

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**



NAAC Accredited-2022  
'B++' Grade (CGPA 2.62)

**Name of the Faculty: Science & Technology**

**CHOICE BASED CREDIT SYSTEM STRUCTURE  
2021 PATTERN**

**Syllabus: Bachelor of Architecture**

**Name of the Course: B.Arch. Third year – Sem. V & VI**

**(Syllabus to be implemented from June 2023)**

Punyashlok Ahilyadevi Holkar Solapur University, Solapur																			
Faculty of Science and Technology																			
Choice Based Credit System structure of Third Year B.Arch with effect from (w.e.D) - 2023-24																			
As per Council of Architecture, New Delhi (COA) Guidelines																			
Scheme of teaching and Examination of B.Arch. Third year - Semester V																			
Subject Code	subject category	Subject Title	Teaching scheme in Periods/Week				Examination Scheme												
			Lectures /Week	Practical, Studio /Week	P/S	T	Paper duration in hours	Theory		ESE		ICA		Practical/Viva-voce		Total	Credits		
								ISE	ESE		Max.	Min.	Max.	Min.	Max.			Min.	
								50%	Max.	Min.	45%	Max.	Min.	50%	Max.	Min.	45%		
21 AR5-01	PC	Architectural Design- V	1	6	7	6					100	45	100	50	150	67	350	7	
21 AR5-02	BS & AE	Building Construction and Material- V	1	4	5									100	50	67	250	5	
21 AR5-03	BS & AE	Theory of Structure - V	2		2	3	3	15	70	31							100	2	
21 AR5-04	PC	History of Architecture- IV	2		2	3	3	15	70	31							100	2	
21 AR5-05	EC/PAEC	Interior Design	1	3	4									50	25	100	45	150	4
21 AR5-06	BS & AE	Surveying and Levelling	1	2	3									50	25		50	3	
21 AR5-07	BS & AE	Building Services- III	2		2	3	3	15	70	31							100	2	
21 AR5-08	PC	Landscape Design	1	2	3									50	25		50	3	
			Elective V :																
			A. Sustainable Building Material																
			B. Green Building and Rating Systems																
			C. Sociology and Architecture																
21 AR5-09	EC/PAEC	Elective VI	1		1									50	25		50	1	
			A. Architectural Journalism																
			B. Earthquake Resisting structures																
			C. Basics of Archeology																
Grand Total					30			90			310			450		400	1250	30	

**Abbreviations:** L- Lectures, P- Practicals, S- Studios, ISE- In Semester Exam, ESE - End Semester exam, ICA- Internal Continuous Assessment

**Subject Categories :** PC - Professional Core Courses, BS & AE - Building Sciences and Applied Engineering, PE - Professional Elective, PAEC- Professional Ability Enhancement Courses, SEC - Skill Enhancement courses

<b>Note :</b>	Number of subjects / Head - 10	Number of Theory Examination - 04	Number of Oral Examination - 03
1. Theory exam - ISE -Internal Tests - marks to be awarded by conducting Minimum Two Test by the subject teacher, ESE - University Theory examination			
2. Practical/ Viva-Voce exam - Progressive marks (ICA) to be awarded by the subject teacher. Practical/ viva - voce examination (ESE - Oral) shall be conducted by one internal and two external examiner appointed by the university			

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Scheme of Teaching and Examination of B.Arch. Third year - Semester VI																			
Subject Code	subject category	Subject Title	Teaching scheme in Periods /Week					Examination Scheme											
			Lectures /Week	Practical, Studio / Week	P/S	T	Total periods /week	Paper duration in hours	Theory ISE		ESE		ICA	Practical/Viva-voce ESE		Total Credits			
											Max.	Min.	Max.	Min.	Max.	Min.			
21 AR6-01	PC	Architectural Design- VI	1	6	6	7	7	-	-	-	-	50%	45%	100	50	150	67	250	7
21 AR6-02	BS & AE	Building Construction and Material- VI	1	4	4	5	5	-	-	-	-	-	-	100	50	150	67	250	5
21 AR6-03	BS & AE	Theory of Structure - VI	2	-	-	2	2	3	30	15	70	31	-	-	-	-	-	100	2
21 AR6-04	PC	Working Drawing- I	1	3	3	4	4	-	-	-	-	-	-	50	25	100	45	150	4
21 AR6-05	PC	Urban Planning	2	-	-	2	2	3	30	15	70	31	-	-	-	-	-	100	2
21 AR6-06	PC	Estimating Specifications and Costing- I	3	-	-	3	3	3	30	15	70	31	-	-	-	-	-	100	3
21 AR6-07	BS & AE	Building Services- IV	2	-	-	2	2	3	30	15	70	31	-	-	-	-	-	100	2
21 AR6-08	PC	Site Planning	-	3	3	3	3	-	-	-	-	-	-	100	50	-	-	100	3
		Elective VII																	
21 AR6-09	EC/PAEC	A.Prefabricated Construction B.Digital Graphics and Art C. Road Safety and Civic Sense	1	-	-	1	1	-	-	-	-	-	-	50	25	-	-	50	1
		Elective VIII :																	
21 AR6-10	EC/PAEC	A.Hospitality Design B.Dissaster Mitigation and management C. Architectural Design with structural steel	1	-	-	1	1	-	-	-	-	-	-	50	25	-	-	50	1
		<b>Total</b>					30		120		280		450		400			1250	30
<b>Abbreviations:</b> L- Lectures, P- Practicals, S- Studios, ISE- In Semester Exam, ESE - End Semester exam, ICA- Internal Continuous Assessment																			
<b>Subject Categories :</b> PC - Professional Core Courses ,BS & AE - Building Sciences and Applied Engineering , PE - Professional Elective , PAEC- Professional Ability Enhancement Courses , SEC - Skill Enhancement courses																			
<b>Note :</b>			Number of subjects / Head - 10				Number of Theory Examination - 04				Number of Practical /Viva-Voce Examination - 03								
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Pass percentage shall not be less than 50% in aggregate of the total marks of the year .																			

**Grade and Grade Point Average:**

A grade assigned to each head based upon marks obtained by the student in examination of the course.

CONVERSION OF MARKS INTO GRADES SGPA				
Sr.No.	Range of Marks	Grade	Grade Point	Description of Performance
1	80 onwards	O	10	EXCELLENT /OUTSTANDING
2	70-79	A+	9	VERY GOOD
3	60-69	A	8	GOOD
4	55-59	B+	7	FAIR
5	50-54	B	6	ABOVE AVERAGE
6	45-49	C+	5	AVERAGE
7	<45	F	0	FAIL
8		DR		DROPPED OUT

CONVERSION OF AVERAGE GRADE POINTS INTO GRADES		
Sr.No.	SGPA/CGPA	Grade
1	9.5-10	O
2	8.5-9.49	A+
3	7.5-8.49	A
4	6.5-7.49	B+
5	5.5-6.49	B
6	4.5-5.49	C+
7	<4.49	F

**Computation of SGPA and CGPA**

- 1) The University adopts absolute grading system wherein the marks are converted to grades, and every semester result will be declared with semester grade point average (SGPA) and Cumulative Grade Point Average (CGPA). The CGPA will be calculated for every semester, except for the first semester.
- 2) The grading system with the letter grades and the assigned range of marks under absolute grading system are as given below:

**Computation of SGPA and CGPA**

1. The following expressions shall be used to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) respectively:

$$SGPA = \frac{\sum \text{CourseCredits} \times \text{GradePoints for all the Courses in that Semester}}{\sum \text{CourseCredits for all the Courses in that Semester}}$$

$$CGPA = \frac{\sum \text{CourseCredits} \times \text{GradePoints for all Courses excluding those with F grades until that Semester}}{\sum \text{CourseCredits for all Courses excluding those with F grades until that semester}}$$

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the grade cards.

**Illustration for Computation of SGPA and CGPA**

**Sem. I**

(a) SGPA and CGPA Calculations: An Illustrative Example for one academic year							
Semester (Odd:I, Even:II)	Course Number	Credits	Marks scored	Grade Points	Grade	Credit points	SGPA
	1	2	3	4	5	(2x4) 6 (2x4)	7
SEM.I	21 AR1-01	8	45	0	F	8x0 = 0	SGPA = 132/30 = 4.40
SEM.I	21 AR1-02	6	48	5	C+	6x5 = 30	
SEM.I	21 AR1-03	2	50	6	B	2x6 = 12	
SEM.I	21 AR1-04	2	50	6	B	2x6=12	
SEM.I	21 AR1-05	4	50	6	B	4x6=24	
SEM.I	21 AR1-06	3	64	8	A	3x8 = 24	
SEM.I	21 AR1-07	3	53	6	B	3x6 = 18	
SEM.I	21 AR1-08	2	54	6	B	2x6 = 12	SGPA = 4.40
		30 (*22)				132	

(22\*): Total credits of the semester excluding the credits of the courses under F grade. Considered for

the calculation of CGPA of the two consecutive semesters under consideration.

**Sem.II**

<b>(a) SGPA and CGPA Calculations: An Illustrative Example for one academic year</b>							
Semester (Odd:I,Even:II)	Course Number	Credits	Marks scored	Grade Points	Grade	Credit points	SGPA
	1	2	3	4	5	(2x4) 6 (2x4)	7
SEM.II	21 AR2-01	8	43	0	F	8X0 =0	SGPA = 139/30 = 4.63
SEM.II	21 AR2-02	6	50	6	B	6x6 = 36	
SEM.II	21 AR2-03	2	54	6	B	2x6 = 12	
SEM.II	21 AR2-04	2	84	10	O	2x10=20	
SEM.II	21 AR2-05	4	50	6	B	4x6=24	
SEM.II	21 AR2-06	3	51	6	B	3x6= 18	
SEM.II	21 AR2-07	3	49	5	C+	3x5 = 15	
SEM.II	21 AR2-08	2	55	7	B+	2x7 = 14	SGPA= 4.64
		30 (*22)				139	

(22\*): Total credits of the semester excluding the credits of the courses under F grade. Considered for the calculation of CGPA of the two consecutive semesters under consideration.

CGPA = 132 + 139 (TOTAL SGPA SEM.I + SEM.II) / 22+22 (EARNEDCREDITS) = 6.15

**CGPA = 6.15**

If the Student secures letter grades as detailed below after reappearance to SEE, then the SGPA and CGPA shall be calculated as indicated below.

**Sem. I**

<b>(a) SGPA and CGPA Calculations: An Illustrative Example for one academic year</b>							
Semester (Odd:I,Even:II)	Course Number	Credits	Marks scored	Grade Points	Grade	Credit points	SGPA
	1	2	3	4	5	(2x4) 6 (2x4)	7
SEM.I	21 AR1-01	8	50	6	B	8X6 =48	SGPA = 132+48/30 = 6.00
		30				148	

**Sem.II**

<b>(a) SGPA and CGPA Calculations: An Illustrative Example for one academic year</b>							
Semester (Odd:I,Even:II)	Course Number	Credits	Marks scored	Grade Points	Grade	Credit points	SGPA
	1	2	3	4	5	(2x4) 6 (2x4)	7
SEM.II	21 AR2-01	8	55	7	B+	8X7 =56	SGPA = 139+56/30 = 6.50
		30				139	

CGPA = 180 + 195 (TOTAL SGPA SEM.I + SEM.II) / 30+30(EARNEDCREDITS) = 6.25

**CGPA = 6.25**

**2. (b) CGPA Calculation of the Programme: An Illustrative Example**

SEMESTER	IST YEAR	IIND YEAR	IIIRD YEAR	IVTH YEAR	VTH YEAR	TOTAL
CREDITS OF THE SEMESTER	60	60	60	50	40	270
CGPA	6.25	7.50	6.50	8.00	10.00	38.5

CGPA = (60X6.25 + 60X7.50+60X6.5+50X8+40X10) / 270 = 2015/270 = 7.46

**CGPA = 7.46**

**B. ARCH -SEM.V**

**21 AR5 – 01: ARCHITECTURAL DESIGN – V**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	06	06	ISE	ESE	ICA	ESE	
Total	07	07	--	100	100	150	350

**Course Objective:**

- To introduce students with designing through function, technology, user comfort integration of landscape and various services along with knowledge gained in previous semesters.
- To develop acquaintance of landscape while designing indoor and outdoor space to maximize potential of space planning.
- To introduce various services to integrate in planning and design
- To acquaint and develop the students with knowledge of fundamental concepts in multifunctional mid-rise or campus planning

**Course Outcome:**

At the end of semester students will be able to

- Apply acquainted knowledge of designing through function, technology, user comfort integration of landscape and various services along with knowledge gained in previous semesters.
- Use relevant application for designing various acoustical services to integrate in planning and design.
- Apply acquainted knowledge of fundamental concepts in multifunctional mid-rise or campus planning.

