

4.1 CLIMATOLOGY

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RATIONALE

Understanding of the basic principles of climatology and environment are very important for diploma holders in Architectural Assistantship. The knowledge of this subject will be very useful in the design of buildings.

DETAILED CONTENTS

1. General Introduction (06 hrs)
 - Introduction to Climatology
 - Movement of earth around sun.
 - Different elements of climate like: Wind, temperature, humidity, precipitation and pressure.
 - Different climatic zones
 - Orientation of building with respect to above mentioned elements of climate
 - Effect of climate on man and shelter.
2. Relation of Climate and comfort (04 hrs)
 - Macro-micro climatic effects
 - Concept of comfort zone and bio-climatic chart
 - Climatic evaluation by season
3. Sun Control and shading devices (without calculations) (08 hrs)
 - Solar Chart (sun path diagram)
 - Orientation for sun
 - Internal and external sun protection devices
 - Natural lighting
 - Introduction and objectives of Solar Passive Design
 - Passive solar heating and cooling

4. Wind control (02 hrs)
 - Orientation with respect to wind
 - Wind protection devices
5. Use of building materials with respect to climate (02 hrs)
 - Concrete
 - Brick
 - Glass
 - Plastics
 - Stone
 - Insulating material
6. Criteria for site selection (02 hrs)
7. Environment and Ecology (08 hrs)
 - Basic elements of ecology
 - Concepts of natural cycles in Eco-system
 - Source of noise and air pollution, their effects and controls
 - Use of landscape elements for micro and macro climate control
 - Introduction to climate change, principle causes and effects- methods of mitigating climate change.

STUDY REPORT AS AN ASSIGNMENT

A study report on the effect of climate and environment on ancient and modern buildings should be prepared by the students. The study should emphasize on orientation of court-yards, windows, jallies, chajjas, landscape and various other sun and wind control devices.

INSTRUCTIONAL STRATEGY

Audio-video should be used for explaining various component of climatology and environment. Teachers are expected to impart instructions of the above course keeping in view the effect of above course in the design of buildings. The course contents should be taught with reference to tropical climates.

RECOMMENDED BOOKS

1. Environmental Engineering and Management by Santosh Sarkar
2. Tropical Architecture by Wolfgang Lauber; Publisher: Prestel Publishing, ISBN: 3791331353, ISBN-13:
3. Tropical Architecture by C.P. Kukreja; Publisher: McGraw-Hill, New Delhi
4. Ecology: The Link Between The Natural And The Social Sciences by EP Odem; Oxford and IBH Publishing Co. New. Delhi.
5. Design With Climate by Arvind Krishan, Publisher, Tata McGraw-Hill, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	6	20
2	4	15
3	8	20
4	2	10
5	2	5
6	2	10
7	8	20
Total	32	100

4.2 BUILDING CONSTRUCTION – II

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RATIONALE

Students of Architectural Assistantship at diploma level are supposed to prepare structural drawings, working drawings and detailed drawings to various components of buildings. Also students are expected to design small residential buildings, for this purpose, it is essential that students are taught various components of building construction comprising foundations, super structure, openings, roofs, staircases, floorings and finishing and other allied building components.

Therefore, the subject of building construction is very important for students undergoing diploma course in Architectural Assistantship.

Teachers while imparting instructions are expected to show various components to buildings under construction. Make use of models or other audio-visual media to clarify the concepts. While preparing drawings, teachers should lay considerable stress on proper toning. Dimensioning, specification writing and printing and composition of drawing work. Students should be asked to maintain a sketch book for recording the observations from site visit. While conducting viva, teachers should ask specific questions on various topics.

DETAILED CONTENTS

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Roof and roof coverings <ul style="list-style-type: none"> ➤ Pitched roof and terms related to roof ➤ Types of timber roofs ➤ Lean to roof ➤ Double collar roof ➤ King post and queen post trusses | <ol style="list-style-type: none"> 1. Drawing details of fixing and layout of AC, GI sheets, slates, tiles and locally available materials. 2. Drawing of king post and queen post trusses along with their constructional details |
| <ol style="list-style-type: none"> 2. Staircases and ramps <ul style="list-style-type: none"> ➤ Definition and types of staircases as per nomenclature ➤ Staircases of different materials ➤ Relation between different components ➤ Definitions, purpose, slopes, types of ramps and moving walks | <ol style="list-style-type: none"> 3. Drawing a dog leg wooden staircase 4. Steel spiral staircase 5. RCC staircase cast-in-situ and also precast |
| <ol style="list-style-type: none"> 3. Interiors of Buildings <ul style="list-style-type: none"> ➤ False ceiling and partitions ➤ Different counters as per usage | <ol style="list-style-type: none"> 6. Drawing of false ceiling details 7. Drawing of counter |
| <ol style="list-style-type: none"> 4. Expansion joints | <ol style="list-style-type: none"> 8. Expansion joint in walls and |

