

UNIVERSITY OF KERALA

**B. ARCH. DEGREE COURSE
(2013 SCHEME)**

**SYLLABUS FOR
IV SEMESTER**

SCHEME -2013

IV SEMESTER

Course No	Course Title	Credits	Hours/ week			Duration of Exam	Marks			Total
			L	T	P		W	J	S	
13AR1401	Architectural Design III	5			10		250	250	500	
13AR1402	Building Materials and Construction III	4	1		3	4	100	100	200	
13AR1403	History of Architecture -III	2	2			3	100	50	150	
13AR1404	Landscape Architecture	4	1		3	4	100	100	200	
13AR1405	Architectural Acoustics	3	2	1		3	100	50	150	
13AR1406	Estimation and Specification	2	2			3	100	50	150	
13AR1407	Building Services I Plumbing and Sanitation	2	2			3	100	50	150	
13AR1408	Structural Design -III	2	2			3	100	50	150	
Total		24	12	1	16				1650	

13AR1401 ARCHITECTURAL DESIGN – III

Teaching Scheme: 0(L) - 0(T) - 10(P)

Credits: 5

Course Objective:

- *To introduce the functional, symbolic, social-needs, and the link between the architectural space and human activities.*
- *Design of multifunctional residential buildings involving vertical and horizontal linkages between spaces.*
- *To equip the students to prepare municipal drawing.*

The students are required to do one major project and one minor project.

Major Project – Multilevel Residential buildings, low rise apartments.

Short Project – Preparation of Municipal drawings.

Note: *Students are required to get exposed to the importance of climate responsive and environment friendly buildings that meet the needs of physically challenged. Importance should be given to regional and time factors in the built form. All design sheets should be manually drafted and explained through study models.*

References:

1. Mills E. D., *Planning: Architect's Handbook*, 10/e, Butterworths, 1985.
2. De Chiara J. and J. H. Callender, *Time Saver Standards for Building Types*, McGraw Hill, 2001.
3. Neufert E., P. Neufert, and J. Kister, *Neufert Architects' Data*, Wiley- Blackwell, 2012.
4. Ramsey C. G., H. R. Sleeper, *Architectural Graphic Standards*, 11/e, Wiley, 2008.
5. BIS, Various Codes of Practice and National Building Code of India

Internal Continuous Assessment (Maximum Marks - 250) (Group 1 Subject)

20% - Tests (minimum 2)

70% - Class work

10% - Regularity in the class

University Examination Pattern:

Course work will be assessed by a panel of Jury. (Maximum Marks - 250)

Course Outcome:

The students shall be exposed to need based, functional designing of spaces.

They shall have acquired the knowledge to prepare municipal sanction drawings technically.

13AR1402 BUILDING MATERIALS AND CONSTRUCTION – III

Teaching Scheme: 1(L) - 0(T) - 3(P)

Credits: 4

Course Objectives:

- *To introduce the study of building materials, their applications and construction methods.*
- *To familiarize the students with market study of building components and details.*
- *To understand conventional as well as vernacular and traditional building materials and practices.*
- *To understand prevailing BIS specifications.*

Module – I

Study of deep foundations.

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 & disk piles, Under-reamed piles, Bored compaction piles, Sand piles, Sheet piles, Pile cap.

Caissons: Box caissons, Open caissons & pneumatic caissons

Discussion: Building load-factors, soil condition, need for deep foundations, stability of buildings.

Exercise: Site visits and case study of deep foundation construction shall be done

Module – II

Wall systems:

Structural frames, bearing walls, metal and wood stud walls. Concrete columns, concrete walls, precast concrete walls panels and columns, tilt-up construction. Masonry walls unreinforced and reinforced, solid walls and cavity walls, masonry columns and pilasters, lintels and sunshades. Structural steel framing, steel columns, light gauge steel studs, balloon framing. Wood stud framing, stud wall sheathing, wood columns, wood post and beam framing, Kerala traditional wooden wall systems. Partition wall systems. Glass block walling system.

Discussion: Need for introducing Sustainable wall construction in buildings.

