

## SYLLABUS FOR GOVERNMENT POLYTECHNIC FOR THE POST OF LECTURER (ARCHITECTURE)

### PAPER I

#### 1. BASIC DESIGN & ARCHITECTURAL DESIGN

Role of an Architect in the built environment; Building process; Role of other professional in building; Architects act, C.O.A., I.I.A., NASA;

Form and Transformations - Understanding and application of Additive, Dimensional, Subtractive concepts.

Order in Architecture - Understanding and application of Geometrical, Structural, Dimensional, Material, Spatial order etc.

Anthropometrics Studies - Understanding and application of human dimensions and functions; Space-activity relationships; Understanding of measure drawings etc.

Elements of Space making - Understanding and application of elements of space making e.g. Floor, Wall, Door, Window, Column, Stairs, Roofs etc.

#### 2. BUILDING MATERIALS

Complete understanding of constituents, properties and application of traditional building materials e.g. Mud including stabilised earth, Burnt Bricks, Brick Tiles, Brick Ballast, Surkhi, Lime, Cement, Sand etc.

Complete understanding of application of building materials e.g. Timber and its Classification, Characteristics, Defects, Preservation; Hardware e.g. Hinges, Handles, Knobs, Bolts, L-drops, Locks, Stoppers, Stays, Silencers, Cham guards, Closers, Catchers, Knockers etc. in various materials; Damp Proofing Courses e.g. Asphalt, Bitumen, Synthetic, etc.; Cement Concrete and its types (Plain & Reinforced), Mixing, Curing, Water Cement Ratio, Qualities and Workability etc.;

Stone and its classification, availability, characteristics and application etc.

Surface (Wall) Finishing & Painting and Polishing - Types and application of plasters; Jointing and Pointing; Cladding; Preparation of variety of surfaces; Application of various coats; Finishes - Lime / Colour wash, Dry distemper; Oil bound distemper; Cement paints; Acrylic emulsions; Synthetic enamels; Wall textures etc. Polishes and Varnishes.

Roof Coverings and their constituents, properties and application of - Clay Tiles (Country, Allahabad, Mangalore tiles etc.), Stone Slating; Shingles; Thatch etc.

Timber Products and their constituents, properties and application of - Variety of Plywood; Ply-board; Block board; Particle board; Wood wool cement board; Fiberboard; Compressed straw board; Cement fiberboard; Mineral fiber board; Veneers; Laminates etc.

Glass & Ceramics Glass and their constituents, properties and application of - Translucent; Transparent and Special glasses; Glass bricks; Patch fittings for glazed partitions and shutters.

Ceramics and their constituents, properties and application of - Terra-cotta, Faience, Fireclay, Stoneware, Earthenware, Vitreous China; Porcelain etc.

Adhesives and their constituents, properties and application of -

Natural Adhesives - Animal, Casein, Bituminous etc.

Thermoplastic Adhesives - Polyvinyl Acetate etc.

Thermosetting Adhesives & Plastics - Urea Formaldehyde; Phenol Formaldehyde; Melamine Formaldehyde, Resorcinol Formaldehyde; Epoxide Resins etc. Rubber Adhesive.

#### 3. BUILDING CONSTRUCTION

Element of Building - Terminology, Nomenclature of various parts of building from foundation to roof

Brick Work - Brick Terminology; Simple Bonds e.g. English bond & Flemish (single and double) bond in brick work for up to two brick thick walls; Details at quoins and junctions in English bond and Flemish bond for up to two brick thick walls; Details of piers (attached and detached); Buttresses; Lintel and Sill; Special Bond - Rat Trap Bond; Brick joints; Corbelling; Coping; String courses;

Arches in brick and stone; Elementary principles; Centering; Cavity walls etc.

Foundation - Its Need; Design criteria; Foundation concrete; Details of simple spread foundations for load bearing walls of various thicknesses up to two brick thick etc.

Timber - Elementary carpentry; Common joints; Details of framed, ledged, braced and batten doors etc.

D.P.C.- Horizontal and Vertical D.P.C. etc.

Stone Work - Elementary Stone Masonry; Types of joints; Random, Course and Ashlar Stone Work in walls etc.  
 Door, Window & Ventilator (Timber) - Types and details of Panelled door shutters and Mosquito proof door shutter; Types of Windows & Ventilators and details of glazed window and ventilator shutters and frames etc.  
 Roof Terracing - Complete process of laying of terracing with provisioning of Gola & Khura etc.; Lime concrete; Mud phaska with brick tiles; Brick coba etc.  
 Temporary Timbering - Timbering of shallow trenches.  
 Door (Timber Products) - Types and details of Flush door shutter with finishes.  
 Door (Operational Mechanism) - Understanding of operational mechanism (automatic and manual) of variety of Sliding door shutters; Sliding-folding door shutters and Revolving doors shutters.  
 Partition - Terminology, Partitioning methods with use of different materials e.g. Timber and Timber Products, Clay and Terracotta Brick / Block, Pre-cast Concrete Block, Wood Wool Cement Board, Compressed Straw Board, Glass and Glass Brick.  
 Panelling (Timber & Timber Products) - Terminology, Panelling methods with use of materials e.g. Timber and variety of timber products.  
 Brick Work Temporary Constructions - Shoring (Raking, Flying and Needle); Underpinning etc.

