles & Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss. 2, pp 117-127, MCB UP Ltd
18. American Society of Civil Engineers (2011) ASCE Code of Ethics - Principles Study and Application
19. Ethics in Engineering- M.W.Martin& R.Schinzinger, McGraw-Hill
20. Engineering Ethics, National Institute for Engineering Ethics, USA
21. www.ieindia.org
22. Engineering ethics: concepts and cases - C. E. Harris, M.S. Pritchard, M.J.Rabins
23. Resisting Bureaucratic Corruption: Alacrity Housing Chennai (Teaching Case Study) -S. Ramakrishna Velamuri -CEIBS
24. CONSTRUCTION CONTRACTS,  
<http://www.jnormanstark.com/contract.htm>
25. Internet and Business Handbook, Chap 4, CONTRACTS LAW,  
<http://www.laderapress.com/laderapress/contracts1aw1.html>
26. Contract &Agreements ,  
<http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law>,
27. Contracts, <http://206.127.69.152/jgretch/crj/211/ch7.ppt>
28. Business & Personal Law. Chapter 7. "How Contracts Arise",  
<http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt>
29. Types of Contracts,  
<http://cmsu2.cmsu.edu/public/classes/rahm/meiners.con.ppt>
30. IV. TYPES OF CONTRACTS AND IMPORTANT PROVISIONS,  
<http://www.worldbank.org/html/opr/consult/guidetxt/types.html>  
Contract Types/Pricing  
Arrangements Guideline- 1.4.G (11/04/02),  
<http://www.sandia.gov/policy/14g.pdf>

## **Fluid Mechanics**

**201003 : Fluid Mechanics**

**Credits : 03**



## **Unit I:**

**a) Properties of Fluids:** Definition of fluid and fluid mechanics: examples and practical applications, classification of fluids: Real and Ideal, , physical properties of fluids: mass density, specific weight, specific volume, relative density, viscosity, Newton's law of viscosity Dynamic and kinematic viscosity, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure.

**b) Fluid Statics:** Basic equation of hydrostatics, concept of pressure, pressure head, Pascal's Law, measurement of pressure (absolute, gauge), principle of manometers: Balancing liquid column, dead weight, pressure transducers and their types, total pressure and centre of pressure: on plane horizontal, vertical, inclined and curved surfaces: practical applications, **Buoyancy and Floatation:** Principle of floatation and buoyancy, stability of floating and submerged bodies

## **Unit II:**

### **a) Fluid Kinematics**

Eulerian and Lagrangian approach, velocity and acceleration, and their components in Cartesian co-ordinates, Classification of flows, stream line, stream tube, path line, streak line, control volume. Equation of continuity for 3-D flow in Cartesian co-ordinates, components of rotation, velocity potential, stream function and flow net.

**b) Fluid Dynamics:** Forces acting on fluid mass in motion, Euler's equation of motion along a streamline and its integration to get Bernoulli's equation and its limitations, Modified Bernoulli's equation, concept of HGL and TEL, Application of Bernoulli's equation to measure discharge and velocity of flow: Venturimeter, Orifice meter, Rotameter and Pitot tube.

## **Unit III:**

### **a) Dimensional Analysis and Model Studies**

Dimensional homogeneity, dimensional analysis using Buckingham's  $\pi$  theorem method, geometric, kinematic and dynamic similarity, important dimensionless Numbers (Reynolds No., Froude No., Euler No., Mach no. and Weber No) and their significance, Model Laws (Reynold's law and Froude's Law)

### **b) Boundary layer Theory**

Concept, development of boundary layer on flat plate and factors affecting growth, Boundary layer thickness, displacement thickness, momentum and energy thickness, Laminar sub layer, Local and mean drag coefficients, Hydrodynamically smooth and rough boundary, boundary layer separation and methods to control separation

## Unit IV

**a) Laminar & Turbulent Flow through Pipe:** Characteristics of laminar flow, laminar flow through a circular pipe: Hagen Poiseuille equation, Characteristics of turbulent flow, instantaneous velocity, temporal mean velocity, scale of turbulence and intensity of turbulence, Prandtl's mixing length theory, velocity distribution equation, variation of friction factor for laminar flow and for turbulent flow, resistance to flow in smooth and rough pipes, friction factor for commercial pipes, Moody's diagram.

