

## SECOND YEAR (4<sup>TH</sup> SEMESTER)

### 2RARC401: ARCHITECTURAL DESIGN - IV

	SUBJECT CODE	SUBJECT NAME	L	T	P/S	Evaluation				Contact Hours	Credits
YR		FOURTH SEMESTER				In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks		
SECOND	2RARC401	ARCHITECTURAL DESIGN – IV	1	0	8	100	50	50	200	9	8

#### OBJECTIVES:

- To understand and, to apply the principles of architectural composition (organized physical structure) in design.
- Use of appropriate presentation techniques to explain the contents of design.
- Developing drawing, graphic and model making and oral presentation skills.

#### CONTENTS:

**Understanding relationship of human scale, activity, space and form in mono-functional buildings:** Suggested studio exercises: Creative design of simple buildings such as Community halls, Restaurants, College Canteens, Reading rooms etc.

#### **Functional, geometric and visual order of respective**

**units:** Suggested studio Exercises: Design of buildings having primarily horizontal circulation and repetitive units such as nursery and primary schools. Motels , way-side tourist arcades and kiosks.

**Note:** The studio exercises in addition to the above should also have at least one time problem as a preparation for the examination.

#### APPROACH:

- Lectures with slide and field visits on similar design. Models to supplement each stage of development of design for greater understanding of Stress on working in the studios and referencing in Library.

**Note:** The subject will be taught by at least one teacher, for every 20 students

#### NOTE FOR CONDUCT OF EXAMINATIONS:

- The duration of Examination for this subject is 6x2 =12 hours .The examination shall be held over two days. The drawings completed on the first day shall be left in the examination hall and shall be completed and submitted on the second day.

#### References:

1. Ching, Francis D. K. (2007). *Architecture: Form, Space and Order*, John Wiley and Sons Inc., 3<sup>rd</sup> Edition, New Jersey, Canada, ISBN 978-0-471-75216-5
2. Lidwell, William, Holden, Kestina, Butler, Jill, “Universal Principles of Design”, Rockport – Publications, Massachussets.

## 2RARC402: BUILDING CONSTRUCTION & MATERIALS- IV

	SUBJECT CODE	SUBJECT NAME	L	T	P/S	Evaluation				Contact Hours	Credits
YR		FOURTH SEMESTER				In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks		
SECOND	2RARC402	BUILDING CONSTRUCTION & MATERIALS- IV	1	0	6	100	50	50	200	7	7

### OBJECTIVES:

- To introduce and familiarize the students with constituents, manufacturing process / availability, properties/characteristics, Defects, classification and uses of building materials used in construction.
- To understand the use of these building materials in building works.

### CONTENTS:

#### MATERIALS:

**Timber Products:** Decorative and Commercial Plywood, Ply-Board, Block Boards, Particle Board, Wood Wool Cement Board, Fiber Board, Compressed Straw board, Veneers, Laminates, Cement Fiber Board.

**Roof Coverings:** Clay Tiles (Country, Allahabad. Mangalore tiles etc.), Concrete Tiles, Asbestos Cement sheets (Plain & Corrugated), Aluminum Sheets (Plain & Corrugated), Galvanized iron Sheets (Plain & Corrugated), Stone Slating, Shingles. Thatch.

**Adhesives:** Introduction, Natural Adhesives - Animal. Casein, Bituminous Thermoplastic Adhesives - Polyvinyl Acetate. Thermosetting Adhesives & Plastics - Urea Formaldehyde, Phenol Formaldehyde, Melamine Formaldehyde, Resorcinol Formaldehyde, Epoxide Resins Rubber Adhesive.

#### CONSTRUCTION:

**Roofs & Trusses (Timber):** Terminology, Single roof, Double or Purlin roof, Trussed rafter Roof, Triple or Framed roof.

**Partition, Cladding & Panelling:** Terminology, Timber and Timber Products, Clay and Terracotta Brick & Block, Pie-cast Concrete Block, Wood Wool Cement, Compressed Straw Board, Glass and Glass Brick.

**Doors & Windows (Timber):** Sliding Door, Sliding- folding door & Revolving Doors.

### APPROACH:

- The students would be familiarized with vernacular terminology prevalent in this part of the country.
- The emphasis will be on construction details as applicable to Indian conditions.
- Site visits and market surveys will be integral part of sessional work.