**Course Curriculum:**

<b>Unit 1</b>	<b>Major Design Problem</b>	Designing through function, technology, user comfort integration of landscape and various services along with knowledge gained in previous semesters.
		Public Building like Govt. offices, corporate offices, Bank with residence, Exhibition centre, pavilions, food malls, Motel, Multipurpose halls, Child care centre, Health centre, recreation (auditorium, theatres), City Library, Memorials, Public Health Centre, town centre.
		Suggested Design Methodology:
		Design responding to climate, landscape, services and interiors. Application of subjects studied in design process like acoustics, structures, MEP ACMV etc.
		Design problem of built-up area about 1000 to 1500 sqm. Plot areas can vary from 3-4 times of the built-up area.
<b>Unit 2</b>	<b>Minor Design Problem</b>	<b>Minor Design Assignment: literature study and analysis</b> The student should be introduced with a design problem total built-up 500-750sqm,
<b>Unit 3</b>	<b>Time bound design assignment</b>	Design - 12 hours Duration. Drawing work of minor design assignment to be completed in time bound

**Submission/Assignments format:**

- Study documentation, reports and data collection in file form/drawing form.
- Pre-Design Process Drawings
- Design portfolio.

• Design Models, study models.

**Reference Books:**

1. Anthony Di Mari and Nora Yoo, " Operative Design: A Catalogue of Spatial Verbs", BIS Publishers.
2. Bruno Munari,"Design as Art", Penguin UK, 25-Sep-2008.
3. Charles George Ramsey and Harold Sleeper, "Architectural Graphic Standards", 1992, Wiley.
4. Debkumar Chakrabarti, "Indian Anthropometric Dimensions for Ergonomic Design Practice", 1997.
5. Frank Ching, James F. Eckler, "Introduction to Architecture", 2012, John Wiley & Sons, US.
6. Frank D.K. Ching, " Architecture: Form, Space, and Order", 4th Edition, Sep. 2014, John Wiley & Sons.
7. John Hancock Callender, "Time-Saver Standards for Architectural Design Data", 1982, McGraw-Hill.
8. Neufert Architects' Data by Ernst Neufert.
9. Francis D.K. Ching –Elements of Architecture.
10. Walter Gropius – Total Architecture.
11. Site Planning by Kevin Linch, Gary Hack.

**21 AR 5-02: BUILDING CONSTRUCTION & MATERIAL – V**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	04	04	ISE	ESE	ICA	ESE	
Total	05	05	---	---	100	150	250

**Course Objective:**

- To study construction systems with focus on roofing (MS truss).
- To study Construction techniques of deep foundation - pile foundation.
- To develop strong sense of designing windows, doors and partitions using aluminum as a building material

**Course Outcome:**

At the end of semester student should be able to Exhibit understanding of

- Foundations in loose soil,
- Door and windows of wide opening,
- Roof truss of various span along with roofing material & their installation,
- Partition walls using various materials and their installation.
- Use of non-ferrous metals and false ceiling material in buildings .

**Course curriculum:****Building Construction:**

<b>SUB STRUCTURE</b>		
<b>Unit 1</b>	RCC Deep Foundation	a. Pile foundation, types of piles, Pressure piles and end bearing pile, precast piles, cast-in situ piles, b. Method of driving piles, pile caps etc.
<b>SUPER STRUCTURE</b>		
<b>Unit 2</b>	Steel Trusses	a. Steel trusses of various span (north light), covering material (AC/CGI/Aluminium sheet), patent glazing, Turbo vent and joinery details.
<b>Unit 3</b>	Steel Structure	a. Introduction to steel frame from foundation to roofing, joints connections etc. b. Framing girders in steel, steel stanchion & erection of steel structure.
<b>Unit 4</b>	Aluminium Doors Windows and partitions	a. Pivoted, doors windows and partitions with mosquitoes, and fly protection b. Revolving, doors windows and partitions with mosquitoes, and fly protection c. Sliding doors, windows and partitions with mosquitoes, and fly protection d. Folding doors and windows with mosquitoes, and fly protection.
<b>Unit 5</b>	UPVC, PVC, FRP Door, windows and Partitions	a. Partition walls using different materials like brick, wood, steel, glass blocks, concrete, metal, composite etc.
<b>Unit 6</b>	False ceilings	a. Construction and detailing of false ceiling using Fiber board, Plaster of Paris, Particle Board, Wood, Wool, Metals, Straw etc.



**Building Materials:**

Unit	Topic	Details
Unit 1	Non-ferrous material- (Lead, copper, brass, aluminium, zinc)	a. Properties of Lead, Copper, Brass, Aluminium, Zinc. b. Uses, applications of Lead Copper, Brass, Aluminium, Zinc in building. c Advantages and disadvantages Lead, Copper, Brass, Aluminium, Zinc
Unit 2	Painting	a. Characteristics/properties of paint. b. Ingredients used for paints c. Types of paints d. Painting on different surface, e. Defects in painting.
Unit 3	False ceiling materials	a. Teak wood, aluminium and steel framing materials, b. Covering materials, like acoustical boards, commercial boards, gypsum boards, commercial boards etc.

**Submission Format :**

Sheet Work on -

1&2 -Pile foundation, types of piles, Pressure piles and end bearing pile, precast piles, cast-in situ piles, method of driving piles, pile caps etc.

3&4- Steel trusses of various span (north light), covering material (AC/CGI/Aluminum sheet), patent glazing, Turbo vent and joinery details.

5&6 Introduction to Steel Frame from Foundation to Roofing, Joints Connections etc. Framing girders in steel, steel stanchion & erection of steel structure.

7. Pivoted, doors, with mosquitoes, and fly protection

8. Sliding doors and windows

9. Folding doors, Revolving door

10. Partition walls using different materials like brick, wood, steel, Glass blocks, concrete, metal, composite

**Journal and sketches on building construction and material.** - Frames (Concrete, stone, wood etc.) shutters of different types (synthetic boards, P.V.C, F.R.P. etc.).

**Report** – Site Visit and Case Study.

**Model** – Doors Windows, Partitions, Truss

**ESE weightage - 60% Building Construction, 40% For Building Material.**

**Reference Books:**

1. Barry, R. (1999). The Construction of Buildings Vol. 2. 5th Ed. New Delhi : East-West Press.

2. Foster, J. and Mitchell, S. (1963). Building Construction: Elementary and Advanced, 17th Ed. London : B.T. Batsford Ltd.

3. McKay, W. B. (2005). Building Construction Metric Vol. I–IV. 4th Ed. Mumbai : Orient Longman.

4. Moxley, R. (1961). Mitchell’s Elementary Building Construction. London : B. T. Batsford.

5. Rangwala, S. C. (1963). Building Construction: Materials and types of Construction. 3rd Ed. New York : John Wiley and Sons.

6. Chudley, R. (2008). Building Construction Handbook. 7th Ed. London : Butterworth-Heinemann.

7. Sushil-Kumar, T. B. (2003). Building Construction. 19th Ed. Delhi : Standard Publishers.

8. Rangwala, S. C. (1963). Engineering Materials. 3rd Ed. New York : John Wiley and Sons

**21 AR5 – 03: THEORY OF STRUCTURE – V**

Teaching Scheme per week		Credits	Examination scheme				
Lecture (L)	02	02	Theory exam		Practical/Oral exam		Total
Practical/Studio(P/S)	--	--	ISE	ESE	ICA	ESE	
Total	02	02	30	70	----	----	100

**Course Objective:**

To help students to understand and analyses the behavior of RCC structural members like slabs, beams and columns by limit state method using IS 456-2000. (The students are allowed to carry IS 456-2000 with themselves in exam halls)

**Course Outcome:**

By the end of the term, the student should be able to analyze and design RCC structural members like slabs, beams ,columns and footing by limit state method using IS 456-2000.

**Course Curriculum:**

Unit-1	Introduction to Limit state design of RCC members	Philosophies of design, Types, and classification of Limit states, Characteristic strength and characteristic load, Load factor, Partial safety factors, Limit state of serviceability, Significance of deflection – IS code recommendation
Unit-2	Design of slabs and staircases	Design of one-way simply supported, one-way continuous, two-way slabs with different end conditions as per IS 456-2000, cantilever slab, Staircase waist slab
Unit-3	Design of beams	Analysis and design of singly reinforced rectangular sections using IS 456-2000, Design of continuous beams using IS 456-2000
Unit-4	Design of Columns	Analysis and design of axially loaded and eccentrically loaded columns, Introduction to bi-axial bending, Interaction charts, Circular columns with helical reinforcement
Unit-5	Design of Footing	Design of square and rectangular isolated footing by limit state method using IS 456-2000

**Assignments:**

Topic-wise assignments

**References:**

1. Reinforced concrete – limit state method by A. K. Jain
2. Limit state design of reinforced concrete by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain
3. Reinforced Concrete – Vol – 1 by Dr. H. J. Shah
4. IS 456-2000 Plain and reinforced concrete – Code of practice

**21 AR5-04 –HISTORY OF ARCHITECTURE –IV**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	02	02	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	--	--	ISE	ESE	ICA	ESE	
Total	02	02	30	70	--	--	100

**Course Objective:**

- To study the modern architectural movements in India and west through ideas and works of great architects of modern era during 20<sup>th</sup> century, that flourished during the 20<sup>th</sup> century period.
- To analyze the contemporary trends/approaches in architectural production in terms of design, practices, its perception, appreciation and critical discourses.
- To critically reflect and comment on contemporary architecture across the world.

**Course Outcome:**

At the end of semester students should be able:

To exhibit understanding the contemporary trends/approaches in architectural production in terms of design, practices, its perception, appreciation and critical discourses, and can reflect and comment on contemporary architecture across the world.

**Course Curriculum:**

Modern architecture in India:		
<b>Unit 1</b>	Architecture in India (Post independence)	a. Le-Corbusier - Works of public nature in Chandigarh - Secretariat Chandigarh b. Mill Owners "Building, Ahmedabad
		a. BV Doshi –Sangath, Ahmedabad, CEPT university b. Charles Correa- Kanchan Janga Apartments, Mumbai, Jaipur Kala Kendra, Jaipur
		a. Achyut Kanvinde- Nehru Science Centre, Mumbai b. Raj Rewal – Hall of Nations, Pragati Maidan, New Delhi
<b>Unit 2</b>	Cost effectiveness and local influences	a. Laurie Baker - Centre for Development Studies, Thiruvananthapuram, Indian Coffee house, Trivandrum b. Anant Raje - Bhopal development Authority headquarters.
Modern architecture in west:		
<b>Unit 3</b>	Modern architecture	a. Le Corbusier - Villa Savoy, France b. Mies Van der Rohe - Barcelona Pavilion.
<b>Unit 4</b>	International style	a. Oscar Niemeyer- national congress complex, Brazil. b. Alvar Alto – Viipuri Library, Russia
<b>Unit 5</b>	Organic architecture	a. FL Wright - Falling Waters- Pennsylvania, Prairie house b. Antoni Gaudi –Casa Mila apartment, Spain
<b>Unit 6</b>	The High-tech architecture	a. Sir Norman Foster- HSBC Building in Hong Kong b. Renzo Piano - Pompidou Centre, Paris
<b>Unit 7</b>	Postmodernism	a. Robert Venturi – Vanna venture house, Philadelphia, USA. b. Philip Johnson – AT and T building, New York city.
<b>Unit 8</b>	Deconstructivism	a. Frank Gehry - Guggenheim Museum, Bilbao b. Zaha Hadid – IBA Housing, Germany.

