

SCHOOL OF ARCHITECTURE
GITAM UNIVERSITY
VISAKHAPATNAM

IIIrd SEMESTER

Sl. No.	Subject Code	Subject Name	S/L/Th/P (Hrs)		Credits	Marks			End Exam Duration
						I	E	T	Hours
1	AURAR 301	Climatology in Architecture	Th	3	3	50	50	100	3
2	AURAR 302	History of Western Architecture	Th	3	3	50	50	100	3
3	AURAR 303	Building Materials-III	Th	3	3	50	50	100	3
4	AURCE 304	Theory of Structures - I	Th	3	3	50	50	100	3
5	AURAR 305	Architectural Design-I*	S	9	6	200	200	400	10**
6	AURAR 306	Building Construction-III	S	6	4	50	50	100	5
7	AURAR 311	Computer Aided Design-I	P	3	3	100	-	100	-
8	AURAR 312	Climatology Lab	P	3	3	100	-	100	-
Total				33	28	650	450	1100	

NOTE:

*AURAR 305 Architectural Design-I, 40% of internal marks are evaluated by Viva Voce with one external member.

** Examination will be conducted TWO days each of 5 Hrs. duration; the first day work of the student shall be retained in the examination hall under the invigilator seal.

IIIrd SEMESTER

AURAR 301 CLIMATOLOGY IN ARCHITECTURE

Credits: 3

UNIT 1

Climate and Thermal Comfort

- Global climatic factors, elements of climate, classification & characteristics of tropical climates, site climate.
- Thermal balance of the human body, Thermal comfort indices.
- Relation of climatic elements to comfort, Bioclimatic chart.

UNIT 2

Solar Geometry & Design of Solar Shading Devices

- Apparent movement of the sun, and sun path diagram.
- Solar angles, Shadow angles, Solar shading masks.
- Significance of building orientation
- Effect of Landscaping on microclimate modification

UNIT 3

Heat Flow through Materials

- Thermal quantities – heat flow rate, conductivity (k-value) & resistivity
- Conductance through a multi-layered body, surface conductance, transmittance – calculation of U- value
- Periodic heat flow, Time lag and decrement factor.

UNIT 4

Ventilation and Day lighting

VENTILATION

- Air movement in and around buildings
- Basic objectives of ventilation
- Ventilation due to stack effect
- Ventilation due to pressure effect
- Combined ventilation due to pressure and stack effect

DAYLIGHTING

- Sources of light, significance of Day lighting
- Classification of Daylight, Daylight Factor and Sky Component.
- Day lighting in Tropics and hot dry climates and warm humid climates

UNIT 5

Design Principles for Different Climates

Building design & lay out planning considerations for various climates

Climatic design criteria for:

- Hot and dry climate
- Warm and humid climate
- Composite climate

Recommended Books:

1. O.H. Koenigsberger and others, *Manual of Tropical Housing and Building – Part I – Climatic Design*, Longmans, London, 1980.
2. B.Givoni, *Man, Climate and Architecture*, Applied Science, Banking, Essex, 1992.
3. Victor Olgyay, Aladár Olgyay, *Design with climate: bioclimatic approach to architectural regionalism*, Princeton University Press, 1963.
4. M.Evans – *Housing, Climate and comfort* – Architectural Press, London, 1980.
5. Donald Watson and Kenneth Labs., *Climatic Design* – McGraw Hill Book Company – New York – 1983.

UNIT 1

Development of prehistoric and historic architecture

Egyptian Architecture

- a. Characteristic features
- b. Secular Architecture
- c. Mastabas. *Example: Mastaba of Thi, Sakkâra*
- d. Pyramids. *Example: Step pyramid of Djoser (Zoser), Sakkâra; Bent pyramid of Dahshur, Great pyramid of Cheops, Gizeh.*
- e. Temples. *Example: Temples of Khons and Karnak*

UNIT 2

Ancient near East Architecture

- a. Characteristic features
- b. Sumerian Architecture, Ziggurats. *Example: White Temple Warka*
- c. Babylonian Architecture. *Example: City of Babylon*
- d. Assyrian Architecture. *Example: City of Khorsabad*
- e. Persian Architecture. *Example: City of Susa*

UNIT 3

Classical Greek Period

- a. Characteristic feature of Aegean Architecture
- b. Hellenic period and Hellenistic period
- c. Greek orders. *Example: Doric, Ionic and Corinthian*
- d. The Acropolis at Athens. *Example: Parthenon, Propylaea.*
- e. Theatre, Stadium and Agora

UNIT 4

Classical Roman Period

- a. Characteristic feature of Etruscan and Roman Architecture
- b. Roman Orders. *Example: Doric, Ionic, Corinthian, Tuscan and Composite*
- c. Temples. *Example: Temples of Saturn and Pantheon*
- d. Basilica of Trajan, Baths (Thermae) of Caracalla
- e. Amphitheatre. *Example: Coliseum*
- f. Forum, Circus, Triumphal arch, Aqueduct, Bridge, Road Sewer and Fountain

