

ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
B.ARCH.
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Bachelor of Architecture curriculum is designed to prepare the graduates having aptitude and knowledge

1. To facilitate a successful professional career.
2. To imbibe a strong foundation in Humanities and Sciences, Engineering Sciences and Architectural Design Skills.
3. To appreciate the theories and practices in the field of Architecture and design.
4. To update themselves abreast of new developments in the field of architecture through life-long learning.
5. To emulate and inspire high ethical values in professional practice.

PROGRAMME OUTCOME (PO):

- 1) Ability to gain knowledge of Humanities, Sciences, Engineering Sciences and Architecture.
- 2) Ability to understand elements of Architecture and apply basic principles in Architectural Design.
- 3) Ability to identify social, economical environmental and cultural issues that have bearing on the Architectural Design Process.
- 4) Ability to analyze and apply theoretical knowledge to achieve Architectural Design solutions.
- 5) Ability to understand ethical and professional responsibilities.
- 6) Ability to review, comprehend and report technological developments in the profession of architecture and construction.
- 7) Ability to understand real life situation of Architectural Practice.
- 8) Ability to communicate effectively and work in interdisciplinary groups.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOME:

A broad relation between the programme objectives and the outcome is given in the following table

PEO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
1						√	√	√
2	√		√	√				
3		√	√	√	√			
4						√	√	√
5					√		√	√

		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
YEAR I	SEMESTER I	History of Architecture and Culture I			√					
		Mathematics	√							
		Architectural Drawing I	√							
		Art Studio	√							
		Communication English						√		
		Basic Design		√						
YEAR I	SEMESTER II	Theory of Architecture				√				
		Mechanics of Structures I	√							
		Architectural Drawing II	√							
		Building Materials and Construction I				√		√		
		Model Making and Architectural Delineation		√					√	
		Architectural Design I		√						√
YEAR II	SEMESTER III	History of Architecture and Culture II				√				
		Mechanics of Structures II	√							
		Building Materials and Construction II	√					√	√	
		Site Surveying and Planning	√	√	√	√				
		Climate and Built Environment		√						
		Architectural Design II		√						√

		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
YEAR II	SEMESTER IV	Design of Structure I	√							
		Environmental Science for the Built Environment	√		√					
		Building Materials and Construction III	√					√	√	
		Building Services I						√	√	
		Computer Aided Visualization	√							
		Architectural Design III		√						√
		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
YEAR III	SEMESTER V	Design of Structures II	√							
		History of Architecture and Culture III			√	√				
		Professional Elective I			√			√		
		Building Materials and Construction IV	√					√	√	
		Building Services II	√			√				
		Architectural Design IV		√						√
		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
YEAR III	SEMESTER VI	Design of Structures III	√							
		History of Contemporary Architecture			√	√				
		Professional Elective II			√			√		
		Building Materials and Construction V	√					√	√	
		Building Services III	√			√				
		Architectural Design V		√						√
		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
YEAR IV	SEMESTER VII	Landscape Design	√							
		Urban Design	√		√		√		√	√
		Specification, Estimation and Valuation	√					√	√	
		Professional Elective III			√			√		
		Architectural Design Detailing	√					√	√	
		Architectural Design VI		√	√					√

		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	
YEAR IV	SEMESTER VIII	Human Settlements Planning	√		√						
		Professional Practice and Ethics					√		√		
		Urban Housing			√	√					
		Professional Elective IV			√			√			
		Professional Elective V			√			√			
		Architectural Design VII		√	√	√				√	√
		Educational Tour			√			√	√		
		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	
YEAR V	SEMESTER IX	Practical Training	√	√	√				√	√	
		COURSE TITLE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	
YEAR V	SEMESTER X	Professional Elective VI			√			√			
		Thesis		√	√	√	√		√		

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CHOICE BASED CREDIT SYSTEM
I TO X SEMESTERS CURRICULA & SYLLABI

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C
THEORY								
1.	AR8101	History of Architecture and Culture I	HS	3	3	0	0	3
2.	MA8102	Mathematics	BS	4	2	2	0	3
THEORY CUM STUDIO								
3.	AR8121	Architectural Drawing I	ES	5	1	0	4	3
4.	HS8121	Communication English	PAEC	4	2	0	2	3
STUDIO								
5.	AR8111	Art Studio	HS	6	0	0	6	3
6.	AR8112	Basic Design	PC	12	0	0	12	6
TOTAL				34	8	2	24	21

