

**AUTONOMY 2022**  
**TKM COLLEGE OF ENGINEERING KOLLAM**

**B. ARCH**  
**SEMESTER III**

Course No.	Course Name	L-T-S P/D	Credits	Year of introduction
22ARB301	CLIMATE AND BUILT FORM- I	2-0-0-2	4	2022

**Course Objectives:** To introduce students to climate responsive architecture and enable them to apply climate responsive design strategies in the design of built environment.

**Course Outcomes:** After the completion of this course, the students will be able to

Course Outcome	Description of Course Outcome	Prescribed learning level
CO-1	Interpret the global and local climate	Understanding
CO-2	Examine the thermal comfort of a space	Analysing
CO-3	Summarize the heat exchange process in buildings and the thermophysical properties of building materials	Understanding
CO-4	Apply climate responsive design strategies in the design of shelters for tropical climates	Applying

**Mark distribution:**

Total marks	Continuous internal evaluation marks	End semester examination marks	End semester examination duration
100	40	60	3 hours

**Continuous internal evaluation pattern:**

Attendance: 4 Marks  
 Tests (2 numbers): 20 Marks  
 Assignment/Quiz/Course project: 16 Marks

**End semester examination pattern:**

There will be two parts; Part A and B. Part A contains 5 questions with 1 question from each module, having 4 marks for each question. Students should answer all the questions (5x4= 20 marks). Part B contains 2 questions from each of the 5 modules, of which the student should answer any one. Each question carries 8 marks (Total 5x8=40). Part B questions can have subdivisions.

## Syllabus

Introduction to Climate, Climate in Site Study, Thermal Comfort, Heat transfer in buildings, Climate responsive design for tropical climates.

## Course Plan

Module	Topic	Course Outcome	No. of Hours
I	<b>Introduction to climate</b> Definitions – climate and weather, Climate and architecture, Need of study – comfort, sustainability, Active and passive systems, Global climatic factors Climate classifications - global classification (Koppen), Indian climate classification (SP 41) Tropical climates and its classification	CO1	10
II	<b>Climate in site study</b> Elements of climate, Macro and microclimate Site climate – factors affecting site climate and their influence on different elements of climate Urban climate <b>Exercises (Lab):</b> 1. Measurement of temperature 2. Measurement of humidity 3. Measurement of mean radiant temperature	CO1	15
<b>FIRST INTERNAL TEST</b>			
III	<b>Thermal comfort</b> Thermal balance of the human body – regulatory mechanisms and subjective variables Thermal comfort – factors affecting thermal comfort Thermal comfort indices – effective temperature, corrected effective temperature, bioclimatic chart, Fanger’s model of thermal comfort <b>Exercises (Lab):</b> 1. Calculation of ET and CET 2. Evaluation of thermal comfort using architectural evaluation System	CO2	15
IV	<b>Heat transfer in buildings</b> Heat exchange process in buildings, Thermophysical properties of materials – conductance, resistance and transmittance (U value), Absorbance reflectance and	CO3	10

	emittance, Specific heat and thermal capacity, Sol air temperature and solar gain factor Periodic heat flow		
<b>SECOND INTERNAL TEST</b>			
V	<b>Climate responsive design for tropical</b> climates Design considerations for warm humid, hot dry and composite climates.	CO4	10
<b>END SEMESTER EXAMINATION</b>			

### Reference Books

- Koenisberger O. H., Ingersoll T. G., Mayhew A., Szokolay S. V., Manual of Tropical Housing and Building, Orient Blackswan, 1975.
- Givoni B., Man, Climate and Architecture, Elsevier Publishing Company Limited, 1969.
- Olgyay V., Design with Climate, Princeton University Press, 2015.
- Krishan A., et al., Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings, Tata McGraw-Hill Education, 2001.

### Course materials, Guidance and Evaluation methods

- Aspects of climate to be examined in the site study for architectural projects should be emphasised in module 2.
- Students should be made aware of the practical Architectural applications of each topic.

Course No.	Course Name	L-T-S P/D	Credits	Year of introduction
22ARS301	<b>HISTORY OF ARCHITECTURE AND CULTURE - II</b>	3-0-0-0	3	2022

**Course Objectives:** The course tries to understand religious and domestic architecture in India and Europe during the 5th to 15th century. In Europe, the Architectural vocabulary is studied as it evolved from Gothic to Renaissance. In India, the period of development of a style later known as Hindu architecture in India, and its regional variations are studied. An introduction to the architectural vocabulary of traditional Kerala architecture as it evolved from the climatic and cultural contexts also form part of the course.

**Pre-requisite of the course:** Understanding of historical development of architecture across Asia, Europe and Africa from prehistoric era to 10th century. Gothic period, Vedic and Buddhist Architecture studied in the second semester has to be refreshed in memory.