UNIT 5

Early Christian period

Characteristic feature

Basilican Churches. *Example: St. Peter, Rome*

Byzantine Period

Characteristic feature,

Example: Hagia Sophia

Romanesque Period

Characteristic feature

Example: Pisa Cathedral complex

Gothic Period

Early Gothic style and Late Gothic style

Example: Notre Dame, Paris

Recommended books:

1. Sir Banister Fletcher, *A History of Architecture*, University of London, the Antholone Press, 1986.
2. S. Lloyd and H.W. Muller, *History of World Architecture – Series*, Faber and Faber Ltd. London, 1986.
3. Hiraskar ;*The Great Ages of World Architecture*
4. Kenneth Frampton, *Modern Architecture: A Critical History*; Thames and Hudson, London, 1994.
5. Sigfried Gideon, *Space Time and Architecture: The growth of a New Tradition*, Hazard University Press, 1978.

UNIT 1

Plastics: Polymer types, thermo setting and thermo plastics, resins, common types of mouldings, fabrication of plastics, polymerization and condensation, plastic coatings. Composite materials, classification, properties and uses - linoleum, plastic coated paper, polythene sheets, reinforced plastic, plastic laminates and Poly Vinyl Chloride (PVC)

UNIT 2

Laminates and Veneers: Resin bonded plywood, types of laminates, laminated wood, insulating boards and other miscellaneous boards, veneers from different varieties of timber, their characteristics and uses, Medium Density Fibre (MDF) and High Density Fibre (HDF) boards.

UNIT 3

Glass: Sheet glass, plate glass, float glass, wired glass, laminated glass, obscured glass coloured glass, heat absorbing glass, etched glass, stained glass, tinted glass, glass block - their sizes and uses. Glazing putty.

UNIT 4

Paints and Distempers: Compositions of paints and their uses. Writing specifications for whitewashing, distemping, cement-based paints, oil emulsion paints, enamel paints. Uses of tar paints, aluminium paints.

Lacquers, Polishes and Varnishes: Method of application for lacquers, polishes and staining varnishes.

UNIT 5

Miscellaneous Materials: Properties and uses of Asbestos, cork, felt, mica, rubber, gypsum, sealants, heat and sound insulation materials.

Note: All the students should do a Market Survey on above listed building materials and a detailed report of the study should be submitted.

Recommended Books:

1. B. C. Punmia; *Building Materials and Construction* .Laxmi Publications Pvt Ltd, New Delhi,1993
2. Bindra & Arora; *Building Materials and Construction*.
3. W.B. McKay, '*Building Construction*', Vol. 1,2,3 Longmans, U.K. 1981.

UNIT - I

Deflections of Beams:

Introduction; strain-curvature and Moment-Curvature relation; Governing differential equation for deflection of elastic beams; Alternative differential equations of elastic beams; solution of beam deflection problem by Direct integration; Introduction to moment area method; Derivation of Moment area theorems; conjugate-beam method; slope and deflection of beams using moment area method and conjugate-beam method.

UNIT-II

Strain Energy; Strain energy due to normal stress, bending stress, shear stresses and torsion; Modulus of resilience, Maxwell's Reciprocal theorems, and Betty's law. Applications of Castiglano's theorem, Unit load method to find deflections in determinate a) beams b) Trusses.

UNIT III

Introduction to Arches; Analysis of two and three hinged arches of Parabolic and Circular shapes: Eddy's theorem, Bending moment, Normal thrust and radial shear due to concentrated load and uniformly distributed loads.

UNIT IV

Analysis of Indeterminate Structures:

Analysis of Statically Indeterminate structures: Introduction, Degree of Indeterminacy of rigid joint and pin joint plane structures

Propped Cantilevers

Analysis of propped cantilever by method of consistent deformations.

Fixed Beams

Fixed moments for a fixed beam of uniform section for different types of loading; Effect of sinking of support; Effect of rotation of a support; Bending moment diagram for fixed beams.

Clapeyron's Theorem of Three Moments

Analysis of continuous beam by Clapeyron's theorem of three moments.

UNIT V

Analysis of Rigid joint plane structures: fixed beams, continuous beams and frames (second degree redundancy) using Energy methods. Analysis Trusses (up to second degree redundancy) using Energy Method

Text Books:

1. Pundit & Gupta, Structural Analysis, Tata McGraw Hill Publishing Company Ltd, New Delhi
2. Junarkar, Mechanics of structures, Charotar Book Stall, 2nd edition, 1957.
3. Structural Analysis By LS Negi, RS Jangid, TMH outline Series

Recommended Books:

1. Timoshenko and Young, Elementary Strength of Materials, Affiated East West Press Pvt. Ltd, 5th edition, 1968.
2. Singer. F.L, Strength of materials, Harpe Collins Publishers India Ltd., Delhi.
3. Jain and Arya, Strength of Materials, Khanna Publishers, New Delhi.
4. Vazirani.V.N and Ratwani.M.M, Analysis and Design of Structures, Khanna Publishers, New Delhi.