Exercise: Documentation of Kerala Traditional wooden wall systems.

Drawings: Precast concrete walls and connections. RCC lintels and sunshades, Structural steel framing, Wood stud framing.

Module – III

Floor systems:

Concrete : One-way slab, One-way joist slab, Two-way slab, Two-way slab and Beam, Two-way waffle slab, Two-way flat plate, Two-way flat slab, Pre tensioning, Post tensioning, Hollow core slabs, T beam and slab, Pre cast construction, Alternative technology.

Steel: One-way beam system, Two-way beam system, Triple beam system, Moment connections, Shear connections, Semi rigid connections, Open- web steel joists, Metal decking, Light-gauge steel joists.

Wood: Wood joists, Wood joist framing, wood beams- supports and connections, plank and beam framing.

Kerala traditional floor system construction.

Discussion: Basic load bearing concepts of floor systems.

Exercise: Site visits to study shuttering and placement of reinforcement for concrete floors and beams.

Drawings: Reinforcement details of one way slab and two way slab with beams. Steel beam connections. Open web steel joist framing. Metal decking. Wood joist framing.

Module – IV

Plastics and Polymers:

Introduction, Polymerisation, Polymer types, Properties of plastic, Plastic forming process, Plastics in construction, Plastic- environmental issues, recycling of plastic.

Polymers- adhesives, sealants, building components.

Discussion: Discuss the advantages and disadvantages of using plastic in building construction.

Exercise: Market study and sample collection of plastic building materials and components.

References

1. Parker H., *Materials and Methods of Architectural Construction*, John Wiley & Sons, Canada, 1958.
2. McKay W. B., *Building Construction*, Orient Longman 21, London, 1938-44.
3. Barry R., *The Construction of Buildings (Vol. I-II)*, 6/e, Affiliated East-West Press Pvt. Ltd., New Delhi, 1996.
4. Simmons H L., *Construction – Principles, Material & Methods*, 7/e, John Wiley & Sons Inc., New York, 2001.

5. Ching F. D. K., *Building Construction Illustrated*, 4/e, Wiley, New Delhi, 2012.
6. Relevant BIS codes.
7. Harold R. J., *Construction Materials for Architecture*, Krieger Pub Co, 1992.
8. Varghese P.C., *Building Materials*, Prentice Hall of India Pvt. Ltd, New Delhi, 2010.
9. Smith R. C. and T. L. Honkala, *Principles and Practices of Light Construction*, Prentice Hall, Englewood, 1986.
10. Lyons A., *Materials for Architects and Builders*, Elsevier Butterworth- Heinemann, 2004.

Internal Continuous Assessment (*Maximum Marks - 100*) (*Group 1 Subject*)

20% - Tests (minimum 2)

70% - Class work

10% - Regularity in the class

University Examination Pattern:

Examination duration: 4 hours

Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A:

Question 1. (40 marks) - Eight Short answer questions of 5 marks each. All questions are compulsory. There should be two questions from each module.

Question 2. (10 marks) – Questions for 10 marks from module I and II. Candidates have to answer any one out of the two.

Question 3. (10 marks) – Questions for 10 marks from module III and IV. Candidates have to answer any one out of the two.

Part B:

Question 4. (20 Marks) – Drawing: Candidates have to answer any one full question out of the two from module II.

Question 5. (20 Marks) – Drawing: Candidates have to answer any one full question out of the two from module III.

Course outcome:

Upon completion of the course, the student of architecture shall have acquired knowledge in wall and floor construction. The student shall acquire knowledge in both conventional as well as vernacular building practices.

13AR1403 HISTORY OF ARCHITECTURE III

Teaching Scheme: 2(L) - 0(T) - 0(P)

Credits: 2

Course Objective:

- To introduce to the students the world architectural scenario from around 1200 AD to around 1850 AD.
- To induce an appreciation to the importance of history of architecture and its relationship to the development of any place.
- To develop awareness about the precious architectural past we had and how to build our future based on that tradition, wisdom and technical knowledge.