**Course Outcomes:** After the completion of this course, the students will be able to

Course Outcome	Description of Course Outcome	Prescribed learning level
CO-1	Study of evolution of European architecture from Gothic to Renaissance	Understanding
CO-2	Study of Hindu temple Architecture in Asia and India	Understanding
CO-3	Study of evolution of domestic and religious architecture in Kerala from the cultural and climatic contexts	Analysing
CO-4	Understanding of elements and materials of Kerala traditional architecture	Applying

**Mark distribution:**

Total marks	Continuous internal evaluation marks	End semester examination marks	End semester examination duration
100	40	60	3 hours

**Continuous internal evaluation pattern:**

Attendance: 4 Marks  
 Tests (2 numbers): 20 Marks  
 Assignment/Quiz/Course project: 16 Marks

### End semester examination pattern:

There will be two parts; Part A and B. Part A contains 5 questions with 1 question from each module, having 4 marks for each question. Students should answer all the questions (5x4= 20 marks). Part B contains 2 questions from each of the 5 modules, of which the student should answer any one. Each question carries 8 marks (Total 5x8=40). Part B questions can have subdivisions.

### Syllabus

Hindu Architecture, Early Temple form

Indo Aryan temples and Dravidian Temples. Temple towns and complexes.

An introduction to Architecture of Kerala- culture and traditional Architecture- domestic types.

### Course Plan

Module	Topic	Course Outcome	No. of Hours
I	Cultural changes that led to Renaissance in Europe- Early, Middle and High Renaissance- Characteristics Brunelleschi, Michael Angelo- Florence Dome, New St. Peter's church, Rome. Baroque, Rococo, Neo Classical-Definition.	CO1	12
II	Hindu Temple Architecture- Evolution and features. Vocabulary of Hindu temples. Kailasnath Temple at Ellora. Angkorwat temple, Cambodia.	CO2	6
<b>FIRST INTERNAL TEST</b>			
III	Evolution of Hindu temples from Buddhist stupas- Gupta Temple at Sanchi. Essential Features of Dravida and Nagara Temples. Temples at Badami, Aihole, Pattadakal, Virupaksha at Hampi, Belur, Halebid, Ladhkan, Vitthala	CO2	9
IV	Dravidian Temple Architecture- PanchRathas- Shore Temple at Mahabalipuram. Brihadeswara Temple at Tanjore. PanchaPrakara Temple planning- Madurai Meenakshi temple. Nagara Temple Architecture- Kandara Mahadeo temple at Khajuraho, Lingaraja Temple at Orissa.	CO2	9
<b>SECOND INTERNAL TEST</b>			
V	Vernacular architecture- definition. Influence of culture on vernacular architecture. Agraharams Introduction to Kerala Architecture- Geographic, climatic, cultural, socio-economic, occupational and religious structure that helped evolution of Kerala architecture. Evolution of Kerala domestic Architecture. Ekashala to Chaturshala.	CO3, CO4	9
<b>END SEMESTER EXAMINATION</b>			

### **Text Books:**

- Sir Banister Fletcher, “A History of Architecture”, CBS Publications (Indian Edition),1999.
- Percy Brown, ‘Indian Architecture: Buddhist and Hindu Periods’, D.B.Taraporevala,1965
- Satish Grover, ‘The Architecture of India: Buddhist and Hindu’, Vikas, 1980
- Thampuran, Ashalatha. Traditional Architectural Forms of Malabar Coast. India, Vastuvidyapratishthanam Academic Centre, 2001.
- Koduveliparambil, Jacob Joseph. Construction Practices in Traditional Dwellings of Kerala, India. Canada, McGill University Libraries, 1997.
- Chakrabarti, Vibhuti. Indian Architectural Theory: Contemporary Uses of Vastu Vidya. India, Curzon, 1998.
- Oliver, Paul, ed. Encyclopedia of vernacular architecture of the world. Vol. 3. Cambridge: Cambridge University Press, 1997.

