

# Engineering and Management Institute of India

**Diploma in Engineering**

**ARCHITECTURE ENGINEERING SYLLABUS**

<b>Second Year</b>		
<b>Subject Code</b>	<b>Subject Name</b>	<b>Page</b>
ARE-2.1	STRENGTH OF MATERIAL	3
ARE-2.2	CONSTRUCTION TECHNOLOGY-I	5
ARE-2.3	BUILDING CONSTRUCTION & MATERIAL	7
ARE-2.4	SURVEYING	9
ARE-2.5	ARCHITECTURAL DESIGN	11
ARE-2.6	BUILDING SERVICES	13
ARE-2.7	ENVIRONMENTAL ENGINEERING	15
ARE-2.8	STEEL STRUCTURE DESIGN	17
ARE-2.9	R.C.C.STRUCTURE	19
ARE-2.10	HISTORY OF ARCHITECTURE	21

<b>Third Year</b>		
<b>Subject code</b>	<b>Subject Name</b>	<b>Page</b>
ARE-2.11	CONSTRUCTION TECHNOLOGY-II	23
ARE-2.12	COMPUTER SIMULATION & MODELLING	25
ARE-2.13	ESTIMATION & COSTING	27
ARE-2.14	BUILDING BYE LAWS	29
ARE-2.15	ARCHITECT DRAWING	31
ARE-2.16	ENTREPRENEURSHIP DEVELOPMENT. & MANAGEMENT	33
ARE-2.17	CONSTRUCTION PROJECT MANAGEMENT	35
ARE-2.18	PROJECT WORK	37

**Department of Architecture Engineering**

**Vision:-**

To strengthen the region through imparting superior quality technical education and research; which enables the fulfillment of industrial challenge and establish itself as a Centre of Excellence in the field of Architecture Engineering.

**Strength of Material (ARE-2.1)****UNIT-I**

**Simple Stresses & Strains :-** Elasticity and plasticity – Types of stresses & strains–Hooke’s law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson’s ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

**UNIT –II**

**Shear Force and Bending Moment Diagrams:-** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure.

**UNIT – III**

**Flexural Stresses:-** Theory of simple bending – Assumptions – Derivation of bending equation:  $M/I = f/y = E/R$  Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, sections. Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T sections.

**UNIT – IV**

**Thin Shells:-** Definition – Thin and thick cylindrical shell Failure of thin cylindrical shell subjected to internal pressure Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure simple problems change in dimensions of a thin cylindrical shell subjected to internal pressure -problems Derivation of tensile

stress induced in a thin spherical shell subjected to internal pressure simple problems change in diameter and volume of a thin spherical shell due to internal pressure.

### UNIT -V

**Torsion of Circular Shafts:-** Theory of pure torsion, Derivation of torsion equations:  $T/J=q/r=N\theta/L$  Assumptions made in theory of pure torsion-Torsional moment of resistance – Polar section modulus – Power transmitted by shafts. Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders.

**Reference Book :-**

- 1.Strength of Materials by (R.K. Bansal ,Laxmi Publications 2010).
2. Strength of materials by (Sadhu Singh.Khanna Publications).
3. Strength of Materials by (S.Timshenko)

**CONSTRUCTION TECHNOLOGY-I (ARE-2.2)****UNIT-I**

**Pile Foundations :-** Introduction, uses, selection of pile, types of piles, pile spacing, group of piles, efficiency of group of piles, pile cap and pile shoe, load tests on piles, pile driving, pulling of piles, loads on piles, causes of failures of piles, pile driving formulas.

**UNIT –II**

**Coffer Dams:-** Definition, uses, selection of coffer dams, types of coffer dams, design D. Lesson Planning features of coffer dams; leakage prevention, economic height.

**Special Structures:-** Tall structures, Spatial structures, Pre-stressed structures.

**UNIT – III**

**Caissons:-** Definition, uses, construction material, types of caissons, loads on caisson, design features of caissons, floating of caissons, cutting edges, sinking of caisson, tilting of caisson, caisson diseases.

**UNIT – IV**

**Control of Ground Water in Excavations: -** Methods- pumping, well points, bored wells, electro-osmosis, injections with cement, clays and chemical, freezing process, vibro-flotation.

**Construction of Earthquake Resistant Buildings: -** Planning of earthquake resistant building, Construction of walls –provision of corner reinforcement, Construction of beams and columns. Base isolation.