Module – I

Gothic Architecture: Evolution of structural systems in Gothic Architecture; Arches, vaults, flying buttress, pinnacles etc. (*Example:* York Minister Cathedral, England and Notre Dame, Paris).

Renaissance Architecture: Introduction, Evolution and Characteristics. (*Example:* Works of Michael Angelo, St. Peters, Rome. Works of Bramante, Florence)

Baroque Architecture: (*Example:* Works of Bernini)

Rococo Architecture: (*Example:* Basilica at Ottobeuren, Germany)

Palladian Architecture: (*Example:* The Rotunda, University of Virginia and Palladian Window).

Module – II

Islamic Architecture in India: Tughlaq Dynasty (*Example:* Tomb of Ghias-Ud-din & Khirki Masjid).

Sayyid & Lodi Dynasty (*Example:* One Octagonal & Square tomb).

Mugal Architecture (*Example:* Taj Mahal & Fatehpur Sikri).

Provincial Islamic Styles - Gujarat (*Example:* Teen Darwaza & Stepped Well, Adalaj), Bijapur (*Example:* Golgumbaz) Malwa (*Example:* Hindola Mahal), Deccan (*Example:* Charminar at Hyderabad).

Module – III

Colonial Phases in India : French Colonial Architecture in India: The styles and trends of architecture brought by French to India; their evolution and Impact on Indian Architecture. (*Example:* Puducherry, Mahe Tanjavoor French Fort, etc.).

Portuguese colonial architecture in India. The styles and trends of architecture brought by Portuguese to India, their evolution and Impact on Indian architecture. Characteristics of Portuguese Colonial Architecture (*Example: Bom Jesus Cathedral, Goa and St. Francis Church, Cochin*).

Module – IV

Kerala Architecture: Residential architecture: Residential Typologies (Nalukettu, Ettukettu, etc.) Palaces (*Example: Padmanabhapuram Palace*).

Religious architecture: Hindu Temples, Churches and Mosques. Evolution of religious architectural forms (*Example: Hindu: Vadakkumnathan temple at Thrissur. Christian: St. Mary's Church at Kallooppa, Muslim: Miskal Masjid at Kozhikode*).

Cultural Architecture (*Example: Koothambalam of Vadakkunnathan Temple, Kottu-pura at St. Mary's Church, Kuravilangad*).

References:

1. Fletcher B. and D. Cruickshank [Ed.], *Sir Banister Fletcher's a History of Architecture*, Architectural Press, 1996.
2. Grodecki L., *Gothic Architecture*, Rizzoli, 1991.
3. *History of World Architecture (Series), Vols: Ancient Architecture, Primitive Architecture, Greek Architecture, Roman Architecture and Byzantine Architecture*, Faber and Faber, London, 1988.
4. *Builders of Ancient World: Marvels of Engineering*, A National Geographic Society Publication, 1986.
5. Michael R., *Architecture of the Western World*, Popular Press, England, 1988.

Internal Continuous Assessment (Maximum Marks - 50) (Group 2 Subject)

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, quiz, seminar, term-project, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours

Maximum Total Marks: 100

The question paper shall consist of Two Parts

Part A (40 marks) - Eight Short answer questions of 5 marks each. All questions are compulsory. There should be two questions from each module.

Part B (60 Marks) – Two Questions from each module. Candidates have to answer any one full question out of the two from each module. Each question carries 15 marks.

Course Outcome:

Knowledge about the history of a culture, its building art and construction techniques helps an architecture student to develop designs that are rooted in the country. Upon completion of the course, the student will be able to develop a keen appreciation of our heritage buildings leading to the understanding that architecture is the product of a particular culture, time and place.

13AR1404 LANDSCAPE ARCHITECTURE

Teaching Scheme: 1(L) - 0(T) - 3(P)

Credits: 4

Course Objective:

- *To know the various approaches to Landscape Architecture from history.*
- *Evolving understanding of the site and its context.*
- *Creation and design of open space structure on the site and achieving aesthetic, functional and environmental goals.*

Module – I

Introduction to Landscape Architecture: Scope, Difference between Landscape Design and Building Design, Significance of Time in Landscape Design

Landscape Development in historical perspective:

Gardens of Ancient World- Babylon, Egypt, Persia, Greece, Rome;

Islamic tradition, Mughal in India. Renaissance, English;

Industrialization, Parks movement in America;

Indian, Japanese, and Chinese Landscapes and Contemporary movements.