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C
THEORY								
1.	AR8201	Theory of Architecture	PC	3	3	0	0	3
2.	AR8202	Mechanics of Structures I	ES	4	2	2	0	3
THEORY CUM STUDIO								
3.	AR8221	Architectural Drawing II	ES	5	1	0	4	3
4.	AR8222	Building Materials and Construction I	PC	5	1	0	4	3
STUDIO								
5.	AR8211	Model Making and Architectural Delineation	PC	6	0	0	6	3
6.	AR8212	Architectural Design I	PC	12	0	0	12	6
TOTAL				35	7	2	26	21

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C	Pre-requisites	
THEORY										
1.	AR8301	History of Architecture and Culture II	HS	3	3	0	0	3	A pass is required in Basic Design I (Sem I)	
2.	AR8302	Mechanics of Structures II	ES	4	2	2	0	3		
THEORY CUM STUDIO										
3.	AR8321	Building Materials and Construction II	PC	5	1	0	4	3		
4.	AR8322	Site Surveying and Planning	PC	4	2	0	2	3		
5.	AR8323	Climate and Built Environment	BS	4	2	0	2	3		
STUDIO										
6.	AR8311	Architectural Design II	PC	14	0	0	14	7		
TOTAL				34	10	2	22	22		

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C	Pre-requisites	
THEORY										
1.	AR8401	Design of Structures I	ES	4	2	2	0	3	A pass is required in Architectural Design I (Sem II)	
2.	AR8402	Environmental Science for the Built Environment	BS	3	3	0	0	3		
THEORY CUM STUDIO										
3.	AR8421	Building Materials and Construction III	PC	5	1	0	4	3		
4.	AR8422	Building Services I	ES	4	2	0	2	3		
5.	AR8423	Computer Aided Visualization	PAEC	5	1	0	4	3		
STUDIO										
6.	AR8411	Architectural Design III	PC	14	0	0	14	7		
TOTAL				35	9	2	24	22		

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C	Pre-requisites
THEORY									A pass is required in Architectural Design II (Sem III)
1.	AR8501	Design of Structures II	ES	4	2	2	0	3	
2.	AR8502	History of Architecture and Culture III	HS	3	3	0	0	3	
3.		Professional Elective I	PE	3	3	0	0	3	
THEORY CUM STUDIO									
4.	AR8521	Building Materials and Construction IV	PC	5	1	0	4	3	
5.	AR8522	Building Services II	ES	4	2	0	2	3	
STUDIO									
6.	AR8511	Architectural Design IV	PC	14	0	0	14	7	
TOTAL				33	11	2	20	22	

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C	Pre-requisites
THEORY									A pass is required in Architectural Design III (Sem IV)
1.	AR8601	Design of Structures III	ES	4	2	2	0	3	
2.	AR8602	History of Contemporary Architecture	HS	3	3	0	0	3	
3.		Professional Elective II	PE	3	3	0	0	3	
THEORY CUM STUDIO									
4.	AR8621	Building Materials and Construction V	PC	5	1	0	4	3	
5.	AR8622	Building Services III	ES	4	2	0	2	3	
STUDIO									
6.	AR8611	Architectural Design V	PC	14	0	0	14	7	
TOTAL				33	11	2	20	22	

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C	Pre-requisites
THEORY									A pass is required in Architectural Design IV (Sem V)
1.	AR8701	Landscape Design	PC	3	3	0	0	3	
2.	AR8702	Urban Design	PC	3	3	0	0	3	
3.	AR8703	Specification, Estimation and Valuation	PAEC	3	3	0	0	3	
4.		Professional Elective III	PE	3	3	0	0	3	
THEORY CUM STUDIO									
5.	AR8721	Architectural Design Detailing	PC	5	1	0	4	3	
STUDIO									
6.	AR8711	Architectural Design VI	PC	16	0	0	16	8	
TOTAL				33	13	0	20	23	

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C	Pre-requisites
THEORY									A pass is required in Architectural Design V (Sem VI)
1.	AR8801	Human Settlements Planning	HS	3	3	0	0	3	
2.	AR8802	Professional Practice and Ethics	HS	3	3	0	0	3	
3.	AR8803	Urban Housing	HS	3	3	0	0	3	
4.		Professional Elective IV	PE	3	3	0	0	3	
5.		Professional Elective V*	PE	3	3	0	0	3	
STUDIO									
6.	AR8811	Architectural Design VII	PC	16	0	0	16	8	
7.	AR8812	Educational Tour **	PC	14 days		-	-	1	
TOTAL				31	15	0	16	24	

* Except Dissertation - Requirements for Dissertation as given in Elective List.