### **Reference Books**

- Hardy, Adam. The temple architecture of India. United Kingdom, Wiley, 2007.
- Encyclopaedia of Indian Temple Architecture. India, American Institute of Indian Studies, set of 3 volumes.
- Desai, Miki. Wooden Architecture of Kerala. India, Mapin Publishing, 2018. B.Arch 2021 Regulations
- Sarkar, H.. An Architectural Survey of Temples of Kerala. India, Archaeological Survey of India, 1978.
- Sarkar, H.. Monuments of Kerala. India, Archaeological Survey of India, 1978.
- Leland M Roth; “Understanding Architecture: Its Elements, History and Meaning”; Craftsman House; 1994
- A TEXT BOOK OF VASTUVIDYA (VASTUVIDYAPRAVESIKA) - by Dr.Balagopal. T.S. Prabhu and Dr. A. Achyuthan.
- Lloyd S. and Muller H.W., “History of World Architecture – Series”, Faber and Faber
- Patrick Nuttgens, “The Story of Architecture FROM ANTIQUITY TO THE PRESENT”, H.F.Ullmann Pub: 1983
- Pier Luigi Nervi, General Editor, “History of World Architecture – Series”, Harry N. Abrams, Inc. Pub., New York, 1972.
- Vincent Scully, “Architecture – The Natural and the Manmade”, Harper Collins Pub: 1991.
- Amos Rapoport: House Form and Culture

### **Course materials, Guidance and Evaluation methods**

- Books, research papers, e-books, videos etc. to be provided to the students by the faculty and ensure that they read it, by initiating discussions.
- Faculty to act as facilitator and guide rather than one way lecturing.
- Book Reviews are to be part of assignments.
- Students are to be encouraged to watch movies and documentaries which give information about culture and architecture and prepare reviews/ reports and have discussions in class.
- As far as possible the students are to be encouraged to visit the architectural monuments in their vicinity and prepare reports and sketches, regardless of whether they are part of the syllabus.

- At the end of the course, each student has to prepare a short video on any of the topics in the syllabus.
- Each student should be encouraged to have a sketchbook with sketches of all the topics covered.

Course No.	Course Name	L-T-S-P/D	Credits	Year of introduction
22ARC301	<b>THEORY OF STRUCTURES- III</b>	2-1-0-0	3	2022

**Course Objectives:** The goal of this course is to assess the structural response of simple structures subjected to different types of loads. The students will be trained to develop mathematical models of structures and to analyse them using appropriate methods. The course will help the students to enhance their problem-solving skills. Students are introduced to the concept of determinate beams and indeterminate beams as well as to force and displacement methods of analysis. Special cases of structural response analysis of arches and cables are also introduced in this course. After this course, the students will be able to perform the analysis of similar problems in real world situations and respond accordingly.

**Course Outcomes:** After the completion of this course, the students will be able to

Course Outcome	Description of Course Outcome	Prescribed learning level
CO-1	Compute the slope and deflection of determinate beams using appropriate method	Applying
CO-2	Explain the concept of static and kinematic indeterminacy and calculate the static and kinematic indeterminacy of structures	Understanding
CO-3	Recognize the fundamentals of force and displacement methods of analysis	Understanding
CO-4	Apply specific methods to analyse the structural response of beams and frames without sway subjected to different types of loading	Applying
CO-5	Apply suitable methods to analyse the structural response of cables and arches.	Applying

**Mark distribution:**

Total marks	Continuous internal evaluation marks	End semester examination marks	End semester Examination duration
100	40	60	3 hours

**Continuous internal evaluation pattern:**

Attendance: 4 Marks  
 Tests (2 numbers): 20 Marks  
 Assignment/Quiz/Course project: 16 Marks

### End semester examination pattern:

There will be two parts; Part A and Part B. Part A contain 5 questions from each module, having 4 marks for each question. Students should answer all the questions. Part B contains 2 questions from each module, of which the student should answer any one. Each question can have sub divisions and carries 8 marks.

### Syllabus

Determinate beams – Slope and Deflection of determinate beams– Conjugate beam method; Moment area method

Indeterminate beams- Static and kinematic Indeterminacy – Force and displacement methods of analysis

Force methods -Consistent deformation method – Analysis of fixed and propped cantilever

Analysis of continuous beams using Three moment theorem - Discussion on Support settlement case

Displacement method – Slope deflection method and Moment distribution method - Analysis of beams and frames without sway

Arches - Analysis of three hinged arches – Parabolic and segmental arches with supports at same level

Cables – General cable theorem – Cables under concentrated load and uniformly distributed load – Anchor cables

### Course Plan

Module	Topic	Course Outcome	No. of Hours
I	Determinate beams – Slope and Deflection of determinate beams only – Conjugate beam method; Moment area method (subjected to concentrated load and full uniformly distributed load only)	CO1	9
II	Indeterminate beams- Static and kinematic Indeterminacy –Force and displacement methods of analysis Force methods -Consistent deformation method – Analysis of fixed and propped cantilever (subjected to single concentrated load and full uniformly distributed load only) Analysis of continuous beams using Three moment theorem - Discussion on Support settlement case (Derivation not required)	CO2, CO3	10
<b>FIRST INTERNAL TEST</b>			
	Displacement method – Slope deflection method- Analysis of beams and frames without sway (subjected to single concentrated load and full		