## References:

1. McKay, W. B. (1955). *Building Construction*. Volume I, II, III and IV. Longmans. Harlow.
2. Ching, F. D. K., Adams & Cassandra (2000). *Building Construction Illustrated*. Wiley and Sons.
3. Barry R. (2007). *The Construction of Buildings – Barry* Volume I, II, III and IV. Blackwell Science Ltd.
4. Chudley, Roy (2005). *Construction Technology*. Longmans.
5. Mitchell & Charles F. (1934). *Building Construction (Elementary and Advanced)*. B. T. Batsford.
6. Rangwala, S. C. (2007). *Building Construction*. Charotar Publishing House.
7. Punmia B. C., Jain A. J., and Jain A.J. (2005). *Building Construction*. Laxmi Publications.
8. Rangwala S.C. (2014). *Building Materials*. Charotar Publishing House.
9. Gambhir M., Jamwal Neha. (2011). *Building Materials Products, Properties and Systems*. Tata McGraw Hill Publishers, New Delhi.
10. Gupta R. K. (2009). *Civil Engineering Materials and Construction Practices*. Jain brothers, New Delhi.
11. National Building Code of India, 2005, Bureau of Indian Standards.
12. Morris, M., (2000). *Architecture and the Miniature: Models*. John Wiley and Sons.
13. Raghuwanshi, B.S. (2001). *A Course in Workshop Technology - Vol. I and II*. Dhanpat Rai and Co.

## 2RARC403: STRUCTURES- IV

	SUBJECT CODE	SUBJECT NAME	L	T	P/S	Evaluation				Contact Hours	Credits
YR		FOURTH SEMESTER				In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks		
SECOND	2RARC403	STRUCTURES- IV	2	2	0	50	50	-	100	4	4

### OBJECTIVES:

To understand the analysis of indeterminate structures and their use in field in greater depth.

### CONTENTS:

**Overview of construction materials:** Cement, aggregate. Water. reinforcement.

**Concrete used in R.C.C:** Grade of concrete, workability & durability, Design mix & normal mix.

**Introduction to working Stress Method and ultimate Load Method.**

**Singly Reinforced Beams:** Introduction. Bending of beam Assumptions, Moment of resistance, Modes of failure, max. depth of neutral axis, Limiting Values of tension steel & moment of resistance, Minimum and Maximum tension reinforcement, Effective span, Type of problem.

**Doubly Reinforced Beams:** Introduction, Type of problem, Stress in compression reinforcement, design steps. Minimum and maximum reinforcement.

**Flanged Beams:** Introduction. Effective width of flange, Minimum & Maximum reinforcement

**Shear & Development Length:** Introduction. Shear stress, Diagonal tension Shear reinforcement, Development length, Anchorage bond, Flexural bond,

**Detailing of Reinforcement:** Introduction. Requirements of good detailing, Cover to reinforcement, Spacing of reinforcement. Reinforcement requirements, Reinforcement splicing.

**Slabs:** Introduction. One way slab, Two-way slab.

**Masonry Structures Foundation:** Introduction. Masonry wall, Design of wall & columns footing.

### APPROACH:

- The lectures by the experts in the fields will be arranged followed by the tutorial examples.

### References:

1. Nautiyal B. D. (2011) *“Introduction to Structural Analysis”*. B.H.U.
2. Punmia P. C. (2012) *“Strength of Materials & Mechanics of Structures”*. L.P.
3. Khurmi R. S., (2009) *“Strength of Materials”*. S. Chand.
4. Ramamrutham S.(2004) *“Strength of Materials”*. Dhanpat Rai Pub.

## 2RARC404: HISTORY OF ARCHITECTURE - II

	SUBJECT CODE	SUBJECT NAME	L	T	P/S	Evaluation				Contact Hours	Credits
YR		FOURTH SEMESTER			In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks			
SECOND	2RARC404	HISTORY OF ARCHITECTURE - II	2	1	0	50	50	-	100	3	3

### OBJECTIVES:

- Understanding of the period in terms of its location, climate as well as the socio-cultural historical, economic and political influences of the time.
- Study of the building 'types' and the development of architectural form and character based on the developments in construction and technology exemplified through specific building examples that identify the works of the period.
- Understanding the intentions of the period and architects as a solution to the need or demands of the period.