**2 weeks Educational Tour to be conducted during VI - VII Semester vacation or VII - VIII Semester vacation

SEMESTER IX

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C	Pre-requisites
1.	AR8911	Practical Training	PAEC	Full duration of semester	-	-	-	12	A pass is required in Architectural Design VI (Sem VII)
TOTAL				Full duration of semester	-	-	-	12	

SEMESTER X

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C	Pre-requisites
THEORY									
1.		Professional Elective VI	PE	3	3	0	0	3	A pass is required in Architectural Design VII & Educational Tour (Sem VIII) as well as Practical Training (Sem IX)
2.	AR8081	Thesis	PC	36	0	0	36	18	
TOTAL				39	3	0	36	21	

TOTAL NO. OF CREDITS: 210

PROFESSIONAL ELECTIVES (PE)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C
PROFESSIONAL ELECTIVE I								
1.	AR8001	Theory of Design	PE	3	3	0	0	3
2.	AR8002	Vernacular Architecture	PE	3	3	0	0	3
3.	AR8003	Art Appreciation	PE	3	3	0	0	3
PROFESSIONAL ELECTIVE II								
4.	AR8004	Interior Design	PE	3	3	0	0	3
5.	AR8005	Structure and Architecture	PE	3	3	0	0	3
6.	AR8006	Evolution of Human Settlements	PE	3	3	0	0	3
PROFESSIONAL ELECTIVE III								
7.	AR8007	Contemporary Building Materials	PE	3	3	0	0	3
8.	AR8008	Glass Architecture and Design	PE	4	2	2	0	3
9.	AR8009	Steel Architecture and Design	PE	3	3	0	0	3
PROFESSIONAL ELECTIVE IV								
10.	AR8010	Contemporary Process in Architectural Design	PE	3	3	0	0	3
11.	AR8011	Energy Efficient Architecture	PE	3	3	0	0	3
12.	AR8012	Architectural Conservation	PE	3	3	0	0	3
PROFESSIONAL ELECTIVE V								
13.	AR8013	Advanced Structures	PE	3	3	0	0	3
14.	AR8014	Sustainable Architecture and Planning	PE	3	3	0	0	3
15.	AR8015	Dissertation	PE	6	0	0	6	3
PROFESSIONAL ELECTIVE VI								
16.	AR8016	Architectural Journalism and Photography	PE	3	3	0	0	3
17.	AR8017	Construction and Project Management	PE	3	3	0	0	3
18.	AR8018	Earthquake Resistant Architecture	PE	3	3	0	0	3

HUMANITIES AND SOCIAL SCIENCES (HS)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C
1.	AR8101	History of Architecture and Culture I	HS	3	3	0	0	3
2.	AR8111	Art Studio	HS	6	0	0	6	3
3.	AR8301	History of Architecture and Culture II	HS	3	3	0	0	3
4.	AR8502	History of Architecture and Culture III	HS	3	3	0	0	3
5.	AR8602	History of Contemporary Architecture	HS	3	3	0	0	3

6.	AR8801	Human Settlements Planning	HS	3	3	0	0	3
7.	AR8802	Professional Practice and Ethics	HS	3	3	0	0	3
8.	AR8803	Urban Housing	HS	3	3	0	0	3

BASIC SCIENCES (BS)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C
1.	MA8102	Mathematics	BS	4	2	2	0	3
2.	AR8323	Climate and Built Environment	BS	4	2	0	2	3
3.	AR8402	Environmental Science for the Built Environment	BS	3	3	0	0	3