III	uniformly distributed load only) - Settlement case not required	CO4	9
IV	Displacement method – Moment distribution method- Analysis of beams and frames without sway (subjected to single concentrated load and full uniformly distributed load only) - Settlement case not required	CO4	9
<b>SECOND INTERNAL TEST</b>			
V	Arches - Analysis of three hinged arches – Parabolic and segmental arches with supports at same level only Cables – General cable theorem – Cables under concentrated load and uniformly distributed load – Anchor cables	CO5	8
<b>END SEMESTER EXAMINATION</b>			

#### **Text Books**

- Junnarkar S. B. and H. J. Shah, Mechanics of Structures, Vol – II, Charotar Publishing House Pvt. Ltd., 2017.
- Punmia B. C., A. K. Jain and A. K Jain, Theory of Structures (SMTS- II), Laxmi Publications Pvt. Ltd., 2017.
- Ramamrutham S. and R. Narayan, Theory of Structures, Dhanpat Rai Publishing Company Ltd., 2020
- H. J. Shah, and Junnarkar S. B., Mechanics of Structures (Vol. I), 30/e, Charotar Publishing House Pvt. Ltd., New Delhi, 2017
- M.M. Ratwani, S. K. Duggal & V.N. Vazirani, Analysis of Structures, Vol. 1, Khanna Publishers – Delhi, 1987

#### **References Books:**

- Devdas Menon, Structural analysis, Alpha Science International Ltd
- Timoshenko, S.P. and D.H. Young, Elements of Strength of Materials, Fifth edition, East West Press, 1993.
- A.R. Jain and B.K.Jain, Theory and analysis of structures, Vol. 1, Nemchand and Bros, Roorkee, 1987.
- R.K. Rajput “Strength of Materials”, S.Chand & Company Ltd., New Delhi 1996

Course No.	Course Name	L-T-S-P/D	Credits	Year of introduction
22ARC302	BUILDING SERVICES I- (WATER SUPPLY, PLUMBING AND SANITATION)	2-0-1-0	3	2022

**Course Objectives:** The course is to develop an understanding of fundamentals of water supply, wastewater management and solid waste management in buildings.

**Course Outcomes:** After the completion of this course, the students will be able to

Course Outcome	Description of Course Outcome	Prescribed learning level
CO-1	To identify and evaluate the basic elements of water supply	Understanding, Analyzing and evaluating
CO-2	To analyse the various stages of water supply within buildings	Understanding and Analyzing
CO-3	To acquire the ability to apply basic principles of sanitation in buildings and carryout documentation	Understand and Applying
CO-4	To understand the various elements of wastewater transport and treatment and to design treatment unit for isolated buildings	Understand, Analyzing and Applying
CO-5	To appreciate the importance of solid waste management in houses and suggest suitable solution	Understand and Applying

**Mark distribution:**

Total marks	Continuous internal evaluation marks	End semester examination marks	End semester Examination duration
100	40	60	3 hours

**Continuous internal evaluation pattern:**

Attendance: 4 Marks  
 Tests (2 numbers): 20 Marks  
 Assignment/Quiz/Course project: 16 Marks

### End semester examination pattern:

There will be two parts; Part A and Part B. Part A contain 5 questions from each module, having 4 marks for each question. Students should answer all the questions. Part B contains 2 questions from each module, of which the student should answer any one. Each question can have sub divisions and carries 8 marks.

### Syllabus

Introduction to water sources – water demand and factors affecting demand – characteristics - water supply – building sanitation – wastewater management – sewage and sewage treatment – plumbing systems – layout and documentation – solid waste management

### Course Plan

Module	Topic	Course Outcome	No. of Hours
I	<b>Water</b> Sources of water / hydrological cycle – Per capita demand –Types of water demand and factors effecting demand and consumption – population forecasting – Drinking water standards – physical and chemical characteristics of water, Flowchart of a centralized water treatment system (brief description only) -Water supply systems (Gravitational, pumping, combined) - Water distribution networks	CO1	10
II	<b>Water supply in buildings</b> House/service connection, upfeed and downfeed systems, capacity of over head tanks and calculation of water consumption. Domestic water piping systems: Cold and hot water distribution within the building.  Plumbing fittings - valves, aps and other fittings for water supply and conveyance	CO2	10
<b>FIRST INTERNAL TEST</b>			
III	<b>Wastewater and wastewater treatment</b> Wastewater characteristics - Sanitation: Basic principles of sanitation from buildings – Plumbing systems in buildings (4 types) – Sanitary fittings – Wash basin, bath tub, water closets etc. – Types of traps  Design of sanitary plumbing system – General principles, design considerations, Model bye laws regarding	CO4	10