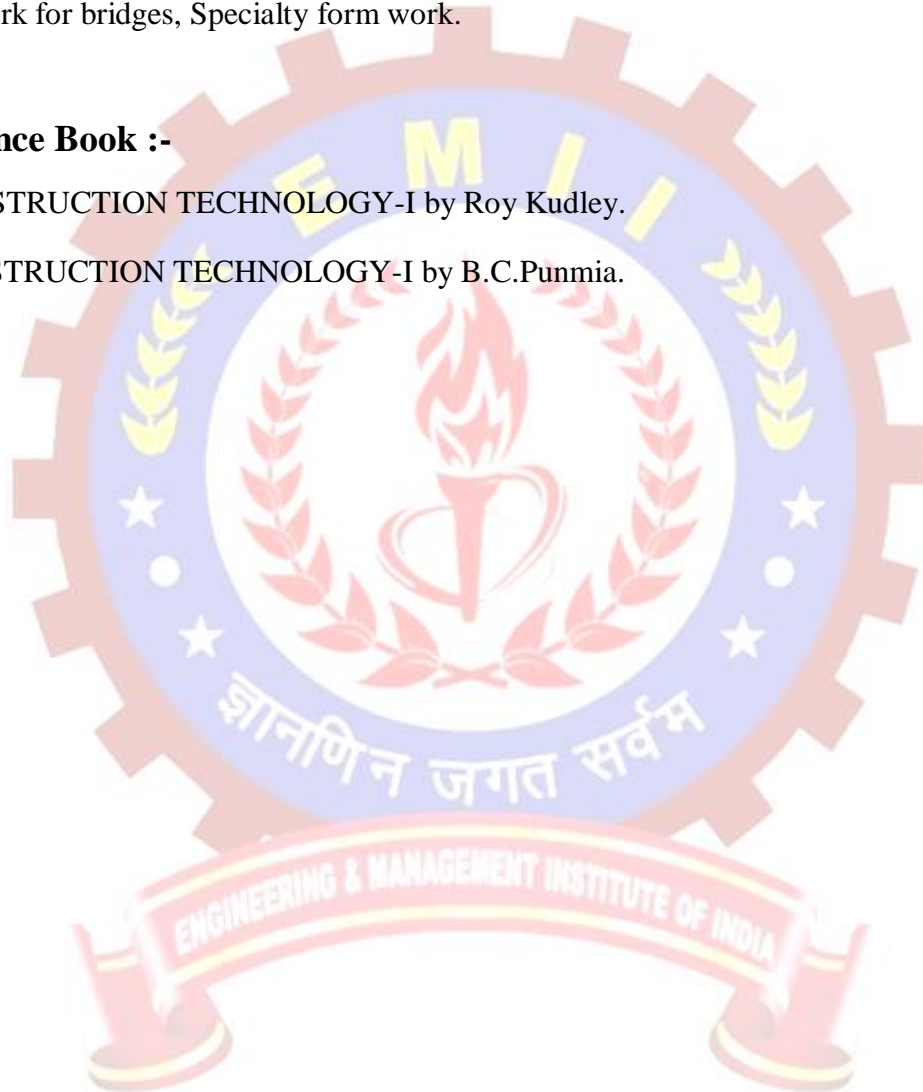
---

**UNIT –V**

**Temporary Works:-** Form work for R.C.C. wall, slab, beam and column, Centering for arches of large spans and dams, design features for temporary works, Slip formwork, False work for bridges, Specialty form work.

**Reference Book :-**

1. CONSTRUCTION TECHNOLOGY-I by Roy Kudley.
2. CONSTRUCTION TECHNOLOGY-I by B.C.Punmia.



**BUILDING CONSTRUCTION & MATERIAL (ARE-2.3)****UNIT-I****Building Materials I:-**

**Aggregate :-** Classification, Physical and mechanical properties, soundness, alkali-aggregate reaction, thermal properties of aggregate Bricks and Masonry Blocks: Types, properties and field and laboratory tests to evaluate quality Lime: classification, properties Cement: types, Portland cement: chemical composition of raw material, bogue compounds, hydration of cement, role of water in hydration, testing of cements, fly ash: properties and use in manufacturing of bricks and cement.

**UNIT –II**

**Mortar :-** Types and tests on mortars.

**Concrete:-** Production, mix proportions and grades of concrete, fresh, mechanical and durability properties of concrete, factors affecting properties of concrete, tests on concrete,

**admixtures, Special concrete:-** light weight concrete, high density concrete, vacuum concrete, shotcrete, steel fiber reinforced concrete, polymer concrete, Ferro cement, high performance concrete, self-compacting concrete.

**UNIT – III****Basic Building Materials II:-**

**Building stone :-** classifications, properties and structural requirements;

**Wood and Wood products:-** Introduction to wood macrostructure, sap wood and heart wood, defects and decay of timber, seasoning and preservation of timber, fire resisting treatment, introduction to wood products- veneers, plywoods, fibre board, particle board, block board, batten boards.

**Metals :-** Steel: Important properties and uses of Iron (Cast iron, wrought iron and steel), Important tests on steel rebar, aluminum and copper. Glass: types and uses, gypsum: source, properties, uses; plastic: properties and uses, paint: types, distemper, varnish, Adhesive: Types, Bitumen: types, properties and tests.

**UNIT – IV****Basic Building Constructions**

**Foundation:** - purpose, types of foundation- shallow, deep, pile, raft, grillage foundation.

**Masonry: Brick Masonry:** - types of bonds, relative merits and demerits of English, Single Flemish and Double Flemish bond.

**Stone Masonry:** - General principles, classification of stone masonry and their relative merits and demerits,

**Cavity wall :** - components and construction,

**Arches :** - Terminology and classifications Doors and Windows: Types, materials used.

**UNIT –V****Finishing, Services and Special constructions**

**Wall Finishes :** - Plastering, pointing, distempering and painting: Purpose, methods, defects and their solutions.

**Vertical communication:** - Stairs: Terminology, requirements of good staircase, classification; ramps, lifts and escalators.

**Damp proofing:** - causes, effects, prevention and treatments, Fire resistant construction: Fire resistant properties of common building materials, requirements for various building components.

**Reference Book : -**

1. BUILDING CONSTRUCTION & MATERIALI by N Subramanian.
2. BUILDING CONSTRUCTION & MATERIAL by S.S.Bhavikatti.



**SURVEYING (ARE-2.4)****UNIT-I**

**Chain surveying:-** Principle, purpose and suitability of chain surveying, equipments used in chain surveying. Different types of chains, tapes, ranging rods, arrows, pegs, mallet, crossstaves, Indian optical square, and line ranger- their construction and use, Direct and indirect ranging, chaining on flat and sloping ground. Reconnaissance survey, selection of stations. Conducting chain survey over an area, recording the field data, plotting the chain survey, conventional signs. Obstacles in chain surveying erroneous length of chain, correction for measurements by erroneous length of chain, simple problems. Errors in chain surveying, permissible errors in chaining.

