ARCHITECTURAL ENGINEERING

Ancient Indian Architecture—A Pillar of Civilization

Any Indian familiar with the history of Indian civilization, culture and heritage feels proud of India's outstanding achievements in the fields of architecture and civil engineering. The whole of India is dotted with magnificent structures comprising of stupas, temples, mosques, churches, palaces, fortresses, etc. which have stood for centuries bearing testimony to Indian ingenuity, creativity, aesthetic sense and professional skills in the above fields. Be it the temples at Ellora or the Taj Mahal at Agra, examples abound to make it a wonder on architectural excellence, aesthetic, engineering skills in design, workmanship and construction technology.

Architect and New Construction Materials & Techniques

The architect of today is both an artist and an engineer, who must synthesise his architectural ideas with scientific knowledge of design and construction of civil structures. He must be conversant with the available resources in labour, techniques and materials to produce a harmonious, durable and functional structure in line with his architectural concept.

Architecture has always been constrained by the availability of materials and restricted by techniques of design and construction. Discovery of newer materials of construction alongwith the development of sophisticated design and construction technology, steel-framed superstructures and reinforced and prestressed concrete have provided the architect an unlimited scope to use their creative imagination to put up structures which not only display architectural elegance but also meet the functional requirements without jeopardizing structural safety in any manner. Thus, the modern structures represent a harmonious blending of art, aesthetics, environmental considerations, application of sophisticated design and construction technology and expression of modern culture.

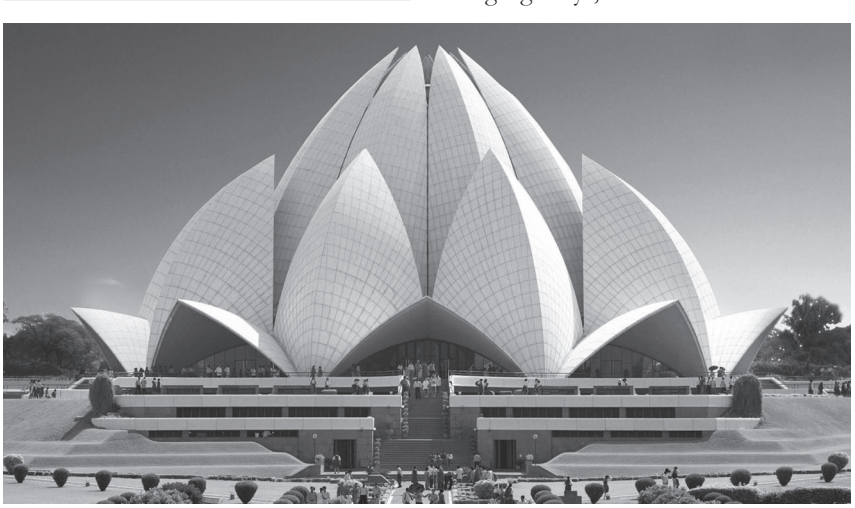
The term Architectural Engineering is used to indicate a field embracing all the engineering aspects of building design, including mechanical and electrical equipment, acoustics, illumination, airconditioning, safety measures and layout. When used in this broader sense, architectural engineering connotes building structures as its speciality, since the growing complexity of other fields generally requires their engineering design to be accomplished by specialists trained in the pertinent branches of engineering. However, the coordination of the structural, mechanical and electrical aspects with each other and with the architectural scheme is often the responsibility of the architectural engineer.

According to Nervi, "The themes submitted to the designer are every day loftier and of greater structural importance. The schools of architecture will fail in their aims and architecture will become empty formalism, unless we give our young architects the kind of training necessary to tackle such problems. I believe, therefore, that the schools of architecture should above all teach structural correctness, which is identical with functional, technical and economic truthfulness and is a necessary and sufficient condition for satisfactory aesthetic results. The aesthetic results achieved by these means usually suffice even if they do not reach the superior heights of art".