**b) Flow through pipes:** Energy losses in pipe flow, Equation for major loss and minor losses in pipe, flow through pipes in simple and compound pipe, pipes in series, parallel, Dupit's equation, pipe network analysis by Hardy Cross method, Introduction to siphon.

## Unit V

**a) Introduction to Open channel flow:** Classification of channels, channel flows and geometric elements of channel, Basic governing equations of Channel flow viz. continuity equation, energy equation and momentum equation, One dimensional approach, Velocity distribution in open channel flow.

**b) Uniform flow in open channels:** Uniform flow formulae: Chezy's and Manning's formulae; Factors affecting Manning's roughness coefficient; Important terms pertaining to uniform flow, viz. normal depth, conveyance, section factor, concept of second hydraulic exponent, Uniform flow computations. Most efficient channel sections: rectangular, triangular and trapezoidal. **Depth-Energy**

**Relationships in Open Channel Flow:** Specific energy and Specific force diagram, Depth discharge Diagram, Critical depth, Conditions for occurrence of critical flow; Froude's number, flow classification based on it, Important terms pertaining to critical flow viz. section factor, concept of first hydraulic exponent

## Unit VI

**a) Gradually Varied Flow (GVF) in Open Channel Flow:** Theory and Computation Basic Assumptions of GVF; Dynamic equation of GVF - Alternative forms; Classification of channel bed slopes, Various GVF profiles, Methods of GVF computations: Direct Step method. (mention of other method )

**b) Fluid Flow around Submerged Objects:**

Practical problems involving fluid flow around submerged objects, Definitions and expressions for drag, lift, drag coefficient, lift coefficient, types of drag. Introduction to Drag on sphere, cylinder, flat plate and Aerofoil, Karman's vortex street, Development of lift,

Introduction to Magnus effect, Lift on cylinder and Aerofoil, Polar diagram.

## **Books:**

### **Text books:**

- 1 Hydraulics and Fluid Mechanics including Hydraulic Machine by Dr P. N. Modi & S. M. Seth Pub: Standard book house, Delhi-6
2. Flow in Open Channels by K Subramanya, Pub: Tata McGraw Hill, New Delhi
3. A Text Book on Fluid Mechanics and Hydraulic Machines by Sukumar Pati Pub: McGraw Hill, New Delhi

### **Reference books:**

1. Engineering Fluid Mechanics by R. J. Garde and A.J Mirajgaonkar, Pub: SCITECH Publications( India )Pvt.Ltd, Chennai
2. Fluid Mechanics and its Applications, Vijay Gupta, Santosh K Gupta, New Age international pvt. Ltd, New Delhi,
3. Fluid Mechanics, Fundamentals and applications by Yunus. A Cengel and John.M Cimbala, Mc Graw Hill International, New Delhi.
4. Fluid Mechanics by Streeter, Wylie and Bedford - Pub: McGraw Hill International, New Delhi.
5. Open Channel Hydraulics by Ven Tee Chow, Pub: Mcgraw- Hill Book Company- Koga.
6. A Text Book of Fluid Mechanics and Hydraulic Machines- by Dr. R K Rajput Pub: S Chand and Co Ltd. New Delhi

## **Engineering Geology**

### **207003 Engineering Geology**

#### **Credits: 03**

#### **Unit I: General Geology, Mineralogy and Petrology**

##### **a) Introduction to the subject, scope and sub divisions. General**

**Geology:**The Earth as a planet, Interior & General composition of the Earth, The rock cycle

**b) Introduction to mineralogy:** Physical Properties of Minerals, Classification of Minerals, silicate and non-silicate minerals, Rock forming minerals.

##### **c) Introduction to petrology and Broad classification of rocks.**

**Igneous Petrology:** Plutonic, Hypabyssal and Volcanic rocks, Structures, Textures and Classification of Igneous rocks. Study of common rock types prescribed in practical work and their

engineering applications.