- Viva-voce based upon theory syllabus
 - Preparation of drawing file
5. Form work and steel work
- Definitions of form work, shuttering and centring
 - Form work for different structural members
 - Bending of bars, formation of hooks and cranks

Total Number of Drawings: 8

INSTRUCTIONAL STRATEGY

This subject is of practical in nature. While imparting instruction for preparation of various drawings of different types of buildings and their components, the teacher should organize demonstration and field/site visits to show various stages, sizes and scales of operations involved in building construction. The teacher should involve the theoretical aspects of the instructions to the students before drawings are attempted by the students. Students may prepare the port-folio of the work done by them throughout the session. Teacher may also organize viva-voce after each drawing assignment so as to test the level of understanding of the students about unlying concepts, principles, and procedures.

RECOMMENDED BOOKS

1. Building Construction by WB Mackay; Khanna Publisher, New Delhi
2. Building Construction by SP Bindra and SP Arora; ; publisher Dhanpat Rai & Co. New Delhi
3. Building Construction by BC Punmia; Publisher Laxmi Publication, New Delhi
4. Building Construction by Sushil Kumar; Standard Publisher, New Delhi
5. Construction of Buildings (Vol I and II) by Barry
6. Building Construction by VB Sikka; Publisher Tata McGraw Hill Publisher, New Delhi
7. Building Construction by Rangwala; Publisher Charotar Publishing House Pvt. Ltd., New Delhi

4.3 COMPUTER APPLICATIONS IN ARCHITECTURE - I

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RATIONALE

In the present times an architectural assistant should be capable of drafting drawings on the computer. Due to increasing need for computerized drawings by most architects 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 versions.

DETAILED CONTENTS

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

1. Introduction to AutoCAD (02 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 (02 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
- Customization of tool bars

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

3. Drawing Commands (12 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 (04 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.

7. Dimensioning and Text (08 hrs)

- Dimension type, style, units
- Dimension utilities
- Dimension variables
- Dimensioning of different elements like (Horizontal, vertical, inclined). Arc. Circle Radius, diameter), continuous dimensioning etc.
- Editing dimension text and updating (adding new text and editing existing text)
- Text style – font types, height, width factor etc.

Exercise: Dimensioning and editing text in composition made in Sections 5 and 6.

8. Plotting Drawings (08 hrs)

- Plot command
- Selecting area for plotting
- Scale of plot, scale to fit
- Selecting plotting device
- Selecting paper size and type
- Selecting black and white or colored plots
- Selecting appropriate print speed, quality
- Print preview
- Working in Paper space and plotting

INSTRUCTIONAL STRATEGY

This is a highly practical oriented subject. Efforts should be made by the teachers to procure relevant softwares and give practical exercises to individual students, so that they develop proficiency in operating computer softwares as applied to the profession of architecture. The theoretical instructions should be dovetailed with practical work. Towards the end of the session each student should be given independent computer based project assignment. Experts from practicing architectural field may be invited to deliver talks and for presentation of live case studies on computers to motivate the students and increase their level of awareness. Special efforts should be made by the teachers to develop well defined small tutorial exercises on each topic and supervise the exercises being performed by the student throughout the session. If need be some basic operational fundamental exercises may be repeated in the beginning of the session. Special emphasis may be laid on training the students through availing help from the user friendly architectural softwares so that they develop confidence and are able to work independently.

Note :- The Board will set the Question Paper for exercises for external examination

4.4 REINFORCED CONCRETE DESIGN

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RATIONALE

Student of Architectural apprenticeship diploma are expected to understand the behaviour of structures under load. They should understand the theory and design of simple RCC structures and should be able to sketch the RCC details of reinforcement.

DETAILED CONTENTS

1. Introduction (2 hrs)
 - 1.1 Concept of Reinforced Cement Concrete (RCC)
 - 1.2 Reinforcement Materials:
 - Suitability of steel as reinforcing material
 - Properties of mild steel and HYSD steel
 - 1.3 Loading on structures as per IS: 875
2. Introduction to following methods of RCC design (2 hrs)
 - 2.1 Working stress method
 - 2.2 Limit state method
3. Shear and Development Length (4 hrs)
 - 3.1 Shear as per IS:456-2000 by working stress method
 - i) Shear strength of concrete without shear reinforcement
 - ii) Maximum shear stress
 - iii) Shear reinforcement
4. Singly Reinforced Beam (Working stress method) (8 hrs)
 - 4.1 Basic assumptions and stress strain curve, neutral axis, balanced, under-reinforcement and over reinforced beams, Moment of resistance for singly reinforced beam.
 - 4.2 Design of singly reinforced beam including sketches showing reinforcement details.
5. Concept of Limit State Method (8 hrs)
 - 5.1 Definitions and assumptions made in limit state of collapse (flexure)
 - 5.2 Partial factor of safety for materials
 - 5.3 Partial factor of safety for loads
 - 5.4 Design loads
 - 5.5 Stress block, parameters