	sanitation of buildings - Preliminary data for design in individual buildings, plumbing layout in residential - documentation		
IV	<b>Sewers and wastewater treatment system</b> Disposal of sewage from isolated buildings (septic tank, soak pit), Design of septic tank and soak pit Sewers and types of sewers - sewer systems (separate, combined, partially combined) –Self cleaning velocity - Sewer appurtenances: Manholes, Sub drains, culverts, ditches and gutters, drop inlets and catch basins, storm overflow/regulators. Flowchart of a centralized waste water treatment system (brief description only)	CO4	10
<b>SECOND INTERNAL TEST</b>			
V	<b>Solid waste management</b> Solid waste management – Source based classification of solid waste – factors affecting generation – 3R concept – Decentralised solid waste management systems - Composting, Vermicomposting, Bio gas systems.	CO5	5
<b>END SEMESTER EXAMINATION</b>			

#### **Text Books:**

- B.C Punmia, “Water Supply Engineering”, Laxmi Publications Pvt. Ltd., 2016
- B.C Punmia , “Waste Water Engineering”, Laxmi Publications Pvt. Ltd, 2012
- S.K.Garg, “Water Supply Engineering”, Khanna Publishers. 2010
- S.K. Garg,, Environmental Engineering, Vol. II, Khanna Publications, New Delhi,2009.
- P.N. Modi, Sewage Treatment and Disposal and Wastewater Engineering, StandardBook House, New Delhi, 2008
- George Tchobanoglous, Frank Kreith et al “Hand book of solid waste management.” Mc Graw hill publications –New York
- Relevant BIS Codes, CPHEEO Manuals, KMBR, National Building Code

#### **Reference Books**

- Metcalf and Eddy, Wastewater Engineering Treatment, Disposal and Reuse, Tata McGraw Hill, 2007.
- G. Kiely., Environmental Engineering, McGraw Hill, McGraw Hill, 2009.
- Mark J. Hammer and Mark J. Hammer Jr., Water and Waste Water Technology, Prentice Hall of India Pvt. Ltd. New Delhi, 2009.

#### **Course materials, Guidance and Evaluation methods**

- Contents learnt can be applied to a design problem.

Course No.	Course Name	L-T-S P/D	Credits	Year of introduction
22ARD301	ARCHITECTURAL DESIGN -II	0-0-8-2	10	2022

**Course Objectives:** To study about the spatial relationships and organization, form and space in the built environment. By the end of the course students should develop a sense of structure and enclosure along with application of concept like accessibility for differently abled and elderly in design of built environment. To enable students to understand the processes involved in the transformation of space into place as well as to involve students in design process through analysis of factors like context, site, environmental conditions.

**Course Outcomes:** After the completion of this course, the students will be able to

Course Outcome	Description of Course Outcome	Prescribed learning level
CO-1	To get a basic understanding of standards, concepts in design of built environment and get familiarized with individual activity space, group activity space.	Understanding
CO-2	Application of knowledge to initiate architectural design process by using space standards and environmental aspects to formulate concepts and design.	Applying
CO-3	Analysis and inference through data collection, case studies of projects related to the design project and developing skills so as to create a design programme	Analysing and evaluating
CO-4	To involve students in a design project that includes design of a built space integrating site planning aspects, needs of differently abled and elderly and also climate responsive elements.	Creating

**Mark distribution:**

Total marks	Continuous internal evaluation marks	End semester Jury examination marks	End semester Jury examination duration
100	50	50	2-3 days

**Continuous internal evaluation pattern:**

Attendance: 5 Marks  
Design Assignments/Reviews/Tests/CAD Assignments: 45Marks

## Syllabus

To understand the needs of the elderly and differently-abled, and to design accessible built environment. Study of accessibility needs in context of built environment for diverse user typologies, Design of a public building and outdoor space based on the consideration of the context. Integration of climate factors and site planning into design. Introduction to 2D drafting in CAD software. Development of design programme and concept development and detail drawings.

## Course Plan

Module	Topic	Course Outcome	No. of Hours
I	<p><b>Concept of Universal Design for the Built Environment</b> Study of Accessibility needs in context of built environment for diverse user typologies, anthropometric and spatial allowances for differently abled.</p> <p>Exercises relating to detailing of ramps, steps, handrails, circulation spaces etc for elderly and differently abled.</p>	CO1, CO2	30
II	<p><b>Introduction to 2D drafting in CAD software</b> Computer aided design tools, drawing lines and shapes, modifying lines and shapes, text styles and sizes, hatches and dashed lines. Stencils and blocks, advanced editing tools, and dimensioning drawings. Drawings of plans, sections of simple single unit room using CAD tools.</p>	CO1	30
<b>FIRST INTERNAL TEST</b>			
III	<p><b>Application of Universal design</b> Design and detailing of a built space based on an understanding of factors (contextual) influencing the design of built environment. Needs of differently abled and elderly to be incorporated in design and detailing. Scale/Complexity: Projects involving multi-room, single use, single floor and small span projects Typology/Project: Clinic, art gallery, crèche, cafeteria, cottage etc</p>	CO1, CO2, CO3, CO4	30
IV	<p><b>Integration of climate factors and site planning into design:</b> Introduction to site planning. Interpretation of site information as a decision making aid and to design the buildings suitable to climatic conditions</p>	CO2,	30

