

## Fourth Semester B.Arch.

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4S-A-1

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### Architectural Design IV

This semester shall explore community, tradition, theoretical constructs, building systems and its implications on architectural design.

#### Objectives:

- Exploring the relationship between various building systems and design.
  - Studying and understanding integration of building systems with architectural concepts and form.
  - Understanding of a community setup, its people, and their spatial requirements.
  - Exploring various theories and design process development in architectural design.
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**Sessional Work:** Built and un-built spaces for multiple activities for a large group of people/community.

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### Allied Design Studio IV

The course content will be developed by the individual colleges as per their choice of allied design scheme.

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### Building Construction and Materials IV

**Objectives:** To impart knowledge on various types of floors and flooring material, partitions and paneling, various surface finishes. To equip students with advances in building construction methods and its applications.

**Unit I:** Introduction to Building Materials : -

Roof and Floor Tiles, Plaster, Finishes & all Plastic w.r.t composition, general know-how about their physical, chemical and structural properties, their utility and selection criteria

**Unit II:** Windows in Steel and Aluminum. Steel doors; design criteria and principles. Standard Terminologies and types.

Special doors such as Sliding, Sliding and Folding, Revolving Doors, Rolling Shutter, Collapsible Gates - Design Criteria and principles. Standard Terminologies.

**Unit III:** Paneled and Glazed Partitions out of Timber and Aluminum - Types, design principles and considerations, Standard Terminologies. Design details and drawing work, fixing details to surrounding elements / components.

**Unit IV:** Timber Roofs - Timber Trusses, Standard Terminologies, Types - Design Criteria, principles, construction details. Design details and drawing work of King Post and Queen Post Truss. General and Conceptual drawing work of other types of timber roofs.

Steel Roof - Trusses. types, design principles and considerations, Standard Terminology - Design details and drawing work of M.S. angle and Tubular Trusses.

North Light Truss system. Conceptual and drawing work of types of Steel Trusses.

General study of M.S. Frame and its various joints.

**Unit V:** Expansion Joints; types, design considerations, location consideration, principles and types.

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**References:**

- Barry, R. (1999). The Construction of Buildings Vol.II. 5th Ed. New Delhi: East-West Press.
- Bindra, S. P. and Arora, S. P. (2000). Building Construction: Planning Techniques and Methods of Construction, 19th Ed. New Delhi: Dhanpat Rai Pub.
- McKay, W. B. (2005). Building Construction Metric Vol.1–IV, 4th Ed. Mumbai : Orient Longman.
- Rangwala, S. (2004). Building Construction. 22nd Ed. Anand: Charotar Pub. House.
- Rangwala, S. C. (1963). Building Construction: Materials and types of Construction, 3rd Ed. New York: John Wiley and Sons.

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## **Surveying and Documentation**

**Objectives:** To enable the students to get conversant with locating the object positions in horizontal and vertical plane with desired accuracy as needed for architecture professionals.

To help the students understand the technique of graphical documentation of a built structure /environment through measured drawings

### **Surveying**

**Unit I:** Introduction to surveying and leveling, types of surveying methods and application, Introduction to Chain Survey.

**Unit II:** Plane table survey, method and instruments used.

**Unit III:** Leveling, methods of leveling -dumpy level and its uses.

**Unit IV:** Contours, use of theodolite, contour survey.

**Unit V:** Planimeter and its use.

**Unit VI:**Total Station Survey

Practical:

- a) Total Station Survey.
- b) Plane table survey of cluster of buildings.
- c) Leveling using dumpy level and water table.
- d) Setting out site layout.
- e) Contour survey, plotting contour maps.

### **Documentation**

**Unit VII:** Measured Drawing: Measurement techniques of Heritage Structures and preparing measured drawing to suitable scale.

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**Sessional works:** Practical record book, Sketches, notes and plates.

### **References**

- Arror, K.R. (2004). Surveying Vol. 1-3. Delhi : Standard Book House.
  - Chandra, A. M. (2002). Plane Surveying. New Delhi : New Age International.
  - Ching Francis D.K.: Architectural Graphics.
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## **Structural Design & Systems IV**

**Objectives:** To foster the understanding of basic principle of limit state design in RCC structural systems.

To develop the understanding of characteristics of soil on structural behavior.

### **Unit I: Overview of the Structural System in Architecture.**

Study of different types of soils their characteristics, bearing capacities, Settlement of foundation. Study of structural elements like beams, columns & footings.  
Theory of Determinate and indeterminate structures – degree of indeterminacy.

### **Unit II: Deflection of beams**

Simply supported and cantilever beams by using Macaulay's method.

### **Unit III: Concept of fixity**

Independent fixed beams with different loadings - BM and SF diagrams.  
(By using First Principle method).

### **Unit IV: Method of Moment distribution ( BM diagrams only)**

- a) For continuous beams (Up to three spans only, without settlement)

b) For Single portal frames (Without sway moments)

### **Unit V: Basic Principle of RCC**

- a) Different Limit states, partial safety factors, permissible stresses Introduction to RCC design, characteristics of RCC, assumptions, Neutral axis; balanced, under & over reinforced sections
- b) Design of singly reinforced beams , doubly reinforced beams & Moment of resistance of T beam

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**Sessional work:** Sketches/ Notes/ Tutorials & Presentations

**Desirable:** Site visits to develop better understanding.  
To prepare relevant study models.  
Laboratory exposure wherever possible.