ENGINEERING SCIENCES (ES)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C
1.	AR8121	Architectural Drawing I	ES	5	1	0	4	3
2.	AR8202	Mechanics of Structures I	ES	4	2	2	0	3
3.	AR8221	Architectural Drawing II	ES	5	1	0	4	3
4.	AR8302	Mechanics of Structures II	ES	4	2	2	0	3
5.	AR8401	Design of Structures I	ES	4	2	2	0	3
6.	AR8422	Building Services I	ES	4	2	0	2	3
7.	AR8501	Design of Structures II	ES	4	2	2	0	3
8.	AR8522	Building Services II	ES	4	2	0	2	3
9.	AR8601	Design of Structures III	ES	4	2	2	0	3
10.	AR8622	Building Services III	ES	4	2	0	2	3

PROFESSIONAL CORE (PC)

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C
1.	AR8112	Basic Design	PC	12	0	0	12	6
2.	AR8201	Theory of Architecture	PC	3	3	0	0	3
3.	AR8222	Building Materials and Construction I	PC	5	1	0	4	3
4.	AR8211	Model Making and Architectural Delineation	PC	6	0	0	6	3
5.	AR8212	Architectural Design I	PC	12	0	0	12	6
6.	AR8321	Building Materials and Construction II	PC	5	1	0	4	3
7.	AR8322	Site Surveying and Planning	PC	4	2	0	2	3
8.	AR8311	Architectural Design II	PC	14	0	0	14	7
9.	AR8421	Building Materials and Construction III	PC	5	1	0	4	3

10.	AR8411	Architectural Design III	PC	14	0	0	14	7
11.	AR8521	Building Materials and Construction IV	PC	5	1	0	4	3
12.	AR8511	Architectural Design IV	PC	14	0	0	14	7
13.	AR8621	Building Materials and Construction V	PC	5	1	0	4	3
14.	AR8611	Architectural Design V	PC	14	0	0	14	7
15.	AR8701	Landscape Design	PC	3	3	0	0	3
16.	AR8702	Urban Design	PC	3	3	0	0	3
17.	AR8721	Architectural Design Detailing	PC	5	1	0	4	3
18.	AR8711	Architectural Design VI	PC	16	0	0	16	8
19.	AR8811	Architectural Design VII	PC	16	0	0	16	8
20.	AR8812	Educational Tour	PC	14 days	-	-	-	1
21.	AR8081	Thesis	PC	36	0	0	36	18

PROFESSIONAL ABILITY ENHANCEMENT COURSES (PAEC)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P/S	C
1.	HS8121	Communication English	PAEC	4	2	0	2	3
2.	AR8423	Computer Aided Visualization	PAEC	5	1	0	4	3
3.	AR8703	Specification Estimation and Valuation	PAEC	3	3	0	0	3
4.	AR8911	Practical Training	PAEC	Full Duration of Semester	-	-	-	12

SUMMARY

SL. NO.	SUBJECT AREA	CREDITS PER SEMESTER										CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1	HS	6		3		3	3		9			24
2	BS	3		3	3							9
3	ES	3	6	3	6	6	6					30
4	PC	6	15	13	10	10	10	17	9		18	108
5	PE					3	3	3	6		3	18
6	PAEC	3			3			3		12		21
	Total	21	21	22	22	22	22	23	24	12	21	210
	Non-Credit Mandatory	NCC/NSS/ YRC/ Rotaract		Rural study tour								

OBJECTIVES:

- To inform about the development of architecture in the Ancient Western World and the cultural and contextual determinants that produced that architecture.
- To understand architecture as evolving within specific cultural contexts including aspects of politics, society, religion and climate.
- To gain knowledge of the development of architectural form with reference to Technology, Style and Character in the prehistoric world, Ancient Egypt, West Asia, Greece , Rome, Medieval times and Renaissance period.

UNIT I WISDOM OF THE ANCIENTS THRO RIVER VALLEY CIVILIZATION 07

Response to culture and context in building shelter in the Neolithic period- R. Nile and the architecture of Egypt with relevant examples – Urban form in the Indus Valley and the Tigris and Euphrates basin and relevant examples of architecture.

