

Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal  
BACHELOR OF ARCHITECTURE

IV Semester (CBGS) For batches admitted in July,19 (w.e.f. July, 2019)

S. N o.	Subject Code	Subject Name	Catego ry	Maximum Marks Allotted					Total Mark s	CT HR S.	Periods			Total Credits	
				Theory Slot			Practical Slot				Contact per week	L	T		P
				End Sem .	Mid Se m.	Quiz/ Assignme nt	End Sem .	Lab work & Session al							
1.	AR221	Architectural Design – IV	DC- 9	100	30	20	50	50	250	7	2	3	2(1.5)	8	

**PURPOSE:** Analyze the housing typology, the locally available materials & craftsmanship and the integration of landscape with the built environment.

**COURSE OUTCOME:-**

After completion of this course student will be able to-

1. Study the settlement lay out in villages, the rural occupations & life style,
2. Analyze the housing typology, the locally available materials & craftsmanship and the integration of landscape with the built environment.
3. Workshops on building with rammed earth, adobe, compressed stabilized earth blocks, bamboo and other cost effective technologies help the student to explore rural housing solutions.
4. Explore concepts an agglomeration of simple spaces with particular emphasis on the special needs of elderly, handicapped etc
5. Apply bio climatic approach to design and develop the design of buildings in response to climate

**PROJECT 1: VILLAGE SURVEY & RURAL HOUSING**

Study of the physical, socio economic and cultural aspects of a selected village by conducting various surveys to understand the settlement pattern, housing stock and amenities that are existing or required – To understand the linkages between Occupation, Social structure and Religious beliefs and its physical manifestation in the form of the settlement – Identification of a suitable Design intervention that would improve the quality of life – Ex. Design of housing prototypes for a particular community / occupation using rural building materials & cost effective technology. Design exercise may include the design of any facility required such as Primary health center / Community hall / Farm training center etc.

**PROJECT 2: DESIGN OF COMMUNITY FACILITIES**

**Community facilities** –Design of Community hall, Nursing home, Youth hostel, Old age home etc., encourage the student to explore concepts an agglomeration of simple spaces with particular emphasis on the special needs of elderly, handicapped etc. It also focuses on the bioclimatic approach to the design of the building envelope i.e. articulation of openings, choice of materials for roof & walls of different orientations etc. Concepts integrating the use of passive, active & hybrid solar technologies with the design proposals are encouraged.

**PROJECT 3 & 4: Time bound Problems of 6 hours to 48 hours.**

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**REFERENCES:**

1. Time saver standards for building types, DeChiara and Callender, McGrawhillcompany.
2. Neufert Architect's data, BousmahaBaiche& Nicholas Walliman, Blackwell science ltd.
3. National Building Code – ISI.
4. Time saver standards for landscape architecture – Charles W Harris – McGraw Hill.
5. New Metric Handbook – Patricia Tutt and David Adler – The Architectural Press.

**Note :** Design exercises that explore Architecture as responding to Social issues such as community, culture, religion, politics etc. Students familiarize themselves with designing for special groups such as the villagers, elderly, and the handicapped.

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2.	AR222	Building Construction -IV	BSAE-10	50	30	20	20	30	150	5	2	1	2(1.5)	6

**COURSE OUTCOME:-**

After completion of this course student will be able to-

1. Understand about Execution of building component ( R.C.C) with their constructional details and presentation of working.
2. Understand the importance ,function and joinery details of formwork.
3. Analyze the properties of material used in R.C.C.

**Course content:**

unit1. R.C.C Beams: Simply supported, continuous, cantilever L& T beams, lintels & chajjas, details at odd junctions.

UNIT 2. R.C.C Slabs: One way, and continuous, two way slab, flat slab, waffle slab, R.C.C covered pathways, reinforced brick slab.

UNIT 3. R.C.C Foundation: RCC column footings and setting out plan.

UNIT 4. R.C.C Staircases & Ramps: Types of staircases, detail of RCC dog leg staircase, RCC ramps.

UNIT 5. Timber & steel form work for various RCC building components.

**Note:** i) There should be regular site visits to buildings under construction or constructed to explain the above topics.

Use of audio-visuals should be stressed.

- ii) Minimum 8 sheets shall be prepared out of which two may be in sketch form (scaled).