**Secondary Petrology:** Rock weathering, Sedimentary Structures, lithification and diagenesis Process, Genetic classification of secondary rocks and grain size classification and Textures, Study of common rock types prescribed in practical work and their civil engineering applications.

**Metamorphic Petrology:** Agents, Types of metamorphism, Texture and structures. Study of common rock types prescribed in practical work and their civil engineering applications.

## **Unit II: Geomorphology and Historical Geology.**

**a) Geomorphology:** Endogenic and Exogenic processes, Geological action by fluvial process i.e. river and Landforms formed it, Aeolian and glacial process, Coastal geomorphology.

**b) Historical Geology:** General principles of Stratigraphy, Geological time scale w.r.t. Indian geological time scale, Physiographic divisions of India, Archean's & Dharwar formation, Cudappah formations, Vindhyan formations, Gondwana formations, Deccan Trap formations, significance of their structural characters in major civil engineering activities.

## **Unit III: Structural Geology, Plate Tectonics**

**a) Introduction to plate tectonics and Mountain building activity.**

**b) Structural Geology:** Out crop, dip and strike, conformable series, unconformity, its types and overlap, faults and their types, folds and their types, inliers and outlier. Civil engineering importance of faults and folds with examples.

**c) Structures of rocks:** Igneous intrusions and their types, joints and their types, stratification and lamination.

## **Unit IV: Remote Sensing and G.I.S., Preliminary Geological Studies**

**a) Remote sensing (RS):** Definition, Stages of Remote sensing, Remote sensing platforms, Active & Passive Remote sensing, Electromagnetic spectrum, visible band, scattering & absorption of EMR in atmosphere and its effect on Satellite Imagery; resolution of satellite images, Elements of remote sensing for Visual interpretation viz. Tone, shape, size, pattern, texture, shadow and Association.

**b) Geographical Information System (GIS):** Introduction, Definition, tools, applications of remote sensing and geographical information system in Civil Engineering.

**c) Preliminary Geological Exploration:** reconnaissance survey,



Desk Study, surface and subsurface Geological Investigations: Direct methods like Test & trial pits, pilot trenches, Drilling, Core inspection significance and limitations of it. Indirect methods like Resistivity, seismic survey and its significance and limitations.

## **Unit V: Role of Engineering Geology in Dams, Reservoirs and Tunneling.**

**a) Geology of Dams & Reservoir:** Strength, stability and water tightness of foundation rocks, influence of geological conditions on the choice and type of dam, preliminary geological work on dam and reservoir sites, precautions to be taken to counteract unsuitable conditions and their relevant treatments with case studies.

**b) Tunneling:** Preliminary geological investigations, important geological considerations while choosing alignment, difficulties during tunneling as encountered due to various geological conditions, Role of groundwater and suitability of common rock types for excavation and tunneling and important case studies in Kasara and BorGhat sections of central railway in Maharashtra and in India, particularly in Himalayas etc.

## **Unit VI: Geological Hazards, Ground Water and Building Stones.**

**a) Geological Hazards:** Volcanism, Earthquakes & Seismic zones of India, Landslides and stability of hill slopes and preventive measures.

**b) Groundwater:** Types of ground water, water table and depth zones, influence of hydro geological properties of rocks, types of aquifers, artesian wells and its geological conditions, artificial recharge of groundwater. Geological work of groundwater, levels, effects of dams and canals, effect of pumping, cone of depression, circle of influence, fluctuations in water table Methods of conservation of groundwater and its management; introduction of watershed management.

**c) Building stones:** Requirements of good building stone: strength, durability, ease of dressing, appearance, mineral composition, textures and field structures, suitability of common rocks as building stone.

### **Books:**

#### **Text Books:**

1. Text Book of Engineering Geology by R.B. Gupte , 2001, P.V.G. Publications, Pune.



2. A Text Book of Engineering Geology by N. ChennaKesavulu. 2010, McMillan India Ltd.
3. Principles of Engineering Geology by D. Venkat Reddy. 2010, Vikas Publishers.