### CONTENTS:

Introduction: Introduction and understanding of 'Islam's' philosophy and its interpretation in building type e.g. mosque, tomb, first and their elements like domes, minarets, arch, squinch etc

The Sultanate Style: With reference to the Slave, Khalji, Tughiaq, Sayyid, Lodhis and Shashah Suri regimes (who mied from Delhi) and their architecture.

Provmcial Architecture: Development of colloquial styles in various provinces of India like

Puigab, Jaunpur, Gujrat, BengaL Bjapur, Bidar and Deccan.

Cities and Citadels: Morphology of fortified cities of Jaisalmer, fort! palaces like Mandu, Chittorgarh, Orchha, Datia, Jodhpur etc. with an overview on architectural types like havelis, stepwells, gates, baradaris etc.

Mughal Architecture: The architecture of the Timurids in India- Babur, Harnayun, Akhbar, Jahangir and Shahjahan.

The Later MoghuLi: The Oudh architecture in Lucknow and its surroundings briefly outlining the Lucknow city.

Colonial Architecture: The British architecture of the colonial days in India- the capitol at Ddhi and the residency at Lucknow emphasizing on their Planning criteria and architectural features.

### APPROACH:

- Lectures to be specifically conducted with the visual aids and seminars presented by students.
- Students will make written assignments and seminar presentations on architectural characteristics that identify the building types and the intentions of the period in response to context and time.
- Students will make free-hand sketches and orthographic drawings in the tutorials of specific bniMing examples to familiarize them with the architectural character that identifies the work of a particular period.

Free hand sketches and orthographic drawings could be made by students in the tutorials on specific building examples to familiarize them with the architectural character that identifies the works of the particular period.

**References:**

1. Fletcher, S. F. B. (1996). *A History of Architecture*, The Athlone Press. University of London.
2. Kostof, S. (1958). *A History of Architecture*. Oxford University Press. London.
3. Roth, L. M. (1994). *Understanding Architecture: Its elements, history and meaning*. ISBN-13:978-0813349039.
4. Huxtable, A. L. (1972). *Pier Luigi Nervi; History of World Architecture*. George Braziller. German.
5. Guidoni, E., Murray, P., Norberg-Schulz, C. & Muller, H. W. (1978). *History of World Architecture Series, 10 Volumes: Byzantine, Oriental, Modern, Gothic, Islamic, Ancient, Pre-columbian, Baroque, Renaissance, Primitive (History of World Architecture)*. Harry N. Abrams.
6. Scully, V. (1991). *Architecture the Natural and the Man Made*: Harper Collins Pub.
2. Hirasker, G. K. (1899). *The Great Ages of World Architecture*. ISBN-13: 978-8189928889.

## 2RARC405: CLIMATOLOGY

	SUBJECT CODE	SUBJECT NAME	L	T	P/S	Evaluation				Contact Hours	Credits
YR		FOURTH SEMESTER				In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks		
SECOND	2RARC405	CLIMATOLOGY	2	1	0	50	50	-	100	3	3

### OBJECTIVES:

- To acquaint the students about human thermal comfort as an essential function of a building and its analysis and use in Architecture.

### CONTENTS:

<b>Introduction to Climate:</b>	importance of climate in Architecture, Factors affecting climate, Elements of climate, Solar radiation, Temperature, Wind humidity and precipitation and their measurement.
<b>Tropical Climate:</b>	Climatic zones, characteristics of tropical climate, Macroclimate and Microclimate.
<b>Human Thermal Comfort:</b>	Study of body's heat production and heat loss, Comfort zone. Bioclimatic chart and effective temperature, Isopleths.
<b>Shading Davies:</b>	Method of recording position of sun in relation to earth. Solar chart Shadow angle protractor and its application in designing of shading devices.
<b>Day Light:</b>	Natural lighting, Glare, day light factor and day lighting in tropics.
<b>Ventilation and Air-movement:</b>	Requirement size and position of openings, Air-flow pattern inside and outside buildings.
<b>Orientation:</b>	Orientation of buildings in relation to sun and wind.

### APPROACH:

- Course would be covered through lectures.
- Tutorials for Practical designing of sunshades/louvers to be carried out in studio and through case studies.

### References:

1. Evans, Martin. (1980). *Housing, Climate and Comfort*. Architectural Press, London.
2. Koeningsberger, et al. (1975). *Manual of Tropical Housing and Building (Part-II)*. Climate Design, Orient Longman Ltd. Hyderabad.