It is understandable that architecture and engineering play complementary roles from conception to construction, though the relative importance of either would vary from structure to structure. In the case of a temple, a church or a mosque, the architectural considerations may outweigh the engineering requirements of economy but the same is reversed in the case of a bridge, a hospital or an industrial building. The fact remains that for proper planning, designing and erecting a structure, its intended functions, architectural needs, quality of construction, durability and overall cost have all to be weighed and a judicious application of the sciences of architecture and engineering have to be made. Thus, an architect, to be true to his profession, needs to be an engineer as well.

Role of Architectural Engineers

In the planning and execution of large and complex civil engineering works, India has made rapid strides in the last two decades. It is now recognised that architecture and aesthetics are no longer confined exclusively to buildings but play an important part in the construction of bridges, flyovers, warehouses, factories, special structures for hydro/thermal power projects, marine structures, landscaping along highways, etc.



Lotus Temple of Delhi

AGRICULTURAL ENGINEERING

Compulsory Subjects

I C 402 Engineering Management
AR 403 History of Architecture
AR 404 Building Services
AR 405 Quantity Surveying, Specifications, Contracts and Valuation
AR 406 Surveying, Building Construction and Materials
AR 407 Architectural Design

+

Optional Subjects

(*Any three* from *any one* group)

Group I Structural Engineering

AR 411 Soil Mechanics and Foundation Engineering
AR 412 Construction Technology
AR 413 Theory of Structures
AR 414 Prestressed and Precast Concrete Structures
AR 415 Structural Design

Group II Design and Planning

AR 421 Ekistics
AR 422 Town Planning and Landscape Architecture
AR 423 Climatology

Group III Professional Practice

AR 431 Professional Practice
AR 432 Mapping a Thesis Project
AR 433 Interior Design
AR 434 Computer Graphics

+

Project Work

and

Laboratory Experiments

[10 (ten) experiments are to be undertaken from the prescribed list]

ARCHITECTURAL ENGINEERING

IC 402 ENGINEERING MANAGEMENT

(See page 13, subject IC 402)

AR 403 HISTORY OF ARCHITECTURE

Group A

Indian architecture: Prehistoric and primitive architecture. Study of art and architecture in Indus Valley. Vedic village—social conditions and way of life. Rockcut temples, viharas, caves, limitations of implements. Buddhist, Jain and Hindu architecture—reflection of religious thought and way of life.

Islamic architecture: Cultural differences and similarities of local inhabitants and invaders. Influence of advanced technology—domes, arches, vaults, conversion of places of worship into new needs of invaders.

Study of early buildings in India expressing vigour in the form of buildings. Study of advancement of building technology and space conception in places like Bijapur, Mandu, Fatehpur Sikri.

Study of the examples of Moghul architecture such as tomb, forts and palaces, and the development of various provincial styles of architecture like Sudh, Bijapur, Gujarat, etc.

Group B

Foreign architecture: Developments of styles and forms in Europe, Egypt, West Asia, Greek and Roman architecture. Developments in Renaissance and Boroque periods. Integration of indoor and outdoor frames, study of development of art forms with respect to cultural events.

Modern architecture: Role of steel, RCC, aluminium, plastics, glass and timber technology in modern buildings. Modern skyscrapers, Chicago school works, Frank Lloyd, Machintosh, Le-Corbusier, Nervi, etc.

Recommended Books

- P K Acharya. A Dictionary of Indian Architecture.
- P Brown. Indian Architecture—Buddhist and Hindu.
- B Fletcher. A History of Architecture on the Comparative Method.
- A D F Hamlin. A Text Book of History of Architecture.
- P Brown. Indian Architecture—Islamic.

AR 404 BUILDING SERVICES

Group A

Sanitation: Importance and basic approach. Location of sanitary units. House drainage system. Sewers—materials, workmanship, septic tanks, testing of drains, gradients, ventilation, local bye-laws, maintenance traps of various types. Planning and layout of lavatory blocks, different types of sanitary fittings and their installation, selection and testing of fittings. Layout of sewers and drains in various types of buildings.

Domestic water supply: Meter chambers, overhead and underground tanks, pump houses, installation, selection and testing of pressure fittings. Domestic hot water supply. Layout of water supply system in buildings of various types.