6. Singly Reinforced beam (10 hrs)
Theory and Design of singly reinforced beam by Limit State Method
7. Doubly Reinforced Beams (9 hrs)
Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method
8. Behaviour of T beam, inverted T beam, isolated T beam and 'L' beams (No Numericals) (4 hrs)
9. One Way Slab (10 hrs)
Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..
10. Two Way Slab (10 hrs)
Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketches showing reinforcement details (plan and two sections)
11. Axially Loaded Column (10 hrs)
 - 11.1 Definition and classification of columns
 - 11.2. Effective length of column,
 - 11.3. Specifications for longitudinal and lateral reinforcement
 - 11.4. Design of axially loaded square, rectangular and circular (with lateral ties only) short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)
12. Prestressed Concrete (3 hrs)
 - 12.1. Concept of pre-stressed concrete
 - 12.2. Methods of pre-stressing : pre-tensioning and post tensioning
 - 12.3. Advantages and disadvantages of prestressing
 - 12.4. Losses in pre-stress

Important Note:

Use of BIS:456-2000 is permitted in the examination.

INSTRUCTIONAL STRATEGY

Teachers are expected to give simple problems for designing various RCC structural members. For creating comprehension of the subject, teachers may prepare tutorial sheets, which may be given to the students for solving. It would be advantageous if students are taken at construction site to show form work for RCC as well as placement of reinforcement in various structural members. Commentary on BIS:456 may be referred along with code for relevant clauses.

RECOMMENDED BOOKS

1. Ramamurtham, S; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi
2. Singh Harbhajan "Design of Reinforced Concrete Structures for Architects" Abhishek Publishers, Chandigarh
3. Singh Harbhajan "Limit State Designs for Architects" Abhishek Publishers, Chandigarh
4. Gambhir, M.L., "Reinforced Concrete Design", Macmillan India Limited
5. Singh, Birinder "RCC Design and Drawing", Kaption Publishing House, New Delhi
6. Mallick, SK; and Gupta, AP; "Reinforced Concrete", Oxford and IBH Publishing Co, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	2	3
2	2	3
3	4	5
4	8	10
5	8	10
6	10	12
7	9	12
8	4	5
9	10	12
10	10	12
11	10	12
12	3	4
Total	80	100

4.5 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. (01 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. (02 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. (01 sheet)
 - 1.4 Terrace Plan:

Preparation of terrace plan with the rain water disposal details and overhead water tank (01 sheet)
 - 1.5 Section:

Cross and longitudinal sections (01 sheet)

1.6 Elevations:

Front and rear elevations (01 sheet)

1.7 Details of:

-Toilet (Plan, Elevations and Sections as required) (02 sheets)

- Kitchen (Plan, Elevations of Sections as required) (02 sheets)

Total No. of Sheets: 11

INSTRUCTIONAL STRATEGY

This subject forms the basis for making the students ready to work in the field and is highly practical oriented. Teachers, while imparting instructions in the class room, should lay emphasis on proportioning, dimensioning, specification writing, lettering and composition of the drawing work of the students. Field visits may be arranged to the construction sites of residential, commercial and public buildings to demonstrate various components/stages of buildings under construction. Students should be exposed to: the system of preservation and maintenance of working drawings at the site during the field visits. Teachers may procure some working drawings of existing/live buildings and present the same to the students. The students should be encouraged to maintain portfolio of the work done by them throughout the session and give seminar. Teachers may conduct viva voce on completion of each assignment. Experts from the design organizations may be invited to present case studies, to motivate the students. Repetitive exercises should be given to the students, till they develop confidence and attain proficiency. Relevant BIS codes and conventions may be referred/followed, while imparting instructions. Teachers may introduce the topics by giving simple set of instructions before giving any assignment to the students

RECOMMENDED BOOKS

1. Construction Details by OK Ching, Standard Publishers, New Delhi
2. Building Drawing by MG Shah, CM Kale, SY Patki; Tata McGraw Hill Publisher, New Delhi

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 (18 hrs)
 - 1.1 Introduction of Islam in India, new building types, structural system and ornamentation (Qutab Complex)
 - 1.2 Development of Indo-Islamic architectural style, the sultanate period of Lodhi's & Tughlaqs.- General architectural vocabulary and construction methods/materials of Lodhi Tomb & Tomb of Ghiya-ud-din Tughlag.
 - 1.3 Provincial Styles- Jaunpur and Bijapur (Jama Masjid and Gol Gumbaz)
 - 1.4 Mughal Architecture-General architectural characteristics to understand architectural vocabulary & construction methods in (Humayun Tomb, Fatehpur Sikri, Red Fort, Taj Mahal at Agra and Jama Masjid at Delhi).
2. Industrial revolution. (08 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, bridges, exhibition halls.