**Submission / Assignment :**

Journals with sketches, A3 size sheets with sketches- preferably plans and sections- of various buildings discussed in the above units. Models of examples studied in above theory in group work.

**Reference Books :**

1. 20th century architecture, Banister Fletcher- History of Architecture.
2. Contemporary Architecture by Morgan, Ann. Lee & Taylor.
3. Modern Architecture in India by Bahga

**21 AR5 -05 –INTERIOR DESIGN**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	03	03	ISE	ESE	ICA	ESE	
Total	04	04	--	--	50	100	150

**Course Objective:**

To make students understand the integration and importance of interior design spaces to create pleasant interior ambience by understanding history of interior design, furniture design, use of latest and green interior materials, interior landscaping, interior lighting and services.

**Course Outcome:**

By the end of the semester, the student should be able to:

To prepare interior design Plans, Sections and views along with details reflecting latest market trend including latest innovative interior materials and green interior materials creating pleasant interior ambience.

**Course Curriculum:**

<b>Unit-1</b>	Overview of interior and furniture design and design movements through history and understanding elements of Interior designing.
<b>Unit-2</b>	Market survey of interior materials and finishes including green building interior materials and retrofitting materials.
<b>Unit-3</b>	Exploring Furniture and landscape interior designing using various materials which includes various components like wall finish, false ceiling, floor finish, artifacts, curtains etc.
<b>Unit-4</b>	Understanding Interior lighting by calculating required fixtures as per Lux requirement to various spaces as specified by the standards. Understanding Electrical layout for interior designing. Other services details like AC, MEP, Firefighting or any other specialized service can be explored.

**Submission /Assignments:**

1. Sheetwork to size A1 (Number of sheets may vary as per materials explored) showing Table of Interior materials and finishes with specifications, properties, method of application, available sizes and rates.
2. Sheetwork to size A1 sheets (Major Problem) - Furniture and Landscape interior designing for space not more than 150 sq.m with Lumen calculations indication type of luminaire adopted and positioned. Electrical layout for the same should be designed.
  - Plans and 4 Sectional elevations on A1 sheets to the scale 1:50 for Furniture and Landscape designing.
  - Electrical Layout with Lumen calculations on A1 sheets to the scale 1:50 over light drafted Furniture and Landscape plan.
  - Any 1 other services detail on A1 sheets to the scale 1:50 (AC, MEP, Fire fighting or any other specialized service)
3. Sheet work to size A1 sheets (Minor Problem) = Plans and 4 Sectional elevations for a small commercial space of approx. 75 sq.m.

**References Books :**

1. Pile, John.F, “Interior Design”, Pearson; 4 edition (2007)
2. Ching, Francis D.K., “Interior Design Illustrated”, John Wiley & Sons; 3 edition (2012)
3. Panero, Julius and Zelnik, Martin, “Human Dimension and Interior Space: A Source Book of Design Reference Standards”, Watson-Guption; New edition (1979)
4. DeChiara, Joseph, Panero, Julius and Zelnik, Martin “Time Saver’s Standards for Interior Design”,
5. Rengel, Roberto J, “The Interior Plan: Concepts and Exercises”, Bloomsbury Academic USA
6. Mitton, Maureen, “Interior Design Visual Presentation: A Guide to Graphics, Models and Presentation Techniques”, John Wiley & Sons; 4 edition (2012)
7. Pile, John.F, “A History of Interior Design Hardcover”, John Wiley & Sons Inc (2000)

**21 AR5 – 06: SURVEYING AND LEVELLING**

Teaching Scheme per week		Credits	Examination scheme				
Lecture (L)	01	01	Theory exam		Practical/Oral Exam		Total
Practical/Studio(P/S)	02	02	ISE	ESE	ICA	ESE	
Total	03	03	--	--	50	----	50

**Course Objective:**

To help students to understand linear measurement techniques, angular measurements techniques, area measurement techniques, and finding the relative positions of any point or object of the earth, prepare contour maps and other surveying maps.

**Course Outcome:**

By the end of the term, the student shall be able to

- Exhibit understanding to use linear measurements, angular measurements, area measurement and determine relative positions of point on earth.
- Prepare contour maps and other surveying maps.

**Course Curriculum:**

Unit-1	Introduction to survey	
Unit-2	Land record survey	Aims, objects, and importance of subject, index map and toposheets
Unit-3	Chain survey	Definition, principles, classification, scales, conventional signs, triangulation, instruments for ranging, offsetting
Unit-4	Measurement of area	Measurement of area by method of triangles, simpson's rule, planimeter, digital planimeter
Unit-5	Prismatic compass	Introduction to prismatic compass and its uses
Unit-6	Plane table surveying	Instruments, accessories and types of plane table surveying
Unit-7	Levelling	Instruments and methods of calculation of levels, concept of contour and its characteristics and introduction to theodolite
Unit-8	Introduction to photographic survey and GPS	Introduction and its uses
Unit-9	Advanced surveying instruments	Introduction to digital planimeter, digital theodolite, automotive level, radiation survey method, environmental survey instruments, digital distance meter etc.
Unit-10	Line out	Line out of simple residential building plan, identify different types of foundation strata by simple inspection

**Submission/ Assignment :****Field book:**

1. Recording of chain survey
2. Application of prismatic compass
3. Sign conventions of various objects (symbols)
4. Area measurement by planimeter
5. Levelling instruments
6. Application of theodolite

**Drawing Sheets:**

1. Close traversing of building by compass
2. Planimeter
3. Block contouring

4. Plane table survey

**Reference Books:**

1. Surveying by B.C. Punmia, S. K. Jain, Vol.- I and II, Laxmi Publication, New Delhi
2. Surveying and Levelling by T. P. Kanetkar and S. V. Kulkarni, Vol.-I and II, Vidyarthigriha Publication, Pune
3. Surveying by K. R. Arora, Vol-I and II
4. Surveying and Levelling by N. N. Basak, Tata McGraw Hill Publishing Co., New Delhi.

**21 AR5-07: BUILDING SERVICES – III**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	02	02	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	--	--	ISE	ESE	ICA	ESE	
Total	02	02	30	70	--	--	100

**Course Objective:**

To develop the knowledge and skill required for understanding integration of acoustical, vertical transportation and fire safety in building for residential and public building architecture.

**Course Outcome:**

At the end of semester students should be able to:

- Exhibit understanding concept of sound and its properties, acoustical design criteria for user
- Use relevant application to control noise and acoustical treatment in various buildings
- Apply acquainted knowledge of mechanical transportation systems, fire protection and fire safety in space planning

**Course Curriculum:**

<b>Unit 1</b>	<b>Sound and its properties</b>	Origin and propagation of sound, properties of sound
		Behaviour of sound in enclosed spaces
		Units of measurement of different properties of sound
		Reverberation, absorption, Reflection and resonance
		Insulation and transmission of sound, Sabins formula
<b>Unit 2</b>	<b>Acoustical design criteria for various uses</b>	Properties and different materials for these purposes, choice of site and location of buildings, considering acoustics conditions.
		Principle of, effect of geometry and shape of rooms.
		Choice and location of suitable acoustic materials, sound shadows
<b>Unit 3</b>	<b>Noise</b>	Characteristics of noise, noise criteria for different types of rooms, sources of noise.
		Control of noise in buildings, and town planning, structure borne sound, acoustical problems in multi-storied buildings.
<b>Unit 4</b>	<b>Sound amplification</b>	Principles of sound amplification and distribution.
		Introductory specifications for sound reinforcement systems for different types of halls.
<b>Unit 5</b>	<b>Mechanical transportation systems in buildings</b>	Elevators: Types of Elevator systems, design considerations like Peak Handling capacity, Average Waiting Time, Lift speed etc
		Architectural Requirements & Details for Elevator shaft Possible Location and arrangements of Elevators in a building.
		Escalators & Travellators: Applications, Traffic capacity, Location and arrangements of escalators and travellators, inclination factor
<b>Unit 6</b>	<b>Fire protection system</b>	Fire safety in buildings & fire protection and Concepts in active and passive fire protection in buildings:
		Causes of fire, reasons for loss of life due to fire,
		Development of fire, fire classification of buildings, Fire water storage requirements, Fire control room, Code of practices
		Idea of smoke detectors, Fire alarms, Wet risers,
		Fire escape stair case, equipment used, materials used to fight fire,
		Fire rating and Hydrants.



**Submission/ Assignment:** Files and sketches sheets as required.

**Reference Books:**

1. Acoustics in Building Design by Siraskar K.A.
2. "National Building Code of India (NBC)", 2016, Bureau of Indian Standards
3. Walter T. Grondzik, Alison G. Kwok, "Mechanical and Electrical Equipment for Buildings", 2010;
4. 11th edition, Wiley Publication.
5. "National Building Code of India (NBC) 2016"; Part 8 Section 3 and 5 & Part 3 & 4, BIS.
6. NFPA 101

**21 AR5-08 - LANDSCAPE DESIGN**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	02	02	ISE	ESE	ICA	ESE	
Total	03	03	----	----	50	--	50

**Course Objective:**

- To introduce the students to Landscape Architecture and its functional significance of landscape on site planning and design,
- To make students familiar about historical development French & English, Mughal, Japanese, Landscape
- To make students familiar the elements and Principles of landscape design.
- and to create a database for native plantation of your region and apply the concept to select plants, taxonomy plantation & maintenance

**Course Outcome:**

At the end of semester student will be to analysis and develop design skills for small landscape projects and to do advance analytical and planning skills for Architectural project sites.

- Elements of Landscape, Land forms, water bodies, Vegetation.
- Apply the acquainted knowledge about historical development French & English, Mughal, Japanese, Landscape and work of noted architects and landscape projects.
- Apply the concept to select plants, taxonomy plantation & its maintenance.
- Apply acquainted knowledge in selection of Garden sculpture, furniture, hard scape.

**Course Curriculum:**

<b>Unit-1</b>	Definition of Landscape architecture, scope and magnitude. Elements of Landscape, Land forms, water bodies, Vegetation. Garden sculpture, furniture, hardscape- detailed study. Selected plants, taxonomy plantation & maintenance.
<b>Unit-2</b>	Historical development French & English, Mughal, Japanese, Landscape.
<b>Unit-3</b>	Works of noted landscape architects and landscape projects, case study of existing landscape project.
<b>Unit-4</b>	Elements of landscape architecture and their application in landscape design a. Natural elements: Landform, water and vegetation, Design considerations and their role in articulating outdoor spatial design. b. Secondary / Manmade Landscape: Design considerations and their role in spatial design. Hard and soft landscapes.
<b>Unit-5</b>	Landscape layout site development for given site covering design criteria and presentation through models, sketches and drawings.

**Submission /Assignment:**

- Files and sketches, Audio-visual Presentations and photographs.
- Visit to nurseries, gardens collection and information of selected plants and form a database for native plants in region.
- Design problem of same semester ; site plan to be resolved.