Drainage, sewerage and sewage disposal: Sewage disposal systems for small projects, treatment plants, gas plants, disposal of refuse, incinerator, refuse disposal in high rise buildings, treatment of industrial refuse. Refuse and pollution problem. External drainage and sewerage systems.

Acoustics: Basic problems, criteria and terminology. Transmission of sound in rooms, speech privacy between offices, coefficient of sound absorption, noise reduction, co-efficient, classification and selection of acoustical materials, acoustics of auditorium, schools, religious buildings, recommendations for acoustical treatment.

Group B

Air-conditioning, heating and ventilation: Different types of heating equipment, viz., radiators, convertors, electric radiant panel heaters. Requirements of comfort conditions, temperature control, humidity control. Mechanical ventilation, plenum system, exhaust system, fans exhaust and blower fans, air filters of different types, air-conditioning plants and layout of ducts for cinema, auditoriums, offices, hotels, etc.

Fire fighting: Cause of fire, spread of fire, fire-fighting equipment and different methods of fire fighting, sprinklers, fire regulations and requirements of fire insurance, fire-fighting in high rise buildings.

Electrical services: General distribution of electric power in towns, sub-stations for small schemes and industrial units, meter rooms, electrical installations in buildings, electrical wiring—different materials employed and specifications, electrical appliances and electrical services, earthing, bye-laws pertaining to electrical installations. Different types of artificial lighting systems. Lighting systems for residential buildings, public buildings, hotels, cinemas, hospitals, exhibition halls, libraries, schools, colleges, scientific laboratories, etc.

Recommended Books

- The Use of Architectural Acoustical Materials—Theory and Practice. American Institute of Acoustics.
- ASHRAE Guide and Data Book. American Society of Heating, Refrigeration and Air-conditioning Engineers.
- C M Harris. Noise Control Handbook. Mc-Hill International.
- B Louis. Design of Plumbing and Drainage Systems. Industrial Press, New York.
- H M Sharp. Introduction to Lighting.

AR 405 QUANTITY SURVEYING, SPECIFICATIONS, CONTRACTS AND VALUATION

Group A

Estimating: Introduction, definition, objective, scope and importance. Approximate estimate on plinth area basis, estimate based on cubic content method as approved by Indian Bureau of Standards. Estimate based on detailed quantities and mode of measurements as per BIS 1200.

Quantity surveying: Bill of quantities, methods of taking off quantities, preparation of abstract. Units of work and rate analysis. Quantities for excavation, foundations and quantities for load bearing structures. Quantities of RCC and prestressed structures. Quantities for steel structures. Quantities for services—plumbing, water supply sewers, electrical services, air-conditioning and acoustic treatment, lifts, etc. Quantities for land development and access roads. Quantities for landscape work. Measurement of completed works in accordance with practice stipulated by National Building Code.

Rate analysis: Rate analysis of important items like materials, labour, plant and contractor's profit.

Specifications: Importance of specifications, methods of developing specifications, typical specifications for building items, standard reference.

Group B

Execution of contract: Nature of supervision—periodical/ full time. Appointment of clerk of works, resident engineer, resident architect. Quality control and workmanship. Powers and duties, appointment of subcontractor, appointment of specialists and consultants and co-ordination of their work. Payments, earnest money, security deposits, interim and final bills.

Problems arising out of operation of contract. Extra items, variations. Progress and stages of execution. Termination of contract. Certificate of completion of contract, arbitration, forms and procedures.

Valuation: Introduction—techniques of valuation, elements of valuation and factors affecting valuation. Methods, valuation of landed property and building property, rate of interest for sale, purchase, mortgage, capital gains tax, wealth tax, estate duty and death duty. Compensation—valuation for compensation on acquisition, compensation under central and state legislation, relevance of Town Planning Act. Types of valuation—valuation for renewal of lease, extension of lease, standard rent, easement rights, dilapidation, insurance, estate development and advice of investment policy. Report—preparation of feasibility report, valuation report, awards, etc.