AURAR 305 ARCHITECTURAL DESIGN-I

Credits: 6

The design issues to be addressed:

- Formulations of concept.
- Design methodology through bubble diagram.
- Interior volumes and space articulation through different materials.
- Understanding the climatic data & human behaviour in space planning.
- Integration of form and function.

The list of suggested topics to be covered as design problems:

Major Design Problem:

Kindergarten school, Primary health centre, Small residential building, Museum, Small resort, etc.

Minor Design/Time Problem:

Doctor's clinic, Small cafeteria, Highway restaurant, Architect's office, Departmental store, etc.

Viva voce

Final external Viva-Voce on all the design assignments done in the semester

Note: At least two major exercises and two minor design/time problems should be given. The final submission shall necessarily include a model for at least one of the two main problems.

Reference:

All books and journals on architecture.

UNIT 1

Flooring: Types of flooring, methods of laying, furnishing of floors with different floor finishes like cement, coloured cement, mosaic, terrazzo, tiles etc. special consideration for rubber, linoleum and PVC flooring, flag stone Flooring, parquet flooring.

UNIT 2

Foundation & Basement: Wall foundation, isolated and combined foundation in RCC. Raft foundation. Parts of pile foundation and its type, grillage foundation, construction detail of basement wall, Retaining wall, floor and foundation.

UNIT 3

Damp-Proofing: Definition, causes and effects of dampness. Materials, general principles and methods of damp-proofing.

Water-Proofing: Definition, reasons and preventive measures for water leakage. water-proofing of flat roofs. Methods for water-proofing: finishing, bedding concrete and flooring, mastic asphalt and jute cloth, use of water-proofing compounds.

Termite-Proofing: Definition, general principles and methods of termite-proofing.

UNIT 4

Wood Framing Detail: Details of joist, Girder, Bridging, Floor platform, Truss joints, different connections.

UNIT 5

Staircase: Layout and its construction details, Different elements of staircase, Types of staircase, Details of various types of staircase in wood, RCC and steel.

Text Books:

1. S.C. Rangwala, *Building Construction*, Charotar Publishing House Pvt. Ltd, India, 2010.

Recommended Books:

1. W.B. MacKay, '*Building Construction*', Vol. 1,2,3 longmans, U.K. 1981.
2. B. C. Punmia; *Building Materials and Construction* .Laxmi Publications Pvt Ltd, New Delhi,1993.
3. Bindra & Arora; *Building Materials and Construction*.

Creating two-dimensional architectural drawing with special emphasis on presentation and visualization using CAD applications.

- Introduction to AutoCAD.
- Getting started with AutoCAD.
- Starting with advanced sketching.
- Working with drawing aids.
- Editing sketched objects.
- Creating text and tables.
- Basic dimensioning, geometric dimensioning and tolerancing.
- Editing dimensions.
- Dimension styles, multileader styles and system variables.
- Adding constraints to sketches.
- Model space viewports, paper space viewports and layouts.
- Template drawings.
- Plotting drawings.
- Hatching drawings.
- Working with blocks.

Practice and preparation of 2D documentations based on class projects in the previous semester in Architectural Designs.

Details of task to be determined each semester by the individual instructor.

The course is designed to develop the awareness of the students on the problems faced due to the unwanted direct or indirect solar radiation penetration into the building, while the main idea of architect is to utilize daylight, to create visual links between indoor and outdoor, to let the direct solar radiation when radiation is required during under heated period of the year and to avoid solar radiation to enter the building during over heated period. The students will learn various solar control methods and their applicability.

Assignment 1

Function of different instruments with sketch:

- Wet and dry bulb Hygrometer
- Sunshine recorder
- Cup and counter anemometer
- Wind vane
- Rain guage
- Lux meter

Assignment 2

Psychometric chart to find the saturated point humidity, DBT & WBT

Assignment 3

Relation of climate elements to comfort the Bio-climatic chart and climatic evaluation by region.

Assignment 4

The motion of the Earth around the Sun.

Assignment 5

Stereographic projection / Sun path diagram.

Method of calculating solar altitude / Azimuth angle / Shadow angle

Assignment 6

Obstruction of the sky vault and shading mask.

Shadow angle and shadow angle protractor.

Assignment 7

External solar control
External shading devices

Assignment 8

Effective temperature nomograph

Assignment 9

Daylighting for Tropics
Wind effects and air flow patterns

Assignment 10

Design considerations for
Hot and Dry Climate
Hot and Humid Climate
Composite Climate

Recommended Books:

1. O.H. Koenigsberger and others, *Manual of Tropical Housing and Building (Part-I) Climatic design*, Longmans, London 1974.
2. M. Evans; *Housing, Climate and Control. Architectural Press*, London, 1980.
3. B. Givoni; *Man, Climate and Architecture. Applied science. Barking Essex. 1982.*
4. IS: 3362-1977, *Code of Practice for natural ventilation of residential building.*
5. Victory Olgyay, *Design with Climate: Bio climatic approach to Architectural Regionalism*, Van Nostrand Reinhold, New York, ISBN -0-442-01110-5