**Reference Books:**

1. Mcharg, I, Design with Nature. John Wiley and co. 1978.
2. Jellicoe, G and Jellicoe, S, The Landscape of Man, London: Thames and Hudson, 1991.
3. Simonds, J. O, Landscape Architecture: The Shaping of Man's Natural Environment, N Y: McGraw Hill Lynch, K, Site Planning, Cambridge: The MIT Press, 1962.
4. Shaheer, M, Wahi Dua, G and Pal A (editors), Landscape Architecture In India.
5. Lyall, S, Designing The New Landscape: UK: Thames and Hudson, 1998.
6. Dee, C, Form And Fabric In Landscape Architecture: A Visual Introduction, UK: Spon Press, 2001.
7. Eckbo, G, Urban Landscape Design, N Y: McGraw hill co. 1961.
8. Laurie, M, An Introduction to Landscape Architecture, N Y: American Elsevier Pub. Co. Inc. 1975
9. Rutledge, A J. A Visual Approach to Park Design. New York: John Wiley and Sons, 1985.
10. Randhawa, M S, Flowering Trees, New Delhi: National Book Trust, 1998.
11. Bose, T K and Choudhary, K, Tropical Garden Plants in Colour, Horticulture and Allied publishers, 1991.
12. Krishen, P. Trees of Delhi: A Field Guide, Penguin India, 2006.
13. Mukherjee, P, Trees of India (WWF Natures Guide), Oxford, 2008.
14. Sahni, K C, The Book of Indian Trees (Bombay Natural History Society), Oxford, 1998.
15. Krishna, N and Amrithalingam, M, Sacred Plants of India, Penguin Books Limited, 2014.
16. Motloch, J. L, Introduction to Landscape Design, US: John Wiley and Sons, 2001.
17. Dines, N and Harris, C, Timesavers Standards for Landscape Architecture, McGraw Hill Education, 1998.
18. Reid, G, L, Landscape Graphics, Watson-Guptill, 2002.
19. Botkin, D. B and Keller, E. A, Environmental Science: Earth As a Living Planet, N Y: John Wiley and Co. 1995.
20. Grosholz, E, The Poetics of Landscape Architecture, University of Pennsylvania Press, 2010.

**21 AR5-09: ELECTIVE V**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	--	--	ISE	ESE	ICA	ESE	
Total	01	01	--	--	50	---	50

The student will opt for any one of the following courses

**A.Sustainable Building Material****B.Green Building and Rating Systems****C.Sociology and Architecture**

The detail syllabus for the above subjects is given hereby

**A. SUSTAINABLE BUILDING MATERIAL****Course Objective:**

To understand the features of Sustainable Building Materials, understand basic elements, principles and techniques of Selecting & use of materials

**Course Outcome:**

After successful completion of this course, student shall be able to:

- Apply knowledge to select sustainable materials, selection of material, technology and use of local material.
- Exhibit understanding of material as per green rating systems and green certified products

**Course Curriculum:**

<b>Unit 1</b>	Features of Sustainable Building Materials:	Pollution prevention in Manufacturing, Waste Reduction Measures in Manufacturing, Recycled Content, Embodied Energy Reduction, Use of Natural Material, Reduction of Construction Waste, Local Materials, Energy Efficiency-Thermal properties, Chemical Properties, Physical Properties, Longer Life, Reusability, Recyclability, Biodegradability.
<b>Unit 2</b>	Key Building Materials and Sources:	Limestone, Steel, Aluminum, Bricks and Tile, Petrochemicals, Wood, Alternatives to conventional building materials, etc
<b>Unit 3</b>	Selecting Sustainable Building Materials:	Selecting Sustainable Building Materials- Criteria: Methodologies and selection criteria, Cradle to Cradle approach.
<b>Unit 4</b>	Strategy of use of materials Strategy of use of materials in Pre-Building Phase	Manufacture; Building Phase: Use; Post-Building Phase: Disposal; considering issues mentioned above. Alternatives to conventional building materials.
<b>Unit 5</b>	Construction Technology and Material	Examples of Materials, Construction technology and Detailing

**Submission/Assignments:**

Study documentation, reports and data collection in file form/drawing form.

Pre-Design Process Drawings

Design portfolio.

Design Models, study models.

**Reference Books:**

1. Handbook of Sustainable Building by David Anink, Chiel Boonstra, John Mak.
2. 1 Adobe: Building & Living with Earth, by Orlando Romero & David Larkin.

## **B. GREEN BUILDING AND RATING SYSTEMS**

### **Course Objective:**

- To develop and acquire knowledge about the green buildings
- To Gain knowledge about the green Building codes
- To understand the code compliance Process
- To understand the Indian and International green building codes
- To understand the design ideas for the green building
- To understand about energy usage and code compliance.

### **Course Outcome:**

After successful completion of this course, student shall be able to:

- Apply acquaint knowledge of the basic concept of green buildings; green rating systems around the world;
- Apply criteria involved in the green rating systems.
- Exhibit understanding for documentation of project for green Building certification.
- Document design techniques to be followed as per codes.

### **Course Curriculum:**

<b>Unit 1</b>	Green building codes & Certification	Green building design, benefits, rating systems, Introduction to USGBC, IGBC codes for various types of buildings, campus rating, cities rating, factory, health care, schools, interiors etc. LEED, GRIHA, ECBC
<b>Unit 2</b>	Energy usage and code compliance	Energy, Conventional systems, Modern systems, Energy bills, Equipment & Utility, Embodied energy, Energy performance Assessment, Energy ratings ECBC guidelines – ECBC CODE compliance & Certification- ECBC, ECBC+, Super ECBC, ECO- NIWAS Samhita 2018, Part – I (Building Envelope), ECO – NIWAS Samhita 2021, (Code Compliance and Part – II:( Electro mechanical and Renewable Energy Systems), ECO NIWAS TOOL.
<b>Unit 3</b>	GRIHA ratings and compliance	GRIHA codes – all credits & ratings – Compliance Process & Certification

### **Submission /Assignment:**

Presentations, Journal.

### **Reference Books:**

1. Nayak, J. K., Prajapati, J. A., 2006. Handbook on Energy Conscious Buildings, Prepared under the interactive R&D Project No. 3/4(03)99-SEC between Indian Institute of Technology, Bombay, and Solar Energy Centre, Ministry of New and Renewable Energy, Government of India.
2. Slessor, 1997 —Eco-Tech: Sustainable Architecture and High Technology| - Thames and Hudson
3. Mostaedi (A) – Carles Broto 2002 —Sustainable Architecture: Low tech houses|
4. Yeang Ken, 2006 —Eco-design: A manual for Ecological Design| Wiley Academy
5. ECO – NIWAS Samhita 2018, Part – I ( Building Envelope),
6. ECO – NIWAS Samhita 2021, (Code Compliance and Part – II:( Electro mechanical and Renewable Energy Systems), ECO NIWAS TOOL.
7. ALL ASHRAE standards, USGBC, IGBC Guide, GRIHA manual
8. All NPTEL, SWAYAM courses related to the Topics to be referred

## C. SOCIOLOGY AND ARCHITECTURE

### Course Objective:

To familiarize students with the basic concepts of sociology and its influence on architecture.

### Course Outcome:

After successful completion of this course, student shall be able to:  
Exhibit understanding of basic sociological concepts and learn their applications in space planning and architectural design

### Course Curriculum:

<b>Unit 1</b>	Introduction to Sociology	Definition of Sociology; Nature, Scope and Utility of Sociology; Branches of Sociology; Relation of Sociology and its branches to architecture and the built environment.
<b>Unit 2</b>	Elements of Society	Biosocial and Sociocultural associations; Definitions of sociological terms: society, community, family, culture; Difference between society and community;
		Different family structures and architectural responses to different family types in and outside India (examination of different housing typologies responding to different family types — traditional and contemporary); Relation between culture and built form (exploration of architectural examples).
<b>Unit 3</b>	Communities	Origin, growth and nature of settlements and communities. Their characteristics and spatial patterns
<b>Unit 4</b>	Urban and Rural Communities	Definitions of the terms "urban" and "rural". The social, economic and spatial characteristics associated with urban and rural settlements. Relation and interdependencies between urban and rural settlements. Urban sociology and rural sociology.
<b>Unit 5</b>	Cities and Society	Urbanization — definition; causes. Effects of urbanization on rural areas. Impact of growing urbanization on urban life, viz. health, housing, transportation. Different types of migration. The impact of migration on urban form. The origin and characteristics of slums in European, American and Indian cities. Official definition of slums as per Census of India. Governmental and non-governmental approaches to engaging with issues regarding slums in Indian cities.
<b>Unit 6</b>	Social Research	The need for research; the research process; ethics of social research; scope of social research. Difference between methodology and methods. Types of research methods: qualitative, quantitative, mixed research methods. Sources of research data: primary and secondary sources. Secondary data sources include literature review, official and unofficial documents. Primary data sources use methods such as field surveys, questionnaires, different types of interviews (open-ended / closed / structured / semi- structured), and case study approach.

### Submission /Assignment:

Presentations, Journal.

### Reference Books:

1. Oliver, P., ed. 1997. Encyclopedia of Vernacular architecture of the World Vol. 1-3, CUP, Cambridge.
2. Rappaport, Amos, 1969. House Form & Culture. Prentice Hall Inc.
3. Brunskill, R.W., 1987. Illustrated Handbook on Vernacular Architecture.
4. Pamar, V.S, 1989. Haveli: Wooden Houses & Mansions of Gujarat. Mapin Pub. Ahmedabad. Jain, Kulbhushan 1992. Mud Architecture of the Indian Desert, Aadi Centre, Ahmedabad.
5. Fathy, Hassan 2000. Architecture for the Poor: An Experiment in Rural Egypt. Univ. of Chicago Press.
6. Rudofsky, Bernard, 1964. Architecture without Architects. . Museum of Modern Art, NY.
7. Heath, K., 2009. Vernacular Architecture & Regional Design - Cultural Processes & Environmental Responses, Architectural Press,London.
8. Bhatia, Gautam,1981. Laurie Baker: Life, Works & Writings. Viking/ HUDCO, New Delhi.

**21 AR5 – 10: ELECTIVE VI**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	--	--	ISE	ESE	ICA	ESE	
Total	01	01	--	--	50	--	<b>50</b>

The student will opt for any one of the following courses

- A. Architectural Journalism**
- B. Earthquake Resisting Structures**
- C. Basics of Archeology**

The detail syllabus for the above subjects is given hereby

**A. ARCHITECTURAL JOURNALISM****Course Objective:**

It introduces students to the fundamentals of writing, explaining of various strategies and Introduction to Photojournalism and the contributions of photography to the professional their criticism. Practice of architecture and develop proficiency in this art using modern photography techniques.

**Course Outcome:**

After successful completion of this course, student shall be able to:

- Apply knowledge on fundamentals of writing, explaining of various strategies and design narratives.
- Exhibit understanding of Contemporary Architectural Journalism by the students.
- Apply knowledge on Regional, National, and international discussion forums.
- Exhibit understanding of Photojournalism and the contributions of photography.

**Course Curriculum:**

<b>Unit 1</b>	Introduction	Introduction to journalism, key concepts and objectives of Journalism Specialized journalism: with emphasis on architectural journalism
		Journalism skills: research, reporting, writing, editing, photography, columnists, public relationships, criticism. Issues such as copyright, public art policy, the arts and urban redevelopment.
		Introduction to local culture scene.
<b>Unit 2</b>	Technologies in Journals	Environment, Social Change, Persuasion- Interviewing techniques, Argument and debate as a technique in the investigation of social problems; evidence, proof, refutation, persuasion; training in argumentative speaking.
		Introduction to software needed in journalism and photography, video coverage, walk-through of buildings, production of contemporary architectural journalism.
		Understanding the individual demands in the context of newspapers, radio, film, and television.
<b>Unit 3</b>	Contemporary Architectural Journalism	Role of the Editor - Editing of Articles, Features and other stories - Editing for online newspaper and magazines
		Text preparation, Mode of presentation, Standards and Guidelines for documentation

		Code of ethics, Basic knowledge on Press laws, Press Council of India, Multimedia/online journalism and digital developments.
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**Submission/ Assignment:**

Presentations, article writing and term paper.