UNIT II CLASSICAL WORLD 10

Landscape and culture of Greece –Greek character – Greek polis and democracy – Domestic architecture– Evolution of the Greek temple and the building of the Acropolis –Public architecture: Theatre and Agora- optical illusions in architecture- City Planning.
Roman history: Republic and Empire –Religion, culture, lifestyle - Roman character – Roman urban planning –architecture as imperial propaganda: forums and basilicas – structural forms: materials and techniques of construction spanning large spaces with relevant examples - domestic architecture.

UNIT III EARLY CHRISTIANITY AND CHRISTIAN KINGDOMS 10

Birth and spread of Christianity – transformation of the Roman Empire – early Christian worship and burial. Church planning – Basilica concept and Centralized plan concept with relevant examples in the West and in the Byzantine.
The Carolingian Renaissance – Feudalism and rural manorial life – Papacy – Monasticism – Craft and merchant guilds. Medieval domestic architecture – Romanesque churches with relevant examples in Europe – Development of vaulting.

UNIT IV THE AGE OF CHURCH BUILDING 08

Development of Gothic architecture Church plan, structural developments in France and England with using relevant examples of church architecture in Europe – wooden roofed churches.

UNIT V IDEA OF RE-BIRTH AND RENAISSANCE IN EUROPE 10

Idea of rebirth and revival – Humanism –Development of thought – Reformation- the Renaissance patron – Urbanism Renaissance architecture: Brunelleschi and rationally ordered space – ideal form and the centrally planned church using relevant examples– palace and villa architecture with relevant examples – Mannerist architecture- The Renaissance in transition – works of Michelangelo; Sir Christopher Wren, Andrea Palladio, Inigo Jones- Baroque and palace building in France.

TOTAL: 45 PERIODS

OUTCOMES:

- An understanding about the spatial and stylistic qualities associated with architecture.
- An Understanding of architecture as an outcome of various social, political and economic upheavals, and as a response to the cultural and context.

TEXTBOOKS:

1. Sir Banister Fletcher, A History of Architecture, CBS Publications (Indian Edition), 20th Edition 2002.
2. Spiro Kostof – A History of Architecture – Setting and Rituals, Oxford University Press, London, 1986.
3. Francis D.K. Ching et al; A global history of Architecture; John Wiley’s sons, 2nd edition 2010.

REFERENCES:

1. Leland M Roth; Understanding Architecture: Its elements, history and meaning; Westview press, 3rd revised edition; 2014.
2. S. Lloyd and H.W. Muller, Ancient Architecture: History of World Architecture – Series, Phaidon Press, London, 2004.
3. Gosta, E. Samdstrom, Man the Builder, McGraw Hill Book Company, New York, 1970.
4. Bussagh; Marco; Understanding Architecture; I.B.Tauris & co. Ltd; 2005.

MA8102	MATHEMATICS	L T P/S C
		2 2 0 3

OBJECTIVES:

- Identifying practical problems to obtain solutions involving trigonometric and exponential functions.
- Studying the properties of lines and planes in space, along with sphere and providing a tool too.
- Understand 3D material.
- Understand functions of more than one variable, along with differentiation under integral sign.
- Solving differential equation of certain type.
- Analyzing data collection and interpretation of results using statistical tools.

UNIT I TRIGONOMETRY AND MENSURATION 12
 Trigonometric (sine, cosine and tan functions) and exponential functions, De-Moiver’s theorem. Area of plane figures, computation of volume of solid figures.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY 12
 Direction cosines and ratio’s – Angle between two lines – Equations of a plane – Equations of a straight line – Coplanar lines – Shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere.

UNIT III INTEGRATION AND FUNCTIONS OF TWO VARIABLES 12
 Integration of rational, trigonometric and irrational functions, properties of definite integrals, Reductions formulae for trigonometric functions, Taylor’s Theorem - Maxima and Minima (Simple Problems).

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 12
 Linear equations of second order with constant coefficients – Simultaneous first order linear equations with constant coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form.

UNIT V BASIC STATISTICS AND PROBABILITY**12**

The arithmetic mean, median, mode, standard deviation and variance - Regression and correlation - Elementary probability - Laws of addition and multiplication of probabilities - Conditional probability – Independent events.

TOTAL: 60 PERIODS**OUTCOMES:**

- The aim of the course is to develop the skills of the students in architecture. The students will be trained on the basis of the topics of Mathematics necessary for effective understanding of architecture subjects. At the end of the course, the students would have an understanding of the appropriate role of the mathematical concepts learnt.