### **References :**

- Punmia B.C.(2005) Soil Mechanics and Foundations Laxmi Publications, Hyderabad.
- Khurmi, R.S.(2010). Theory Of Structures SI Units. New Delhi: S. Chand And Co Ltd.
- Ramamrutham , S. : Narayanan, R.(2018). Theory of Structure. New Delhi: Dhanpat Rai Publications Ltd
- Dr. V. L Shah & Dr. S. R. Karve. ( 2014) Limit State Theory & Design of Reinforced concrete, Structures publications Pune.
- Punmia, B.C. (2015). R C C Designs. Delhi: Laxmi Publications.

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## **History of Architecture III**

**Objectives:** To provide an understanding of the implications of the Mughal and Colonial rules in India and its Architecture.

**Unit I: Mughal architecture in India,** Forts and Cities during Mughal dynasty.

**Unit II: Architectural contribution of Akbar, and Shahjahan.**

**Unit III: Provincial Architecture in India:** Bengal, Malva, Mandu, Bijapur, Punjab, Kashmir, Gujarat.

**Unit IV: Colonial and Post Independence Indian Architecture:** Colonial architecture of Goa, Pondicherry and Bengal. Lutyens Delhi. City planning of Chandigarh.

**Unit V:** Indian Master Architects, their philosophies and works.

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**Exercises:**

1. Understanding 2. Analysis, 3. Interpretation, 4. Synthesis, and 5. Transform of historical structures, in the form of small exercise and assignments.

The course should culminate in a term paper, documentation or design interpretation and transformation.

### References

- Mehrotra, R. (2011). Architecture in India Since 1990. Pictor.
- Benevolo, L. (1977). History of Modern Architecture. 2 Vols., reprint, MIT Press.
- Jenks, C. (2007). The Story of Post-Modernism. London: Wiley and Sons.
- Grover, S. (2002). Islamic Architecture in India. New Delhi: CBS Publications.

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## Building Services I

**Objectives:** Aim of this subject is make the students aware of the importance, installation and working of essential services in buildings and a way building services help in generating a cleaner and healthier built environment. The students shall also be made familiar with I.S. codes related to services. This part of the building services deals with various systems and components of water supply and its drainage. This also focuses upon the Architectural design consideration regarding space allocation and design of building elements to anchor the services so as to achieve balance of functional efficiency and building aesthetics.

**Unit I:** General idea of sources of water supply, qualitative & quantitative aspects, impurities, hard & soft water, standards for quality of water. Study of standards regarding water demand and consumption in different types of buildings.

**Unit II:** Layouts of water supply systems and their types, Connection from municipal supply to a building, design-construction of suction & storage tanks for a single tenement residence or bungalow by computing demands for domestic use. Study of Down take supply, water supply pipes, and their sizes, jointing, fixing and laying. Various valves, fittings and fixtures like taps, showers etc. Domestic water heaters and hot water supply system. Design of various spaces and building elements to anchor the services such as shafts, ducts etc.

**Unit III:** Principles of sanitation, water carriage systems, collection of waste matter in buildings. Study of Various sanitary fittings and fixtures like water closets, urinals, wash hand basins, sinks, flushing cisterns, shower trays, bath tubs, bidets, drinking water fountains etc with respect to building types and users. Design of various building elements to anchor the services such as walls, Floor and their features etc.

**Unit IV:** Various traps and their function, sewage collection and disposal system for a single tenement residence or bungalow. Various types of sanitary pipes and their jointing, fixing and laying, manholes, inspection chambers, intercepting chambers. Design of various spaces and building elements to anchor the services such as shafts, ducts, immediate surroundings of building etc.

**Unit V:** Self cleansing velocity, invert levels, drains on sloping sites, sewage disposal system in un-sewered localities- Complete study of septic tank - introduction, design principle, criteria, its working, utility and benefits. Its various types with respect to materials, capacity, design and construction. A Brief study of cesspools, aqua-privy, Soak Pit, leeching pits for individual building.

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### References

- Birdie, B. S. (1996). Water supply and Sanitary Engineering. Dhanpat Rai and Sons.
  - Punmia, B. C., Jain, A. K. and Jain, A. K. (1995). Water Supply Engineering. New Delhi : Laxmi Publications.
  - Punmia, B. C., Jain, A. K. and Jain, A.K. (1998). Waste Water Engineering. New Delhi : Laxmi Publications.
  - Rangwala, S. C. (2005). Water Supply and Sanitary Engineering. Charoter Publishing.
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## Climate and Architecture

**Objectives:** This part of subject provides scope to apply the knowledge of basic climatology gained in earlier semester, for design in different climatic conditions with emphasis on tropical climate.

**Unit I:** Study of effect of orientation, topography, vegetation, form, building materials and surfaces in the building design in response to the climate.