Recommended Books

- B N Dutta. Estimating and Costing in Civil Engineering: Theory and Practice. UBS Publishers & Distributors, New Delhi.
- P L Bhasin. Quantity Surveying. S Chand & Co. Ltd., New Delhi.
- S C Rangawala. Valuation of Real Properties. Charotar Publishing House, Anand (Gujarat).

AR 406 SURVEYING, BUILDING CONSTRUCTION AND MATERIALS

Group A

Ideas about chain survey, compass survey, plane table survey, levelling and theodolite survey.

Curves: Simple, compound, reverse and transition curves. Vertical curves for roads and railways. Curve ranging. Setting out curve by offset and by methods of deflection angles. Length of curve calculation (accessible and inaccessible), curve tables.

Setting out building works.

Building Construction

Component-brick masonry. English and Flemish bonds. Other types of bonds. Solid and hollow blocks.Stone masonry of different types; types of finishes; pointing, plastering and finishes. Timber partition walls, doors, windows, and skylights of timber and metals. Lintels, floor finishes, tiles, Indian patent stones, marble, Shahbad and Tandur tiled flooring.

Floor systems: Beam and slab floors, flat slab, rectangular and diagrid systems, present units, hollow tile flooring, timber flooring, precast floors.

Access: Various types of staircases, ramps, lifts, escalators, emergency exits, bye-law requirements. Principles of barrier-free access to handicapped persons.

Basements: Planning, design and construction of basements, waterproofing, disposal of seepage, security measures in bank vaults, precautions against flooding and fire, groundwater uplift in basements.

Roofs: Study of various types of roofs, steel, timber, and pre-cast trusses, corrugated sheets of steel, aluminium, etc., tiled roofs, RCC roofs, domes and shells.

Finishes: Different types of internal and external finishes, exposed, textured and plastered concrete work, plastering—plain, rough set, textured, fibrous, pebbledashed, gypsm and plaster of paris, gunniting, their specialities and appropriate applications. Use of tiles for external finishing and other cladding materials.

Group B

Bricks and tiles —manufacture, types, quality requirements, tests. Stoneware products—manufacture, quality requirements, tests, joints. Limes and cements—types, manufacture, requirements of IBS codes and admixtures. Stones and sand—igneous, metamorphic and sedimentary stones, geologic formations, strengths and tests. Sands and fine aggregate—sieve analysis, requirements for building purposes, BS standards. Rural materials—bamboo, thatch, hay, coir, casurina, palmyra, etc.—their study and uses in rural construction. Stabilized soil construction, innovation and improvements of their characteristics for building purposes. Current trends in the use of mud for house building.

Metals and alloys: Cast iron, mild steel, high tensile steel, special steels, manufacture and requirements of BIS tests. Bar and standard sections. Electrodes, aluminium, brass, copper, bronze, lead, zinc and gun metal, architectural mix.

Timbers: General properties, common methods of preservation, varieties of timber in common use. Essential requirements for building and furniture work. Tests required by BIS laminates, plywood, joints and methods of joining.

Paints, varnishes and polishes: Purposes, types, choice of paint, cement paints, preparation of surfaces, methods of application.

Insulating materials: Fibreboard, thermocole, asbestos, softboard, suitability for insulation against heat, sound and electricity. Fire resistance, requirements of BIS, methods of fixing.

Plastics: Classification, types, merits and demerits, epoxy, polymer, their engineering and architectural uses, fibre reinforced plastics.

Testing of materials commonly used in building industry.

Building glass: Varieties, thickness.

Recommended Books

- R Agor. A Text-book of Surveying and Levelling. Khanna Publishers, Delhi.
- R C Smith. Materials of Construction. Mc-Gill International.
- J K McKay. Building Construction—Vols I to V. Longmans.
- S K Sharma and B K Kaul. Text-book of Building Construction. S Chand & Co. Ltd., New Delhi.

AR 407 ARCHITECTURAL DESIGN

Group A

Basic requirements: Requirements of building with reference to purpose and function, environment, climate, materials and methods of construction.

Design: Marketing centres, offices, clinics, schools, gymnasiums. Block of flats, offices, educational building, departmental stores, libraries, industrial building, recreation centres, laboratories.

Introduction to energy–efficient design of buildings.