### **Reference Books:**

1. Geology P. K. Mukerjee, World Press
2. Engineering Geology by F. G. H Blyth and De Frietus, Reed Elsevier India
3. Geology for geotechnical engineers, J. C. Harvey, Cambridge University Press
4. Principals of Engineering Geology, S.K. Garg, VikasPublishe
5. Engineering Geology, Parbin Singh
6. Geology and Engineering, K. V. G. K. Gokhale, D. M. Rao ,Tata McGraw Hill.
7. Structural Geology, M. P. Billings, Pearson India Pvt. Ltd.

## **Mathematics-3**

### **MODULE I**

#### Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

### **MODULE II**

#### Integral Transforms

Fourier integral, Fourier Transform , Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations, Z-Transform and its application to solve difference equations.

### **Module- III**

Formal Logic ,Group, Ring and Field: Introduction to First order logic, Proposition, Algebra of Proposition, Logical connectives, Tautologies, contradictions and

contingency, Logical implication, Argument, Normal form, Rules of inferences, semi group, Monoid Group, Group, Cosets, Lagrange's theorem, Congruence relation, Cyclic and permutation groups, Properties of groups, Rings and Fields (definition, examples and standard results only)

#### **Module- IV**

Set, Relation, function and Counting Techniques - Introduction of Sets, Relation and Function, Methods of Proof, Mathematical Induction, Strong Mathematical Induction, Discrete numeric function and Generating functions, recurrence relations and their solution, Pigeonhole principle.

#### **Module- V**

Lattices and Boolean Algebra: Introduction, Partially ordered sets, Hasse Diagram, Maximal and Minimal element, Upper and Lower bounds, Isomorphic ordered sets, Lattices, Bounded Lattices and, Distributive Lattices. Duality, Boolean Algebras as Lattices, Minimization of Boolean Expressions, prime Implicants, Logic Gates and Circuits, Truth Table, Boolean Functions, Karnaugh Maps.

#### **Text Books**

1. E. Kreyszig: Advanced Engineering Mathematics; John Wiley & Sons.
2. R.K. Jain & S.R.K. Iyenger: Advanced Engineering Mathematics, Narosa Publishing House.
3. C.L.Liu: Elements of Discrete Mathematics; Tata McGraw- Hill Publishing Company Limited, New Delhi.
4. S. Lipschutz, M.L. Lipson and Varsha H. Patil: Discrete Mathematics; Tata McGraw- Hill Publishing Company Limited, New Delhi

5. B. Kolman , Robert C. Busby & S. C. Ross: Discrete Mathematical Structures' 5

th Edition, Perason Education ( Singapore), Delhi, India.

### **Reference Books**

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers, New Delhi.
2. B.V. Ramana: Higher Engineering Mathematics; Tata McGraw- Hill Publishing Company Limited, New Delhi.
3. Peter V.O' Neil. Advanced Engineering Mathematics, Thomas ( Cengage) Learning.
4. Kenneth H. Rosem: Discrete Mathematics its Application, with Combinatorics and Graph Theory; Tata McGraw- Hill Publishing Company Limited, New Delhi
5. K.D. Joshi: Foundation of Discrete Mathematics; New Age International (P) Limited, Publisher, New Delhi.

## **Hydraulic Engineering and Machines**

### **HYDRAULIC ENGINEERING & MACHINES**

**Credit - 4**

**UNIT I Introduction** : Basic concepts of free surface flows, velocity and pressure distribution,

Mass, energy and momentum principle for prismatic and non-prismatic channels critical, sub-critical and super-critical type of flows. Critical depth, concepts of specific energy and specific

force. Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound sections. [8 Hours]

**UNIT II Energy-Depth relationship:** Application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions. Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of

varied flow equation by analytical, graphical and numerical methods. Measurements of discharge & velocity - Venturi flume, Standing wave flume, Parshall flume, Broad crested weir, Current meter and Floats. [8 Hours]