3. Modern Architecture in Europe and America. (22 hrs)
- 3.1 Emergence of modern architecture in Europe. Social, technological and aesthetic concerns of modern movement. New building materials (concrete, steel and glass) and their architectural expression.
- 3.2 Philosophy and key works of Louis Sullivan, Walter Gropius, Frank Lloyd Wright, Mies Van De Rohe, Le Corbusier.
4. Contemporary/post Independence Architecture in India (16 hrs)
- Work of Le Corbusier in India, Louis Kahn, Charles Correa, B.V. Doshi, Joseph Allen Stein and Raj Rewal.

(Minimum two buildings of each architect to be studied)

INSTRUCTIONAL STRATEGY

The subject may be taught through audiovisual aids, slides, PowerPoint presentations so as to explain salient architectural features and techniques. Emphasis must be laid on freehand drawing and each student should maintain a sketchbook.

RECOMMENDED BOOKS

1. Urban Pattern: Arthur B. Gallion. *Publisher*, Van Nostrand Reinhold, 1993, New York
2. History Builds the Town – Arthur Kohn. Khanna Book Publishing Co. (P) Ltd., New Delhi.
3. World Architecture : An Illustrated History From Earliest Times by Trewin Copplestone, *Publisher*, Crescent Books, New York
4. Architecture of Towns and Cities – Paul D. Spreinegen, publishing by Rainbow Book Co. New Delhi
5. Space, Time and Architecture – Sigfried B. Giedeon *Publisher*, Harvard University Press, UK
6. The New Landscape – Charles Correa *Publisher*: Bombay : Book Society of India, Bombay
7. Charles Correa – William Curtis, *Publisher*: Mapin Publishing, UK

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	18	28
2	08	12
3	22	34
4	16	26
Total	64	100

4.7 ARCHITECTURAL DESIGN - III

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RATIONALE

To develop an understanding of the inter-relationship of the various components of a small public building upto 2 storey.

DETAILED CONTENTS

Three exercises on architectural design spanning to 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 storeys.

- Note:
1. The emphasis must be on site visits and case studies
 2. The final submission should be in the form of rendered drawings to explain the scheme and block/ detailed model must be included for each project.
 3. Each Design project must include the following drawings: Site plan, Detailed floor plans showing furniture layout, Sections, Elevations, Freehand 3-D views, Perspectives.

INSTRUCTIONAL STRATEGY

This is one of the most important practical oriented subject for diploma in architectural assistantship. While imparting instruction, special visits may be arranged to demonstrate and explain important architectural features of different types of residential, commercial and public buildings. Practicing architects may be invited from time to time to present case studies and to deliver expert lectures on important elements like form, function, balance, light of shadow, shape, plane, volume, line, rythem, proportions, textures and other such element appropriate to various designs. Teacher may present some of the already completed design works of practicing architects to the students and explain the important features and elements. Audio-visual material available in this field may be procured and presented to the students from time to time. Students should be encouraged to visit relevant web-sites and teachers should develop the design problems/assignments which can be taken up by the students using relevant and appropriate software. Students should be given group and independent design/drawing assignments and they should also maintain sketch book/portfolio of all the assignments given to them throughout the session. Teachers may conduct viva-voce on completion of each assignment. Students may present seminars towards the end of the session.

RECOMMENDED BOOKS

1. Time Saver Standards for Building Types by Joseph De Chiara and John Callendera
2. Architects Data by Neufert; Publisher Blackwell Publishing Ltd. 9600 Garsington Road, Oxford, OX4 2DQ, UK
3. Space, Time and Order by DK Ching; Publisher: John Wiley & Sons, New Delhi
4. Architectural Aesthetics by Sangeet Sharma, Abhishek Publication, Chandigarh

ENTREPRENEURIAL AWARENESS CAMP

This is to be organized at a stretch for two to three days during fourth semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject

1. Who is an entrepreneur?
2. Need for entrepreneurship, entrepreneurial career and wage employment
3. Scenario of development of small scale industries in India
4. Entrepreneurial history in India, Indian values and entrepreneurship
5. Assistance from District Industries Centres, Commercial Banks. State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other financial and development corporations
6. Considerations for product selection
7. Opportunities for business, service and industrial ventures
8. Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)
9. Legal aspects of small business
10. Managerial aspects of small business