3. Mani, A. (1980). *Handbook of Solar Radiation Data for India*. Allied Publishers, New Delhi.
4. Olgyay, A. and Olgyay, V. (1957). *Solar Control and Shading Devices*. Princeton University Press. New Jersey.
5. Robbins, C. L. (1986). *Day lighting: Design and Analysis*. Van Nostrand Reinhold Co.
6. Kukreja, C. P. (1978). *Tropical Architecture*. McGraw-Hill. ISBN.
7. Krishan, Arvind, et al, (2013). *Climate Responsive Architecture*. Mc Graw Hill Ltd.
8. Tzonis Alexander. (2001 ). *Tropical Architecture*. Wiley & Sons.
9. Casserly, R. James. ( 1979). *Earth Sheltered Housing Design*. Van Nostrand Reinhold Co.



## 2RARC406: BUILDING SERVICES – I (WATER SUPPLY)

	SUBJECT CODE	SUBJECT NAME	L	T	P/S	Evaluation				Contact Hours	Credits
YR		<b>FOURTH SEMESTER</b>				In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks		
SECOND	2RARC406	BUILDING SERVICES – I (WATER SUPPLY)	1	2	0	50	50	-	100	3	3

### OBJECTIVES:

- To understand the basic principles of water supply and sanitation.
- To make them enable to draw the piping system (pipe above ground and under ground) for different types of buildings.
- To familiarize the student with plumbing bye laws as per ISI.

### CONTENTS:

- Water Supply:** Need to protect water supply and requirements of water supply to different types of buildings.  
Sources of water supply, quantity and quality of water and treatment plants.  
Conveyance and distribution of water overhead tank under ground tanks pipe appurtenances.  
Hot and cold water supply system in a low rise and high rise buildings, distribution system in campus, pipes their size, jointing and different fittings.
- Sanitary Engineering:** Purpose and principles of sanitation collection and conveyance of waste matter  
Quantity and Quality of refuse, design and construction of sewer's and sewer appurtenances, roof and surface water drainage.  
Sanitary appliances, traps their variety, pipe and joints, sanitary pipes works below and above ground level.  
Drainage in non-municipal area. Rain waters storage and water harvesting principles and methods.

### System of Plumbing & Plumbing

- Bye-Laws:** The water supply and sanitary system individual and group of buildings.  
Indian standards for designing the toilet /Kitchen.  
Plumbing by-laws.

### APPROACH:

- The emphasis will be on the studio exercise on designing and detailing water supply and drainage in a building, toilet and kitchen.
- The students shall be motivated to visit the practical site.

**References:**

1. The construction of building by Barry-vol.-5.
2. Water supply and Sanitation by Charanjit Shah.
3. Water supply & sanitary Engineering by S.C. Rangawala.
4. Water supply & sanitary Engineering by S. K. Hussain.
5. Water Supply & Engg., Santosha Kumar Garg.
6. Building Automation: Control Devices and Applications by In Partnership with NJATC (2008)

**2RARCP407: OPEN ELECTIVE – II (PRACTICAL)**

	SUBJECT CODE	SUBJECT NAME	L	T	P/S	Evaluation				Contact Hours	Credits
YR		<b>THIRD SEMESTER</b>				In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks		
SECOND	2RARCP407	OPEN ELECTIVE – II (PRACTICAL)	<b>0</b>	<b>1</b>	<b>2</b>	50	-	50	100	3	<b>3</b>

**(i) BUILDING ARBITRATION LAWS**

Arbitration, Laws related to building Arbitrations, Arbitrator, Umpire, Nature, of arbitration. Appointment, Conduct; Powers, and duties of arbitrators and umpires, Procedure of arbitration and preparation of awards.

**(ii) ADVANCE COMPUTER APPLICATION**

Building Management Systems (BMS) Methods to control, monitor and optimize building services, eg., lighting, heating, security, CCTV and alarm systems, access control, audio-visual and entertainment systems, ventilation, filtration and climate control, etc., even time & attendance control and reporting (notably staff movement and availability).

Energy management in services Energy in building design - Energy efficient and environment friendly building - Thermal phenomena - thermal comfort - Indoor Air quality - passive heating and cooling systems.

**(iii) BIO-INSPIRED SYSTEMS IN ARCHITECTURE**

Introduction to concepts behind biomimetics and examples of successful implementation of bio-mimetic design process through lectures, readings, and exercises. Identify your design problem.