#### 4. ARCHITECTURAL DRAWING

Basic Technical Drawing - Concept and types of line; Division of lines and angles; Drawing polygons; Inscribing and circumscribing circles in polygons; Drawing geometrical curves helix; Conoid etc.  
 Orthographic Projections - Vocabulary and concepts of Planes of Projections, First angle projections, Projection of points, Lines and planes in different positions; Projection of regular rectilinear and circular solids (prisms, pyramids, cones, cylinders, spheres etc.) in different positions; Sections of regular rectilinear and circular solids (prisms, pyramids, cones, cylinders, spheres etc.) in varying conditions of sectional plane etc.  
 Development of Surfaces - Vocabulary and concepts of cubes, prisms, cylinders, pyramids, cones and spheres etc.  
 Solid Geometry - Vocabulary and concepts for construction of section, Intersection and interpenetration of solid forms

#### 5. APPLIED MECHANICS AND STRUCTURAL DESIGN

Elements of Statics - Force, Law of parallelogram of forces, Law of triangle of forces, Polygon Law of forces, Resolution of forces; Resultant of number of concurrent coplanar forces; Condition of equilibrium; Moment of force; Moment and arm of couple; Theorems on couples.  
 Simple Stresses and Strains - Elasticity; Stress; Strain; Types of stresses; Elastic limit; Hook's law; Modulus of elasticity; Modulus of rigidity; Bulk modulus; Stresses in composite bars/section; Modular ratio; Equivalent area of a compound section, Primary or Linear strain; Poisson's ratio; Shear stress; Principal stresses and strains (for simple cases); Mohr's circle etc.  
 Centre of Gravity & Moment of Inertia - Methods of finding out center of gravity of simple figures; Centre of parallel forces; Important theorems; Calculation of moment of inertia of different shapes and its application; Moment of inertia of composite sections etc.  
 Shear Force and Bending Moments - Shear force and Bending moment calculation and their diagrams for cantilever and simply supported beam, and overhanging beam.  
 Stresses in Beams - Simple beams bending; Section modulus; Moment of resistance; Shear stress in section of beam etc.  
 Stresses in Trusses - Perfect frame, Deficient frame, Redundant frame; Type of supports and their reactions; Analysis of cantilever and simply supported trusses by Analytical method, Method of sections and Graphical method etc.  
 Torsional Stress in circular shaft - Pure torsion; Theory of pure torsion; Torsional moment of resistance; Assumptions in the theory of pure torsion; polar modulus; Power transmitted by a shaft; Torsional rigidity etc.  
 Plain Cement Concrete - Concrete mix, Curing and strength of concrete; Effect of temperature; Shrinkage; Fatigue; Concrete mix; Curing and strength of concrete; Effect of temperature; Shrinkage; Fatigue etc.  
 Deflection of Beams (Cantilever and Simply supported) - Calculation of slope and deflection by Double Integration; Macaulay's Method and Moment area Method; Conjugate beam method etc.  
 Column and Struts - End conditions; Buckling and critical loads; Slenderness ratio; Various column theories; Stress distribution of the section of an eccentrically loaded rectangular column; the middle third rule; Core or kernel of section (Rectangular and Circular sections) etc.  
 Elastic Theorems & Energy Principles and its Application in Simple Cases - Strain energy stored due to axial loading and due to bending; Law of reciprocal deflections; Betti's law; The first theorem of Castiglione; The second theorem of Castiglione etc.  
 Statically Indeterminate Structures - Degree of indeterminacy; External and internal indeterminacy; Calculation of degree of indeterminacy for beams and frames etc.



Fixed Beams - B.M. Diagram for a fixed beam for various loading; Effects of sinking of support; Advantages and disadvantages of fixed beams etc.

Continuous beams - Clapeyron's theorem of three moments for two to three span of continuous beam; Effects of sinking of support etc.

Moment Distribution Method - Basic Proposition; Relative stiffness; Analysis of continuous beams and portal frames for simple loading etc.

Slope Deflection Method - Basic concepts; Basic formulae; Application to analyse Continuous beams and Portal frames for simple loadings etc.

Introduction to Design Methods - Working stress design; Ultimate load design; Limit state design; Limit state design versus Working stress design; Building code etc.

Limit state design method - Understanding of Limit state; Characteristic strength and characteristic load; Design values; Partial safety factors; Factored loads; Stress strain relationship for concrete and steel; Yield stress; Provisions of IS codes; Loads and Load combination

Detailing of Reinforcement - Requirements of good detailing; Nominal cover to reinforcement; Spacing of reinforcement; Reinforcement requirements; Reinforcement splicing; Anchoring reinforcing bars in flexure; Curtailment of tension reinforcement in flexural members; Bar bending schedule etc.

Analysis & Design of Singly & Doubly Reinforced Rectangular sections and Flanged Beams section - Bending of beam assumption; Moment of resistance; Modes of failure; Maximum depth of neutral axis; Limiting values of tension steel & moment of resistance etc.

Shear and Development Length - Shear stress; Diagonal tension; Shear reinforcement; Spacing of shear reinforcement; Development length; Anchorage bond; Flexural bond etc.

## 6. ART IN ARCHITECTURE

Vocabulary of art; Relevance of art in architecture;

Elements of Design - Line, Direction, Shape, Size and Form etc.

Principles of Design - Unity, Texture, Colour, Tone Direction, Proportion, Form and shape, Solids and Voids etc.

Different eras and movement in Art and their association with Architecture - Renaissance, Baroque; Realism;

Impressionism; Fauvism; Cubism, Expressionism; Surrealism etc.

Contemporary arts and artist in India - Works of Rabanindra Nath Tagore, Nand Lal Bose, Jamini Roy, Amrita Sher Gill, M.F. Hussain, Satish Gujral, S.H.Raza etc.

Suitable materials for murals, sculptures, furniture, pottery and fountains for indoors and outdoors.

## 7. ECOLOGY & ENVIRONMENT

Vocabulary of ecology and environment; Basic concepts of ecology; Ecological factors - light & temperature, precipitation, humidity, gases/wind, topography etc.; Global warming & climate change; Loss of bio-diversity; Desertification; Deforestation etc.

Ecosystem - Kind of ecosystem; Structure; Function and energy flow of ecosystem; Ecological succession; Ecosystem development; Climax concept etc.

Soil - Edifice Factors - Definition of soil; Formation of soil; Soil profile; Classification; Soil complex; Soil depletion, degradation and conservation; Relation of soil and built environment etc.

Water Regimes - Water in nature; Water balance problem; Surface / ground water; Sources of water pollution; Ground water pollution; Marine pollution; Prevention control of pollution; Conservation & management; Impact of human intervention on water.

Air Pollution - Kinds of air pollution; Sources of air pollutants; Effects - Depletion of Ozone; Acid Rain; Prevention & control of air - pollution; Noise pollution; Effect of human habitat and human activity on atmosphere etc.