**UNIT –II**

**Compass Surveying:-** Purpose, principle and suitability of compass surveying instruments used in compass surveying construction and working of prismatic and surveyors compass, temporary adjustment or use of prismatic compass setting and taking observations. Concept of bearing, systems of bearings, magnetic meridian, true meridian and arbitrary meridian, magnetic bearing, true bearing, arbitrary bearing whole circle and reduced bearing, fore and back bearing. Magnetic dip and declination. Local attractions, causes of local attraction, detection of local attraction, errors and corrections, problems on local attraction, calculation of included angles, calculation of bearing in a compass traverse. Concept of traverse; open and closed traverse, traversing with a compass. Check for open and closed traverse plotting traverse, graphical adjustment of closing errors, errors in compass surveying.

**UNIT – III**

**Simple Levelling:-** Purpose of levelling, concept and explanation of all terms connected with levelling work instruments used in levelling, principle and construction of Dumpy, IOP (Tilting) and automatic levels, types of levelling instruments, types of levelling staffs, Concept of line of collimation, axis of telescope, axis of bubble tube and vertical axis. Temporary adjustment of dumpy level, IOP level and automatic level. Methods of levelling. Concept of station, back sight, intermediate sight, foresight, height of instrument, reduced level, parallax, change point. Reduction of levels and maintenance

of level field book, height of instruments method and rise and fall method with arithmetic checks, numerical problems.

#### **UNIT – IV**

**Precise levelling:-** Propose of precise levelling problems on missing entries, longitudinal or profile levelling (L-Section), Cross- Section levelling (X-Section), reciprocal levelling, balancing of back sight and fore sight, Difficulties in levelling : Levelling across hill or hollow, levelling on steep slope (Up hill or down hill ), staff very near the instrument, continuation of levelling across a tall wall, levelling across a pond or a lake too wide and levelling across a river. Effect of earth's curvature and refraction. Error in levelling and precautions to minimize them. Permanent adjustment of dumpy level. Permissible error in levelling. Sensitivity of bubble tube.

#### **UNIT –V**

Constructional details and method of using of Abney level, Ceylon's Ghat tracer, Box Sextant, Tangent Clinometers or Indian pattern clinometers, digital planimeter. Calculation of areas by graphical method : Dividing the plan into triangles, graphical paper method and application of formula. Trapezoidal and Simpson's formula with numerical problems.

#### **Reference Book :-**

1. Surveying and Levelling Vol. I by B.C. Punmia.
2. Surveying and Levelling Vol. I by T.P Kanetkar and Kulkarney
3. Surveying and Levelling Vol. I by Amarjeet Singh Aggarwal

**ARCHITECTURAL DESIGN (ARE-2.5)****UNIT-I****Orientation to the Architecture Profession: -**

Role of an Architect in the built environment. Building process, Role of other professional in building. A general survey of the changes in habitat in history. Architects act, C.O.A., I.I.A., NASA

**UNIT –II****Space and Architecture: -**

Understanding design as to create for a particular purpose and architectural design as to create space – exercise in terms of simple drawing and sketching of objects available in nature and surroundings. Form created through lines (columns) and planes (volumes), combination thereof.

**UNIT – III****Form and Transformations :-**

Additive, Dimensional, Subtractive- exercises primarily through 3-D models of simple geometrics.

**Projectional drawings of solids** – right prism, right pyramid, right cylinder, right cone. Section lines in different angles & drawing of true section.

**UNIT – IV**

**Living Spaces and Building: -** Measuring, Drawing and dimensioning of simple building components. Designing for basic functions of human beings, e.g. living, eating, sleeping, cooking etc.

---

**UNIT –V**

**Building Design:** - Design of mono-cellular-unit/structure on a level plane, Designing of simple activity spaces, Designing of multiple but simple activity spaces involving primarily horizontal circulation.

**Reference Book :-**

1. ARCHITECTURAL DESIGN by N Subramanian.
2. ARCHITECTURAL DESIGN by S.S.Bhavikatti.



---

**BUILDING SERVICES (ARE-2.6)****UNIT-I**

**Introduction to Building Services:-** Definitions, Objective and uses of services, Applications of services for different types building considering, Classification of building services, Types of services and selection of services, Natural and artificial lighting- principles and factors, Necessity of Ventilation, Types of ventilation – Natural and Mechanical, Factors to be considered in the design of Ventilation.

**UNIT –II**

**Electrical Services and Layout in Different Types of Building:-** Technical terms and symbols for electrical installations and accessories of wiring, Types of insulation, electrical layout for residence, small work shop, show room, school building, etc.

**UNIT – III**

**Mechanical Services in Buildings: -** Introduction of mechanical services

**Lift: -** Definition, Types of Lifts, Design Considerations, Location, Sizes, Component parts.

**Elevators & Escalators: -** Different types of elevators and Escalators, Freight elevators, Passenger elevators, Hospital elevators, Uses of different types of elevators Escalators.

**Air Conditioning:-** Definition, Purpose, Principles, Temperature Control, Air Velocity Control, Humidity Control, Air Distribution system, Cleaners, Filters, Spray washers, Electric preceptors, Types of Air Conditioners, (Central type, Window Type,

**UNIT – IV**

**Fire Protection:-** Introduction, Causes of fire and Effects of fire, General Requirements of Fire Resisting Building as per IS: 1642:1989 and NBC 2005, Characteristics of Fire Resisting Materials , Maximum Travel Distance, Fire Fighting Installations for Horizontal Exit, Roof Exit / Fire Lifts, External Stairs.

**UNIT –V**

**Miscellaneous Services and Green Buildings Provisions: -** Plan for Rain Water Harvesting in the New Buildings, Concept of GREEN Buildings, Components of GREEN Building, Components of Grey Water System, Management of Grey Water System and Distribution Pattern, Solar Power System.