Module – II

Elements of Landscape: Major and Minor Elements, Natural and Manmade elements, Tangible and Intangible elements; Landform, Water, Plants and Built Elements.

Understanding Visual (color, form, texture) and Non visual (smell, touch, sound) characteristics.

Principles of Landscape Design: Scale, Proportion, Unity, Rhythm, Harmony, Balance, Contrast. Angle of Vision and approach.

Module – III

Principles of Site Planning: Selection of site, Site analysis, Microclimate, Topography, Hydrology, Functional suitability of site, Movement of Pedestrian and Vehicles, Parking etc.

Landscape Construction: Cutting and Filling, Grading, Retaining walls, fencing, steps, ramps, decks, gates, pergola, pools, ponds, fountains, sculptures etc.

Landscape Services: Lighting, Garden lighting, Avenue lighting; Surface Water Drainage and Irrigation systems; Underwater construction, Issues in riverbank and Coastal Constructions; Terrace gardens, terrace pools, Rock gardens.

Module – IV

Study of Plant Materials: trees, shrubs, ground cover, climbers, physical characteristics and habit; Plant selection criteria - Functional, visual, ecological and microclimatic aspects.

Horticulture: planting and transplanting, planting techniques, techniques of propagation, cutting, pruning, grafting etc. Lawns, preparation and maintenance; Hydroponics, Bonsai

Indoor landscaping: Functions and behavior of indoor plants, light, air and water requirements, plant materials, Potting and Repotting, Raising of Indoor Plants.

References:

1. Appleton J., *The Experience of Landscape*, John Wiley & Sons, 1996.
2. Bose T. K. and K. Choudhary, *Tropical Garden Plants in Colour*, Horticulture and Allied Publishers, 1991.
3. Dee C., *Form and Fabric in Landscape Architecture: A visual introduction*, Taylor& Francis, 2001.
4. Eckbo G., *Urban Landscape Design*, McGraw Hill, 1964.
5. Gopalswamiengar, K. S., *Complete Gardening in India*, 4/e, Gopalswamy Parthasarathy, 1991.
6. Jellicoe G., and S. Jellicoe, *The Landscape of Man*, Thames and Hudson, 1991.
7. Kanvinde A. and H. James Miller, *Campus Design in India: Experience of a Developing Nation*, Jostens/American Yearbook Co., 1969.
8. Kaplan R., R. L. Ryan and S. Kaplan, *With People in Mind – Design and Management of Everyday Nature*, Island Press, 1998.
9. Laurie M., *An Introduction to Landscape Architecture*, Elsevier, 1975.
10. Lyall S., *Designing the New Landscape*, Thames & Hudson, 1998.
11. Lynch, K. and G. Hack, *Site Planning*, 3/e, The MIT Press, 1984.
12. McHarg I., *Design with Nature*, John Wiley, 1978.
13. Motloch J. L., *Introduction to Landscape Design*, John Wiley and Sons, 2001.
14. Randhawa M.S., *Flowering Trees*, National Book Trust, 1998.
15. Rutledge, A. J., *Anatomy of a Park*, McGraw Hill, 1971.
16. Simonds J. O., *Landscape Architecture: The Shaping of Man's Natural Environment*, McGraw Hill, 1961.
17. Thompson I. H., *Ecology, Community and Delight: Sources of Values in Landscape Architecture*, E & FN Spon, 2000.
18. Williams S., *Outdoor Recreation and the Urban Environment*, Routledge, 1995.

Internal Continuous Assessment (*Maximum Marks - 100*) (*Group 1 Subject*)

20% - Tests (minimum 2)

70% - Class work

10% - Regularity in the class

University Examination Pattern:

Examination duration: 4 hours

Maximum Total Marks: 100

The question paper shall consist of 3 parts.

