4.1 ARCHITECTURAL DESIGN - III

L	T	P
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RATIONALE

To develop an understanding of the inter-relationship of the various components of a small public building

DETAILED CONTENTS

Three exercises of 3-4 weeks duration to be done individually. The public building to be designed may be a small health-centre, nursery school, local neighbourhood shopping market or the like. The activity requirements should be laid down by the subject teacher. While the areas required for each activity should be worked out by the student on his learning from the anthropometric studies carried out earlier. The building must not exceed two stories.

Note:

1) The emphasis must be on site visits and case studies

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2. The final submission should be in the form of rendered. Drawings to explain the scheme and block detailed model

3 Each Design project must include the following drawings site plan, detailed floor plans showing furniture layout. Section. Elevations. Freehand 3-D views, perspectives.

4.2 BUILDING CONSTRUCTION - III

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2	-	6

RATIONALE

The aim is to develop an understanding of the behaviour and function of various components of buildings. For this it is essential that the student are taught the various components of building such as foundations, floors, super structure, joints, opening, roofs etc. The first year timber construction and RCC will be dealt with.

Teachers must supplement their lectures with models, audio-visuals and on site study of various building components. For drawing work, stress must be laid on scale, dimensioning, lettering, and composition of the drawing.

At the end of the first year, the students should be able to draw a complete vertical section through a simple single storied flat roof building. The subject teacher shall introduce the theory component of the topic to the students before drawing sheets are attempted by the students.

DETAILED CONTENTS

Note: Relevant theory should be taught along with drawings/practical exercises in each topic

1. Timber Construction

   - Timber doors and windows (flush, paneled, glazed and louvered with joinery details) – 5 sheets
   - Timber flooring – 1 sheet
   - Timber trusses and slates roofing – 1 sheet
   - Timber staircase – 1 sheet
     (Teacher shall assume a suitable plan of a double storey load bearing structure in brick masonry and first floor projecting on all the sides 3'-0" in timber frame construction. Further, suitable opening etc. may also be earmarked with respect to the frame spacing. Placement of staircase shall be left to the discretion of the teacher)

2. Staircases and ramps

   - Staircases of various configurations in RCC are to be studied and drafted to scale with various level plans, sections and elevations (1 sheet)
   - Ramp construction details (A pedestrian ramp) (1 sheet)

Total No. of Sheets: 10

Instructions

The students shall be taken for visits on the construction sites by the teachers for each stage of construction being taught in class.

4.3 BUILDING SERVICES

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RATIONALE

Students of Architectural Assistantship at diploma level are expected to prepare working drawings of various fittings and fixtures and water supply and sanitary installations. Also students should be well conversant with electrical and mechanical installations in the buildings. For this purpose, it is essential that the students are taught various aspects of building services like: sanitation, domestic water supply, electrical layout and air conditioning. Therefore, the subject of building services is very important for students undergoing diploma courses in Architectural Assistantship.

Teachers while imparting instructions are expected to show various fixtures and fittings, water supply and sanitary installations at work sites and by making use of literature, models, charts and other audio-visual aids so that students are able to comprehend the hardware used. Teacher should specifically point out problem areas and other environmental considerations while teaching this subject.

DETAILED CONTENTS

1. Water Supply (14 hrs)

   1.1 Water as a natural resource, public health significance of water quality, demand of water for domestic, commercial industrial and public utility purposes as per BIS standards. Per capita demand, leakage and wastage of water and its preventive measures

   1.2 Storage and Distribution of Water: Different methods of water distribution boosting water, gravity and pressure distribution by storage tanks of individual buildings

   1.3 System of water supply – continuous, intermittent, their advantages and disadvantages

   1.4 Hot water supply for buildings

   1.5 Service connections, types and sizes of pipes, water supply fixture and installations

2. Drainage (20 hrs)

   2.1 Principles of drainage, surface drainage combined and separate system of drainage, shape and sizes of drains and sewers, storm water over flow chambers, methods of laying and construction of sewers

   2.2 House drainage: traps – shapes, sizes, types, materials and function

2.3 Inspection chambers – sizes, and construction

2.4 Ventilation of house drainage – anti siphonage and vent pipes, single stack and double stack system

2.5 Functions and working of sinks, baths, water closets, flushing cisterns, urinals, sinks etc – sizes and types

2.6 Septic tanks, seepage and soak pits

2.7 Simple exercises on layout plans for toilet and kitchens for public and residential buildings

3. Thermal and Sound Insulation (10 hrs)

3.1 Behaviour of heat and sound propagation, co-efficient of thermal conductivity of different materials

3.2 Acoustics in building, acoustical defects such as echo, reverberation, sound focii, methods of correction, special requirements like auditorium, conference halls, studios etc