**Reference Book : -**

1. BUILDING SERVICES by N Subramanian.
2. BUILDING SERVICES by S.S.Bhavikatti.

**ENVIRONMENTAL ENGINEERING (ARE-2.7)****UNIT-I****INTRODUCTION:-**

**Man and Environment :-** Overview (socio-economic structure & occupational exposures) – Scope of Environmental Engineering – pollution problems due to urbanization & industrialization.

**UNIT –II****AIR POLLUTION :-**

**Causes of air pollution :-** types & sources of air pollutants- Climatic & Meteorological effect on air pollution concentration- formation of smog and fumigation.

**UNIT – III**

**Analysis of Air Pollutants :-** Collection of Gaseous Air Pollutants- Collection of Particulate Pollutants – Analysis of Air Pollutants like : Sulphur dioxide – Nitrogen oxide – Carbon monoxide – Oxidants &Ozone – Hydrocarbons – Particulate Matter.

**UNIT – IV**

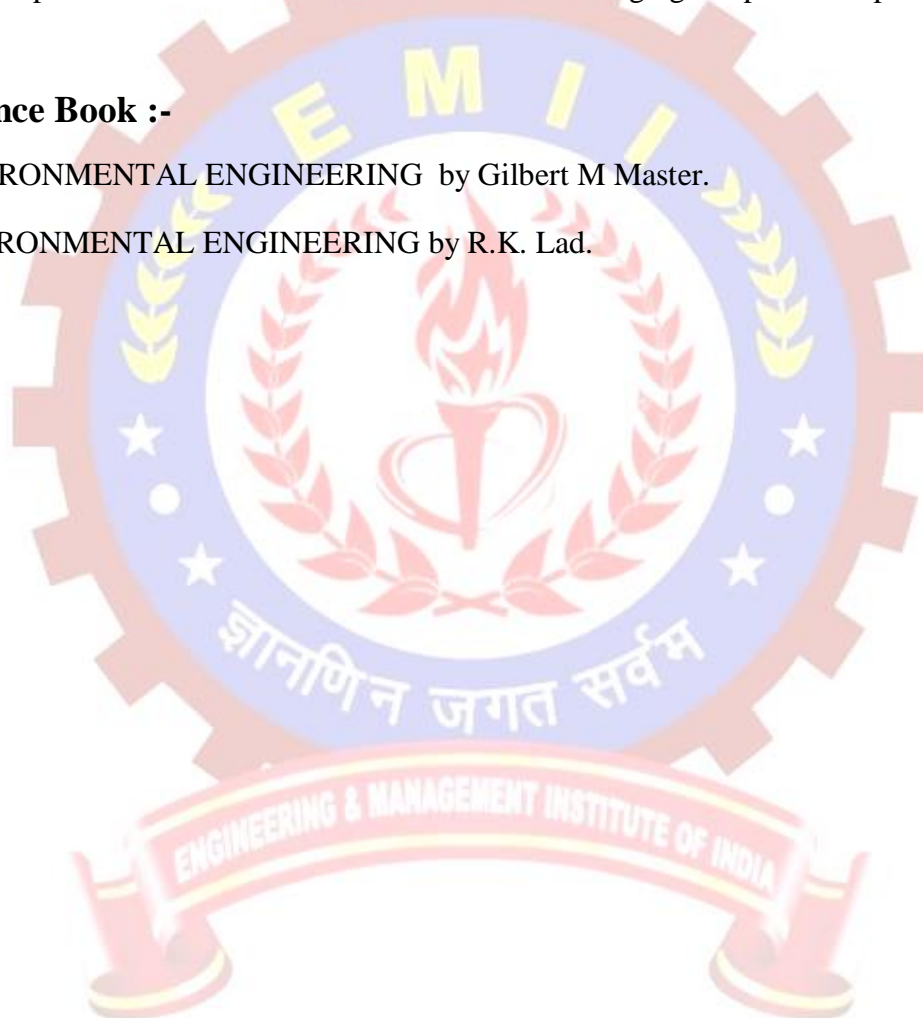
**Air Pollution Control Measures & Equipment :-** Control of Particulate Emission – Control of Gaseous Emission – Flue Gas Treatment Methods : Stacks Gravitational and Inertial Separation, Settling Chambers, Dynamic Separators, Cyclones, Filtration, Liquid Scrubbing, Spray Chambers, Packed Towers, Orifice and Ventury Scrubbers, Electrostatic Precipitators, Gas/solid Adsorption, Thermal Decomposition.

**UNIT -V**

**Methods & Approach of Air Pollution Control :** - Controlling smoke nuisance – Develop air quality criteria and practical emission standards – Creating zones suitable for industry based on micrometeorology of air area – Introducing artificial methods of removal of particulate and matters of waste before discharging to open atmosphere.

**Reference Book :-**

1. ENVIRONMENTAL ENGINEERING by Gilbert M Master.
2. ENVIRONMENTAL ENGINEERING by R.K. Lad.





**Steel Structure Design (ARE-2.8)****UNIT-I****Materials –**

Making of iron and steel - Types of structural steel - Mechanical properties of steel - Concepts of plasticity - Yield strength. Loads - Combined loads - Wind loads on roof trusses, Behavior of steel, local buckling. Concept of limit state design - Different limit states as per IS 800-2007- Design strengths - Deflection limits - Serviceability - Bolted connections - Welded connections - Design Strengths - Efficiency of joint - Prying action - Types of welded joints - Design of Tension members - Design strength of members.

**UNIT –II****Design of compression members -**

Buckling class- Slenderness ratio - Strength design Laced and Battened columns - Column splice - Column base - Slab base.

**UNIT – III****Design of Beams –**

Plastic moment - Bending and shear strength laterally / supported beams design - Built-up sections - large plates Web buckling Crippling and Deflection of beams - Design of Purlin.