**Reference Books:**

1. Edward Jay Friedlander and John Lee, “Feature Writing for Newspapers and Magazines”, 4<sup>th</sup> edition, Longman,.
2. Fuller, David & Waugh, Patricia eds., “The Arts and Sciences of Criticism”, Oxford: Oxford University Press, 1999
3. Foust, James, Online Journalism, “Principles and Practices of News for the Web”, Holcomb Hathaway Publishers, Scottsdale, AZ, 2005
4. M. Harris, “Professional Architectural Photography”, Focal Press, 2001.
5. M. Harris, “Professional Interior Photography”, Focal Press, 2002 68
6. Huckerby, Martin., The Net for Journalists: A Practical Guide to the Internet for Journalists in Developing Countries. UNESCO/Thomson Foundation/ Common wealth Broadcasting Association, 2005.
7. Ward, S. J. A. “Philosophical Foundations of Global Journalism Ethics.” Journal of Mass Media Ethics., Vol. 20, No. 1, 3-21, 2005
8. M. Heinrich, “Basics Architectural photography”, BirkhauserVerlag AG, 2008.
9. Gerry Kopelow, “Architectural Photography: the professional way”, 2007



## B. EARTHQUAKE RESISTING STRUCTURES

### Course Objective:

- To introduce the fundamentals of earthquake and the basic terminology
- To provide basic knowledge of earthquake resistant design concepts
- To inform the performance of ground and buildings.
- To familiarize the students with design codes and building configuration
- To understand the various types of construction details to be adopted in a seismic prone area.
- To apply the knowledge gained in an architectural design assignment

### Course Outcome:

After successful completion of this course, student shall be able to:

- Develop ability to understand the formation and causes of earthquakes
- Design of buildings and services to resist Earthquakes.
- Exhibit understanding of the various types of construction details to be adopted in a seismic prone area.
- Exhibit understanding on the performance of ground and buildings in a seismic prone area.

### Course Curriculum:

<b>Unit 1</b>	Fundamentals of earthquakes	Earth's structure, seismic waves, plate tectonics theory, origin of continents, seismic zones in India.
		Predictability, intensity and measurement of earthquake
		Basic terms- fault line, focus, epicenter, focal depth etc.
<b>Unit 2</b>	Site planning, performance of ground and buildings	Historical experience, site selection and development
		Earthquake effects on ground, soil rupture, liquefaction, landslides.
		Behavior of various types of building structures, equipment, lifelines, collapse patterns
		Behavior of non-structural elements like services, fixtures in earthquake-prone zones.
<b>Unit 3</b>	Seismic design codes and building configuration	Seismic design code provisions – Introduction to Indian codes
		Building configuration- scale of building, size and horizontal and vertical plane, building proportions, symmetry of building- torsion, re-entrant corners, irregularities in buildings- like short stories, short columns etc.
<b>Unit 4</b>	Various types of construction details	Seismic design and detailing of non-engineered construction- masonry structures, wood structures, earthen structures.
		Seismic design and detailing of RC and steel buildings
		Design of non-structural elements- Architectural elements, water supply, drainage, electrical and mechanical components
<b>Unit 5</b>	Urban planning and design	Vulnerability of existing buildings, facilities planning, fires after earthquake, socio-economic impact after earthquakes.
		Architectural design assignment- Institutional masonry building with horizontal spread and height restriction, multistoried RC framed apartment or commercial building.

### Submission /Assignment:

Presentations, Journal with sketches, models

### Reference Books:

1. Guidelines for earthquake resistant non-engineered construction, National Information centre of earthquake engineering (NICEE, IIT Kanpur, India), 2004.
2. C.V.R Murthy, Andrew Charlson. "Earthquake design concepts", NICEE, IIT Kanpur, 2006.
3. Agarwal.P, Earthquake Resistant Design, Prentice Hall of India, 2006.

3. Ian Davis, “Safe shelter within unsafe cities: Disaster vulnerability and rapid urbanization”, Open House International, UK, 1987
4. Socio-economic developmental record- Vol.12, No.1, 2005
5. Mary C. Comerio, Luigia Binda, “Learning from Practice- A review of Architectural design and construction experience after recent earthquakes” - Joint USA-Italy workshop, Oct.18-23, 1992, Orvieto, Italy.

### **C. BASICS OF ARCHEOLOGY**

#### **Course Objective:**

- The objective of the course is to emphasize the relevance and centrality of archaeology to the field of conservation.
- To develop an understanding of the art and science of archaeology, the management of archaeological sites, aspects of display and presentation of heritage at various scales and most importantly the integration of archaeological sites with living habitats.

#### **Course Outcome:**

After successful completion of this course student shall be able to;

- Exhibit understanding on basics of the nature, development and value of archaeology as a discipline

#### **Course Curriculum:**

<b>Unit 1</b>	History of Indian Archaeology	Development of Archaeological Survey of India, Brief idea about Early Indian Archaeologist
		Sources of Ancient Indian History
		Definition, Aims and Scope of Archaeology
<b>Unit 2</b>	Types of Archaeology	Marine Archaeology, Aerial Archaeology, Ethno Archaeology, Historical Archaeology, Environmental Archaeology, New Archaeology and relevance of Archaeology to contemporary Society
		Relation of Archaeology with Natural Sciences and Social Sciences
<b>Unit 3</b>	Brief introduction of Pre-Historic Culture	Mesolithic and Neolithic Culture
<b>Unit 4</b>	Brief introduction of Proto Historic Culture	Harappa, Copper Hoard, Painted grey ware culture, Northern Black Polished ware culture and Megalithic Culture
<b>Unit 5</b>	Acts	Cultural Heritage, Monuments And Archaeological Legislations/ Treasure Trove Act: The Ancient Monuments and Archaeological sites and Remains Act 1958 & 1959, The Indian Treasure Trove Act 1878 & 1973

#### **Submission /Assignment:**

- Seminar/Assignment/ Presentation
- Journal with sketches.

#### **Reference Books:**

1. Atkinson, R. J. C.: Field Archaeology, London
2. Sankalia.H.D : Prehistory and Protohistory of India &Pakistan
3. Binford, S. R. and L. R.: New Perspective in Archaeology
4. Nautiyal, K. P.: Proto-historic India. Delhi
5. Allchin, B. & E.R. Allchin: The Rise of Civilization in India and Pakistan
6. Bhattacharya.D.K. : An Outline of India Prehistory
7. Rajan.K : Archaeology: Principles and Methods
8. Robert.f.Heizer(ed.) : The Archaeologist at Work: A source Book in Archaeological Method and Interpretation

**B.ARCH. SEM. VI****21 AR6 – 01: ARCHITECTURAL DESIGN – VI**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	06	06	ISE	ESE	ICA	ESE	
Total	07	07	--	--	100	150	250

**Course Objective:**

- To introduce students with the fundamental concepts of services and its integration in vertical planning in design process.
- To develop the proficiency to integrate landscape planning in high-rise, vertical planning for public buildings and design.
- To learn the approach of design public building considering various parameter of design along with knowledge gained in previous semester.
- To develop acquaintance with social, economic, climatic, geographical context to design multifunctional high-rise/ vertical public domain buildings of function like, intuitional project, administration service-oriented building

**Course Outcome:**

At the end of semester students shall be able to

- Exhibit understanding of fundamental concepts of services and its integration in vertical planning in design process.
- Apply the proficiency to integrate landscape planning in high-rise, vertical planning for public buildings and design.
- Use relevant application to design public building considering various parameter of design along with knowledge gained in previous semester.
- Apply acquainted knowledge of social, economic, climatic, geographical context to design multifunctional high-rise/ vertical public domain buildings of function like, intuitional project, administration service-oriented building

**Course Curriculum:**

<b>Unit 1</b>	<b>Major Design Problem</b>	Approach to design as a continuous process through function, technology and aesthetics (basic components) of the building and their function.
		Multi-storeyed office apartments, Service apartment, commercial complex, Youth Hostel, Communication centre, Public Building like Govt. offices, High-rise structure. Urban scale project, transport design, public utility, designs with structural grid understanding.
		Suggested Design Methodology:
		Design based on climate, landscape, services and interiors. Application of subjects studied in design process like acoustics, structures, MEP ACMV etc.
		Design problem of built-up area about 1500 to 2500 sqm. Plot areas can vary from 3-4 times of the built up area.
<b>Unit 2</b>	<b>Minor Design Problem</b>	<b>Minor Design Assignment: literature study and analysis</b> The student should be introduced with a design problem total built-up 750-1000sqm

<b>Unit 3</b>	<b>Time bound design assignment</b>	Design - 18 hours Duration. Drawing work of minor design assignment to be completed in time bound
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**Submission/Assignment:**

Study documentation, reports and data collection in file form/drawing form.

Pre-Design Process Drawings

Design portfolio.

Design Models, study models.

**Reference Books:**

1. Anthony Di Mari and Nora Yoo, " Operative Design: A Catalogue of Spatial Verbs", BIS Publishers.
2. Bruno Munari,"Design as Art", Penguin UK, 25-Sep-2008
3. Charles George Ramsey and Harold Sleeper, "Architectural Graphic Standards", 1992, Wiley
4. Debkumar Chakrabarti, "Indian Anthropometric Dimensions for Ergonomic Design Practice", 1997
5. Frank Ching, James F. Eckler, "Introduction to Architecture", 2012, John Wiley & Sons, US
6. Frank D.K. Ching, " Architecture: Form, Space, and Order", 4th Edition, Sep. 2014, John Wiley & Sons
7. John Hancock Callender, "Time-Saver Standards for Architectural Design Data", 1982, McGraw-Hill
8. Neufert Architects' Data by Ernst Neufert
9. Francis D.K. Ching –Elements of Architecture
10. Walter Gropius – Total Architecture
11. Site Planning by Kevin Linch, Gary Hack

**21 AR6-02: BUILDING CONSTRUCTION AND MATERIAL-VI**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	04	04	ISE	ESE	ICA	ESE	
Total	05	05	---	---	100	150	250

**Course Objective -**

- To help students to understand the construction of underground structure and preventive measures against dampness, soil retention etc.
- Construction with specific reference to retaining soil.
- To develop student's analytical skill in facade development by curtain wall and cladding.
- To develop analytical and logical sequence in thinking, through site visit & material study.
- To study the construction system for vertical means of transport.
- To study the construction system adopted for low cost and sustainable practices.

**Course Outcome –**

At the end of semester student able to exhibit understanding on

- Construction of underground structure and preventive measures against dampness, soil retention etc.
- Construction with specific reference to retaining soil.
- Analytical skill in facade development by curtain wall and cladding.
- Analytical and logical sequence in thinking, through site visit & material study.
- The construction system for vertical means of transport.
- The construction system adopted for low cost and sustainable practices.

