Nepal Engineering Council Registration Examination

Architecture Syllabus (AArc)

Chapter-1 relates to the understanding of Nepalese architectural context from the past, whereas chapter-2 relates to the understanding of material, construction technology, services. Chapters 3-5 relate to understand the history and theory of architecture and its application in architectural design projects (of various complexities) and Chapter-6 deals with the engineering aspects and building science in architecture. Accordingly, chapters 7-9 relate to rural/urban planning parameters (act and policy) and design incorporating landscape and society. And the last (10th) chapter is related to project planning, design and implementation.

1. Architectural Context in Nepal (AArc01)

1.1 Architecture of Nepal during the Licchavi, Malla, Shah and Rana periods: Materials, technology and elements of Nepalese Architecture during the above-mentioned periods. Traditional building materials (brick, stone, timber and metal), their types and application. Traditional timber construction of Nepal (focus on various elements such as doors, windows, posts, beams, roofs and carving). (AArc0101)

1.2 Traditional Nepalese architectural typologies: Residential, Religious (Tiered Temples, Shikhara Temples, Stupas and Chaityas, Dyo Chen, Maths), Bahals, Bahils, Palaces, Urban Architecture (Patis, Dabalis, Lachi, Nani, chowks, dhunge dharas, Mandaps and Sattals) with reference to geometrical forms, elemental details, materials, scale and proportion & their use. (AArc0102)

1.3 Vernacular architecture of different physiographic regions of Nepal: General architectural typologies of the same areas. Functional, technological & aesthetic dimensions of Ethnic houses of Nepal. (AArc0103)

1.4 Nepalese world heritage sites and their conservation: Criteria and procedure for nomination and enlisting in World Heritage Site. General Byelaws and Building Control Norms for the same. Materials, Techniques and protection measures used in Conservation in Nepal: traditional and modern. International Principles of Architectural Conservation, Philosophy of Conservation; the Process of Conservation: Inventory, Inspection, Documentation and Degrees of Intervention applicable for a conservation project. (AArc0104)

1.5 Prevailing zoning ordinances and building regulations: knowledge of FAR, ground coverage, set back, ROW, light plane, prevailing area measurement systems and units. (AArc0105)

1.6 Nepalese building typologies, concepts of ownership, legal rights and tenure: Residential, Apartment, Group Housing, Commercial, Mixed Use, Institutional, Industrial. (AArc0106)

2. Building Material, Construction Technology & Components (Services) (AArc02)

2.1 Stone: Types used for architectural works; quarrying, seasoning and dressing. Brick: Constituents, character and local manufacture/ making process, testing of bricks, brick masonry. Timber: Seasoning and Preservation of Timber. Use of Timber in Construction works. Metals and Alloys: Types, use of same as structural and in other construction works. (AArc0201)

2.2. Lime: Constituents, properties, use and application. Cement: Constituents, properties, manufacturing processes, packing and storage, testing of cement, use and application as cement mortar, cement plaster, cement paint. Concrete: constituents, mixing matrix, grading of aggregates, compacting and curing; properties in plastic and hardened state; slump test. (AArc0202)

2.3 Walls and openings: Masonry, cavity, partition and curtain walls. Different types of timber and metal doors and windows. Finishing and Cladding Materials: Paints and varnishes, plasters, wall and floor

finishes, cladding and false ceilings, glass & Pre-fabricated building materials. (AArc0203)

2.4 Foundation works: Types, functions, characteristics: strip, pad, combined, balanced, cantilever and raft foundations. Deep foundation types and materials used. Basic Concepts of Retaining Walls and basement constructions. Temporary Works: Shoring, underpinning, scaffolding, their types and need. Formwork: materials used, characteristics and requirements. (AArc0204)

2.5 Concrete works: R.C.C. foundations, R.C.C floors, concrete stairs; Construction joints and their locations; Concrete frames; Concrete block masonry. Steel: Types of steel structural members: beams, columns, and girders. Types of truss. Rivets and welding methods. (AArc0205)

2.6 Preventive measures in buildings: Fire Prevention through design, material choice and construction. Damp proofing and insulating materials and technologies. Preventive measures for rotting, corrosion, efflorescence, leaching, staining and rusting. Basic knowledge of services in Buildings: mechanical, electrical & plumbing (MEP), its planning & design (lifts and escalators, solar & rain water harvesting, water supply distribution in a residential building (w/c, kitchen, septic tank, soak pit design & solid waste management). (AArc0206)

3. Architectural History and Theories (AArc03)

3.1 Overview of ancient architecture: Egypt, Greece, Rome with focus on materials, technology and architectural typologies. Overview of Medieval Period: Byzantine, Romanesque, Gothic and Renaissance Architecture with focus on materials, technology and architectural examples. (AArc0301)

3.2 Eastern architecture: Buddhist architectural typologies, construction materials; Hindu temple architecture; Vaastu Shastra & Mughal architectural typologies. (AArc0302)