Part A:

Question 1. (40 marks) - Eight Short answer questions of 5 marks each. All questions are compulsory. There should be two questions from each module.

Part B:

Questions 2 to 5. (40 marks)

Two Questions from each module. Candidates have to answer any one full question out of the two from each module. Each question carries 10 marks.

Part C:

Question 6. (20 Marks) – Drawing: Two questions for 20 marks each on Landscape Design and detailing. Candidates have to answer any one full question out of the two.

Course Outcome:

Students should be able to do site analysis and landscape design of building sites, campuses etc. considering environmental, functional and aesthetic aspects.

13AR1405 ARCHITECTURAL ACOUSTICS

Teaching Scheme: 2(L) - 1(T) - 0(P)

Credits: 3

Course Objectives:

- *To familiarize the students with nature and propagation of sound.*
- *To understand the impact of sound on human beings in built as well as un-built spaces and methods to control them.*
- *To understand prevailing standards, materials and methods related to the above and their application.*

Module – I

Nature and propagation of sound: The nature of sound. Propagation of sound. Properties of sound - velocity, frequency, wavelength of sound, sound pressure, sound intensity and loudness. Units for measuring sound.

The human ear and hearing characteristics. Audibility.

Discussion: Noise and human behaviour.

Module – II

Behaviour of Sound: Room acoustics. Behaviour of sound in enclosures - sound reflection, diffusion and Diffraction. Sound absorption and sound absorption coefficient. Reverberation and reverberation time. Calculation of reverberation time. Sabine's formula. Acoustical defects in the enclosed spaces.

Discussion: Changes in the acoustic quality of rooms according to room characteristics.

Exercise: Calculation of absorption coefficient and reverberation time.

Module – III

Study of Noise: What is noise? Sources of noise. Air borne and structure borne sound transmission. Noise criteria. Transmission loss. Permissible noise levels for different types of building. Noise control in specific buildings like Auditoriums and lecture halls.

Discussion: Sound pollution as an issue which needs to be addressed.

Module – IV

Acoustical treatment of spaces: Sound absorptive materials and construction - porous material, membrane absorbers, cavity Resonators, space absorbers, variable absorbers - their absorptive characteristics. Mounting and distribution of absorptive materials . Application of absorptive materials in different types of rooms such as auditoriums, music halls, recording studios and lecture halls.

Discussion: Natural light, natural ventilation and acoustics- how we can achieve in enclosed spaces.

Exercise: Study of acoustical properties of enclosed spaces of Kerala traditional buildings.

Market survey of various materials used for acoustical treatments.

References:

1. Kinsler L. E. and A. R. Frey, *Fundamental of Acoustics*, 4/e, John Wiley & Sons, 2000.
2. Knudsen V. O. and C. M. Harris, *Acoustical Designing in Architecture*, Wiley, 1963.
3. Templeton D., *Acoustics in the Built Environment*, 2/e, Architectural Press, 1997.
4. Acentech and J. P. Cowan, *Architectural Acoustics Design Guide*, McGraw Hill, 2000.
5. Cavanaugh W. J., G. C. Tocci and J. A. Wilkes, *Architectural Acoustics: Principles and Practice*, John Wiley & Sons, 2000.

Internal Continuous Assessment (Maximum Marks - 50) (Group 2 Subject)

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, quiz, seminar, term-project, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours

Maximum Total Marks: 100

The question paper shall consist of Two Parts

Part A (40 marks) - Eight Short answer questions of 5 marks each. All questions are compulsory. There should be two questions from each module.

Part B (60 Marks) – Two Questions from each module. Candidates have to answer any one full question out of the two from each module. Each question carries 15 marks.

Course Outcome:

At the end of the course the student shall be able to understand how the planning and designing of spaces with good acoustics can be done.

13AR1406 ESTIMATION AND SPECIFICATION

Teaching Scheme: 2(L) - 0(T) - 0(P)

Credits: 2

Course Objective:

- *To introduce the study of building materials and methods for working out their quantity.*
- *To understand the factors like transportation and labour, and their relationship with cost.*
- *To familiarize the students with market rates of building materials.*
- *To understand prevailing BIS specifications.*

Module – I

Specifications-Importance, objectives, types.