3.3 Acoustical material and their use in various building

3.4 Simple exercises on sound insulation

4. Lighting and Electrical Fittings (14 hrs)

4.1 Different types of lighting, quality of light of mercury lamps, incandescent lamps, fluorescent tubes and lamps, thumb rules for calculation of illuminating level, various systems of wiring and their sustainability

4.2 Knowledge of various electrical fitting their uses and maintenance, symbolic representation of electrical fittings for different work areas in residential building (e.g. bed room, living room, kitchen, study and toilet)

4.3 Preparation of electrical layout of a simple residential building

4.4 Precautions to avoid electrical accidents

5. Heat Ventilation and Air Conditioning (HVAC) (6 hrs)

5.1 Behaviour of heat propagation, thermal insulating materials and their co-efficient of thermal conductivity

5.2 General methods of thermal insulation. Thermal insulation of roofs, exposed walls
5.3 Ventilation: Definition and necessity
5.4 System of ventilation
5.5 Principles of air conditioning
5.6 Air cooling
5.7 Different systems of ducting and distribution
5.8 Essentials of air-conditioning system

6. Vertical Transportation Systems (4 hrs)

Classification and types of lifts, lift codes, rules, structural provision; escalations, their uses, types and sizes, safety norms to be adopted

7. Fire Fighting Services (4 hrs)

Classification of fire, fire hazards, classification of building materials according to fire load, introduction to fire fighting system, causes of fire in buildings, precaution and controlling devices (fire panels, door and windows automation, fire hydrants and sprinklers fire door operations) fire escape elements (staircases, ramps, lifts), provisions in building from fire safety angle as per BIS; heat detectors, fire alarm systems

8. Integration of lighting, air-conditioning, acoustics and other services/systems (2 hrs)

Note: Students shall prepare a scrapbook for all the above 7 numbers of topics

INSTRUCTIONAL STRATEGY

Building services are import as part of any building. The teachers, besides classroom teaching should supplement the instruction by arranging field visits. Students may be encouraged to collect information, pamphlets and catalogues from different market/ manufacturing sources and prepare a scrapbook of the latest machines fittings available for building services. They may include the detailed specifications, cost and availability of these machines/fittings in their collection. Teachers may also encourage the students to go through relevant BIS codes for each topic

RECOMMENDED BOOKS

1. Handbook of Designing and Installation of Services in Building Complex – High-rise Buildings by VK Jain, Publication. Khanna Publishers, New Delhi Khanna Publishers, New Delhi

4.4 WORKING DRAWING - I

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RATIONALE

Preparation of working drawings and detailing forms the most important activities of diploma holders in Architectural Assistantship. Students are expected to develop mastery of skills in preparing working drawings of different building components and their detailing.

Teachers while imparting instructions are expected to show various components of building under construction by organizing field visits or use models and other audio-visual media to clarify the concepts involved in preparing working drawings. Teachers are expected to lay considerable stress on proportioning, dimensioning, specification writing, lettering and composition of drawing work whilst supervising students. Teachers should also take into consideration environmental aspects while teaching preparation of working drawings.

DETAILED CONTENTS

1. Preparation of working drawings for a simple single storeyed residential building:

1.1 Site Plan

Preparing site plan on a suitable scale with complete dimensioning showing plot area, covered/built-up portion within the site, Approach road, side roads, adjoining buildings/features, boundary wall with gates layout of sewage pipes, water supply pipes, rain-water pipes. 1 sheet

1.2 Preparation of foundation layout plan, section details of foundations for brick external wall, brick internal wall, brick partition wall, brick toe wall, brick boundary wall and R.C.C Column.

2 sheet

1.3 Ground Floor Plan

Preparation of Ground Floor plan with dimensions and specifications of various building components, schedule of joinery i.e. doors, window ventilators etc. along with showing the layout of sewage pipes, water supply pipes, Rain water pipe.