**Course Curriculum:****Building construction:**

Unit	Topic	Details
Unit 1	Basement	a. Construction of basement and measures to be taken against soil water, and roots etc.
Unit 2	Dewatering and waterproofing	a. Dewatering of basement b. Methods of water proofing for basements, tanking, sheet piles.
Unit 3	RCC retaining walls	a. Construction of retaining walls – cantilever,
Unit 4	Curtain wall and cladding	a. Construction of curtain wall using glass and aluminium frame - framed stick and with fittings b. Cladding – dry and wet using different materials
Unit 5	Bamboo construction	a. Detailing of walls, wall panels, doors, windows and roof in Bamboo.
Unit 6	Lifts and escalator	a. Constructional aspects applicable for the grouping and installation of lifts (machine, machine less, panoramic, hydraulic lifts and escalator )

**Building material :**

Unit	Topic	Details
Unit 1	Glass	a. Properties, of glass. b. Use of glass as both interior and exterior. c. Types of glass used in building industry. d. Advantages and disadvantages of glass as a building material.
Unit 2	Plastics	a. Properties of plastics b. uses of plastic as a building material. c. Types of plastics – PVC, FRP, Polycarbonate etc. d. Advantages and disadvantages

<b>Unit 3</b>	Epoxy, Mastic Sealants and adhesives	a. Various types of Epoxies, Mastic Sealants and adhesives b. Compositions of Epoxy, Mastic Sealants and adhesives c. Properties of Epoxy, Mastic Sealants and adhesives d. Application their varied uses in construction.
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**Submission /Assignment:**

**Sheet work on -**

1. Construction of basement and preventive measures to be taken against soil, water, and roots etc.
- 2&3. Methods of water proofing for basements, tanking, sheet piles.
4. Construction of retaining walls – cantilever,
5. Construction of curtain wall using glass and aluminum frame - framed, stick and with fittings
6. Cladding – dry and wet using different materials
7. Bamboo. -detailing of walls, wall panels, doors, windows and roof in
- 8&9 Lifts (machine, machine less, panoramic, hydraulic lifts.
10. Escalator

Journal and sketches on building construction and material.

Report – Site Visit and Case Study.

Model – Shell, Geodesic dome, Bamboo work etc.

ESE weightage – 60% building construction, 40% building Material

**Reference Books:**

1. Barry, R. (1999). The Construction of Buildings Vol. 2. 5th Ed. New Delhi : East-West Press.
2. Foster, J. and Mitchell, S. (1963). Building Construction: Elementary and Advanced, 17th Ed. London : B.T. Batsford Ltd.
3. McKay, W. B. (2005). Building Construction Metric Vol. I–IV. 4th Ed. Mumbai : Orient Longman.
4. Moxley, R. (1961). Mitchell's Elementary Building Construction. London : B. T. Batsford.
5. Rangwala, S. C. (1963). Building Construction: Materials and types of Construction. 3rd Ed. New York : John Wiley and Sons.
6. Chudley, R. (2008). Building Construction Handbook. 7th Ed. London : Butterworth-Heinemann.
7. Sushil-Kumar, T. B. (2003). Building Construction. 19th Ed. Delhi : Standard Publishers.
8. Rangwala, S. C. (1963). Engineering Materials. 3rd Ed. New York : John Wiley and Sons

**21AR6-03 THEORY OF STRUCTURE – VI**

Teaching Scheme per week		Credits	Examination scheme				
Lecture (L)	02	02	Theory exam		Practical/Oral exam		Total
Practical/Studio(P/S)	--	--	ISE	ESE	ICA	ESE	
Total	02	02	30	70	----	----	100

**Course Objective:**

To help students to understand and analyze the behavior of RCC structural members like footings, staircases, retaining wall, water tank by limit state method using IS 456-2000. (The students are allowed to carry IS 456-2000 and IS 3370 with themselves in exam halls)

**Course Outcome:**

By the end of the term, the student develop skills to analysis and design RCC structural members like retaining walls, Pile Foundation, Combine footing and water tanks by limit state method using IS 456-2000.

**Course Curriculum:**

Unit-1	Design of retaining walls	Analysis and design of cantilevered and counter fort retaining wall
Unit-2	Design of water tanks	Design criteria, permissible stresses, Design of circular, square and rectangular ground storage reservoir by using IS 3370
Unit 3	Pile and raft foundations	Concepts and types of pile foundations, Design of pile foundation, Concept and types of raft foundations, analysis and design of raft foundation
Unit 4	Design of combine footing	Concepts and types of combine footing, Analysis and design of combine footing

**Submission /Assignments:**

Topic-wise assignments

**References Books :**

1. Reinforced concrete – limit state method by A. K. Jain
2. Limit state design of reinforced concrete by B. C. Purnima, Ashok Kumar Jain and Arun Kumar Jain
3. Reinforced Concrete – Vol – 1 by Dr. H. J. Shah
4. IS 456-2000 Plain and reinforced concrete – Code of practice
5. IS 3370 Part 1 – 2009 Concrete structures for storage of liquids – Code of practice

**21 AR6-04: WORKING DRAWING- I**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	03	03	ISE	ESE	ICA	ESE	
Total	04	04	--	--	50	100	150

**Course Objective:**

- To enable the students, understand the significance of working drawings from the view point of executing the work on site
- To make students familiar with the components of tender document and prepare working drawings for an architectural Load bearing project.

**Course Outcome:**

By the end of the term students should be equipped to prepare working drawings for an architectural Load bearing project necessary for execution on site and understand its importance in tender document.

**Course Curriculum:**

The Studio work should engage in preparing Working drawing for load bearing structure (80-100 sqm) carpet area of any previous semester load bearing design problem to suitable scale.

Content:

1. All floor plans.
2. Centreline plan. Excavation plan. Foundation plan.
3. All sides Elevation.
4. Minimum 2 Sections passing through toilet and staircase.
5. Architectural drawing details. Any one from Electrical layout. Plumbing layout Drainage layout.
6. Municipal submission drawing.

**Submission /Assignment:**

Portfolio containing all required drawings.



**21 AR6-05: URBAN PLANNING**

Teaching Scheme per week		Credits	Examination scheme				
Lecture (L)	02	02	Theory exam		Practical/Oral exam		Total
Practical/Studio (P/S)	--	--	ISE	ESE	ICA	ESE	
Total	02	02	30	70	----	----	100

**Course Objective:**

- This course is proposed to impart knowledge of Town and regional aspects of planning.
- The process of town planning factors affecting city planning and procedures involved,
- To understand how foresighted city planning will meet present as well as future social, cultural and economic requirements.

**Course Outcome:**

At the end of semester students should develop understanding on

- Evolution of Town Planning and Trends in urbanization in post-independence India;
- Development plans, Urban and Rural Housing, Zoning and other regulations
- Land-use planning and zoning
- Infrastructure in city planning

**Course Curriculum: -**

<b>Unit 1</b>	Planning efforts and impacts on historical cities -	Evolution, origins and growth of settlements
		Characteristics of Rural and Urban settlements; Urban form based on different determinants
		Ancient civilizations, Classical cities, Indian cities
<b>Unit 2</b>	City Planning in Post-Industrial Revolution Era	City Planning in Post-Industrial Revolution Era: Objects of planning
	Pioneers in planning theories	Ebenezer Howard (Garden City), Soria Y. Mata (The Linear City), Patrick Geddes (Outlook Tower, Valley Section, Folk-Work-Place, Civic Survey), Le Corbusier (Ville Contemporaine), Frank Lloyd Wright (Broadacre City), Ludwig Hilberseimer (Decentralized City), Constantinos A Doxiadis (Ekistics), Clarence Arthur Perry (Neighbourhood Unit); Clarence Stein (American Garden Cities).
<b>Unit 3</b>	Trends in urbanization in post-independence India;	Planned cities in post-Independence India
		Growth trends, housing issues and management of Metropolitan cities
<b>Unit 4</b>	Internal spatial structure of the city:	Concentric Zone theory; Sector theory; Multiple Nuclei Theory;
		Characteristics of Central business district, Urban nodes
<b>Unit 5</b>	Land use and Zoning:	Land use categories and representation
		Relationship between Land use and Zoning; Types of Zoning
	Infrastructure in city planning	Classification of roads road layouts, Widths, junctions, flyover bridges, Various road patterns for vehicles and pedestrian traffic.
<b>Unit 6</b>	Planning Processes and Tools	Scales of Planning: Masterplan/Comprehensive Development Plan, Area Plan, Regional Plan, Perspective Plan,
		URDPFI Guidelines; Steps of urban planning, Urban Redevelopment:

**Submission/ Assignment:**

1. Assignments
2. Land use planning
3. Mapping activity

**Reference Books:**

1. The Urban Pattern: City Planning and Design” by Galion and Eisner.
2. Fundamentals of Town planning by G.K. Hiraskar.
3. Text Book of town planning by Amit Bandopadaya.
4. Town planning by Rangwala.
5. Christopher Alexander, "A Pattern Language ", Oxford University Press, 1977.
6. Rob krier, " Street, public square facade"
7. Kamu Iyer, "Bombay: From Precincts to Sprawl", Popular Prakashan Ltd; 2014.
8. Kevin Lynch, "The Image of the City", MIT Press, 1960.
9. Kevin Lynch, "Good City Form", MIT Press, 1981.
10. Charles Correa, " Housing and Urbanization: Building Ideas for People and Cities", Thames & Hudson Ltd, 2000.

**21 AR6 – 06: ESTIMATING SPECIFICATIONS AND COSTING – I**

Teaching Scheme per week		Credits	Examination scheme				
Lecture (L)	03	03	Theory exam		Practical/Oral exam		Total
Practical/Studio(P/S)	--	--	ISE	ESE	ICA	ESE	
Total	03	03	30	70	----	----	100

**Course Objective:**

This subject enables students to understand procedure of detailed estimate for simple load bearing structure (excluding reinforcement details) and gives an idea about financial aspect of construction of buildings.

**Course Outcome:**

By the end of term, the student will be equipped to prepare detailed estimate for simple load bearing structure (excluding reinforcement details) along with determination of final project cost of building considering all required aspects.

**Course Curriculum:**

Unit-1	Fundamentals of Estimating and Costing	Definition, Purpose of estimating and costing, Types of estimates, Roles and responsibilities of estimator, sequence of execution of items of work, terminology like contingencies, work charged establishment, tools and plants, administrative approval, expenditure sanction, technical sanction
Unit-2	Approximate Estimate	Definition and purpose, Methods of approximate estimate
Unit-3	Detailed Estimate	Definition and purpose, Methods of detailed estimate, Methods of taking out quantities, modes of measurement as per IS 1200, rules of deductions for openings in masonry work, plastering, and pointing work, description/specifications of items of work as per PWD, standard format of different sheets, numerical on estimate of different items of work of load bearing structure excluding reinforcement details
Unit-4	Rate Analysis	Definition and purpose, Terminology like lead, lift, bill of quantities, day work, prime cost, provisional quantities, capital cost, composition of rates, contractor's profit, overhead charges, tools and plants, material and labour costs, district schedule of rates numerical of costing of different item of work of load bearing structure

**Submission / Assignments:**

Topic-wise assignments

**Reference books:**

1. Estimating and Costing in Civil Engineering by B. N. Dutta.
2. Estimating Costing Specification and Valuation by M. Chakraborti.
3. Estimating Costing and Valuation by Rangwala.
4. Estimating and Costing by M. N. Gangrade.

**21 AR6-07: BUILDING SERVICES – IV**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	02	02	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	-	-	ISE	ESE	ICA	ESE	
Total	02	02	30	70	--	--	100

**Course Objective:**

- The main objective is to make students familiar with various types of waste, their treatment and disposal.
- To enable students to understand various methods of Sewage disposal – Natural and Artificial Method.
- To enable them to understand maintenance and disposal of refuse in high rise buildings and methods of design of Swimming pool and details.

**Course Outcome:**

The end of semester student should develop understanding about –

- Sewage Treatment plant and its layout, Waste water treatment plant.
- Disposal of Sewage in Un sewerred areas.
- Methods of design and construction of Swimming pool and details.