Group B

Social housing: Housing in relation to national economy housing policies and programmes of the five–year plans; study of various housing schemes such as low income group housing schemes, slum clearance schemes, etc. Housing design and standards, desirable standards for various income groups; climatic considerations in housing design; land sub-divisions and preparation of housing layouts; study of building rules, regulations, byelaws and codes; plot dimensions and densities.

Based on the above topics, the examination will be held for a period of four hours. The candidate will be expected to produce plans, elevation, section, etc. on drawing paper with sufficient dimensions to explain the scheme. Perspective view and detailing of interesting portion may be added by him. Emphasis of the problems shall be on the arrangements of various functional areas on the basis of data provided. Presentation techniques, analysis of area requirement, climatic considerations and following important building regulations.

Recommended Books

- C Correa. Complete Works of Charles Correa.
- Mills. Planning: The Architects' Handbook.
- De-Charia. Handbook of Architectural Details for Commercial Buildings.
- De-Charia. Time Saver Standards for (a) Architectural Design Data, (b) Residential Development, (c) Building Types, and (d) Site Planning.

AR 411 SOIL MECHANICS AND FOUNDATION ENGINEERING

Group A

Soil identification and classification: Introduction—soil as a three-phase system. Atterberg's limits and indices; weight-volume relationship; particle size analysis; specific gravity.

Physical and mechanical properties: Compaction characteristics; determination of field density; standard and modified Proctor's tests. Permeability and laboratory determination; field pumping tests; effective stress principles; flownets and their applications. Elements of shear strength; study of laboratory direct shear; unconfined compression and triaxial shear tests. Theory of one–dimensional consolidation; principles of methods of estimation of settlements.

Subsurface investigations: Exploratory borings, depth of exploration; spacing and number of boring; methods of sampling and types of samples; bore logs; core recovery; rock

quality designation; field vane shear test; standard penetration test and its applications; field plate load test and limitations.

Group B

Ultimate bearing capacity of shallow foundations: Concepts of ultimate bearing capacity; important parameters influencing the ultimate bearing capacity; estimation of safe allowable bearing capacity. Plate load test. Elements of combined and raft foundations.

Deep foundations: Classification of piles; bearing capacity of deep foundations; settlement predictions in case of piles in compressible soils. Elements of well foundations. Pile load test and use of relevant BS code.

Improving the soil at site: Different methods of improving soil characteristics at site. Elements of soil stabilization, sand drains and vibroflotation techniques. Use of geotextiles.

Recommended Books

- B C Punmia. Soil Mechanics and Foundations. A Saurabh & Co. (P) Ltd., Chennai.
- J Jha and S K Sinha. Construction and Foundation Engineering. Khanna Publishers, Delhi.
- V N S Murthy. Soil Mechanics and Foundation Engineering. Dhanpat Rai & Sons, Delhi.

AR 412 CONSTRUCTION TECHNOLOGY

Group A

Clearing of site, diversion of services, planning and execution of temporary works, provision of infrastructural facilities, line out/layout of works.

Foundations: Open foundations, shoring and strutting, pile foundations, various types of piles such as under reamed, cast-in-situ precast, etc., sheet piles, diaphragm wall, problems in water-logged soil, black cotton soil problems, brick and stone masonry in foundations. Raft foundations, machine foundations, use of bentonite, foundations for timber and steel–framed structures, anti–termite treatment of foundations.

Group B

Load bearing and framed structures: Comparison—mode of action, rigid frames, earthquake resistance, timber, steel and RCC frames. Precast columns and beams. Connections. Bye-law requirements. Design of formwork, stationary formwork, sliding and slip forms, materials for economical and reusable forms, material storage practices, design, erection and removal of scaffolding. Structural steel construction—shop fabrication, erection, rivetted and welded connections, fire and corrosion protection. RCC and prestressed concrete construction practices, prefabrication and precasting. Joining, detailing, bar bending, schedule and shop drawings, modular coordination, standardization, manufacture, storage, transportation and rejection of precast components. Advantages and limitations of ready mixed concrete. Construction equipment—use of tractors, bulldozers, shovels, draglines, cablewarp and belt conveyors; batching plants, transit mixers and agitator trucks used for ready mixed concrete; concrete pumps, grouting pumps, air compressors, welding equipment, cranes, hoists and other lifting devices, vibrators, water pumps, trolleys, etc. Field tests on materials and finished components, quality control techniques.