**Torsion design-** Beams, columns Combined axial, flexural and torsion: columns.

**UNIT – IV****Design of eccentric connections with brackets –**

End beam connections - Web angle Unstiffened and stiffened seated connections (bolted and welded types) Design of truss joints.

**Plastic Design:-**

Design of continuous beams and portal frame using plastic design approach.

**UNIT –V**

**Design of welded plate Girders** - Optimum depth - Design of main section - Design of end bearing, stiffness bearing and intermediate stiffness. Connection between web and flange - Design of flange splice and web splices.

**Axial force design:-**

Tension member, compression member.

**Reference Book :-**

Steel Structure Design By (S.S.Bhavikatti)

Steel Structure Design By (S.K.Duggal).

**R.C.C. Design (ARE-2.9)****UNIT-I**

**Reinforcement Materials:-** Various types of reinforcing materials. Suitability of steel as reinforcing material. Properties of different types of steel (mild steel, medium tensile steel, and deformed bars).

**Bond in RCC beams:-** Concept of bond. Permissible bond stresses for plain and deformed bars as per BIS code of practice, minimum length, standard hook.

**UNIT –II**

**Theory of R.C.C. Beams:-** Assumption in the theory of simple bending for RCC beam. Flexural strength of a singly reinforced RCC beam Position of the Neutral axis, concept of balanced, under reinforced and over reinforced sections moment of the section. Shear strength of singly reinforced RCC beam, Assumptions made, permissible shear stresses as per IS code of practice, actual average shear stresses in singly reinforced concrete beam, concept of diagonal stirrups and inclined bars, shear strength of RCC beam section.

**Bond in RCC beams:-** Concept of bond. Permissible bond stresses for plain and deformed bars as per BIS code of practice, minimum length, standard hook.

**UNIT – III**

**Singly Reinforced Concrete Beam: -** Loads and loading standards as per IS:875. Design of singly reinforced concrete beam as per BIS-456 code of practice from the given data such as span, load and properties of materials used. Design of lintel with and without chajja. Design of a main/secondary beam for RCC roof and floor. Design of a cantilever beam/slab.

**Doubly Reinforced Concrete Beams: -** Doubly reinforced concrete beam and its necessity. Design of a doubly reinforced concrete beam.

**RCC Stairs: -** Generator principles for design of RCC stairs. Design of horizontally spanning stairs. Design of dog legged RCC stairs.

**UNIT – IV**

**Columns and Isolated Footings:** - Concept of long and short columns. IS specifications for main and lateral reinforcement including spiral reinforcement. Behaviour of RCC columns under axial load. Design of Axially loaded short and long columns with different end condition. Design of isolated footings to determine depth and width of foundation.

Basic concept of limit state design method and prestressed concrete – introduction to pre and post tensioning methods

**UNIT –V**

**T-Beams:** - Structural behaviour of beam and slab floor laid monolithically. Rules for the design of T-beams. Economical depth of T-beams. Design of simply supported T-beams using IS code of practice.

**RCC Slabs:** - Structural behaviour of slabs under UDL. Type of Boundary conditions. Design of one way slab. Design of two way slab with the help of tables of IS:456.

**Reference Book :-**

1. R.C.C. Design Engineering by (B.C.Pumia)
2. R.C.C. Design Engineering by (N. Krishna Raju)

**HISTORY OF ARCHITECTURE (ARE-2.10)****UNIT-I**

**Prehistory to River Valley Civilizations:-** Introducing concepts of culture and Civilization – Paleolithic and Neolithic culture- art forms and evolution of shelter – megaliths – agricultural revolution and its impact on culture and civilization. Ancient river valley civilizations: Mesopotamia (Tigris/Euphrates) - Ancient river valley civilization – India (river Indus) Indus valley civilization: culture and pattern of settlement, housing pattern. Ancient river valley civilizations: Egypt (Nile) Ancient river valley civilizations: China (yellow river).

**UNIT-II****Greece and Rome: -**

**Greek Architecture: -** Hellenic and Hellenistic cultures – Greek character- Greek polis and democracy- Greek city planning – architecture in the archaic and classic periods – Domestic architecture; Public Buildings: Agora, Stoas, Theatres, bouleuterions and stadia's – Greek Temple: evolution and classification – Parthenon and Erechthion- orders in architecture: Doric, Ionic, Corinthian– Optical illusions in architecture.

**Roman Architecture: -** Structural forms, materials and techniques of construction - orders in architecture: Tuscan and Composite. Rome: Forum Romanum and other Imperial Forums, Enclosure and manipulation of space pantheon – Public buildings: Colosseum, Circus Maximus, Thermae of Caracalla.

**UNIT – III**

**Judaism, Christianity and Islam: -** Judaism and Christianity- Birth and geographic spread. Transformation of the Roman Empire. Early Christian worship and burial. Church planning- Basilican concept. Byzantine empire. Centralized plan concept in churches. Birth and spread of Islam in the first millennium. Outline of building types of Islam. Commonality in forms and ideas across Southern/ Eastern Europe and Western/CentralAsia.

**UNIT – IV**

**Medieval Europe :** - The medieval ages - learning in the monasteries, evolution of the guilds - Factors influencing architecture - outline of architectural character if Italy, France and England - Examples: Pisa group, Tower of London.

**French Gothic** - Religious and social influences - evolution of vaulting and development of structural systems - outline of Architectural character - Examples: Notre Dame, Paris.

**English and Italian Gothic** - Development of English gothic vaulting - outline of Architectural character in England and Italy - Examples: Westminster Abbey, Doges Palace, Venice, Milan Cathedral.