1 sheet

1.4 Terrace Plan:

Preparation of terrace plan with the rain water disposal details and overhead water tank 1 sheet

1.5	Section:	
	Cross and longitudinal sections	1 sheet
1.6	Elevations:	
	Front and rear elevations	1 sheet
1.7	Details of:	
	-Toilet (Plan, Elevations and Sections as required)	2 sheet
	- Kitchen (Plan, Elevations of Sections as required)	2 sheet

Total No. of Sheets: 11

4.5 STRUCTURAL MECHANICS

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RATIONALE

This is a fundamental course. Which covers principles of Applied Mechanics and Strength of Materials. The course covers force systems, stress strain relationship, Centroid of Moment of Inertia, Shear force and Bending moment calculations/diagrams and bending strains in beams.

After going through this course the student shall be able to appreciate the behavior of different structure systems.

DETAILED CONTENTS

1. Force system and Equilibrium (10 hrs)

   1.1 Introduction: Mechanics, Applied Mechanics, Brandes of Mechanics.
   1.2 Force: Definition, cause. Effect, units, force as a vecter, graphical representation.
   1.3 Force Systems: Coplanar Concurrent, non Concurrent and parralled force systems. Non coplanar forces.
   1.4 Rigid body: Free body diagrams.
   1.5 Composition and Resolution of forces. Resultant force and its directions
   1.6 Triangle law of forces, parallelogram law of forces. Polygon law of forces and Lami's Theorem (derivation and numerical problems)
   1.7 Resultant of Coplanar Concurrent force system.
   1.8 Principle of moment, moment of force, varignon's theorem, concept and moment of a couple.
   1.9 Resultant of coplanar non concurrent paralledand non paralled forces.
   1.10 Conditions of equilibrium of Rigid bodies under coplanar forces.

2. Simple stresses and strain

   2.1 Introduction- concept of stress. (10 hrs)
   2.2 Concept of strain
   2.3 Volumetric strain
   2.4 Stresses and strains in bars
   2.5 Temperature stresses and Strains
   2.6 Stress-Strain Curve for mild steel, yield stress, working strain Factor of safety.

3. Centroid and Moment of Inertia (14 hrs)

3.1 Centre of Gravity, Centriod
3.2 Centroid by method of moments of areas for square, rectangular, triangular, L-shape, T-shape and I shape cross- sections.
3.2 Moments of Inertia Radius of Gyration.
3.3 Moment of Inertia of rectangular section.
3.4 Parallel axis theorem.
3.5 Moment of inertia of a Triangular section.
3.6 Perpendicular Axis Theorem.
3.7 Moment of Inertia of a Circular section.

4. Shear Force and Bending Moment (20 hrs)

4.1 Types of loads- Dead line snow, wind, seism ic and impact loads as per BIS: 875
4.2 Types of loading: Point load, Uniformly distributed load and uniformly varying load.
4.3 Types of Supports: Hinges, Roller and fixed supports types of reactions provided by each type of support.
4.4 Types of Beams: Simply supported, cantilever, overhanging and continuous beams (description only)
4.5 Concept of bending moment and shear force.
4.6 Bending moment and shear force diagrams for simply supported, cantilever and over hanging beams subjected to point loads and uniformly distributed loads only
4.7 Calculation of location and magnitude of Max Bending moment point of contra flexure

5. Bending stresses in Beams (10 hrs)

5.1 Introduction: Tension, compression
5.2 Theory of simple bending.
5.3 Position of Neutral Axis.
5.4 Section Modulus. Moment of Resistance. Application of flexure equation (M/I=f/y=E) (no derivation)
5.5 Maximum and permissible bending stresses.

RECOMMENDED BOOKS

1. Mechanics of Solids- DK Singh-Galgotia Publications Pvt. Ltd., New Delhi.

2. Fundamentals of Applied Mechanis- AS Sarao Victor Gambhir Gaurav Agrawal. By Satya Prakashan New Delhi.
3. Structural Mechanics-VS Prasad-Golgotia Publication Pvt. Ltd., New Delhi.
4. Engineering Mechanics and strength of Materials-Dr RK Bansal –Laxmi Publications Pvt. Ltd., New Delhi.
5. A text book of Engineering Mechanics- RK Rajput-Dhanpat Rai Publications Pvt. Ltd., New Delhi
6. Introduction to structural Mechanics- PS Smith-Macmillan Press Ltd., (UK).
7. Applied strength of Materials-Alfred Jensen and Harry Mcgraw- Hill Book Company London.