Recommended Books

- J Jha and S K Sinha. Construction and Foundation Engineering. Khanna Publishers, Delhi.
- W C Huntington. Building Construction. Wiley International.
- P N Khanna. Indian Practical Civil Engineers' Handbook. Engineers' Publishers, Delhi.

AR 413 THEORY OF STRUCTURES

Group A

Slopes and deflections in simply supported beams; double integration and moment area methods. Theorem of moments, fixed and continuous beams. Eccentric loads on short columns. Long columns, secant and empirical formulae. Columns subjected to lateral loads. Basic elastic theorems; Castigliano's, Maxwell's, Betti's theorem and Mueller Breslau's principle.

Group B

Deflection of framed structures. Redundant framed structures. Moving loads on simply supported beams. Influence lines for bending moment and shear force in statically determinate beams and forces in members of framed structures. Moment distribution and slope deflection methods. Kani's methods—application to continuous beams and portals. Arches—3 hinged, 2 hinged and fixed. Suspension bridges with stiffening girders.

Recommended Books

- S Ramamrutham. Theory of Structures. Dhanpat Rai & Sons, Delhi.
- S Timoshenko and D H Young. Elements of Structures of Materials. D Van Nostrand Inc.
- Vazirani and Ratwani. Analysis of Structures: Vols I & II. Khanna Publishers, Delhi.

AR 414 PRESTRESSED AND PRECAST CONCRETE STRUCTURES

Group A

Concrete technology: Types of cement, their manufacture, properties of coarse and fine aggregate and their influence on

quality of concrete. Testing method of materials. Grade of concrete; strength requirements and workability methods of selection and proportioning of materials; water cement ratio; introduction to mix design. Destructive and non-destructive methods of testing of concrete. Shrinkage and creep of concrete.

Precast concrete: Requirements of industrialised buildings, standardization of precast elements and unification of building design. Influence of manufacture, transport and erection technologies on design solution; expansion and contraction joints. Joints and connections; classification and their requirements. Advantages and disadvantages of precast concrete construction; different types of units involved in general building construction, including residential, factory and industrial framed structure; their general principles of design; mechanical handling of large projects.

Group B

Prestressed concrete: Historical development, basic concepts of prestressing, materials used and their properties; methods and systems of prestressing. Losses in prestress. Analysis of sections subjected to prestress and external load; general principles of design; Kern points, cable profile; choice of sections, principal tension; advantages of prestressed concrete over reinforced concrete. Use of prestressed concrete for long span bridges, hangers, auditoria, etc.

Recommended Books

- P Dyachenko and S Mirotvorsky. Prefabrication of Reinforced Concrete. Peace Publishers, Moscow.
- C W Glover. Structural Precast Concrete. C R Books Ltd., Delhi.
- Koncz-Banverlag. Manual of Precast Concrete Construction Principles of Roof and Floor Units.

AR 415 STRUCTURAL DESIGN

Group A

BS loading: Dead loads, live loads, wind and earthquake loadings.

Steel design: Rivetted and welded joints subject to direct loads and moments. Tension and compression members. Plate girders, lattice girders. Columns subject to axial loads and eccentric loads. Gussetted bases and grillages. Design of trusses, elevated tanks, silos, stacks, building frames, highway bridges. Elementary limit design. BS code of practice for steel structure.

Group B

RCC: Slab—singly, 2-way reinforced and flat. Beams—rectangular, T and doubly reinforced. Adhesion, bond anchorage and shear reinforcement. Axially and eccentrically loaded columns. Footings, single and combined, rafts. Design of retaining walls, building frames, water tanks (underground and elevated), bunkers, silos and highway bridges. Elementary ultimate load theory. Prestressed concrete. Principles and practice of prestressing. BS code of practice for RCC.