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3.	AR223	Building Services-I (Water & Sanitation)	BSAE-11	50	30	20	-	-	100	3	2	1	-	3

**COURSE OUTCOME:-**

After completion of this course student will be able to-

1. Identify the different sources of water, list them and describe the method of intake and water purification
2. List and identify water distribution components and networks and sanitation systems in India and their functioning process.
3. Design Plumbing layout and draw plumbing working drawings with specifications for buildings. To Study Water supply, treatments and plumbing system for all type of buildings.
4. List and identify waste water management systems and the drainage for various building typology and understand solid waste management systems with respect to urban and rural set up.
5. Apply of all the above systems to Buildings, Small Campus and a Residential neighborhood.
6. Produce plumbing and fire fighting layouts for various building typology

**UNIT-1 WATER SUPPLY**

Sources of water supply – Water Quality - Water requirements for different types of buildings and for town, simple method of removal of impurities, Rainwater harvesting to include roof top harvesting, type of spouts, sizes of rainwater pipes and typical detail of a water harvesting pit. System of supply - continuous and intermittent supply, sump, overhead tanks, pumps, distribution pipes, cold water and hot water supply for single and multi-storied buildings. Pipes sizes, types – GI, CPVC, Copper, Cast Iron (CI) Pipes, Steel Pipes, Asbestos Cement (AC) Pipe, Concrete Pipes fittings, valves, and types of taps.

**UNIT-2 DRAINAGE AND SEWAGE DISPOSAL**

Recycling/Reuse of Wastewater, Systems of drainage – separate, combined and partially separate system, surface drainage, sizes and construction, system of plumbing - single stack , one pipe system, one pipe partially ventilating system and two pipe system.

House drainage – principles, traps-floor trap, multi-trap, gully trap, grease and oil trap, Anti Siphonage pipe, Types of fixtures and materials, Arrangements of fixtures in a bathroom. Design of Septic tank, Treatment and disposal of septic tank effluents – Design of soak pit and dispersion trench, Biological filter, up flow anaerobic reactors

Sewage treatment technologies: Activated sludge process, Membrane bioreactors, packaged treatment plants, Root zone treatment system, Decentralized Wastewater Treatment Systems (DEWATS), Soil Bio technology

### **UNIT-3 SOLID WASTE DISPOSAL**

Solid waste management: Generation of Solid waste, Collection & Transportation of solid waste to the secondary/ locality storage/community bins, Storage of solid waste at locality level, Transport of solid waste to dumping sites and treatment plants, Treatment and Dumping of Solid Waste, Methods of Disposal of solid waste

Approaches to Solid Waste Management: Waste minimization / reduction at source, recycling, waste processing (with recovery of resources and energy), waste transformation (without recovery of resources) and disposal on land.

### **UNIT-4 EMERGING PROCESSING TECHNOLOGIES**

Emerging processing technologies : Vermicomposting, Biogas from MSW, Pyrolysis (including plasma arc technology), refuse derived fuel, Bio reactor landfill - Biomethanation plant at koyambedu, wholesale vegetable market Chennai, Door-to-door collection, transportation and waste processing services by Exnora Green pammal.

### **UNIT-5 PLUMBING LAYOUT OF SIMPLE BUILDINGS**

Designing of toilet blocks in residential and public buildings, showing complete details of fittings and plumbing required for water supply and drainage.

Designing and preparing a complete water supply and drainage layout of an academic Architectural design project, with all required calculations.

### **REFERENCES:**

1. [Birdie G. S](#) and [Birdie J. S](#) Water Supply & Sanitary Engineering, Dhanpat Rai Publishing Company (p) Ltd (2010)
2. Sanitary Engineering by R S Deshpande
3. S. K. Garg , Water Supply Engineering: Environmental Engineering v. khanna publishers 2010
4. Charangith shah, Water supply and sanitary engineering, Galgotia publishers.
5. Kamala & DL Kanth Rao, Environmental Engineering, Tata McGraw – Hill publishing company Limited.
6. Technical teachers Training Institute (Madras), Environmental Engineering, Tata McGraw Hill publishing Company Limited.
7. M. David Egan, Concepts in Building Fire Safety.
8. V.K. Jain, Fire Safety in Building 43
9. National Building Code 2005.
10. Toolkit for Solid Waste Management, Jawaharlal Nehru National Urban Renewal Mission, November 2012, Ministry of Urban Development Government of India.