Built Environment and Ecology - Interrelationship between man, nature and built-form etc.

## 8. SURVEYING


Vocabulary of surveying & levelling; Principles of surveying; Units of measurement; Scale; Signs convention etc.

Chain Survey - Instruments used; Types of chain; Instruments for ranging; Setting out angles; Erecting perpendiculars; Selection of station; Methods of taking offset and Obstacles in chaining etc.

Plane Table Survey - Plane table and accessories; Methods of plane table survey - Radiation; Intersection, Traversing and resection etc.

Compass Survey - The prismatic compass; Surveyor compass and its uses; Reduced and whole circle bearing; Magnetic declination; Effect of local attraction etc.

Levelling & Contouring - Types of level; Booking and reduction of levels; Profile & cross section leveling; Errors in leveling etc.



Theodolite - Definition of different terms; Temporary adjustments; Uses of instrument; Measuring horizontal and vertical angles; Method of repetition; Extension of lines etc.

## 9. BUILDING SERVICES

### WATER SUPPLY

Vocabulary of water supply; Need to protect water; Requirements of water supply to different types of buildings; Sources of water supply; Quantity and quality of water; Conveyance and distribution of water; Overhead tank; Underground tanks; Pipe appurtenances; Hot and cold water supply system in a low rise and high rise buildings; Distribution system in campus; Pipes and their size; Joining and different fittings etc.  
Rainwater harvesting in buildings and building premises etc.

### SANITATION

Vocabulary of sanitation; Purpose and principles of sanitation; Collection and conveyance of waste matter; Quantity and Quality of refuse; Design and construction of sewer's and sewer appurtenances; Garbage and sewage disposal; Roof and surface water drainage; Rain water storage and water harvesting principles and methods; Sanitary appliances; Traps their variety; Pipes and joints; Sanitary pipes works below and above ground level.  
Knowledge of plumbing and sanitary system for a residence.

### ELECTRICAL

Terminology and architectural symbols (as per NBC/NEC) for electric installations in buildings; Need to generate and save electricity; Transmission and distribution of electricity (single and three phases); Procuring service connection etc.

Lighting accessories - Wires and cables; Metering; Distribution panels / boards etc. for single and three phase supply; Guidelines for installation of fittings etc.

Design of simple light and fan circuits; System of connection of appliances and accessories e.g. series and parallel connection; Joint box system; Looping-in system etc.

Various types of internal wiring systems e.g. cleat, casing and capping, batten and conduit (surface & concealed).

Protection against excess current, short circuit earth fault and protection against electric shock; Various types of protection devices e.g. switches, fuses and circuit breakers; Need for earthing of domestic fittings and appliances; Earthing and its relation with soil resistivity; Earth electrodes Earth wires etc.

Load assessment and selection of appropriate cross section of the conductor.

### ILLUMINATION

Terminology and units; Light and its characteristics - scattering, propagation, transmission, reflection, absorption, reflection and dispersion of light; Electromagnetic spectrum and visible radiation.

Types of illumination schemes e.g. Ambient, Task, Focal and Decorative etc.; Design considerations for illumination Schemes.

Methods for lighting calculation - Watts per square meter, Light flux and Point to point method

Sources of light (Electrical) - Incandescent; Halogen; Low pressure (fluorescent, compact fluorescent, sodium, cold cathode neon); High pressure (mercury, metal halide, sodium); LED; Fiber optics etc.

Types of Luminaires - Indirect; Semi-indirect; General diffusing; Semi-direct and Direct etc.

Electrical and illumination needs for individual spaces e.g. Living room, Dining room, Bed room, Kitchen, Toilet, Staircases, and Corridors etc.

Types of electrical luminaires e.g. Recessed mounted luminaires; Spot / Projectors; Surface mounted luminaires; Decorative luminaires; Pendant luminaires; Free-floor-standing luminaires; Up lights; Trunking lighting systems; Down Lights etc.

### AIR CONDITIONING SYSTEMS

Vocabulary of air conditioning services; Principles of Air Conditioning System Design; Refrigeration Cycle; Psychometric chart; Cooling load etc.

AC systems - Comfort cooling systems & their working - Unitary air conditioning - window AC & split AC; Package AC system; Evaporative cooling systems; Central air conditioning their parts- A.H.U.; Cooling plant; Cooling tower etc.

Air Distribution Systems - Fans; Filters; Fan coil units; Ductwork; Outlets; Dampers etc.

### LIFT SERVICES

Vocabulary of lift services; Average travel lift carrying capacity; Rated load, Rated speed, RTT etc.; Grouping of lifts and design standards of a lift lobby; Types of Lifts; Working of lifts with details of lift section describing various parts of lifts.

Types of Escalators; Function and working of Escalators.



## 10. VERNACULAR ARCHITECTURE

Vocabulary of Vernacular Architecture; Sense of Place, Spontaneity & variation; Control; Open ended form relationship; Symbols & Meanings; Issues of concern in present day architecture and causative forces of the vernacular form etc.

Vernacular and traditional architecture of India, specifically in varied climatic zones etc.

## 11. INTERIOR & FURNITURE DESIGN

Vocabulary of interior design; Enclosing elements e.g. walls, floors, ceilings, openings, staircases, furniture; Design elements e.g. color, light, textures etc. Principles of interior design etc.

History of Interior & Furniture Design - Evolution from ancient to modern, post-modern ideologies to contemporary (Egyptian, Greek, Roman, Gothic, Baroque, Renaissance, Arts and Crafts Movement, Art Nouveau, De Stijl, Modernism, Post Modernism and Contemporary) etc.

Ergonomics, materials, finishes & their applications in Furniture & other Interior Elements; Characteristics and workability of various materials used in interiors, etc.

Modular concepts in furniture design; Mass production and fabrication; Codes and specifications etc.

## 12. HOUSING

Housing Need and Demand in India - Present and Future; House, Housing and Settlement; Detached and Attached House Types; Net & Gross Residential Density; Perceived Density; Zoning etc.