	<p>Design of a public building and outdoor space based on the consideration of the context. Understanding usage of locally available materials and appropriate construction techniques, in addition to thermal comfort, circulation pattern, furniture arrangement, texture, colour etc. in the built environment.</p> <p>Scale/Complexity: Multi use, multifloor, multifunctional spaces with interconnection between spaces, etc.  Typology/Project: Nursery school, Health club, Restaurant, library, bank, post office, etc- emphasizing on site planning, spatial relationships and organization</p>	CO3, CO4	
<b>SECOND INTERNAL TEST</b>			
V	<p>Use of standards, handling of space, and application of knowledge gained from other subjects related to design. Study &amp; analysis of various user types &amp; their activities in public buildings. Development of design programme; Concept &amp; detailed design drawings</p>	CO2, CO3, CO4	30
<b>END SEMESTER EXAMINATION/JURY</b>			

### Reference Books

- Arthur L. Guptill and Susan E. Meyer, 'Rendering in Pen and Ink', Watson-Guption, 1997
- Francis D. K. Ching, 'Architectural Graphics', Wiley, 2009.
- Francis D. K. Ching, 'Architecture: Form, Space and Order', John Wiley & Sons, 2007.
- Geoffrey Broadbent 'Design in Architecture' John Wiley and Sons, 1973.
- Neuferts' Architect's Data
- Simon Unwin, 'Analysing Architecture', Routledge, 2003
- Prak, N. L, 'The Language of Architecture: A contribution to architectural theory'. Hague: Mouton & Co, 1968.
- 'Harmonised Guidelines and Space Standards for Barrier-Free Built Environment for persons with Disability and Elderly Persons' 2016, Ministry of Urban Development, Government of India
- Preiser, W. 'Towards universal design evaluation. New York', McGraw-Hill, 2001.
- Seidle, J. 'Barrier-free design.' 1st Ed. New York : Routledge,1996.
- Story, M. F., Mueller, J. L. and Mace, R. L 'The universal design file: Designing for people of all ages and abilities, North Carolina State University Press, 1998.
- Aouad.G, 'Computer Aided Design Guide for Architecture, Engineering and Construction', Taylor & Francis Publication, 2011

Course No.	Course Name	L-T-S P/D	Credits	Year of introduction
22ARB302	<b>BUILDING MATERIALS AND CONSTRUCTION TECHNIQUES III</b>	1-0-0-2	3	2022

**Course Objectives:** The goal of this course is to expose the students to elementary building materials and their applications. It aims to familiarize students to contemporary as well as vernacular and traditional building materials. It will also introduce students to prevailing & relevant BIS specifications. After this course, the students will be able to recognize materials in the market and use them in their design visualization.

**Course Outcomes:** After the completion of this course, the students will be able to

Course Outcome	Description of Course Outcome	Prescribed learning level
CO-1	Identify the relevant BIS specifications.	Remembering
CO-2	Identify appropriate foundations for various construction needs.	Understanding
CO-3	Work with various building materials in the construction yard and understand their behaviour.	Applying
CO-4	Use the various building materials in their design processes appropriately	Applying

**Mark distribution:**

Total marks	Continuous internal evaluation marks	End semester examination marks	End semester examination duration
100	50	50	3 hours

**Continuous internal evaluation pattern:**

Attendance: 5 Marks  
 Continuous assessment tests (2 nos.): 15 Marks  
 Portfolio presentation (15) / drawings (15): 30 Marks

**End semester examination pattern:**

There will be three parts; Part A, B and C. Part A will contain 5 questions with 1 question from each module, having 3 marks for each question. Students should answer all the questions. Part B

will contain 2 questions from each module, of which the student should answer any one. Each question carries 4 marks. Part C will have two drawing questions, from any two different drawing-based modules, of which the student should answer any one. The question carries 15 marks.

## Syllabus

Foundations: General- Types of foundations. Soil- Bearing capacity of soil. Shallow Foundations: Types of shallow foundations. Deep foundations: Types of pile foundations-Caissons. Iron: Different forms of Ironites uses in building constructions- Steel: properties-types of steels-its uses in construction. Aluminium: its uses in building constructions. Market forms of steel and aluminium. Door&Windows: Doors- Types of Doors. Windows- Types of windows.