Principles of specification writing, BIS specifications, Kerala standard specifications.

Module – II

Specifications for materials - Coarse aggregates, bricks, cement and sand

Specifications for clearing, dismantling and demolition, excavation and earthwork, mortars, concrete work, masonry work, stonework, wood work, iron and steel work, flooring, roofing and finishing work.

Module – III

Estimating - Units of measurement of various items of work - Mode of measurement.

Methods of estimating.

Exercise to write down the detailed estimate to find out the quantity of various items of work of different types of structures-tiled roof, load bearing and framed structures.

Module – IV

Schedule of rates for labour and materials, rate analysis, standard data for items, bills of quantities and estimated cost.

Introduction to computer applications in estimation.

References:-

1. *CPWD Specifications*, Vol. I&II, Director General of Works, CPWD, Government of India, 2009.
2. *Latest Standard Data Book and Schedule of Rates*, Kerala PWD, Govt of Kerala.

3. *IS 1200: Methods of Measurement of Building and Civil Engineering works (Part 1 to 28)*, BIS, New Delhi.
4. Dutta B. N., *Estimating and Costing in Civil Engineering*, USB publishers and Distributers Ltd., New Delhi, 2008.
5. Chakraborti M, *Estimating Costing Specification and Valuation in Civil Engineering*, 24/e, Chakraborti, 2012.

Internal Continuous Assessment (Maximum Marks - 50) (Group 2 Subject)

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, quiz, seminar, term-project, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours

Maximum Total Marks: 100

The question paper shall consist of Two Parts

Part A (40 marks) - Eight Short answer questions of 5 marks each. All questions are compulsory. There should be two questions from each module.

Part B (60 Marks) – Two Questions from each module. Candidates have to answer any one full question out of the two from each module. Each question carries 15 marks.

Course Outcome:

Upon completion of the course, the student of architecture shall have acquired enough knowledge about the cost of constructing a building.

13AR1407 BUILDING SERVICES - I (PLUMBING AND SANITATION)

Teaching Scheme: 2(L) - 0(T) - 0(P)

Credits: 2

Course Objective :

- *Identify the different sources of water supply, its preservation and conservation.*
- *List and identify water distribution components and networks.*
- *List and identify sanitation systems in India and their functioning process.*
- *To understand the design of Plumbing systems with specifications for buildings.*

Module – I

Water Supply: Sources of water supply, standards of purity and treatment of water, qualities of potable water. Domestic water demand, capacity of over head tanks and calculation of water consumption.

Domestic water piping systems: Water distribution networks. Cold and hot water distribution within the building. Specifications and sketches of various plumbing fittings for buildings. Uses of valves, taps, and their different types. Definitions and related terms, plumbing systems (one pipe, two pipe; etc). House/service connection. Layout of water supply lines in a domestic house.

Discussion: Concepts of water management-water efficiency and water conservation.

Exercise: Preparation of sample layout of water supply lines in a domestic house.

Module – II

Sanitation: Basic principles of sanitation and disposal of waste matter from building. Brief description of various systems of sewage disposal and their principles. Details of a Septic tank and capacity calculation.

Sewer System: Quantity of sewage and storm water, infiltration, runoff calculation, Manning's formulae, partial flow diagram. Design of Sewers, shapes of sewers, factors affecting the design of sewers. Materials, bend, pipe joints used in sewer systems.

Discussion: Rain water harvesting a need to address water crisis.

Module – III

Sewer appurtenances: Manholes, Sub drains, culverts, ditches and gutters, drop inlets and catch basins roads and pavements, storm overflow/regulators. Intercepting chambers, inspection chambers and their proper location and ventilation of sewers. Laying and testing of sewer. Gradient used in laying of drains and sewers, and respective sizes.

Sewage treatment: The process of self purification and disposal of sewage from isolated building (septic tank, imhoff tank, soak pit etc.), sewage breakdown.