Settlement Patterns - Human settlement; Settlement types and patterns; Relation of housing in present day context with relation to human settlement patterns etc.

Issues Affecting Housing - Climate Change; Social factors; Affordability; Health; Safety & Security; Noise Control; Utilities and Services etc.

Objectives and role of government, urban local bodies and other agencies in housing development; Census; NSSO; HUDCO; State Housing Board; NBO etc.

Housing schemes- Rajiv Awas Yojana (RAY); Pradhan Mantri Awas Yojna (PMAY); Sita & Services Scheme; Rental Housing Policy; Slum Rehabilitation Policy etc.

Housing categories e.g., Condominiums, Co-operative Housing, Affordable Housing, Rural Housing. - Their Advantages and disadvantages; Neighbourhood Planning etc.

## 13. BUILDING SOCIOLOGY

Vocabulary of sociology, Sociology and Architecture; Basic concepts - Society, Group, Community (Rural and Urban), Association, Institution etc.

Culture and Society - Concepts of culture, Cultural identity and cultural diversity, Factors of socio-cultural changes etc.

Social Development - Concepts of social development; Types of development - rural, urban and suburban etc.

Demography - Population growth and its impact; Population subsistence; Migration etc.

Social Institutions - Family; Marriage; Religion etc.

Social Infrastructure - Education; Health; Recreation etc.

## 14. SPECIFICATIONS, COST ESTIMATION AND BUDGETING

Specifications - Specifications of various materials and building works as per National Building Code (NBC) and Energy Conservation Building Code (ECBC) etc.

Estimation -

Types of Estimates - Preliminary, Plinth area; Cubical content; Approximate quantity; Detailed / Item rate method estimates etc.

Method of Estimation - Separate / individual wall; Centre line methods etc.

Rate Analysis - Labour out turn and norms of consumption of basic materials; Principles of analysis of rates; Market / DSR rates of labour and materials; Preparation of Bill of Quantities (BOQ).

Accounting Procedures - P.W.D. / C.P.W.D. accounts procedure; Measurement book; Daily labour; Muster roll; Stores, stock, and issue of material from stock; Indent form, Imprest account, Cash book; Mode of payment etc.

Valuation, Budgeting for projects etc.



## 15. PROFESSIONAL PRACTICE

The architectural profession and the role of professional bodies and statutory bodies e.g. the Indian Institute of Architects etc., Their objectives, working constitution, bye laws, categories of membership, election procedure etc.; Detailed study of the Architects' Act 1972; Council of Architecture and its role etc.

Conditions of engagement of an architect – Duties, responsibilities and liabilities of an architect towards the profession and society; Scale of professional charges and mode of payment; Code of professional conduct and ethics, Need and types of competitions; Procedure for conducting competitions etc.

Tenders and Contracts - Concept of contract and essential elements of contract, Tenders, their need and types; Preparation of tender documents and procedure for awarding tenders and award of projects; Type of building contracts; Preparation of contract document - General conditions of contract, defect liability period, running & final payment, retention amount and virtual completion etc.

Office organization and Management - Setting up practice e.g. Business organization, Types of offices - Proprietorship, Partnership, Private Limited etc.; Salaried appointments - Public sector, Private sector, Understanding of Income tax and GST; Understanding of office accounting procedures; Office procedure in government organization etc.

Concepts of Valuation; Classification and types of valuation, Elements and factors affecting valuation, Valuation of immovable properties; Techniques for valuation of landed and building property etc.

Concept and need of Arbitration; Law governing arbitration in India – Salient features of the Indian Arbitration Act 1940 and provisions in subsequent amendments; Role of arbitrator; Nature of arbitration; Appointment of arbitrator and umpires, Conduct, powers and duties of arbitrators and umpires; Procedure of arbitration and preparation of awards etc.

## 16. URBAN DESIGN

Urban Space - Historical and contemporary example of urban space e.g. Piazza del campo, St. Peters, Campidoglio, St. Marco, Yerba Buena garden, San Francisco, Pike place market, Seattle Washington; Indian cases, particularly towns on bazars & streets etc.

Urban design Parameters - Space and place, Morphology; Urban form and structure; Fabric, Texture, Grain, Enclosure; Human scale, complexity etc.

Basic Principles and Theories of Urban Design - Theories related to visual or perception aspect (Gordon Cullen); Theories related to physical aspect (Kevin Lynch); Theories related to social aspect (Jane Jacob) etc.

Urban Design Details - Urban outdoor lighting; Urban green infrastructure; Acoustic consideration for urban fabric Air quality at street level etc.

## 17. HISTORY OF ARCHITECTURE

Understanding of the development of architectural form with reference to technology, style and character of following styles of architecture. Also to comprehend and analyze spatial character, scale and structure through historical and traditional built forms of the following periods.

- Prehistoric Age; Birth of Civilization, Ancient River Valley Civilizations of Egypt and Mesopotamia; Ancient Civilization of Aegean; Classical Period of Greece and Rome etc.
- Indus valley civilization; The Aryan civilization; Buddhist, Hindu - Indo-Aryan and Dravidian; Jain etc.
- Early Christian; Byzantine; Romanesque; Gothic; Renaissance; Mannerism; Baroque etc.
- The Sultanate Style; Provincial; Mughal; Colonial etc.

## 18. ARCHITECTURAL PHOTOGRAPHY

Vocabulary of architectural photography. Various types of compositional framing, silhouette photography etc.

Types of Camera - Use of various cameras; Lenses and accessories; SLR, DSLR cameras; lenses for different focal lengths for various contexts; Use of wide angle, normal, tele, zoom, macro, close up lenses etc.

Filters-UV, Skylight, Colour filters, special effect filter etc.

Shutter speeds - Slow, normal and high and their various applications etc.

Apertures - Application of various apertures to suit different lighting conditions and to enhance depth of fields etc.