(Use of relevant BS codes and steel tables allowed in the examination hall.)

Recommended Books

- A S Arya and J L Ajmani. Design of Steel Structures. Nem Chand and Bros (Publishers), Roorkee (UP).
- S Ramamrutham. Design of Reinforced Concrete Structures. Dhanpat Rai and Sons, Delhi.
- Bureau of Indian Standards: BIS Handbook for Structural Engineers—Vol I; Structural Steel Section—Vol II; Steel Beams and Plate Girders—Vol III; Steel Columns and Structures. Manak Bhavan, Bahadur Shah Zafar Marg, New Delhi.

AR 421 EKISTICS

Group A

The science of human settlements—subject and its components. Aspects and elements of human settlement. Ekistic units and grid. Study of human settlements—disciplines of human settlements. Methodologies of ekistics.

Perspectives for ekistics: Ekistics analysis—anatomy and physiology of human settlements. Rural and urban settlements.

Group B

Ekistic evolution: Evolution of species, growth of settlement, transformation of settlements, ekistics pathology and diagnostics.

Ekistic theory: Principles and laws of ekistics, laws of development, internal balance and physical characteristics, human needs, forces shaping settlements, ekistics synthesis. Ekistics therapy—ekistics goals, new tasks ahead, ekistics practice.

Recommended Books

- Ekistics—An Introduction to the Science of Human Settlements. Hutchinson & Co., London.
- Journal on Ekistics. Hutchinson & Co., London.

AR 422 TOWN PLANNING AND LANDSCAPE ARCHITECTURE

Group A

Introduction: Evolution of town planning; aims and objectives of urban and rural planning; study of socioeconomic and demographic characteristics of villages, towns and cities; their present growth trends and future needs; contemporary planning concepts—Goddes, Howard, Dosciadis, Perry and La-Corbusier.

Planning problems: Identification of planning problems related to land use, distribution and change; communication system; overcrowding; slums, sporadic growth and conurbation;

development of satellite towns; urban renewal.

Planning surveys: Importance and techniques of planning surveys; sources of information; analysis of data and use of inferences for working out planning proposals.

Planning standards: Formulation of planning standards for land use, density, roads and various community facilities at local and town levels.

Development plan: Planning process; concept of master plan, its elements, preparation and implementation; detailed planning proposals for residential neighbourhood.

Regional planning: Concept of regional planning, types of regions and locational factors of settlements. A critical review of regional theories.

Planning-legislation: Review of the development of planning legislations in India, UK and some other countries; detailed study of latest planning of Acts on Housing.

Group B

History and modern trends: Introduction to landscape architecture—its importance for human well-being. Early experiments and development. Integration of buildings and landscape, indoor and outdoor spaces, form, colour and texture.

Landscape planning: Landscape planning of large township and estates. Landscape planning for individual building projects. Landscape planning for public spaces, educational institutions. Site developments by exploiting natural forms. Problems of earthwork, grading of alignments, circulation and utilities.

Plantation: Local plants, materials and adoption for landscaping with reference to behaviours and climate, field identification of a new Indian plants and flowers and study of their ecological characteristics.

Environmental design: Application of principles of architecture and landscape for environmental design of projects.

Recommended Books

- N K Gandhi. Study of Town and Country Planning in India. Indian Town and Country Planning Association, Mumbai.
- K Lewis. Principles and Practice of Town and Country Planning. Estate Gazette, London.
- M Lausie. An Introduction to Landscape Architecture. Pitman, London.
- F Gibberd. Town Design. The Architectural Press, London.

AR 423 CLIMATOLOGY

Group A

Effect of climate on men, shelter and environment; conditions for human comfort.

Macro climate and micro climate. Effect of topography on climate. Solar control, standard time, local time, altitude. Declination of sun, sunpath with diagrams. Shading devices for under and overheated periods. Shading effect of trees and vegetation. Use of heliedon and Gunner Pligets sun-dial in the analysis of problems.

Group B

Air flow patterns inside the building. Effect of winds on layouts. Thermal effect on building materials, heat transfer coefficients of different materials. Protective devices for buildings against heavy monsoons. Regional approach of principles of climatology to the design of buildings with respect to site selection.