**UNIT –V****Italian Renaissance, French & English Renaissance:-**

**Italian Renaissance** - The idea of rebirth and revival of art sociological influences in art and architecture - Development of thought, emergence of merchant communities and their patronage. Outline of the Architecture during the early Renaissance, High Renaissance and Baroque Periods - Features of a typical Renaissance palace, e.g., Palazzo Ricardi, Study of life history philosophy, contribution of the following architects; Brunelleschi, Michelangelo, Andrea Palladio.

**French & English Renaissance** -Outline of the architectural character of French and English Renaissance - Domestic Architecture in England - Study of the life, philosophy and works of the following architects: Sir Christopher Wren, Indigo Jones.

**Reference Book :-**

1. History Of Architecture by (B.C.Pumia)
2. History Of Architecture by (N. Krishna Raju)

**CONSTRUCTION TECHNOLOGY-II (ARE-2.11)****UNIT-I**

**Doors:-** Types of doors based on the make (battened, ledged, braced, flush, panelled, framed and etc.) usage (pivoted, single leaf, double leaf, revolving, swing, rolling shutter, safety doors, collapsible, etc.), hardware fixtures, joinery, door-fixing details, and types of materials used in doors (wood, metal, glass, aluminium, & PVC).

**Set of drawings:** - Types of timber and metal doors (joinery and fixing details), fire-rated doors, precast doors, etc.

**UNIT –II**

**Windows and Ventilators:** - Types of windows based on the make (sliding, pivot, casement, louvered, fixed, bay window, etc.) and material (wood, steel, glass and aluminium) hardware fixtures, joinery, window fixing details. Set of drawings: Types of timber and metal doors.

**UNIT – III**

**RCC:-** Introduction, Application of RCC in building components (foundation, columns, beams, slabs and walls) Typical details for RCC footing, pile foundation - precast pile, cast in situ piles, types of piles, method of driving piles, walls, column, beams, lintels, sunshades, floor and roof slabs (1 & 2 way slabs) cantilever.

---

**UNIT – IV**

**Water Proofing and Damp Proofing:-** Causes and defects of dampness, methods adopted for waterproofing and damp proofing at different levels of a building, admixtures and different materials (rigid, flexible) used in the process.

---

**UNIT –V**

**GPSS & SIMSCRIPT, programming in GPSS:** - simulation programming Techniques: Data Structures, Implementation of activities, events and queues, Event scanning, simulation algorithms in GPSS and SIMSCRIPT.

**Reference Book: -**

1. COMPUTER SIMULATION & MODELLING by N Subramanian.
2. COMPUTER SIMULATION & MODELLING by S.S.Bhavikatti.



**Estimating & Costing Construction(ARE-2.12)****UNIT-I**

**ESTIMATE OF BUILDINGS:-** Introduction to estimation- Necessity of Estimation- Units and Measurements-Types of Estimates- Methods of Estimation-Load bearing and framed structures Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.- Estimation of Steel for RCC works.

**UNIT –II**

**ESTIMATE OF OTHER STRUCTURES:-** Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well Estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall.

**REPORT PREPARATION:-** Principles for report preparation – report on estimate of Official building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

**UNIT – III**

**SPECIFICATION AND TENDERS:-** Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications for buildings, Roads Tenders – Contracts – Types of contracts, BOT – Arbitration and legal requirements.

**VALUATION:-** Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Calculation of Standard rent – Mortgage – Lease-Valuation of Building- Loss assessment.

**UNIT – IV**

**Fundamentals of Estimating and Costing:-** Estimating and Costing, Meaning, purpose, Administrative Approval, Technical Sanction and Budget provision. Types of Estimate – Approximate estimate and detailed estimate. Detailed Estimate- of New work. Types and use of Estimate: Revised Estimate, supplementary Estimate, revised and supplementary estimate, renovation Estimate. Roles and responsibility of Estimator, Checklist of items of work in load bearing and framed structure as per Execution, Modes of measurement and Described accuracy in measurements of different items of work as per IS:1200, Rules for deduction in masonry work, Plastering and Pointing and Painting Work as per IS 1200.

**UNIT –V**

**Rate Analysis:-** Definition, purpose, importance and factors affecting, Lead (Standard and Extra), lift, overhead charges, water charges and contractors profit, Task work- Definition, factors, Affecting, types. Task Work of different skilled labour for different items.

**Procedure of rate analysis:-** Load carrying capacity of different types of vehicles, transportation of materials and their hire- charges. Preparing rate analysis of different items of work – PCC, RCC work in (column, beam, lintel, slab), brick masonry, stone masonry, Vitrified tile flooring, plastering, for doors.

**Reference Book :-**

1. Estimating and Costing in Civil Engineering, by Dutta, B.N.
2. A Text Book of Estimating and Costing (Civil), by Kohli, D.D and Kohli, R.C.

**BUILDING BYE LAWS (ARE-2.13)****UNIT-I**

**Development Control:-** Introduction, need and important provisions of building bye laws , Terminology such as setback, light plane, plot size, ground coverage, FAR/SFI, Fire protection and parking spaces. Classification of Buildings, land use, density, means of access, distance from electric lines. Area and height limitations.

**UNIT-II**

**General Building Requirements: -** Plinth Open space (within the plot); Habitable Rooms, Kitchen, Bathroom & water closets, Store room. Garage, Basement, Mezzanine Floor, Loftsize, height, light and ventilation & other requirement. Staircase/ Exit Requirements, Roofs & parapets; Boundary wall; lightning protection. Study of Aligarh Development Authority Manual.