# SYLLABUS FOR GOVERNMENT POLYTECHNIC FOR THE POST OF LECTURER (ARCHITECTURE)

## PAPER 2

### 1. ARCHITECTURAL DESIGN

Structural Systems - Understanding and application of various structural systems e.g. Trabeated, Arcuated, Vector, Form Active, Tensile etc. and their relation to form, materials and function; Their mechanism of load bearing, adaptability, efficiency and limitations.

Context - Understanding and application of the importance of 'context' and built urban environment in design.

Sustainability - Understanding and application of active methods for achieving sustainability e.g. Water harvesting, Waste management, Solar and Wind Energy etc.

### 2. BUILDING MATERIALS

Metals (Ferrous) - Constituents, properties and application of - Iron (Pig, Cast & Wrought), Variety of Mild Steel sections - Sheets (plain & corrugated), Flats, Bars (round & square), Angles (Equal and Unequal), R.S. Sections (I beams, Channels, Tees), Hollow Tubular sections available for application in building industry; Stainless steel and Alloys.

Floor & Floor Finishes - Constituents, properties and application of - Brick; Cement Concrete; Stone; Terrazzo; Chequered Tile; Ceramic Tile; Vitrified Tiles; Wooden etc.

Reinforced Brick Work and their constituents, properties and application of - Types, Mixing, Curing, Water Cement Ratio, Qualities and Workability.

Metals (Non Ferrous) - Constituents, properties and application of - Copper & Copper based alloys (Brass & Bronze), Tin; Cadmium; Chromium; Zinc; Lead and Nickel etc.; Metal Coatings - Electroplating, Anodizing etc.

Various additives and admixtures and their constituents, properties and application of - Cementitious (crystalline) systems; Integral systems; Proprietary systems; Cementitious Coating system etc.

Construction equipments and their application - Electric hand tools; Vibrators; Pumps; Compactors/Rollers; Earth Moving & Excavation - Dozers; Scrapers; Graders; Shovels; Backactor; Dragline; Treacher etc.

Transportation - Lorries; Trucks; Dumpers; Hoist; Cranes (mobile, static, tower); Concrete mixers and pumps for ready mix concrete etc.

Gypsum & Asbestos Products - Constituents, properties and application of Gypsum Board, Suspended Ceiling (Board & Tiles), Gypsum Plaster; Their components and accessories; Their jointing and finishing; Constituents, properties and application of Asbestos Cement products etc.

Water Proofing Compounds - Constituents, properties and application of Neoprene, Butyl, EPDM, PVC, Polyurethane etc.

Plastics and Rubbers Thermoplastics - Constituents, properties and application of Polythene, Polyvinyl chloride, Polypropylene, Polymethyl methacrylate, Acrylonitrile butadiene styrene etc.; Thermosetting Plastics - Constituents, properties and application of Phenol formaldehyde, Urea formaldehyde, Melamine formaldehyde, Polyurethane, Silicone resin etc.; Constituents, properties and application of Rubber etc.

Forms of Steel for Industrial construction & Roofing products - Classification, availability, characteristics and uses of forms of steel and first to fourth generation steel roofing products.

Advanced Structural Concretes, Materials for Pre-Stressing - Classification, availability, characteristics and uses of Structural light weight concrete, High strength concrete etc.

Forms & Materials for Speedy Construction - Classification, availability, characteristics and uses of Reinforcement types, RMC etc.; Advanced Formwork systems - Table Form / Flying Form, Column Formwork Systems, Horizontal Panel Systems, Vertical Panel Systems, Jump Form, Slip Form & Tunnel Form.

### 3. BUILDING CONSTRUCTION

Structural Steel Works - Typical metal joinery - Mechanical (riveted & bolted), Soldering and Brazing and welding; Detailing of structural steel work - Beam to Column joint, Beam to Beam joint, Column Splice, Column Base, Roof Truss to Column Joint; Steel Stairs etc.

Doors & Windows (Metals) - Mild steel L and Z section; Pressed steel section etc.

Shutters (Operational Mechanisms) - Application of operational mechanism (automatic and manual) of variety of Rolling shutters and Collapsible shutters etc.

Reinforced Brickwork - Reinforced brick piers, lintels, slabs and projections etc.

Floor/Dado/Skirting - Complete process of laying of floor and skirting - Brick, Cement Concrete, Mosaic and Terrazzo

floor. Laying and fixing of Stone slabs, Chequered Tile, Ceramic tiles, Vitrified tiles and Wooden (parquet and plank) on subfloors and walls.

Doors, Windows & Partitions (Aluminium) - Classification, availability, characteristics and uses of Doors frames and shutters; Windows Frames and Shutters; Partitions Framework & fixing with other suitable materials etc.

Temporary Constructions - Classification, availability, characteristics and uses of Centering, Shuttering and scaffolding

R.C.C. (Formwork & Laying) - Foundations - Isolated, Combined, Cantilever, Eccentric footing; Grillage and Raft foundation; Pile foundations - details of pile, varieties of piles, pile caps; Columns, Lintel, Projections/Chujjas and Beams; Staircases - Waist and Folded slab; Understanding of steel reinforcement types, laying, bending and binding

Partitions & False Ceilings (Gypsum Board) - Classification, availability, characteristics, uses and construction details of Metal Stud Partition (single layer), Suspended Ceilings etc.

Water Proofing Works - Classification, availability, characteristics, uses and construction details of Basements, Toilets, Kitchens, Terrace gardens etc.

Joints - Classification, availability, characteristics, uses and construction details of Expansion joints; Seismic joints etc.

Doors & Windows (P. V. C.) - Classification, availability, characteristics, uses and construction details of Door Frame and Shutters; Windows Frames and Shutters etc.

Defects and Remedies - Classification, availability, characteristics, uses and construction details of various defects in buildings and their remedies; Defects caused by dampness, Defects caused by applied forces and changes in size.

Industrial Construction (Structural Steel Works) - Classification, availability, characteristics, uses and construction details of Portal Frame Construction, North-light truss and Lattice girder roof with various roof coverings.

Pre-stressed Concrete - Methods of pre-stressing, types of post-tensioning systems; Types of pre-stressed concrete structures - Beams (Short span, medium span, long span), Girders & Joists, Slabs (one way, two way, flat slabs, hollow core slabs, planks), Single & Double T slabs, Channel sections, Folded plate structures etc.; Composite construction.