**UNIT III Rapidly varied flow:** Hydraulic jump; Evaluation of the jump elements in rectangular channels on horizontal and sloping beds, energy dissipater, open channel surge, celerity of the gravity wave, deep and shallow water waves. [8 Hours]

**UNIT IV Impulse momentum equation-** Impact of Jets-plane and curved- stationary and moving plates. Pumps: Positive displacement pumps - reciprocating pumps , centrifugal pumps, operation, velocity triangles, performance curves, Cavitation, Multi staging, Selection of pumps. [8 Hours]

**UNIT V Rotodynamic Machines,** Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves. [8 Hours]

## **Materials, Testing & Evaluation**

### **Materials, Testing & Evaluation**

**Module 1: Introduction to Engineering Materials** covering, Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes, Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses of these

**Module 2: Introduction to Material Testing** covering, What is the “ Material Engineering” ?;

Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material

(brittle, quasi-brittle, elastic and so on) True stress – strain interpretation of tensile test;

hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep –

fundamentals and characteristics; Brittle fracture of steel – temperature transition approach;

Background of fracture mechanics; Discussion of fracture toughness testing – different materials;

concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics

**Module 3: Standard Testing & Evaluation Procedures** covering, Laboratory for mechanical

testing; Discussion about mechanical testing; Naming systems for various irons, steels and

nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and

transition temperatures; Fracture mechanics – background; Fracture toughness – different

materials; Fatigue of material; Creep.

Tutorials from the above modules covering, understanding i) Tests & testing of bricks, ii) Tests

& testing of sand, iii) Tests & testing of concrete, iv) Tests & testing of soils, v) Tests & testing of

bitumen & bituminous mixes, vi) Tests & testing of polymers and polymer based materials, vii)

Tests & testing of metals & viii) Tests & testing of other special materials, composites and

cementitious materials. Explanation of mechanical behavior of these materials.

## **BUILDING DESIGN AND DRAWING**

**Unit: 1** Site Selection criteria: Principles of Building planning, Significance Sun path diagram, Wind Diagram, Orientation, Factors affecting, criteria under Indian condition.



**Unit: 2** Building Planning Byelaws and regulations: As per SP-7, 1983 National Building code of India group 1 to 5.

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Planning of Residential Building: (Bungalows, Row Bungalows, Apartments and Twin Bungalows) Procedure of Building Permission, the significance of commencement, plinth completion or occupancy certificate.

**Unit: 3** Low-cost Housing: Materials and Methods (conceptual introduction only)

Maintenance, Repairs, Rehabilitation of Structures: (Conceptual introduction only)

Green building: Concept and rating.

**Unit: 4** Plumbing system: Various Materials for system like A-PVC, C-PVC, GI, and HDPE. Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing and Drainage plan, introduction to rainwater harvesting.

Electrification: Concealed and Open Wiring, Requirements and Location of various points, Concept of Earthing.

Fire resistance in building: Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire.

**Unit: 5** Ventilation: Definition and necessity of Ventilation, functional requirement, various system and selection criteria.

Air conditioning: Purpose, Classification, Principles, Systems and Various Components of the same.

Thermal Insulation: General concept, Materials, Methods.

Introduction to Acoustics: Absorption of sound, various materials, conditions for good acoustics.

Sound Insulation: Methods of noise control.

**Unit: 6** Paints: Different types and application methods.

Plastering: Pointing and various techniques.

Wall cladding: Skirting, dado work with various materials.

Miscellaneous finishes: POP, Gypsum plaster.

## **Concrete Technology**

**Unit I:** Introduction to Concrete and Ingredients of Concrete. a) Cement and Aggregate- Manufacture, chemical composition, hydration, physical and mechanical properties, classification, types and application of cement, tests on cement, Classification of aggregate, physical and mechanical properties of aggregate, deleterious materials in aggregate, alkali-aggregate reaction, Fineness and gradation of aggregates using sieve analysis, tests on aggregates.

b) Water and Admixtures -Quality of water for use in concrete, role of admixture, classification and types of admixtures like accelerators, retarders, plasticizers, super plasticizers, mineral admixtures-fly ash, silica fume, ground granulated blast furnace slag.