3.3 Doctrinal theories of architecture and design: various movements of Modern and Post-Modern Period and architectural examples of the same period. (AArc0303)

3.4 Philosophies, design theories and works of master and modern architects: Mies Van Der Rohe, Walter Gropius, Frank Lloyd Wright, Le Corbusier, Philip Johnson, Louis Khan, Alvar Aalto, Kenzo Tange, Tadao Ando, Charles Correa, Robert Ventury, Michael Graves, etc.). (AArc0304)

3.5 Emerging concepts of contemporary architects (Zaha Hadid, Norman Foster, Richard Rogers, Renzo Piano, Rem Koolhas, Santiago Calatrava, Charles Correa, B.V. Doshi, Geoffrey Bawa, etc.): Basic architectural concepts of aesthetics, visual appropriateness, social milieu, universal design, mass and void, space and place, anthropometry, design thumb rules and universal standards. (AArc0305)

3.6 Overview of Nepalese modern and contemporary architecture. Concepts, design philosophies and works of prominent Nepalese Architects. (AArc0306)

4. Architecture Design-I (Basic Studio Works) (AArc04)

4.1 Principles of composition: Axis, Datum, Hierarchy, Symmetry, Emphasis, Balance, Harmony, Rhythm; Scale and Proportion; Colours, Colour Wheel, Colour Schemes, texture; shade and sociography. (AArc0401)

4.2 Theory and principles of projection: Orthographic, pictorial projection and perspective projections (at various eye levels). Concept of different scales and different systems of dimension of geometrical figures and building drawings. (AArc0402)

4.3 Basic understanding of architectural drawings: Master Plan, Site plan, floor plans, elevations & sections. (AArc0403)

4.4 Basics of architectural design process: Basic vocabularies/principles in architecture, understanding basic literature/case studies, its analysis & concept formulation through bubble diagram. (AArc0404)

4.5 Basics of computer graphics (CAD): Application of CAD to prepare Two-Dimensional and Three-

Dimensional architectural drawing, modeling and rendering. (AArc0405)

4.6 Small design projects: basic two-dimensional designs, basic volume composition incorporating mass & voids, architectural design such as: guard house, bus stop, studio, residence, café/ restaurant & primary school, etc. (AArc0406)

5. Architecture Design-II (Advanced Studio Works) (AArc05)

5.1 Advanced understanding of architectural drawings: Detailed Master Plan, Site plan, floor plans, elevations, sections with its details and their representation. (AArc0501)

5.2 Architectural design process (advance): advanced interpretation of basic vocabularies, tangible & intangible aspects of design, detailed literature/case studies & analysis, concept formulation and design synthesis incorporating design theories (concepts of aesthetics, visual appropriateness, social milieu), Universal Design standards. (AArc0502)

5.3 Advanced computer graphics: Rendering software's such as Sketchup, Photoshop, V-ray, Lumion, Revit, etc. to prepare advanced Two-Dimensional and Three-Dimensional architectural drawing, modeling and rendering. (AArc0503)

5.4 Municipal set of architectural drawings: including structural, sanitation and electrical drawings and general documents of supporting report. (AArc0504)

5.5 Construction detail drawing: working drawing its details with elemental details, graphical representation of supportive services in architectural design and drawings. (AArc0505)

5.6 Complex design projects: Advanced two-dimensional and three-dimensional designs, volumetric composition incorporating mass & voids, architectural designs such as: High School, Commercial, Museum, Community Center, Sports Center etc). (AArc0506)

6. Basic Engineering Aspects (Structure, Survey, Estimating, Costing and Specification) & Building Science in Architecture (AArc06)

6.1 Fundamentals: Basic knowledge of center of gravity, moment of inertia; stresses and strains, theory of torsion and flexure. Analysis of beams and frames: bending moment, shear force and deflection of beams and frames. (AArc0601)

6.2 Steel structures (basic design and calculations: Design in structural steel (including truss design) with various components, their structural functions. Basic design procedures and calculations for simple structural components in Concrete. Design of R.C.C. beams, one-way and two-way slabs, columns and footing for isolated columns. Detailing of reinforcement. (AArc0602)

6.3 Introduction, basic principles and classification of surveys: Linear measurement techniques; Leveling; Calculation of area and volume: methods of area calculation of land, methods of area and volume calculation of cut and fill. Types of estimates and their specific uses. Methods of calculating quantities. Key components of estimating norms and rate analysis. Preparation of bill of quantities. Purpose, types and importance of specification. (AArc0603)

6.4 Basic concepts of climatology: Solar Radiation, Solar Chart, Solar Altitude, Solar Azimuth, Wall Azimuth, Shadow Angles, absorption and reflection on earth. Concepts of Thermal Aspects, heat transmission, absorptivity, reflectivity and emissivity. Thermal control techniques in varied climatic conditions. (B.Arch 0604)