Discussion: Waste water recycling-an effective system for water conservation

Module – IV

Plumbing House drainage system and sanitary appliances and traps.

Design considerations on drainage scheme: Preparation of plan, Planning of bathrooms, lavatory blocks and kitchen in domestic and multi-storeyed buildings. Indian standards for sanitary convenience. Model bye laws regarding sanitation of buildings.

Discussion: Plumbing, sanitation and hygiene.

Exercise: Preparation of sample layout of toilets, kitchen etc. Site visits to understand the basic concepts.

References:-

1. Punmia B. C., A. K. Jain and A. K Jain, *Water Supply Engineering*, Laxmi Publications Pvt. Ltd., 1995.
2. Punmia B. C., A. K. Jain and A. K Jain, *Waste Water Engineering*, Laxmi Publications Pvt. Ltd., 1998.
3. Rangwala S. C., *Water Supply and Sanitary Engineering*, Charotar Publishing House, 1989.
4. Shah C.S., *Water Supply and Sanitation*, Galgotia Publishing Co., 1998.
5. *Manual on Water Supply and Treatment*, 3/e, Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, New Delhi, 1999.
6. *National Building Code of India (SP 7:2005)*, BIS, New Delhi, 2005.
7. *Kerala Municipal Building Rules*, LSGD, Govt. of Kerala, 2013.
8. Garg S. K., *Water Supply Sanitary Engineering*, Khanna Publishers, 2010.
9. Duggal K. N., *Elements of Public Health Engineering*, S Chand, 1983.
10. Husain S. K., *Water Supply and Sanitary Engineering*, Oxford and IBH Publications, 1981.

Internal Continuous Assessment (Maximum Marks - 50) (Group 2 Subject)

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, quiz, seminar, term-project, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours

Maximum Total Marks: 100

The question paper shall consist of Two Parts

Part A (40 marks) - Eight Short answer questions of 5 marks each. All questions are compulsory. There should be two questions from each module.

Part B (60 Marks) – Two Questions from each module. Candidates have to answer any one full question out of the two from each module. Each question carries 15 marks.

Course Outcome:

Upon completion of the course, the student of architecture shall have acquired enough knowledge about the plumbing and sanitation of a building.

13AR1408 STRUCTURAL DESIGN III

Teaching Scheme: 2(L) - 0(T) - 0(P)

Credits: 2

Course Objective :

- *To bring about awareness of the importance of structural analysis and behaviour of structural elements in buildings.*
- *To familiarize the student with the techniques of analysing structures.*

Module – I

Analysis of statically indeterminate beams (propped cantilever and fixed beams) - consistent deformation method.

Module – II

Analysis of continuous beam by theorem of three moments and slope deflection methods.

Module – III

Analysis of continuous beam by moment distribution method. Shear Force and bending moment diagram and discussion of elastic curves for various loading conditions.

Module – IV

Analysis of simple portal frames with or without sway by moment distribution method, Shear force diagram, bending moment diagram, Kani's method (beams and simple frames)

References:-

1. Junnarkar S. B. and H. J. Shah, *Mechanics of Structures, Vol – II, 23/e*, Charotar Publishing House, 2013.
2. Punmia B. C., A. K. Jain and A. K Jain, *Theory of Structures (SMTS- II)*, Laxmi Publications Pvt. Ltd., 2004.
3. Ramamrutham S. And R. Narayan, *Theory of Structures*, Dhanpat Rai Publishing Co., 2012.

Internal Continuous Assessment (Maximum Marks - 50) (Group 2 Subject)

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, quiz, seminar, term-project, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours

Maximum Total Marks: 100

The question paper shall consist of Two Parts

Part A (40 marks) - Eight Short answer questions of 5 marks each. All questions are compulsory. There should be two questions from each module.

Part B (60 Marks) – Two Questions from each module. Candidates have to answer any one full question out of the two from each module. Each question carries 15 marks.

Course Outcome:

Upon completion of the course, the student shall have developed a basic awareness of the structural behaviour in context of Architecture and Planning, and shall have developed the necessary knowledge and skills required to evaluate the forces developed in the structural elements from external loads.