## Course Plan

Module	Topic	Course Outcome	No. of Hours
I	<p><b>FOUNDATIONS: GENERAL</b></p> <p>Introduction to Foundations – definition, function, types – selection criteria – bearing capacity of soil – methods of testing – settlement of foundations, excavation and timbering of foundation trenches, setting out foundation trenches.</p> <p>Various types of foundations – Wall Footing, Isolated Footing, Causes of failure of foundation and remedial use.</p> <p>Exercise: Sketches of various types of foundations &amp; site visit</p>	CO1, CO2, CO3, CO4	9
II	<p><b>SHALLOW FOUNDATIONS</b></p> <p>Depth of footings, strip footing, isolated footing or pad footing, eccentrically loaded footings, grillage foundations, combined footings, strap or cantilevered footing, raft foundations, foundations for black cotton soil, Footings at different levels: stepped footings. Adjacent footings, machine foundations.</p> <p>Exercise: Drawings of various types of foundations &amp; site visit</p>	CO1, CO2, CO3, CO4	9
<b>FIRST INTERNAL TEST</b>			

III	<p><b>DEEP FOUNDATION</b></p> <p>Pile foundation: Bearing piles, friction piles – concrete, timber, steel and composite piles. Cased and uncased cast in situ concrete piles, Bored piles, pressure piles and precast concrete piles. Screw piles &amp; disk piles. Under reamed piles. Bored compaction piles. Sand piles. Sheet piles. Pile cap.</p> <p>Caissons: Box caissons, Open caissons &amp; pneumatic caissons, Timbering and trenching of foundations</p> <p>Exercise: Drawings of various types of Pile foundations. Site visits and case study of deep foundation construction shall be done.</p>	CO1, CO2, CO3, CO4	9
IV	<p><b>IRON, STEEL, ALUMINIUM</b></p> <p>Iron: Forms of Iron used for building construction– Properties and uses - Cast iron, Wrought iron.</p> <p>Steel: Properties, uses, Anti corrosive measures, mechanical and heat treatment of steel, Forms of steel used for building construction: steel for reinforcement-Hot rolled bars, Cold rolled steel, TMT bars, Welded wire fabrics. Structural Steel, Stainless steel, Steel alloys, current developments.</p> <p>Aluminium in building construction: Properties, Advantages, Available Forms- Extrusion, casting, foil, powder &amp; sheet - uses- finishes - anodizing, surface texture, colour coating &amp; painting. Applications in buildings</p> <p>Exercise: study of standard aluminium &amp; steel products and profiles used for building construction.</p>	CO1, CO2, CO3, CO4	9
<b>SECOND INTERNAL TEST</b>			
V	<p><b>DOORS&amp;WINDOWS</b></p> <p>Door: Different types of doors and uses. Wooden doors, PVC doors, glass doors, Steel doors Solid doors, Flush doors, revolving doors, folding doors, sliding doors, swinging doors, collapsible doors.</p> <p>Windows: Aluminium, Steel &amp; UPVC windows – French windows, bay windows - fixed, casement, sliding &amp; pivoting windows</p> <p>Drawings: Joinery details, Panelled door, battened door, glazed door, sliding door, folding door Aluminium and steel window.</p>	CO1, CO2, CO3, CO4	9

<b>END SEMESTER EXAMINATION/JURY</b>
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**Text Book**

- P.C. Varghese, 'Building Materials', Prentice hall of India Pvt Ltd, New Delhi, 2005
- Dr.B.C Punmia , Building Construction.

**Reference Books**

- Harry Parker, 'Materials and Methods of Architectural Construction', John Wiley & Sons Canada,1958.
- H Leslie Simmons, 'Construction – Principles, Material & Methods', 7thedition, John Wiley & Sons Inc., New York, 2001.
- Relevant BIS codes.
- Rosen Harold J, Construction materials for Architecture, Krieger Pub Co, 1992
- Doran, David; Cather, Bob; Doran, D. K; Cather, R – Construction materials reference book,Routledge, 2013

Course No.	Course Name	L-T-S P/D	Credits	Year of introduction
22ARC303	SURVEYING AND LEVELLING	1-0-0-1	2	2022

**Course Objectives:** To understand various techniques of site surveying.

To learn the importance of site and its content in Building and Infrastructure Design To bring about awareness of the role of surveying and levelling in architectural and planning projects..

To develop skills using surveying instruments including tapes, compass, levels, theodolites, and advanced measurement equipment such as total stations.