**UNIT - III**

**The UP (Regulation of Building Operation) Act 1958: -** Master Plan and Zonal Plan, UP road side land control Act, UP parks, playground, and open spaces (preservation and regulation) Act, UP state industrial development authority (UPSIDA) meetings and regulations, UP apartment (Promotion of construction, ownership and maintenance) Act2010,

**UNIT - IV**

**Standards and Codes: -** : National Building Code (NBC), Leadership in Energy and Environment Design(LEED),Green Rating for Integrated Habitat Assessment (GRIHA),The American Society of Heating , Refrigerating and Air conditioning Engineers(ASHRAE), Energy Conservation Building Code(ECBC) of India-2006, The

Energy and Resources Institute(TERI) Bureau of Indian Standards(BIS), Time Saver Standards, Neuferts Data and other relevant codes. Safety in demolition of buildings- sequence of demolition operations, precautions prior and during demolition, mechanical demolition, lowering, removal and disposal of materials.

### UNIT -V

**Development/Building Permit:** - Requirements for submission drawings- Key plan, Site plan, Floor plans, Elevations, Sections, and Services plan. Fees, Duration of sanction, Deviations, Violation and penalties. Introduction to compounding. An exercise in terms of preparation of complete set of Submission (Municipal) drawings for a small project.

**Reference Book :-**

1. BUILDING BYE LAWS by Gurcharan singh.
2. BUILDING BYE LAWS by Frank Ching.

---

**ARCHITECT DRAWING (ARE-2.14)****UNIT-I**

**Introduction to drawing equipment:** - T-square, set-square, compass, drawing board, parallel motion, pencil, nylon tip pen, drawing (free hand and with the use of equipment); primary lines, secondary lines, crossing lines, dimensions, scale symbols, notes and lettering.

**UNIT-II**

**First stage of drawing competence:** - Drawing (free hand and with equipment) plans elevations, sections, slopes and forms, taking survey measurements and proper survey drawings, interiors and details.

**UNIT - III**

**Second stage of drawing competence:** - Layouts and dimensions, notes, symbols, colours.

**UNIT - IV**

**Third stage drawing competence:** - Isometric, axonometric and oblique projections. One and two point perspectives, rendering.

**Visual presentation:** - Preparation, sequence and timing, consistency, continuity, precision, standards and norms, logic and communication, target audience and receiver.

---

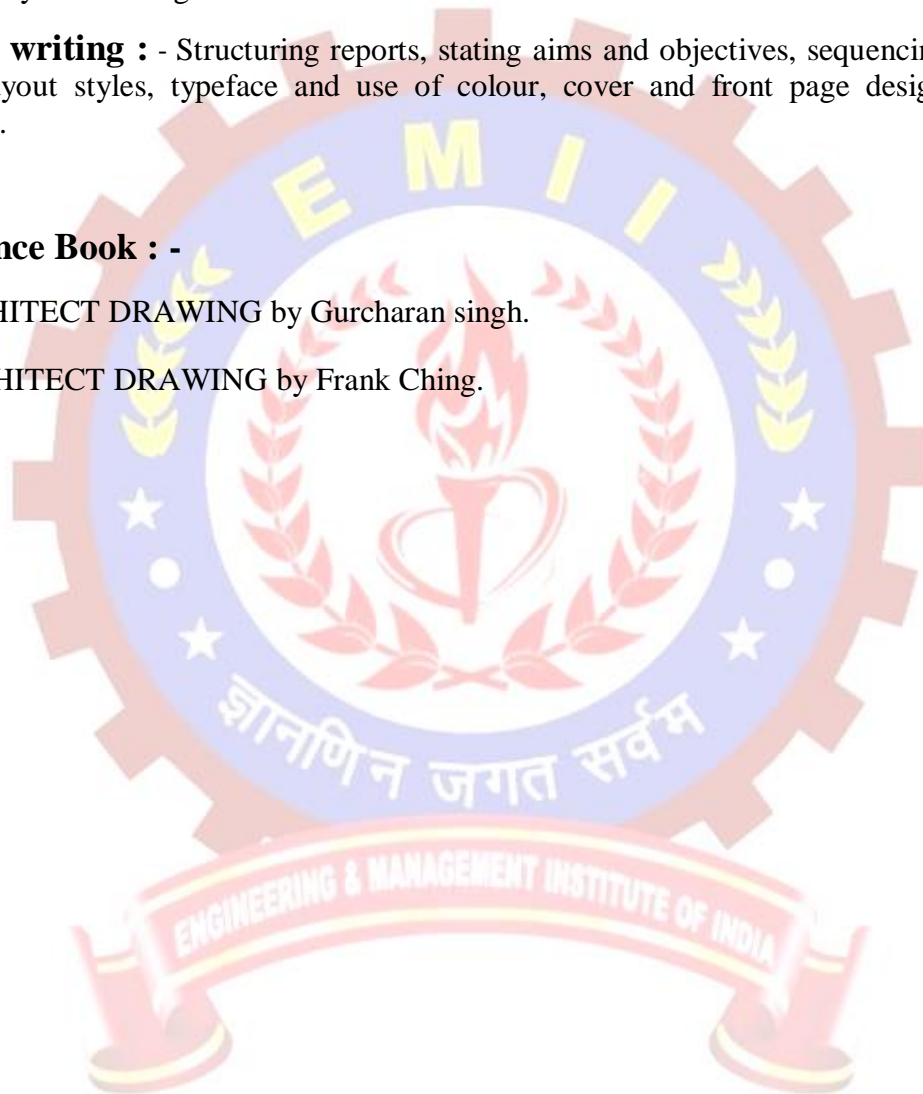
**UNIT –V**

**Techniques:** - Media and tools, pencil, colour transparency, transtext, colour plate copying layouts and legends.

**Report writing :** - Structuring reports, stating aims and objectives, sequencing report, report layout styles, typeface and use of colour, cover and front page design, target audience.