Town structures, public spaces, orientation, colour positions of windows, types of walls and roofs.

Recommended Books

- J E Aronin. Climate and Architecture. Reinhold Publishing Corporation, USA.
- J E Hobbs. Applied Climatology. Butterworths, London.
- R Geiger. The Climate near the Ground. Harvard University Press, Massachusets.
- O H Koenigsberger. Manual of Tropical Housing and Building—Part I, Climatic Design. Longmans.

AR 431 PROFESSIONAL PRACTICE

Group A

Concept of word 'profession'. Difference between profession, business and trade.

Tender documents: Special and general conditions of contract. Types of tenders, their merits and demerits, invitation of tenders, procedure for opening and scrutiny of tenders. Selection and report to client. Contract—legal definition, work order.

Building bye-laws: Building rules and regulations applicable to important metropolitan centres, approval of sites—area, height and ventilation for rooms, open space around buildings, height of buildings, parking, structural requirements, etc. Use of National Building Code of BIS.

Easements and convenants and land acquisition: Indian Easement Act. Natural light and easements in respect of air, light, water, etc. Acquisition of loss of easements, Land Acquisition Act, purpose of acquisition, claim report for acquisition, awards and reference to courts. Property extracts, Urban Land Ceiling Act—introduction of main provisions.

Group B

Insurance: Insurance policy, duties of architect, fire loss assessment, insurable value of property, insurance of constructions, insurance of design, worker's compensation.

Arbitration: Introduction—arbitration, arbitrators, umpire, nature of arbitration, conduct, powers and duties of arbitration and umpire. Procedure—procedure for arbitration, preparation and publication of awards, impeachment. Claims—fire insurance and arbitration of insurable value, claims and damages.

Injunctions: Easements and its definition, features of easements, interim, permanent and mandatory injunctions.

Architect's office: Office setup and administration. Filing and recording of drawings. Nature of partnership, registration of firm and dissolution. Procedure and conduct—membership of professional bodies. Architects Registration Act. Code of professional conduct. Code of architectural competition. Architectural services—normal, additional, special and partial. Scale of fee and mode of payment. Claiming of fee. Architects Act of Registration of 1972, copyright of drawings.

Recommended Books

- Architects Act, 1972.
- Cinematographic Act, 1952.
- Development Control Rules & Building Bye-laws as applicable to the States.
- Indian Arbitration Act, 1940.
- Easement Act, 1982.
- Ronald Green. The Architect's Guide to Site Management. The Architectural Press, London.
- E E Seelye. Field Practice. Wiley International.

AR 432 MAPPING A THESIS PROJECT

Group A

Designing of one live project: Design of a proposed project. The project should include physical survey of site, analysis and formulation of requirements, climatic study of site, circulation diagram, local architectural history and character, local materials, planning process, structural analysis, quantity surveying and specifications, construction method, landscaping, model.

Group B

Optional services: Sanitation, water supply, sewage disposal, acoustics, air-conditioning, heating, ventilation, fire-fighting, electrical supply.

AR 433 INTERIOR DESIGN

Group A

Free–hand sketching, basic colour chart, analysis and study of colour, study of two–dimensional and three–dimensional forms of plan, section, elevation.

Group B

Furniture study and design, study of building materials, perspectives and rendering. Interior layout, furnishings, presentation of interior design.

AR 433 INTERIOR DESIGN

Group A

Introduction—point plotting, line drawing, raster graphics and vector displays—two-dimensional transformations. Clipping, windowing—graphic input devices and input techniques—graphic packages, segmented display files, geometric models, and picture structures.

Group B

Three—dimensional graphics—curves and surfaces—transformations, perspective—hidden surface elimination—device independent graphic systems.

Recommended Books

- D F Rogers. Procedural Elements of Computer Graphics. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
- W K Gilloi. Interactive Computer Graphics. Prentice-Hall of India (P) Ltd., New Delhi.
- W M Newman and R F Sproull. Principles of Interactive Computer Graphics. McGraw-Hill Book Company Ltd., New York.