**Unit II:** Classification of tropical climate, its characteristics, shelters in six climatic regions in India.

**Unit III:** Study of passive techniques for heating and cooling, techniques of solar radiation control and heat transfer and insulation.

**Unit IV:** Environmental issues in urban areas, Urban climate change, concept of urban heat island, climatic elements and urban microclimate, site climate in urban areas.

**Unit V:** Climate responsive design approach, process and design detailing.

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**Sessional Work:** Case studies, creative exercises with climatic considerations Use of simulation software.

### References:

- Climate responsive architecture, *Arvind Krishnam*
- Manual of tropical housing and building, *O H Koenigsberegger & Ingersol.*
- Urban Microclimate, Evyatar Erell,
- Design with climate, Víctor Olgyay, Aladar Olgyay.
- John R. Mather -Climatology: Fundamentals and Application.

- Climatologically & Solar data for India – T. N. Seshadry.
- Tropical Architecture – Maxwell Fry & Jane Drew.

## **Elective IV**

### **Regional Architecture/ Furniture Design/ Design of Building Elements/ Building Bye Laws and DCR/ Theory of Design/ Institutional Project 4**

Note: Following are the suggestive contents; institutes have freedom to formulate the content as per their school of thought

#### **Regional Architecture**

**Key Words:** Region, architectural style, context, customs

**Objectives:**

- Developing understanding of context, regional techniques.
- To develop students cultural and custom understanding for particular region.

**Sub Topics:**

1. Regionalism in architecture
2. context and customs of making buildings in different regions of world.
3. Analyzing the Regional character.

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**Sessional Work:** Assignments, Site visit

**References:**

- “Design with Climate” bioclimatic Approach to Architectural Regionalism by Victor Olgay.
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#### **Furniture Design**

**Key Words :**Creation, Evolution of object, Human scale, Ergonomics and Anthropometrics.

**Objectives:**

- To develop the skills by giving opportunity to work with the material and process technology.
- To develop Critical and analytical ability.

**Sub Topics:**

1. Introduction to furniture design.
2. Aspects of furniture design.

3. Structures and system to human scale.
  4. Intricate user centric design.
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**Sessional Work:**

Workshops ,Assignments

**References :**

- Baiche Bousmaha & Walliam Nicholas, Neufert Architect's Data. Blackwell science Ltd.
  - Chiara De Joseph & crosbie. J. Michael. 1990. Time saver standards for building types. McGraw Hill company.
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**Design of Building Elements**

**Key Words :**Building elements , meanings

**Objectives:** To develop an understanding of design elements and principles relative to their use in the architectural design process

**Sub Topics:**

1. Architectural Design Elements.
  2. The Concept of Space.
  3. Architectural Design Principles.
  4. Additional Design Considerations.
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**Sessional Work:** Assignments, Model making, Visits

**References :**

- Design Through Discovery, The Nature Of Design,
  - The City Shaped: Urban Patterns and Meanings through History,
  - Vitruvius – Ten Books on Architecture
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**Building Bye Laws and DCR**

**Key Words:** Regulations , rules , mandatory

**Objectives:** To develop understanding of rules and regulations .

**Sub Topics:**

1. Introduction to building bye.
  2. Rules and Regulation.
  3. Zoning rules and regulations.
  4. DCR.
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**Sessional Work:** Assignments, Site visits



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## **Theory of Design**

**Key Words:** Architectural expressions, Social Discipline, Ideology, impact of Isms, revolution, Evolution, Variability of perception.

### **Objectives:**

- To develop understanding of Design principles, Development of design vocabulary, generation of creativity, System integration.
- To give understanding of design as a broader field and the changing role of designer in society.
- To give exposure to methodologies, theories and models of the design process.
- To give deeper understanding of the process of creativity as well as to introduce techniques which will enable creative thinking.
- To help understand creativity with respect to the discipline of architecture.
- To introduce participatory approach to design.

### **Sub Topics :**

1. The genesis of Indigenous Architecture.
  2. Architecture as a socially useful discipline.
  3. Design Methodology.
  4. Design evaluation and criticism.
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### **Sessional Work:**

Assignment

### **References:**

- Francis D. K. Ching, Architecture - Form, Space and Order, Van Nostrand Reinhold Company ,1979
  - Roger H. Clark, Michael Pause, Precedents In Architecture, Van Nostrand Reinhold Company , 1996
  - 1. K.W.Smithies, Principles of Design in Architecture, Van Nostrand Reinhold Company , 1981
  - 4. Sam F. Miller, Design Process - A Primer For Architectural & Interior Design, Van Nostrand Reinhold Company , 1995
  - Ernest Burden, Elements of Architectural Design – A Visual Resource, Van Nostrand Reinhold 3 company, 1994
  - V.S.Pramar, Design Fundamentals in Architecture, Somaiya Publications, New Delhi, 1973.
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## **Institutional Project 4**

Institutional project aims at encouraging institutions to explore different areas.

Institution would have freedom to explore into multidisciplinary activities which would explore into other creative discipline and multidisciplinary activities.

This would help student of architecture to have insight into different spectrums of people, place, culture, society, technology etc.

Institution has entire freedom to detail out the assignments to be conducted under this elective.