Identify three biological organisms (plant or animal) that address the problem you want to explore for the semester. Develop a nuanced understanding of your biology through extensive research. Develop preliminary diagrams for communicating and translating your research.

**(iv) ENERGY SIMULATION**

Overview: Energy consumption of buildings in the India; Need of energy efficient building in India

Software programs for energy simulation modeling (Ecotect, EnergyPlus, OpenStudio & SketchUp, eQuest, Trnsys, IES/VE, DOE, TRACE).

Plug loads, lighting, people, equipment. Schedules. Data resources for building sector energy use. Energy Use Intensity (EUI)

**2RARCP408: COMPUTER APPLICATIONS TO ARCHITECTURE – III  
(PRACTICAL)**

	SUBJECT CODE	SUBJECT NAME	L	T	P/S	Evaluation				Contact Hours	Credits
YR		<b>FOURTH SEMESTER</b>				In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks		
<b>SECOND</b>	2RARCP408	COMPUTER APPLICATIONS TO ARCHITECTURE – III (PRACTICAL)	<b>0</b>	<b>1</b>	<b>3</b>	50	-	50	100	4	<b>3</b>

**OBJECTIVES:**

- To develop an understanding of the design based software like Auto Cad. Coral Draw and Adobe Photoshop.
- Learning the application of these software in design exercises as to make use of maximum commands.

**CONTENTS:**

**Understanding AutoCAD:**

Learn various 2D commands their functions and application.  
 Understanding coordinate systems.  
 Working on Layers and Colors  
 Drawing plans, Elevations, Sections using Auto- Cad.  
 Dimensioning Drawings  
 Connecting from one file format to another.  
 Various file formats & their Usefulness.

**Understanding Coral Draw:**

Learn various commands their functions and applications.  
 Putting text & images together in various settings,  
 Importing & exporting documents.  
 Learn various commands & their functions and applications.

**Suggested Exercises:**

- Drawing the entire set of drawings for an already designed residence using Auto Cad.
- Design and draw a logo with the help of Coal draw including Textures and colors (May be use if as a letter head.)

**References:**

1. Ernest Norling,( 1986) *Perspective drawing*, Walter Foster Art Books, California,.
2. Bernard Alkins 147 (1986), *Architectural Rendering*, Walter Foster Art Books,.
3. Rober W.Gill,( 1974.) *Advanced Perspective*, Thames and Hudson, London,
4. Autodesk Revit Architecture 2012: No Experience required – Eric Wing
5. Mastering Autodesk Revit Architecture 2012 – James Vandezande, Phil Read, Edd

**2ARC4010: SEAMLESS LEARNING**

	<b>SUBJECT CODE</b>	<b>SUBJECT NAME</b>	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Evaluation</b>				<b>Contact Hours</b>	<b>Credits</b>
<b>YR</b>		<b>FOURTH SEMESTER</b>			In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks			
<b>SECOND</b>	2ARC4010	SEAMLESS LEARNING	<b>0</b>	<b>0</b>	<b>2</b>	100	-	-	100	2	<b>1</b>

**Course objectives:**

- To sensitize among the students importance of values in a social system.
- To develop a sense of social responsibility among the students and encourage them to take up the initiative to serve for the noble cause.

**METHODOLOGY**

1. The course shall be inclusive of the various activities which shall be performed under the expert guidance of the course instructor.

## 2ARC4011: CO- CURRICULAR ACTIVITIES

	SUBJECT CODE	SUBJECT NAME	L	T	P/S	Evaluation				Contact Hours	Credits
YR		FOURTH SEMESTER			In Sem.	End Sem. Theory	End Sem. Jury and/or Exam.	Total Marks			
SECOND	2ARC4011	CO- CURRICULAR ACTIVITIES	0	0	2	100	-	-	100	2	1

### Course objectives:

- To sensitize among the students importance of co-curricular activities in a social system.
- To give an opportunity of brushing up the skills to a limit of perfection and facilitating for the overall development of the students.
- To encourage the students for taking up the challenge of competing with the students of the other schools to ensure the enhancement of their interaction and coherent development.

### METHODOLOGY

1. The students shall be informed about the various competitions/ conferences, being organized in and around at National and International level, by the respective club and/ or course co-ordinators.
2. The students shall be given effective guidance related to the respective clubs and other activities.
3. The students shall be enrolled in at least one club as a mandate.