**Course Curriculum:**

<b>Unit 1</b>	<b>Sewage disposal</b>	Objectives of Sewage disposal
		Sewage disposal system for housing colony small and medium size project for smaller and in rural area
		Sewage disposal of large area, bigger towns.
<b>Unit 2</b>	<b>Methods of Sewage disposal</b>	Natural and Artificial Method.
		Basic Principles of Sewage treatment plant its objective and
		layout of the Sewage treatment plant
<b>Unit 3</b>	<b>Waste water treatment plant</b>	Basic Principles of waste water treatment plant its objective
		Layout of waste water treatment plant.
<b>Unit 4</b>	<b>Disposal of sewage in unsewerred area</b>	Different types of Privies.
		Public Toilet – Sulabha Shauchalaya (pit latrines).
		Septic Tank, Imhoff tank.
<b>Unit 5</b>	<b>Solid waste management</b>	Refuse disposal system for small house, colony and town Refuse types & disposal problems.
		Methods of dry disposal, wet disposal of refuse.
		Industrial refuse disposal, problems and system.
		Refuse disposal in multi-storied building
<b>Unit 6</b>	<b>Swimming pool (introductory)</b>	Design and construction of swimming pool
		Types of pool
		All construction and services details

**Submission/ Assignment:** Files, sketches and sheets as required.

**Reference Books:**

1. Building services and equipment by Birdie.
2. Building services by S. M. Patil.
3. Water supply and sanitation by Rangawala
4. Building services by Chatre

**21 AR6 – 08 : SITE PLANNING**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	--	--	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	03	03	ISE	ESE	ICA	ESE	
Total	03	03	--	--	100	---	100

**Course Objective:**

To introduce students influencing factors which governs the siting of building/ group of buildings in a given site along with integration of renewable energy systems as per ECBC.

**Course Outcome:**

By the end of the course student should be able to:

- Prepare site analysis diagram and mapping based on site utilities, infrastructure
- Prepare building siting and planning according to analysis done

**Course Curriculum:**

<b>Unit 1</b>	Information Collection	Location, Neighbourhood, Context, Size and Zoning, Legal, Nature Physical Feature, Man Made Feature, Circulation, Utility Sensory, Human and Cultural, Climate.
<b>Unit 2</b>	Site Analysis	Physical, Visual Survey, Contextual, Climatic analysis, Interdependency on existing situations Study Based on: Site condition, Easement, Contours, Drainage, Flora Fauna, Manmade features, Pedestrian, Vehicular, Views from site, and Views through Sites, Noise, Human Culture, Utilities, and Climatic Elements.
<b>Unit 3</b>	Design Assignment	Analysis and Design Interpretation based sites selected in previous four semester design assignment.
<b>Unit 4</b>	Design Response	Interpreting the diagrams and above analysis Response to site conditions based on: Site condition, Easement, Contours, Drainage, Flora Fauna, Manmade features, Pedestrian, Vehicular, Views from site, and Views through Sites, Noise, Human Culture, Utilities, and Climatic Elements.

**Submission /Assignment:**

1. Study documentation, reports and data collection in file form/drawing form.
2. Drawing portfolio.
3. Site Models and Analysis.

**Reference Books:**

Site Analysis by Edward T White

**21 AR6 – 09: ELECTIVE VII**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	--	--	ISE	ESE	ICA	ESE	
Total	01	01	--	--	50	--	50

The student will opt for any one of the following courses

- A. Prefabricated Construction**
- B. Digital Graphics and Art**
- C. Road Safety and Civic Sense**

The detail syllabus for the above subjects is given hereby

**A. PREFABRICATED CONSTRUCTION****Course Objective:**

- To understand application of provisions of National Building Code [India] or any other such case example with respect to modular coordination in building design and standardization of building units & components
- To understand application of prefabrication principles and processes as may be followed in small scale in a project site
- To understand application of principles of specifying tolerances for building units & components
- To understand application of construction techniques for different types of cost effective & environment friendly technologies of building construction (partial prefabrication/pre-casting).

**Course Outcome:**

After successful completion of this course, student should be able to:

- Do layout of factory and stages of loading in precast construction.
- Apply acquaint knowledge about panel systems, slabs, connections used in precast construction and will be in a position to design the elements.
- Apply acquaint knowledge about types of floor systems, stairs and roofs used in precast construction.
- Apply acquaint knowledge about types of walls used in precast construction, sealants, design of joints.
- Apply acquaint knowledge about components in industrial building.

**Course Curriculum:**

<b>Unit 1</b>	Introduction to the concepts of Standardization	Need, Importance and aim Evolution of practice of standardization
		Classification, Requirements & Validity of standards Terms and definitions Process of standardization & Actions for establishment of standards
<b>Unit 2</b>	Introduction to concepts of Modular Coordination	Objectives of Modular coordination & Definition of Basic Module Modular controlling dimensions, Planning Modules and preferred Multi-modules, Nominal size vis-à-vis Actual size, Planning & placing of components
		Annotations for Modular Drafting practice IMG recommendations on choice of multi-modules & BIS (NBC) recommendation on choice of modules for various building components
<b>Unit 3</b>	Introduction to concepts of prefabrication	Factors affecting the growth of prefabrication industry Advantages & disadvantages of on site & off-site prefabrication with respect to Indian scenario
		Terms & Definitions as in IS (NBC) Methods of prefabrication & Examples of prefabricated components

Detailed Syllabus – CBCS 2021 Pattern – B. Architecture

		Process of prefabrication Various issues related to prefabrication industry & Examples of early prefabrication concepts
<b>Unit 4</b>	Concepts of Standardization of Joints and Tolerances	Importance of standardization of Joints & classification of joints Considerations for corner connections & examples of various joints Concept of Tolerance for Deviations in component sizes. Tolerance equalization at joints
<b>Unit 5</b>	Cost Effective & environment Friendly Technologies	Innovative Building materials: Sand-lime, Fly ash lime, clay- fly ash bricks, pre-cast concrete blocks, precast concrete stone masonry blocks
		Cost Effective Foundation & walling techniques: arch foundation. Rat trap bond etc. Cost effective roofing techniques: Ferro-cement vaults, Wardha technique, Pyramidal roof
		Cost Effective Pre-cast Roofing & Flooring Components RCC Planks & Joists, Pre-cast Channel units, Thin RC ribbed slab, Pre-cast Waffle slabs, Pre-cast RC/ Pre-stressed cored slabs, Pre-cast Brick panels Precast RC Door & window frames, Pre-cast manhole covers, Ferro-cement door shutters, Ferro-cement water tanks

**Submission /Assignment:**

Presentations, Journal.

**Reference Books:**

1. Kelly; The Prefabrication of Houses
2. Nagarajan R.; Standards in Building;
3. Standards & Specifications for Cost-Effective, Innovative Building Materials and Techniques; BMTPC; New Delhi
4. Nissen H.; Industrialized Building and Modular Design; Cement & Concrete Association; London; 1972
5. Time Saver Standards: Design Data;
6. National Building Code; Bureau of Indian Standards; New Delhi; 1983

## B. DIGITAL GRAPHICS AND ART

### Course Objective:

To equip students with digital and 3D presentation techniques

### Course Outcome:

After successful completion of this course:

- Students will become conversant of communication through digital presentations.
- Students will explore digital art.

### Course Curriculum:

<b>Unit 1</b>	Digital presentations	Introduction of various software available for architectural presentation such as Photoshop & Coral.
		Basic Tools for Editing and Creating Graphics. Rendering AutoCAD drawings with appropriate materials.
		Compiling and arranging drawings on sheet for presentation or portfolio. Image doctoring and manipulation using computer software for graphics and animation (Photoshop and Flash).
<b>Unit 2</b>	Communication techniques	Advertising - Typography, artwork, Multimedia - digital graphic design techniques, surface decoration such as print, Printmaking – photo screen-printing and etching, scanning and laser printing.
<b>Unit 3</b>	3d digital presentations	Movie making Flash movies, animation graphics, and walkthroughs, 3D Printing.

### Submission /Assignment:

Architectural presentation of one's own term work  
Activities and assignments

### Reference Books:

1. Dinsmore, G. A. (1968). Analytical Graphics. Canada: D. Van Nostrand, Company Inc.
2. Jason Johnson, Joshua Vermillion. (2016). Digital Design Exercises for Architecture Students Paperback. Routledge; 1st edition
3. Frank Melendez . (2019). Drawing from the Model: Fundamentals of Digital Drawing, 3D Modeling, and Visual Programming in Architectural Design. Wiley



**C. ROAD SAFETY AND CIVIC SENSE****Course Objective:**

- To introduce the concepts, principles, tools and aids of Road Safety and Civic Sense to the students.
- To acquaint them with the design and safety standards for roads.
- To inculcate the practice of safe road behavior and civic sense among them.

**Course Outcome:**

After successful completion of this course students shall be:

- Apply concepts, principles, tools and aids of Road Safety and Civic Sense in design.
- Able to inculcate the practice of safe road behavior and civic sense among them.
- Better citizens and respond to urban design challenges.

**Course Curriculum:**

<b>Unit 1</b>	Introduction to Road Safety	Road as an active space, Types of Users, User Behaviour, Sensory Factors like Vision and Hearing in User Behaviour
		Types of Vehicles: Heavy Vehicles, Light Motor Vehicle, Two Wheelers, Auto-Rickshaw, Bicycles and Cycle Rickshaw, Non-Motorised Vehicles.
		Vehicle Characteristics: Dimensions, Weight, Turning Radius, Braking Distance, Lighting System, Tyres, etc.
		Type of Hazards: Conflicts and Accidents.
<b>Unit 2</b>	Typology of Roads: Components and Design	Road Classification: National Highways, State Highways, District Roads (MDR and ODR), Village Roads
		Urban Road Classification: Expressways, Arterial, Sub-Arterial, Collector, Local, Service Roads, One-Way, Two-Way etc. Mountainous Roads. Speed Limits of the Road types.
		Design of Roads: Cross-Sectional Elements-Right of Way, Carriageway, Median, Shoulders, Sidewalk, Lanes, Cycling Track, Green Strip, Curbs, Camber, etc. Spatial Standards for the Cross-Section Design.
		Relationship between Road Design and Road Safety.
<b>Unit 3</b>	Intersections	Types of Road Intersections: Basic Forms of at-grade Junctions (T, Y, Staggered, Skewed, Cross, Scissors, Rotary, etc. Grade Separated Junctions (with or without interchange): Three-Leg, Four-Leg, Multi-Leg, etc.
		Design of Intersections: Design and Spatial Standards for Traffic Islands, Tums, Turning Radil, Directional Lanes, Pedestrian Crossings, Median Openings, Traffic Calming Components like Speed Breakers and Table-Top Crossings etc.
		Design Considerations for Diverging, Merging, and Weaving Traffic. Location and Design for Traffic Signals.
<b>Unit 4</b>	Pedestrian Circulation and Barrier Free Design	Requirement of Pedestrian Infrastructure: Sidewalks and Footpaths, Recommended Sidewalk Widths, Pedestrian Crossings, Pedestrian Bridges, Subways, Cycle Tracks, etc. Barrier Free Design: Location and Design Standards for Ramps for Wheel Chair Access, Other Provisions like Tactile for Visually Challenged etc.
		Safety Provisions: Pedestrian Railings, Anti-skid Flooring, Pedestrian Signal, Walk Button, etc.
<b>Unit 5</b>	Traffic Signs and Road Markings	Type for Traffic Signs: Principles and Types of Traffic Signs, Danger Signs, Prohibitory Signs, Mandatory Signs, Informatory Signs, Indication Signs, Direction Signs, Place Identification Signs, Route Marker Signs, etc. Reflective Signs, LED Signs. Static and Dynamic Signs. Standards for Traffic Signs: Location, Height and Maintenance of Traffic Signs
		Types of Road Markings: Centre Lines, Traffic Lane Lines, Pavement Edge Lines, No Overtaking Zone Markings, Speed Markings, Hazard Markings, Stop Lines,