4.6 HISTORY OF ARCHITECTURE - III

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RATIONALE

The course on History of Architecture develops appreciation regarding past and current trends in the field of architecture. The knowledge of this course will help the students to understand how political, physical, social, economical and technological change affect the architecture, materials and construction techniques. The course covers broad topics like: Islamic Architecture in India, Industrial Revolution, Modern Architecture in Europe and America, Contemporary/post Independence Architecture in India.

The teacher should try to create interest among the students for this course by organizing site visits to the local old monuments. Audio-visual aids should also be used to explain various architectural developments. While imparting instructions, teacher should stress upon the context of form and space, construction methods structural systems and materials. The teacher should motivate the students to take general reference for form, drawings structural solutions and materials from the history, while designing their project.

DETAILED CONTENTS

1. Islamic Architecture in India (15 hrs)

   1.1 Introduction of Islam in India, new building types, structural system and ornamentation (Qutab Complex)

   1.2 Development of India-Islamic architectural style sultanate (Lodhi's & Tughlq).- General visual vocabulary and construction methods/materials (e.g. Lodhi Tomb & Tomb of Ghiya-ud-din Tughlag.)

   1.3 Provincial Styles- Jaunpur and Bijapur

   1.4 Mughal Architecture-General architectural characteristics to understand visual vocabulary & construction methods. (Humayun Tomb, Fatehpur Sikri, Red Fort, Taj Mahal at Agra and Jama Masjid at Delhi).

2. Industrial revolution. (6 hrs)

   2.1 Industrial revolution and its impact on architecture.

   2.2 Influence of new construction materials and functional needs on building types and architectural form.

   2.3 Advancements in steel construction.

3. Modern Architecture in Europe and America. (15 hrs.)

3.1 Emergence of modern architecture in Europe. Social, technological and aesthetic concerns of modern movement. New building materials and architectural expression.

3.8 Role of Louis Sullivan, Walter Gropous, Frank Lloyd Wright, Mies Van De Rohe, Le corbusier.

4. Contemporary/post Independence Architecture in India (12 hrs.)

Work of Le Corbusier in India, Louis Kahn, Charles Corres, B.V.Doshi, Joseph Allen Stein and Raj Rewal.
(Minimum two buildings of each architect to be studied)

4.7 COMPUTER APPLICATIONS IN ARCHITECTURE - I

L	T	P
-	-	4

RATIONALE

In the present times an architectural assistant should be capable of drafting drawings on the computer as most of the architects lay greater stress on computerized drawings for their ease of drafting, editing, managing and presentation. At the end of the course the students should be able to make 2-D architectural drawings for presentation and construction purposes. The student should get familiar with the latest AutoCAD software

DETAILED CONTENTS

Note: Relevant theory may be taught along with practical exercises in each topic.

1. Introduction to 2-D CAD (8 hrs)

- Input devices
- Graphics
- Starting AutoCAD
- Inside the drawing editor
- Commands in the menus (Tool bars)
- Accessing Commands
- Entity selection
- Entering coordinates
- Folders for organizing drawings and files

Exercise: Creating folders and sub folders

2. Creating and Saving a new Drawing (4 hrs)

- Commands and options to create new drawings
- Units
- Limits
- Snap
- Grid
- Ortho
- Layer
- Application of layers
- Open a new, existing drawing
- Save, save as, quit, close, exit

Exercise: Setting up a new drawing with units, limits etc

3. Drawing Commands (16 hrs)

- Line
- Poly line/Double line.
- Arc
- Ellipse
- Polygon
- Rectangle
- SP line
- Circle
- Sketch.
- Hatch
- Donuts

Exercise: Making a composition of different geometrical shapes using various drawing commands

4. Viewing an Existing Drawing (8 hrs)

- Zoom
- Pan
- Redraw and Regen all
- Regen Auto
- View

Exercise: Viewing, zooming of existing drawing made in section 3.

5. Modifying an Existing Drawing (16 hrs)

- Undo Redo/Oops
- Trim
- .Move
- Offset
- Rotate
- Array
- Stretch
- Divide
- Champher
- Erase
- Break
- Copy, multiple copy
- Mirror (Mirror test)
- .Change (change properties)
- Extend
- Explode
- Blip mode

- Scale
- Fillet

Exercise: a) Modifying composition made in section 3
b) Making plan, elevation and section of simple building

6 Making and Inserting Blocks (12 hrs)

- Blocks
- Insert block
- Base
- Using library for blocks
- W-block
- X-ref
- Explode

Exercise Inserting furniture, fixtures, trees etc. in the plans, sections and elevations made in section 5.