**Unit II:** Production, Properties and Testing of Fresh Concrete a) Production and Properties of Fresh Concrete: Nominal mixes, Water-cement ratio, Process of manufacturing fresh concrete-batching, mixing, transportation, compaction, curing of concrete, curing methods, influence of temperature, maturity rule, workability and factors affecting workability, cohesion and segregation.

b) Tests on fresh concrete - Workability by slump cone, compaction factor, Vee-Bee consistometer and flow table apparatus, Effect of admixture on workability of concrete and optimum dosage of admixture by Marsh cone test.

**Unit III:** Properties and Testing of Hardened Concrete a) Hardened concrete - Strength of concrete, factors affecting strength, micro-cracking and stress-strain relationship, relation between tensile and compression strength, impact strength, abrasion resistance, creep and shrinkage.

b) Testing of hardened concrete -Destructive tests -compression strength, flexural strength, indirect tensile strength, core test. Nondestructive tests: rebound hammer, ultrasonic pulse velocity, pullout test and impact echo test.

**Unit IV:** Concrete Mix Design and Methods of Mix Design

a) Concrete Mix Design- Concept and objectives of concrete mix design, factors affecting the mix design, quality control, variability of laboratory test result, acceptance criteria, Grade designation and IS requirements as per IS 456 (Exposure conditions, minimum & maximum cement content and maximum W/C ratio

b) Methods of Mix Design: IS code method and DOE method (with and without mineral admixture), Use of spreadsheet/programming/software for concrete mix design.

**Unit V: Concreting Equipments, Techniques and Special concretes**

a) Concreting Equipments and Techniques–Batching plants, concrete mixers, hauling, pumps, concrete vibrators and compaction equipments. Special concreting techniques- ready mix concrete,

under water concreting, roller compacted concrete, cold and hot weather concreting. b) Special concretes – Light weight concrete and its types, foam concrete, no fines concrete, self compacting concrete, high density concrete, fiber reinforced concrete, geo-polymer concrete and Ferrocement technique.

**Unit VI: Deterioration and Repairs in Concrete (06 Hours)** a)

Deterioration –Durability, factors affecting the durability of concrete, Permeability, sulphate attack, acid attack, chloride attack, corrosion of reinforcement, carbonation of concrete b) Repairs – Symptoms and diagnosis of distress, evaluation of cracks, selection of repair procedure, repair of defects using various types and techniques – shotcrete and grouting. Introduction to retrofitting of concrete structures by fiber reinforced polymer (FRP), polymer impregnated concrete. Corrosion monitoring and preventive measures.

## **Introduction to Solid Mechanics**

### **UNIT I Simple stress and strains:**

Concept of stress and strain, types of stresses and strains, Hook's law, stress and strain diagram for ductile and brittle metal. Lateral strain, Poisson ratio, volumetric strain, elastic moduli and relation between them. Bar of varying cross-section, composite bar and temperature stress. Strain energy for gradual, sudden, and impact loading.

Compound stress and strains:

Normal stress and strain, shear stress and strain, stresses on inclined sections, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain,

equilibrium equations, generalized Hook's law-3D, Theories of failure and factor of safety.

## **UNIT II Shear force and bending moment diagrams**

Shear force (SF) and Bending moment (BM) diagrams for simply supported, cantilevers, overhanging and fixed beams. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads.

## **UNIT III Flexural Stresses**-Theory of simple bending - Assumptions

- Derivation of bending equation:  $M/I = f/y = E/R$  - Neutral axis - Determination of bending stresses - Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections - Design of simple beam sections.

Torsion- Derivation of torsion equation and its assumptions.

Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion.

Shear Stresses- Derivation of formula - Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

## **UNIT IV Deflection of Beams:** Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Short Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules.

## **UNIT V Helical and Leaf Springs:** Deflection of springs by energy

method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs.

Thin cylinders, Thick cylinders & Spheres: Introduction, difference between thin walled and thick walled pressure vessels, thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain. Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders.

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