		Pedestrian Crossings, Cyclist Crossings, Route Direction Arrows, Word Messages, Marking at Intersections, etc. Material, Colour and Typography of the Markings.
<b>Unit 6</b>	Traffic Signals, Traffic Control Aids, Street Lighting	Traffic Signals: Introduction, Advantages, and Disadvantages
		Signal Indications: Vehicular, Pedestrian and Location of the Signals.
		Signal Face, Illustration of the Signals. Red, Amber, Green Signals and its Significance, Flashing Sign DELI Warrant of Signals, Co-ordinated Control of Signals
		Traffic Control Aids Roadway Delineators (Curved and Straight Sections), Hazard Markers, Object Markers Speed Breakers, Table Top Crossings, Rumble Strips, Guard Rails, Crash Barriers etc. Street Lighting: Need for Street Lighting, Type of Lighting, Illumination Standard, Location and Intermediate Distance
<b>Unit 7</b>	Road Accidents	Nature and Types of Road Accidents (Grievously Injured, Slightly Injured, Minor injury, Non-injury, etc.)
		The situation of Road Accidents in India (Yearly), Fatality Rates, etc.
		Factors (and Violations) that cause accidents, Prevention and First Aid to Victims Collision Diagrams and Condition Diagrams exercises.
		Traffic Management Measures and their influence in Accident Prevention.
<b>Unit 8</b>	Road Safety and Civic Sense	Need for Road Safety, Category of Road Users and Road Safety Suggestions Precautions for Driving in Difficult Conditions (Night, Rain, Fog. Skidding Conditions, Non-Functional Traffic Lights, etc.)
		Types of Breakdowns and Mechanical Failures Accident Sign (Warning Light, Warning Triangle, etc.)
		Introduction to Concept of Civic Sense and its relationship to Road Safety: Importance of Civic Sense, Road Etiquettes and Road User Behaviour, Rules of Road, Right of the Way. Providing Assistance to Accident Victim. Sensitisation against Road Rage.
<b>Unit 9</b>	Traffic Regulations, Laws & Legislations	Indian Motor Vehicles Act (Chapter VIII: Control of Traffic to be discussed in detail)
		Regulations Concerning Traffic: Cycles, Motor Cycles and Scooters, Rules for Pedestrian Traffic. Keep to the Left Rule, Overtaking Rules, Turning Rules, Priority Rules, Hand Signals, etc.
		Speed and Hazard Management. Penal Provisions.
		National Road Safety Policy. Central Motor Vehicle Rules, State Motor Vehicle Rules
		Introduction to Good Practices.

**Submission /Assignment:**

Journals with sketches, A3 size sheets with drawings.

**Reference Books:**

1. Introduction to Traffic Engineering, R Srinivasa Kumar
2. Traffic Engineering and Transport Planning, LR Kadiyali
3. Book on Road Safety Signage and Signs, Ministry of Road Transport and Highways, Government of India
4. MORT&H Pocketbook for Highway Engineers, 2019 (Third Revision)
5. Publications by UTTIPEC namely, Street Design Guidelines, UTTIPEC Guideline for Road Markings, UTTIPEC Guideline and Specification for Crash Barriers, Pedestrian Railing and dividers, UTTIPEC Standard Typical Crossing Design
6. Street Design Standards as provided in Times Savers, Neuferts etc.
7. Publications by Indian Road Congress.

**21 AR6 – 10 : ELECTIVE VIII**

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	--	--	ISE	ESE	ICA	ESE	
Total	01	01	--	--	50	--	50

The student will opt for any one of the following courses

**A. Hospitality Design**

**B. Disaster Mitigation and Management**

**C. Architectural Design with Structural Steel**

The detail syllabus for the above subjects is given hereby

**A. HOSPITALITY DESIGN**

**Course Objective:**

To develop a comprehensive understanding of the specialized nature of services, and infrastructure provisions required for a hotels and restaurant design and planning

**Course Outcome:**

After successful completion of this course, student should be able to design for various typologies in the hospitality sector.

**Course Curriculum:**

<b>Unit 1</b>	Introduction to hospitality typologies and their requirements	Hotels, restaurants, resorts, convention centres
		Study of comprehensive and specialized services, amenities and infrastructure provisions in restaurants and hotels.
		Study of Building bye laws, rules and code provisions for various Star of hotels and emerging concepts of smart hotels, etc.
		Study of spatial- planning for a hotel integrating all the services such as HVAC, sanitary, waste management, electricity/ energy, surveillance systems, telecommunication, fire safety, parking and site planning.
<b>Unit 2</b>	Project feasibility study	Introduction to the hospitality industry, influence of socio- cultural ethos of a place and how hotel building projects have contributed in urban developments, raising the economic and the tourism profile of a locality or region.

**Submission / Assignment :**

Project report

**Reference Books:**

1. Richard H. Penner, Lawrence Adams, Walter Rutes. Hotel Design, Planning and Development. 2013. Routledge

## **B. DISSASTER MITIGATION AND MANAGEMENT**

### **Course Objective:**

- To acquaint students about natural disasters, reasons of their occurrence and
- Basic Knowledge of disaster management, mitigation and techniques for post disaster monitoring and design.

### **Course Outcome:**

After successful completion of this course, student should be able to:

- Exhibit understanding of various types of occurrences of disaster and their mitigation through design interventions.
- Exhibit understanding of post disaster recovery and rehabilitation.

### **Course Curriculum:**

<b>Unit 1</b>	Brief introduction to Disasters management & mitigation, Disaster its definition, types such as natural, man-made etc., characteristics, their causes& impact.
	Natural hazards and Disasters -Earthquake, cyclone, floods, droughts, landslides, lightning. –Causes, hazardous effects, mitigation measures.
	Man induced hazards & disasters: - soil erosion-causes, conservation measures; nuclear explosion-environmental problems, corrective measures; fire mitigation measures; terrorism.
	Earthquake -Seismology, seismic waves, magnitude intensity, and epicentre and energy release, characteristics of strong earthquake ground motions, Earthquake occurrences in the world, plate tectonics, faults, earthquake hazard maps in India. Building Codes and practices - building shapes, architectural features and design of building in seismic zones.
	Cyclone - India cyclone profile, causes, characteristics, past occurrences, regulations and code and bye-laws.
	Flood - India flood profile, types, characteristics, strategies, development regulation and byelaws or flood prone areas. Fire - Causes and precautions for fire safety in different type of building. BIS code for fire safety.
<b>Unit 2</b>	Hazard & vulnerability assessment, tools & techniques, pre disaster mitigation safety management system, strategies for implementation, legislative responsibilities of disaster management
	Disaster Management; Community health and casualty management; Disaster Management – role of various agencies; Relief measures; Post disaster- Recovery, Reconstruction and Rehabilitation. Remote- sensing and GIS applications in real time disaster monitoring.
<b>Unit 3</b>	Preparedness and mitigation - Preparing hazard zone maps, Predictability/ forecasting & warning, Community preparedness, design against the disasters, retrofitting, Population reduction in vulnerable areas, Awareness, Capacity building.
	Case Studies to understand disasters National as well as international disasters occurred in past and their inferences.

### **Submission /Assignment:**

Presentations, Journals with sketches and brief report.

**Reference Books:**

1. S.C. Sharma, Disaster Management
2. Abbott, L. P. (2013). Natural disasters. 9th Ed. McGraw-Hill.
3. Dutta, S. C. and Mukhopadhyay, P. (2012). Improving Earthquakes and Cyclone Resistance of Structures: Guidelines for the Indian Subcontinent. TERI.
4. Agarwal, P. and Shrikhande, M. (2009). *Earthquake Resistant Design of Structures*. New Delhi: PHI Learning.
5. ICIMOD. (2007). Disaster Preparedness for Natural Hazards: Current Status in India. Kathmandu: ICIMOD.
6. Goel.S.L, 'Encyclopaedia of Disaster Management'
7. Government of India, (2004), 'Disaster Management in India' – A Status Report, Ministry of Home Affairs (Disaster Management Division), New Delhi.
8. Ministry of Home Affairs (MHA), (2004)-, 'National Programme for Capacity Building of Architects in Earthquake Risk Management (NPCBAERM)', National Disaster Management Division (Government of India), New Delhi.
9. World Bank. (2009). Handbook for Reconstructing after Natural Disasters.
10. Charles Janes (2002), *Inviting Disaster: Lessons from the Edge of Technology*, Harper Business
11. Levinson Jaye & Granot Helim(2002), *Transportation Disaster Response handbook*, Academy Press
12. Macdonald Roxana (2003), *Introduction to Natural and Manmade Disasters and their Effects on Buildings*, Architectural Book Publication Co
13. Manual of EQR, Non engineered construction, Indian Society of Earth Quake Technology, Roorkee.
14. Singh, P. P. and Sharma, S. (2006). *Modern dictionary of natural disaster*. Deep & Deep Publications.
15. Thomas, F. (2013). *Designing to avoid disaster: The Nature of Fracture-Critical Design*. London Routledge.

## C. ARCHITECTURAL DESIGN WITH STRUCTURAL STEEL

### Course Objective:

- To introduce the design potential of steel as an important material in modern construction and familiarize the students with the structural merits and limitations of steel.
- To make students familiar to advance applications of steel in buildings.

### Course Outcome:

By the end of semester students shall be able to deal with

- The application of steel as structural material and its use in buildings of simple and complex nature.
- Advance applications of steel in buildings.

### Course Curriculum:

<b>Unit 1</b>	Introduction	Study of materiality of steel, structural properties of steel
		Advantages of steel in construction.
<b>Unit 2</b>	History and technological development	Overview of history of metal in construction and technological development from iron to steel, study industrialization and mass fabrication of steel.
		Various industry-manufacture steel- hollow structural sections, hot rolled steel shapes, various hollow structural sections.
		Understanding of various typologies of high-tech movement- extruded, grid/bay, arched / curved structures, tensile.
		Comparison of diagrid structures with standard frame structures.
<b>Unit 3</b>	Study of curved steel	Creating curves in steel buildings, limitations in curving steels. Study of evolution of AESS (architecturally exposed structural steel) through high-tech movement, its connection types (bolted, welded and cast connections), member types (tubular and standard sections).
<b>Unit 4</b>	Various steel frame designs	Basic connection strategies, basic understanding of steel floor systems, truss systems and braced systems.
<b>Unit 5</b>	Introduction to steel as a sustainable material	Recycled, reuse, adaptive reuse of steel.
<b>Unit 6</b>	Study of technical aspects of combining steel with glass	Glazing systems, support systems for glazing,
		Various steel and glass envelope systems- curtain wall system, wind braced support systems, spider steel connections with structural glass, simple and complex cable systems
		Handling curves and lattice shell construction.
<b>Unit 7</b>	Advanced studies	Study of advanced framing system,
		Low carbon design strategies,
		Transformations of architectural design into fabricated elements,
		Use of steel in temporary/ exhibit buildings.
<b>Unit 8</b>	Corrosion and fire protection	Need for corrosion and fire protection.
		Various finishes and coating systems of steel.
		Detailed study of corrosion protection and fire protection systems.

### Submission format:

Journals with sketches, A3 size sheets with drawings of details

Models of examples studied in above theory in group work.

### Reference Books:

1. S. K. Duggal, “Design of Steel Structures”, McGraw Hill Education; 3rd edition (1 July 2017)
2. S. Ramamrutham, Design of Steel Structures, Dhanpat Rai Publishing Company Private Limited-New Delhi; Sixth edition (1 January 2014)
3. Roger L. Brocken brough (Author), Frederick S. Merritt, Structural Steel Designer's Handbook, McGraw Hill; 6th edition (30 September 2019)