Prefabrication & Precasting - Classification, availability, characteristics, uses and construction details of open prelab system, large panel prelab system, joints, pre-casting methods, materials, on-site and off-site prefabrication, components, etc.; Precast R.C.C. Frames - Beams and Column Frames, Wall Frames, Hollow core slabs, Planks and Tee slabs resting on Beam & Column frames and Wall frames. Connections between various components - beam to column, column to column, beam to slab, wall to slab. Etc.

Speedy Construction - Methods, Types of floor construction - cast in situ, precast & composite construction; One-Way Slabs - Solid slabs, Slabs with wide beams, Ribbed slabs (One-Way Joists); One-Way joists with wide beams; Troughed slabs (ribbed slabs with integral beams and level soffits); Two-Way Slabs - Solid slabs; Waffle slabs designed as Two-Way slabs; Waffle slabs designed as Two-Way slabs with integral beams and level soffits; Flat slabs; Flat slabs with drops; Flat slabs with column heads; Waffle slabs designed as flat slabs; Lift slab construction; Cast-in-situ service & stair cores; Cross wall & Box frame construction etc.

Modular Coordination - Aims, basis, planning, dimensioning; Assembly of components, tolerances, positioning of functional elements - slabs, walls, staircases etc.

#### 4. ARCHITECTURAL DRAWING

Metric Drawing - Vocabulary and concepts of types, uses and advantages; Isometric, Axonometric and Pictorial view etc.

Perspective Drawing - Vocabulary and concepts of application and use; Differences with matrix projections; Anatomy of a perspective e.g. cone of vision, station point, picture plane, eye level, horizon line, ground line, vanishing point, etc.; Types of perspective - One point, Two points, and Three point perspectives etc.

Shades and Shadows - Vocabulary and concepts of values in shades and shadows; Constructing shadows in plan, elevations and 3-D etc.

#### 5. STRUCTURAL DESIGN

Analysis and Design of R.C.C. Slab - Analysis and Design of one way, two way and flat slabs and detailing of its reinforcement etc.

Analysis and Design of R.C.C. Beam (Continuous) - Analysis and Design of R.C.C. continuous beam and detailing of its reinforcement etc.

Analysis & Design of Portal frame (R.C.C.) - Analysis and design of portal frame (Single bay, Single storey) with fixed and hinged base, in R.C.C. etc.

Analysis and Design of R.C.C. Stairs - Type of stairs; Effective span of stairs; Loading on stairs; Analysis and design of stairs (dog legged with waist slab) and detailing of its reinforcement etc.

Elementary Soil Mechanics - Classification of Soil; Properties of Soil; Safe bearing capacity; Active & Passive earth pressure etc.

Analysis & Design of R.C.C. Column - Effective height of column; Assumptions; Minimum eccentricity; Analysis and



design of short R.C.C. column under pure axial load as well as under axial load and bending moment and detailing of its reinforcement etc.

Analysis & Design of R.C.C. Foundation & Footing - Type of foundation; Depth of foundation, Theory & design of axially loaded isolated square footing and detailing of its reinforcement; Pile foundation - Introduction, classification and its application etc.

Analysis and Design of R.C.C. Retaining wall - Types of retaining walls, Analysis and Design of cantilever retaining walls and detailing of its reinforcement etc.

Analysis and Design of Steel Structure - Various types of connections - Riveted connection - Introduction, Classification, Strength of riveted joint, Bolted connection - Introduction, Classification of bolts based on type of load transfer, Terminology, Specifications for spacing and edge distances of bolt holes as per IS: 800-2007, Types of bolt connections, Type of actions on bolts, Design strength of plates in a joint, Design strength of bearing bolts; Welded connection - Introduction, Types of welded joints, Important specifications for welding as per IS code, Design strength of welded joints; Analysis and Design of various types of members - Tension members - Design Strength, Analysis and design; Compression members - Slenderness ratio, Actual length, Effective length, Design strength, Analysis and design;

Steel Structure - Understanding of Miscellaneous Structural Elements - Beam and plate girder & its use in building industry; Grillage foundation and its' components & its use in building industry; Types of roof trusses and nomenclature of its members etc.

## 6. ART APPRECIATION

Grammar of the language of art - Natural, Realistic; Symbolic; Abstract, Modern; Contemporary etc.

Ideologies of Aesthetics in Art - Understanding of Ideologies of aesthetics in art while discussing the art of Western and Oriental;

Plato, Aristotle, Brahmagan, I.A. Richards, Leo Tolstoy, Sigmund Freud; Shadanga; Six limbs of Indian painting; Rasa theory of 'Bharat Muni'; Iconography etc.

Development of Art Development of art over the period of time; Tracking the progress in art in aspects of the Functional diversity of styles; Art as form of social consciousness, Impact of Cultural and Religion on art; Understanding the role of art in contemporary society etc.

## 7. CLIMATOLOGY

Vocabulary of climate; Importance of climate in architecture; Factors affecting climate; Elements of climate: solar radiation, temperature, wind, humidity & precipitation and their measurement etc.

Climate types - Climate types all over the world; Tropical climate: climate zones, their characteristics & responses of the traditional/ vernacular; Micro Climate & Site Climate etc.

Human thermal comfort - Body's heat production & heat loss; Comfort zone; Bio-climatic chart; Effective temperature isopleths etc.; Various models of Thermal Comfort - Static & Adaptive Mode, thermal indices & their applicability.

Solar chart - Solar position of a place, azimuth, altitude, incidence, using shadow angle protractor for designing shading devices.

Daylight - Natural lighting; Glare; Day light factor & factors affecting day-lighting in various space types; Principles of day-lighting in tropics.

Ventilation & Air Movement - Requirement; Size & position of openings; Air-flow pattern inside & outside buildings etc.

Orientation - Orientation of buildings in relation to sun & wind; Design strategies in different climate zones; Vernacular and contemporary responses to climate etc.