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4.	AR224	History of Architecture -III	DC- 10	50	30	20	-	50	150	4	1	1	2	3

**COURSE OUTCOME:-**

1. Acquire basic concepts regarding the historical and architectural development in ancient India as this is an integrated expression of art, culture, vernacular material and techniques of the place.
2. Understand the diverse artistic and architectural expressions with regard to the historical context in which they are developed.
3. Utilize visual and verbal vocabularies of Indian Architecture
4. Develop a critical view towards development and expression of Indian architecture, and Value the different architectural developments in ancient India.
5. Analyze the diversity of imperial Indian Temple Architecture, Indian Mosques, Tombs, Forts, Cities, etc. including the buildings viewed as architectural masterpieces, and their urban settings.
6. Develop an appreciation of our varied culture and the resulting architectural productions which are unique in time and place & suitable to the lifestyle of its people.

**UNIT-1 EVOLUTION OF HINDU TEMPLE ARCHITECTURE:**

Hindu forms of worship – evolution of temple form - meaning, symbolism, ritual and social importance of temple - categories of temple - elements of temple architecture - early shrines of the Gupta and Chalukyan periods Tigawa temple - Ladh Khan and Durga temple, Aihole - Papanatha, Virupaksha temples, Pattadakal- Kailasanatha temple, Ellora.

**UNIT-2 NORTHERN INDIAN TEMPLES:**

Temple architecture of Gujarat, Orissa, Madhya Pradesh and Rajasthan - their salient features

Lingaraja Temple, Bhubaneswar - Sun temple, Konark. – Somnath temple, Gujarat, Surya kund, Modhera, Khajuraho, Madhya Pradesh - Dilwara temple, Mt. Abu

**UNIT-3 DRAVIDIAN STYLE TEMPLES:**

Brief history of South India - relation between Bhakti period and temple architecture - of temple towns - Dravidian Order - evolution and form of Gopuram Rock cut productions under Pallavas . Dravidian style – Definition / explanation of Mandapas & Rathas. Masonry temples & Rock cut architecture of Pallavas - Shore temple and five rathas at Mahabalipuram and Kailasanathar temple at Kanchipuram - Dravidian Orders – evolution of Dravidian orders under pallavas, chola's and

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pandya's. Example of Chola style - Brihadeeswara temple at Tanjore - Evolution of Gopuram & temple complexes – Example of Pandyan style - Meenakshiamman temple, Madurai, temple towns: Madurai, Srirangam and Kanchipuram Hoysala architecture: Belur and Halebid.

#### **UNIT – 4 INDO ARYAN ARCHITECTURE**

Classification of Indo-Aryan temples, Salient features of an Indo Aryan Temple - Examples of Orissa style - Lingaraja temple at Bhubaneswar & Sun temple at Konark - Example of Madhya style - Kandariya Mahadev temple at Khajuraho - Example of Gujarat style - Surya Temple at Modhera.

#### **UNIT-5 ISLAMIC AND MUGHAL ARCHITECTURE**

Introduction to Islamic culture worldwide, Classification of Islamic architecture in Indian, religious and secular typologies of Islamic architecture, Features of an Indian mosque, concept of squinch arches, and its variation. Examples under imperial style - Qutub Complex, Qutubminar and Alai Darwaza at Delhi - Tomb of Ghiasuddin Tughlaq, Lodi garden at Delhi. Characteristics of the provincial styles in different regions through examples - Punjab style - Tomb of Shah Rukni Alam - Bengal style - Chotasona masjid at Gaur - Gujarat style - Jami masjid at Ahmadabad - Deccan style – Golgumbaz at Bijapur and Charminar at Hyderabad. Characteristics of Mughul architecture, planning, dome construction, materials. Development of the Mughal style under different rulers - Humayun- Humayuns Tomb at Delhi, Akbar- examples - Fatehpur Sikhrī (planning, Buland Darwaza, Diwan-i-Khas, Tomb of Salim Chisti ) and Akbars Tomb at Sikandara. Shahjahan - examples - The Taj Mahal, at Agra - Red Fort at Delhi (Diwan-i-Aam, Diwan-i-Khas, Mumtaz Mahal and Rang Mahal).

#### **REFERENCES:**

1. Percy Brown, Indian Architecture (Islamic Period) - Taraporevala and Sons, Bombay, 1983
2. Satish Grover, The Architecture of India (Buddhist and Hindu period), Vikas Publishing House, New Delhi, 1981
3. Satish Grover, The Architecture of India (Islamic) Vikas Publishing House Pvt. Ltd., New Delhi, 1981.
4. Christopher Tadgell, The History of Architecture in India, Longman Group, U.K. Ltd., London, 1990
5. A. Volwachen, Living Architecture - India (Buddhist and Hindu), Oxford and IBM, London, 1969.
6. George Mitchell, Monuments of India, Vol I, Buddhist, Jain, Hindu; Penguin books, 1990
7. Gateway to Indian Architecture, Guruswamy Vaidyanathan, Edifice Publication, 2003
8. Architecture of the Islamic World - George Michell - (its history and social meaning), Thames and Hudson, London, 1978.
9. Islamic Architecture, Form, Function and Meaning, Robert Hillenbrand, Edinburgh University Press, 1994

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5.	AR225	Ecology & Environmental Science in Architecture	PE- 1	50	30	20	-	-	100	3	2	1	-	3

**Subject Objective:** To introduce the basics of environmental science and its relevance to mankind, the built envelop around.