**Course Outcomes:** After the completion of this course, the students will be able to

Course Outcome	Description of Course Outcome	Prescribed learning level
CO-1	Describe the importance, objectives and principles of surveying and determination of area using chain/tape	Understanding and applying
CO-2	Discuss the fundamental aspects of theodolite and compass survey and apply various triangulation techniques in surveying	Understanding and applying
CO-3	Apply the principles of levelling to find the level difference between points in the field	Applying and analysing
CO-4	Use of Plane Table as an instrument involved in surveying with respect to utility and precision.	Understanding and applying
CO-5	Know the use of modern equipments like GPS, EDM, Total station in surveying and area calculations	Understanding and applying

**Mark distribution:**

Total marks	Continuous internal evaluation marks
100	50

**Continuous internal evaluation pattern:**

Attendance:	10 marks
Presentation/Demonstration (course work including tests):	40 marks
• Internal tests (2 no.s) :	20 marks
• Assignments/ practicals:	20 marks
Marks for record/ report:	25 marks
Final test & Viva:	25 marks
• Final test:	20 marks
• Viva:	5 marks

## Syllabus

Introduction to surveying and relevance of surveying in architecture. Introduction to chain surveying. Compass survey and computation of bearings and angles. Introduction to theodolite surveying. Measurement of horizontal and vertical angle using theodolite. Principles of levelling and reduction of levels. Introduction to plane table survey. Different methods used for calculation of area. Introduction to modern surveying equipments.

## Course Plan

Module	Topic	Course Outcome	No. of Hours
I	<p>Introduction: Importance and principles of Surveying.</p> <p><b>Chain Surveying:</b> Types of chains and tapes, chaining and ranging, method of taking offsets. Chaining on sloping ground. Errors in chaining.</p> <p><b>Calculation of area:</b> General methods of determining areas by dividing the area into triangles. By offsets to base line average ordinate rule, trapezoidal rule and Simpsons rule</p> <p><b>Practical: Computation of area using chain surveying</b></p>	CO1	7
II	<p><b>Compass Surveying:</b> Bearings and angles, computation of angles from bearings, designation of bearings.</p> <p><b>Theodolite Surveying:</b> Theodolite, its temporary and permanent adjustment, measurement of horizontal &amp; vertical angles.</p> <p><b>Practical: Computation of height of a building using Theodolite</b></p>	CO2	6
<b>FIRST INTERNAL TEST (THEORY BASED)</b>			
III	<p><b>Levelling:</b> Principles of leveling; Study of instruments – Dumpy level and leveling staff, Temporary and permanent adjustments of level, Booking and reduction of levels – ‘line of collimation method’ and ‘rise and fall method’.</p> <p>Basic ideas on plotting of longitudinal and cross sections</p> <p><b>Practical: Determination of elevation of points on ground by differential levelling</b></p>	CO3	7
IV	<p><b>Contouring:</b> Contour interval, Contour Maps characteristics, use and interpretation.</p> <p><b>Plane Table surveying</b> – instruments and accessories, advantages and disadvantages of plane table surveying. methods – radiation, intersection, traversing, resection.</p> <p><b>Practical:</b></p>	CO4	5

	<ul style="list-style-type: none"> <li>• <b>Determination of elevation of points on ground by differential contouring</b></li> <li>• <b>Plane table survey using radiation and intersection method</b></li> </ul>		
<b>SECOND INTERNAL TEST</b>			
V	<p><b>Introduction to modern surveying equipments:</b> Total Station, GPS, Distomat, Digital Levels and Auto-Levels Electromagnetic distance measurement (EDM) - Principle of EDM</p> <p><b>Total Station</b> – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey.</p> <p><b>Practical: Computation of height, distance and area using Total Station</b></p>	CO5	5
<b>FINAL TEST (THEORY BASED) AND VIVA</b>			

#### **Text Books**

- Punmia, B. C., Jain and Jain, A. K., Surveying (Vol. I and II), Laxmi Publications (P) Ltd., New Delhi, 16th Edition, 2016.
- Edward. T. Q. Site Analysis – Architectural Media, 1983
- John Ormsbee Simonds, Landscape Architecture, Fourth Edition: A Manual of Land Planning and Design
- Joseph De.Chiarra and Lee Copleman - Planning Design Criteria - Van Nostrand
- Kanetkar and Kulkarni, ‘Surveying and Levelling’, Vol I, Pune Vidyarthi Griha, 2008.

#### **Reference Books:**

- Duggal, S. K., Surveying (Vol. I and II), Tata Mc Graw Hill, 2015.
- N. Madhu, R. Sathikumar, Satheesh Gopi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India Publishers 2006
- Shahani P.B., ‘Surveying and Levelling’, Vol I and Vol II, Oxford and IBH Publishing Company, 1971.