## 8. ADVANCED SURVEYING & GEOMATIC TECHNIQUES

Total Station Survey - Working principle of total station and its use; Use of software for different applications etc.

Photogrammetry - Vocabulary, Principles and application of photogrammetry and stereoscopy in surveying etc.

GIS (Geographic Information System) - Understanding and application of geographical concepts and terminology; Difference between Image Processing system and GIS; Utility of GIS; Raster and Vector Data; Raster Versus Vector; Raster to Vector conversion; Remote Sensing Data in GIS; Topology and Spatial Relationships; Data storage verification and editing; Data preprocessing; Geo-referencing; Interpolation of data; Database Construction; Data Output; GIS analysis functions; Generation of thematic maps; Digital Elevation Model (DEM) etc.

Remote Sensing - Understanding concepts of remote sensing; Electromagnetic spectrum; Platforms and sensors; Remote sensing data products; Understanding of visual and digital image interpretation techniques and image processing software; Field verification etc.

GPS (Global Positioning System) - Understanding concepts of GPS surveys; GPS data collection for mapping etc.

## 9. BUILDING SERVICES

### FIRE PROTECTION

Causes and spread of fire; Fire triangle / tetrahedron; Classes of fire; Combustibility of materials and fire resistance etc.

Fire Detection & Alarm Systems; Equipment - Heat & Smoke sensors etc.

Firefighting equipment & Extinguishing techniques; Ladders; Snorkel ladder; Firefighting pump and water storage; Hose and hose fittings; Dry and wet risers; Automatic sprinklers; Portable fire extinguisher etc.

Means of escape; Fire escape staircase; Fire doors; Water curtain etc.

### ELECTRONIC SECURITY AND SURVEILLANCE SYSTEMS

Perimeter Protection - Barriers, Doors, Gates, Turnstiles and Fences; Intrusion Detection Sensors and Systems - Outdoor & Indoor

Access Control Systems; Locks & Emergency Exits; Visitor Management Systems; Identification Systems - PIN, Card, Wireless and Biometric systems etc.

Security Lighting; Illumination including Infra-red; Understanding CCTV cameras - Pan, Tilt & Zoom mechanisms; Digital and Analog Recording etc.

### ADVANCED SERVICES

Gas Installation - L.P.G / Bio-gas installations, their location and layouts in residential and non-residential buildings etc.

Automated Parking System - Vocabulary; Types; Working and Advantages of automated parking systems etc.

Mechanical Ventilation - Standard requirements of ventilation for different conditions of living and work places; Conditions for comfort; Control of quality, quantity, temperature and humidity of air etc.

Waste Treatment & Management - Vocabulary; Reduce-Reuse-Recycle; Waste collection; Treatment & disposal; Thermal treatment; Dumps and Landfills; Biological waste treatment; Waste water treatment etc.

Integrated Building Management System - Objectives of the Integrated Building Management System, Various components of IBMS, Types of integration with the utility, safety and security systems and its designing and installation etc.

## 10. ARCHITECTURAL CONSERVATION

Vocabulary of conservation; Various issues and practices of Conservation; values and ethics; Causes of defects and decay of a heritage structure; Natural agents of deterioration and loss; Documentation for the conservation & restoration of the any Heritage built form; Status of conservation in India and the various agencies involved in the field of conservation worldwide and their policies; Various guidelines for the preservation, conservation and restoration of buildings; Management of historic sites; Understanding of various charters; Character and issues of heritage towns in India; Role of INTACH, UNESCO, ICOMOS and other such organisations etc.

## 11. DISASTER MITIGATION AND MANAGEMENT

Hazards & Disasters; Indian scenario; Understanding of disaster; Hazard and its classification; Vulnerability; Capacity; Risk etc.

Various Types of disasters - Cause, adverse effects, distribution patterns, mitigation measures of Earthquake, Tsunami, Cyclone, Flood, Landslide etc.

Disaster Management cycle -

Disaster Preparedness; Disaster Management Act; guidelines NDMA; Vulnerability Assessment & warning systems; Risk assessment etc.

Disaster Response; Programmes for disaster reduction, Communications

Disaster Mitigation; Pre disaster, emergency, transition, and recovery; Disaster management plan; Natural crisis management committee; State crisis management group; Disaster Damage Assessment etc.

Disaster Resistant Construction Techniques; Risk reduction measures through land use control; site planning and land management; design and construction of structures for above mentioned disaster.

## 12. URBAN PLANNING

Elements and planning principal of cities; Shapes of city plan in accordance to road networks; Concepts, theories and principles of urban planning of cities - Indus Valley, Ancient (Vedic), City beautiful movement (Chicago, Chandigarh), Urban Utopia (Broadacre), Garden city (Leitchworth), Radburn Theory (Radburn) and Neighbourhood planning etc.

Understanding of planning process; Relevance of standards in planning as per URDPFI guidelines prepared by TCPO etc.

Awareness of concepts related to various traffic problems in India; Understanding of PCU; Traffic volume; Road capacities; Road types and their sections and intersections; Traffic calming as per IRC guidelines; New concepts in

mass and rapid transportation systems e.g. BRT, LRT and Metro rail etc.  
Modern Approach in Planning - Green City, Compact City, Smart City etc.

### 13. BUILDING ECONOMICS

Vocabulary of Economics; Scarcity; Utility - Marginal, Total & Average; Laws of Demand and Supply; Economic system in India; Building Efficiency; Building Life-cycle; Costs and Benefits of Building - Monetary and Non-Monetary etc.

Project Financing - Equity; Financing Institutions in Financing Process; Interim Finance and Permanent Financing; Bank Loan - Simple Interest and Compound Interest; Types of Mortgage; Lease Arrangements etc.

Economic performance of building - Decision Making using techniques of economic performance to measure tangible and non-tangible issues - Cost-Benefit Analysis, Incremental Analysis and Multi-Criteria analysis etc.

### 14. LANDSCAPE DESIGN

Factors affecting Landscape; Elements of Landscape Design - Natural and design elements; Principles of Landscape Design - Unity, Symmetry, Balance, Hierarchy, Repetition, Sequence etc.; Different garden styles etc.