**Reference Book : -**

1. ARCHITECT DRAWING by Gurcharan singh.
2. ARCHITECT DRAWING by Frank Ching.



---

**Entrepreneurship Development & Management ( ARE-2.15)****UNIT-I**

**Introduction:-** Meaning and Importance, Evolution of term 'Entrepreneurship, Factors influencing entrepreneurship, Psychological factors, Social factors, Economic factor, Environmental factors, Characteristics of an entrepreneur, Entrepreneur and Entrepreneur, Barriers to entrepreneurship.

**Types of entrepreneur:-** According to Type of Business, According to Use of Technology, According to Motivation, According to Growth, According to Stages, New generations of entrepreneurship viz. social entrepreneurship, Edupreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc.

**UNIT –II**

**Entrepreneurial Motivation:-** Motivation, Maslow's theory, Herzberg's theory, McGrigor's Theory, McClelland's Need – Achievement Theory, Culture & Society , Values / Ethics , Risk taking behavior.

**Creativity:-** Creativity and entrepreneurship, Steps in Creativity, Innovation and inventions, Using left brain skills to harvest right brain ideas, Legal Protection of innovation, Skills of an entrepreneur, Decision making and Problem Solving (steps indecision making).

**UNIT – III**

**Organisation Assistance:-** Assistance to an entrepreneur, New Ventures, Industrial Park (Meaning, features, & examples), Special Economic Zone (Meaning, features & examples), Financial assistance by different agencies, MSME Act Small Scale Industries, Carry on Business (COB) licence, Environmental Clearance, National Small Industries Corporation (NSIC), Government Stores Purchase scheme (e-tender process), Excise exemptions and concession, Exemption from income tax, Quality Standards with special

reference to ISO, Financial assistance to MSME, Modernisation assistance to small scale unit, The Small Industries Development Bank of India(SIDBI), The State Small Industries Development Corporation(SSIDC), Export oriented units, Incentives and facilities to exports entrepreneurs, Export-Import Bank of India, Export oriented zone.

#### **UNIT – IV**

**Rules And Legislation:-** Applicability of Legislation, Industries Development (Regulations) Act, 1951., Factories Act, 1948, The Industrial Employment (Standing Orders) Act, 1946, Suspension, Stoppage of work, Termination of employment, West Bengal Shops and Establishment Act, 1963, Environment (Protection) Act, 1986, The sale of Goods Act, 1950, Industrial Dispute Act 1947.

**Project Report:-** Introduction, Idea Selection, Selection of the Product / Service, Aspects of a Project, Phases of a Project, Project Report, Contents of a Project Report, Proforma of a Suggested Project Report for a manufacturing Organization, Suggested Readings.

#### **UNIT –V**

**Agencies for industrial assistance:-** West Bengal Electronics Development Corporation, ICICI West Bengal Infrastructure Development Corporation, West Bengal Industrial Infrastructure Development Corporation, Other Corporations with focus as specific segments, State Industrial Development Corporation (SIDC), State Financial Corporation (SFCs), Directorate General of Supplies and Disposals(DGS & D), Registration with DGS & D, Registration Categories, Registration Procedure, Benefits of DGS & D, Information facilities centre in DGS & D, Khadi and Village Industries Commission (KVIC), Industrial Estate, Financing of Industrial Estates, Shilpabandhu-M Incentives for entrepreneurs 9reference to The West Bengal State Support for Industries Scheme 2008 & 2013.

#### **Reference Book :-**

1. Entrepreneurial Development, by S S Khanka.
2. The Entrepreneur, by Mark Casson.



**Construction Project Management (ARE-2.17)****UNIT-I**

**Probability:-** Probability theory and its importance: Definition of probability, Rules of Probability, The Baye's theorem. Random variable. Probability distribution. Mean or Expectation of Random variable. Properties of Mean of Expectation.

**Distributions:-** Theoretical probability Distributions: Binomial Distribution, Poisson Distribution. Normal Distribution, Exponential Distribution, Beta, Gamma.

**UNIT –II**

**Sampling:-** Sampling and sampling distribution: Probability samples, Non-probability Samples, sample Random sampling, other sampling schemes, sampling distribution and Standard error, some Sampling and Quality control. Use of concepts of standard deviation, Coefficient of variance, range in quality control of concreting and similar such activities.

**UNIT – III**

**Testing:-** Testing Hypothesis: Sampling of distribution – Test based on Normal Distribution, Studentstest, chi-square, K-S test for goodness of fit and distribution. Analysis of variance one Way & two way classification.

**Applications:-** Use of mathematical models based on probabilistic and statistical methods, Simulation in risk identification, analysis and mitigation of project risks. EOQ in civil Engineering, Sensitivity analysis, ABC analysis.

**UNIT – IV**

**Correlation Analysis:-** Correlation types, co-efficient. Bi-variate Frequency Distribution, Scatter Diagram, Correlation Analysis, Practical applications in civil engineering projects.

**Regression Analysis:-** Regression and Multivariate Analysis, Multiple Regression Analysis Nonlinear Regression. Use of regression analysis in Construction Projects.

**UNIT –V**

**Simulation:-** Simulation – Types, case studies in construction using simulation Techniques, simulation software's used. Griffi's waiting line Method, Concept of Downtime Cost of Equipment, Cox and Nunally Model, Failure Cost Profile (FCP), LID.

**Reference Book :-**

1. Construction Management by Eugenio Pellicer, Victor Yepes, Jose C. Teixeira.
2. Construction Project Management by Frederick E. Gould, Nancy Eleanor Joyce.

**Final year Project**

**Project (ARE-2.18)**

**Select any one topic:-**

1. Polymer fiber Reinforced Concrete Pavements.
2. Waste & Recycled Material in Concrete technology.
3. Highway Network System.
4. Design Of Under Ground water System.
5. Treatment of Waste Water.
6. Hydraulic Bridge.
7. Make a Historical architect Design.
8. Architecture and urban planning.