**UNIT 1: Introduction.**

Structure and Function: Introduction to ecology, its importance in daily life.. Fundamental concepts of ecology. Ecology – Environment relationship.

**UNIT 2: Bio-diversity and its conservation**

Value of bio-diversity - consumptive and productive use, social, ethical, aesthetic and option values. Bio- geographical classification of India – India as a mega diversity habitat. Threats to biodiversity-Hotspots, habitat loss, poaching of wildlife, loss of species, seeds etc. Conservation of bio-diversity, in-situ and ex-situ conservation.

**UNIT 3: Environmental impacts**

Environmental impacts of Industrial activities, urbanization, de-forestation, mining and similar incursions on nature for technological progress. The ecological crisis. Relevant case studies from abroad and India

**UNIT 4: Social issues and Environment**

Social issues and the environment, from unsustainable to sustainable development, urban problems related to energy; human population and environment- population explosion, resource exploitation and depletion, human-wild conflict, loss of wet lands, mangroves, increasing desert areas, spread of diseases.

**UNIT 5: Institutions and Governance**

Introduction to Government regulations, Monitoring and enforcement of environmental regulations, Introduction to Environmental Acts, viz., Water (Prevention and Control of Pollution) Act, Air Prevention and Control of pollution act, Environmental Protection Act, Wild life protection Act, Forest Conservation Act, etc.

Note: Sessional shall be prepared in the form of notes etc. as per above topics

**LIST OF TEXT AND REFERENCE BOOKS:**

1. Fundamentals of Ecology by E.P. Odum
2. The Ecology of Man: An Ecosystem Approach by Robert Leo Smith
3. Introduction to Ecology by Kurmundi
4. Review Our Dying Planet by Sarala Devi
5. Modern Concepts of Ecology by H.D. Kumar
6. Environmental Biology by Agrawal, K.C.(2001).
7. Environmental Studies New Delhi: Tata Mc Graw Hill by Benny, J.(2005).
8. Text book of Environmental Studies by Bharucha, E (2005).
9. Hazardous waste incineration. New Delhi: McGraw Hill by Brunner, R.C. (1989)
10. Basics of Environment and Ecology by Kaushik A and Kaushik ,C.P.2010



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6.	AR226	Structure –IV ( R.C.C)	BSAE-12	50	30	20	-	-	100	3	2	1	-	3

**COURSE OUTCOME:-**

After completion of this course student will be able to-

1. Illustrate the preparation of concrete, construction methods, special concrete and concreting methods, the properties and use of architectural glass
2. Apply the special types of Door Window detailing in building application
3. gain knowledge of material properties and construction techniques of Glass, concrete, RCC and special concreting methods and appropriate material and technology.

Study the advanced construction systems developed by research organizations in India.

UNIT 1: Introduction to R.C.C., Working Stress method, Limit State method.

UNIT 2: Design of Beams :- analysis of beams, design of singly, doubly reinforced beam, T-beam, L-beam, (cantilever and simply supported ) lintel, chhajjas

UNIT 3: Design of Slabs :- analysis of slabs, design of One way, Two way, Continuous, Cantilever Slabs (simply supported and continuous)

UNIT 4: Design of Columns:- axially loaded, columns with Uni-axial and Bi-axial bending

UNIT 5: Design of Staircases :- dog-legged, and open well only

**Note:** Sessional work should include the analysis of simple elements along with the drawings.

**LIST OF TEXT AND REFERENCE BOOKS:**

1. RAMAMURTHAN, "Theory of Structures", Dhanpat Rai & Sons.
2. DR. B.C. PUNAMIA, "Strength of Materials & Theory of Structure Vol.2", Laxmi Pub.
3. JINDAL, "Indeterminate Structure".
4. SOLOMAN, "R.C.C. Vol.I", CBS Publishers.
5. SUSHIL KUMAR, "Treasure of R.C.C"