Landscape Engineering - Road and Parking; Paths and Plazzas; Wall, Steps, Ramps and Decks; Planters, Bed edges and Terraces; Pools and Water bodies; Terrace landscape and Vertical garden etc.

Classification of Plants - Trees, shrubs, groundcovers, flowering plants, creepers and climbers etc.

### 15. PROFESSIONAL PRACTICE

Law related to Land - Understanding of the Land Acquisition Act - 1894 and its subsequent amendments through Act of 2013 and 2015; LAND ACQUISITION AMENDMENT BILL, 2018; Notification to acquire land under various sections, concept of public purpose, and compensation apportionment etc.

The Uttar Pradesh Urban Buildings (Regulation of Letting, Rent and Eviction) Act, 1972- Its important provisions and effect on the urban development;

Urban Development Law - Understanding of the UP Urban Planning and Development Act-1973- Concept of Urban Development Authority its power authority and Role in regulating the urban development; Salient features of the provisions of the act; The Uttar Pradesh Slum Areas (Improvement and Clearance) (Amendment) Act-1981 and its important provisions for achieving etc.

Law of Easement - Concept of Easement and essential elements of valid easement; creation of easement - Types of Easement, Easement by prescription, Easement by necessity and quasi easement, Termination, suspension and revival of easement and other related concepts etc.

Mercantile Law - The Contract Act - 1872 and subsequent amendments - Concept of Agreement; Essential elements of Contract; Flaws in contract etc.; Indian Partnership Act - 1932 and subsequent amendments; Relationship of Partners, sharing of profits; Exit of a partner; Liabilities of and rights of other partners etc.

The Law of Environment - Understanding of purpose, provisions, and the impact of various components of the environmental law e.g. The National Green Tribunal Act-2010; The Air (Prevention and Control of Pollution) Act-1981; The Water (Prevention and Control of Pollution) Act- 1974; The Environment Protection Act, 1986; The Hazardous Waste Management Regulations, etc.

Real Estate (Regulation and Development) Act, 2016 (RERA) - Understanding of real estate; Need of the RERA and its impact on real estate; RERA authority; Registration under the Act; Role and responsibilities and liabilities of architects under the provisions of the RERA etc.

### 16. BUILDING CONSTRUCTION MANAGEMENT

Vocabulary of construction management; Project management concepts-objectives & scope, planning /monitoring and control, scheduling / Quality and cost; Theory of probability and statistics; Cost model and cost optimization etc.

Construction Management Techniques - Construction Planning scheduling and controlling phases; Levels of details & time scale Resource scheduling; Smoothing & levelling; Project execution; Monitoring & progress reporting; Use of Management techniques - Bar charts and limitations of bar charts; Mile Stone Chart etc.

PERT and CPM - Event; Activity; Dummy; Network rules; Graphical guidelines for network; Numbering of events; CPM network analysis & PERT time estimates; Time computation & network analysis; Cost time analysis in network planning using CPM etc.

Resource Allocation & Quality Control - Resource usage profile - Histogram, Resource smoothing and Resource levelling; Planning of temporary services at the site; Safety precautions at construction sites; Security of materials at building site; Stages of inspection and quality control etc.





## 17. THEORY OF ARCHITECTURE

Understanding of the various theories and concepts of design and how philosophy, style and strategies are related to architecture of following periods.

Pre Modern - Antonio Gaudi; Charles Rennie Mackintosh, Antonio Sant'Elia, Adolf Loos; Auguste Perret; Peter Behrens; Bruno Taut; Gerrit Rietveld; Tadao

Modern - Gropius; Mies Van der Rohe; Frank Lloyd Wright; Le Corbusier; Alvar Aalto; Terragni; Louis Kahn.

Post Modern - Spatial/Deconstruction (Frank O Gehry, Michael Graves, Peter Eisenman, Moore, Richard Meier, Robert Venturi, Zaha Hadid, Coop Himmelblau, Richard Rogers, Tadao Ando, Rem Koolhaas, Herzog and de Meuron, Daniel Libeskind). Historicism (Michael Graves & Robert Venturi, Bernard Tschumi); Urbanist (Mario Botta, Aldo Rossi, Cesar Pelli); Classicists (Arata Isozaki, Michael Graves, Mario Botta); Revivalists (Louis I Kahn, James Stirling, Charles Gwathmey, Richard Meier); Vernacular (Hasan Fathy); Philosophy (Charles Jencks, Bernard Tschumi, Peter Eisenman, John Hejduk); Critical Regionalism (Charles Correa, B. V Doshi, Tadao); Materialist (Peter Zumthor) etc.

## 18. ARCHITECTURAL ACOUSTICS

Vocabulary of acoustics; Science of sound; Characteristics of audible sound - Propagation, Velocity, Frequency, Pitch, Quality/timbre, Loudness and Intensity; Behavior of audible sound in enclosures - Reflection, Absorption, Diffraction and Transmission of sound.

Common acoustical defects and recommended remedies - Echo, Sound foci, Dead spots, Sound shadows, Resonance, Insufficient loudness, External noise and Reverberation; Sabine's expression for calculation of Reverberation time, Absorbents and absorption coefficient etc.

Noise control - Noise and its types; Noise pollution; Sources of indoor noise; Indoor noise levels; Planning and design against indoor noise; Sources of outdoor noise; Traffic noise levels; Planning and design against outdoor (traffic & buildings in built-up area) noise.

Constructional measures for sound insulation of buildings - Materials, Hollow & composite wall construction, Floors & Ceilings; Properties of good acoustical materials.

Sound system - Sound reinforcement system; Public address system; Sound system equipment e.g. Amplifiers, Microphones, Speakers, Mixers, Conference systems and accessories etc.

Acoustical design principles and factors - Acoustical design principles for Auditoriums, Cinema halls, Conference rooms etc.; Factors e.g. Site selection & planning, Dimensions, Shape, Seats & seating arrangements; Treatment of interior surfaces; Reverberation & sound absorption etc.