6.5 Lighting and acoustics: Natural and artificial lighting: Principles of architectural lighting. Artificial lighting design: Illumination design and calculation. Basic concepts of Acoustics design and Insulation: factors effecting good acoustic design of a hall. (AArc0605)

6.6 Passive methods of energy conservation for heating and cooling in a building: Climate and Site

response; Design Solutions with respect to different climatic conditions (in mountain, hill and terai). (AArc0606)

7. Settlement Planning and Architecture (AArc07)

7.1 Planning concepts and theoretical models of planning: Morphology of the city and processes in city growth. Theoretical models of planning coined by Sir Patric Gedds, Sir Ebenezer Howard, CA Perry, Lewis Mumford. (AArc0701)

7.2 Urbanization, development plans and planning practices in Nepal: National plan, regional plan, planning hierarchy, master plan, structure plan, zonal development plan, local development plan, land use planning. (AArc0702)

7.3 Demography/population studies: survey, statistical analysis -mean/mode/medium, standard deviation. Population projection, growth rate & demand forecasts and its relevance in design and planning. (AArc0703)

7.4 Land development: Knowledge of GLD, Site and Services, Land Pooling, Slums and Squatters, housing and their application in Nepalese context. (AArc0704)

7.5 Basic concepts, fundamental principles and elements of urban design: Knowledge of Image of a city and Place Making. (AArc0705)

7.6 Regulatory frameworks: Planning Legislation, Policies Norms and Standards in Nepalese context. (AArc0706)

8. Site Works and Landscaping (AArc08)

8.1 Site analysis and the relationship of natural systems components: micro and macro climate, ecology, soils and subsurface conditions, physiographic, visual character and land use. Site Factors: parameters and geometric properties of a given site and contextual mapping of a site. (AArc0801)

8.2 Soil's bearing capacity, topography: soil types, soil investigation, calculating and improving bearing capacity. Concepts of topography, landforms and contours. (AArc0802)

8.3. Synthesis and interpretation of site data: Design response through program 'fit' for site; Master planning, site planning, grading, site layout and setting out, excavation, trenching and drainage layout. (AArc0803)

8.4 Hard and soft landscape elements and their application: Design Resources involved in Landscaping: Landforms, water, vegetation, Surface Materials, Outdoor fittings, Construction materials, structures and installations. (AArc0804)

8.5 Open spaces: Types, Roles and importance; Historical use, nature and types of open spaces; Contemporary typologies of open spaces focusing on the urban context. (AArc0805)

8.6 Miscellaneous: Landscape typologies; Roof gardens, atriums, roadside plantations, avenues, indoor landscape, children's play area, and design of the same. Understanding of Environment & Ecology for architectural design. (AArc0806)

9. Architects, Society and Policies (AArc09)

9.1 Architecture, built environment and the society: Architecture and its relation with society, culture, community, caste, religion, social structure, technology and built environment. (AArc0901)

9.2 Architect as a profession: its role and responsibility in the society; relation with client/employer, contractors and fellow professionals, potential areas of conflict. (AArc0902)

9.3 Understanding sociological and anthropological aspects in architecture: Social philosophy of life

and its importance and impacts in building construction. (AArc0903)

9.4 Business enterprise and its types: Property rights and inheritance, changing family structure in Nepalese context & its influence in architectural design. (AArc0904)

9.5 Regulatory controls: National Building Codes (mandatory- architectural code), Town planning Act, Shelter Policy, Housing and Apartment Act of Nepal, Company Act and Registration, Procurement Act & Consultancy Development Act. (AArc0905)

9.6 Property assessment methods for land and building: Valuation as per guidelines of the Nepal Rastra Bank. (AArc0906)

10. Project Planning, Design and Implementation (AALL10)

10.1 Engineering drawings and its concepts: Fundamentals of standard drawing sheets, dimensions, scale, line diagram, orthographic projection, isometric projection/view, pictorial views, and sectional drawing. (AALL1001)

10.2 Engineering Economics: understanding of project cash flow; discount rate, interest and time value of money; basic methodologies for engineering economics analysis (Discounted Payback Period, NPV, IRR & MARR); comparison of alternatives, depreciation system and taxation system in Nepal. (AALL1002)

10.3 Project planning and scheduling: project classifications; project life cycle phases; project planning process; project scheduling (bar chart, CPM, PERT); resources levelling and smoothing; monitoring/evaluation/controlling. (AALL1003)

10.4 Project management: Information system; project risk analysis and management; project financing, tender and its process, and contract management. (AALL1004)

10.5 Engineering professional practice: Environment and society; professional ethics; regulatory environment; contemporary issues/problems in engineering; occupational health and safety; roles/responsibilities of Nepal Engineers Association (NEA). (AALL1005)

10.6 Engineering Regulatory Body: Nepal Engineering Council (Acts & Regulations). (AALL1006)