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition, 2011.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
3. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
4. Gupta S.C and Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 9th Edition, 1996.

AR8121**ARCHITECTURAL DRAWING I**

L	T	P/S	C
1	0	4	3

OBJECTIVES:

- To understand drawing as a medium to visualize and communicate design ideas.
- To understand the concepts of Architectural Drawing with the introduction of drafting fundamentals.
- To understand the language of Architectural representations through Architectural Drawing systems.
- To introduce the basics of measured drawing.

UNIT I GEOMETRICAL DRAWING: INTRODUCTION TO DRAFTING**10**

Introduction to fundamentals of drawing/ drafting: Construction of lines, line value, line types, lettering, dimensioning, representation, format for presentation, use of scales etc. Construction of lines and angles, construction of triangles, circles, tangents, curves and conic sections.

UNIT II PLANE GEOMETRY AND SOLID GEOMETRY**20**

Construction and development of planar surface – square, rectangle, polygon etc. Introduction of multi- view projection – projection of points, lines and planes. Multi- view projection of solids – cube, prism, pyramids, cones, cylinders etc. Sections of solids, true shape of solids.

UNIT III ARCHITECTURAL DRAWING SYSTEMS 10
 Communicating Architectural Design Ideas from Concept to Construction - Case studies of Architect's Sketches translated as Drawing systems – Types of Projection systems and Pictorial systems – Types of Pictorial systems such as Multi view, Para line and Perspective drawings.

UNIT IV MULTIVIEW AND PARALINE DRAWINGS 15
 Principles of Orthographic views – Reading multi view drawings - Representing materials in Architectural Design and Construction drawings – Drafting of Building Components in Plans – Elevations – Sections through Case studies of Architects' drawings – Construction of Para line drawings – Isometric and Axonometric.

UNIT V MEASURED DRAWING 20
 Introduction to fundamentals of measured drawing, format for presentation methods - Techniques of measuring buildings and their details –Measured drawing of simple objects like furniture, ornamentation, measured drawing of building components like column, door, window, cornice, etc. isometric projections of simple construction details of the building components.

TOTAL: 75 PERIODS

OUTCOMES:

- Understanding on the concepts of architectural drawing as well as representation skills is imparted.
- Understanding on the building representation in 2D and 3D among students in addition to preparation of measured drawing.

TEXTBOOKS:

1. I.H.Moris, Geometrical Drawing for Art Students; Universities Press 2012.
2. Francis D. K. Ching, "Architectural Graphics", John Wiley and Sons, 2009.

REFERENCES:

1. Francis D.K.Ching with Steven P.Juroszek, "Design Drawing" John Wiley & Sons, Inc. Second edition, reprint 2012.
2. Fraser Reekie, Reekie's, "Architectural Drawing", Edward Arnold, 1995.
3. Scidler & Korte; Hand drawings for Designers - Communications ideas through area graphics; Four child books NY; 2012.

HS8121	COMMUNICATION ENGLISH	L T P/S C
		2 0 2 3

OBJECTIVES: The English Language Course for students of architecture would,

- Enhance their communication skills in English by developing their listening, speaking, reading and writing skills.
- Develop their speaking skills with specific reference to prospective/actual clients, suppliers, business partners and colleagues.
- Enhance their reading particularly, rules and regulations, catalogues, architecture journals and textbooks.
- Develop their writing skills especially writing emails, proposals and reports.

UNIT I	INTRODUCTION	10
Listening- short talks, interviews and discussions from various media Speaking-negotiating meaning, convincing people- describing places- Reading- texts on architecture-Writing-process descriptions -Vocabulary Development-Abbreviations and Acronyms. Grammar-Suitable tenses to write descriptions and describe.		
UNIT II	SPEAKING, READING AND WRITING	10
Listening –listen to talks for specific information- Speaking- Speaking- preparing a presentation using the computer, participating in small group discussion- Reading- lengthy articles related to architecture and construction Writing- writing formal emails , vocabulary-appropriate words to describe topics in architecture, Grammar- suitable grammar for writing a report.		
UNIT III	DESCRIPTIVE PRESENTATION	10
Listening- Descriptions of place, conversations and answering questions, Speaking- making a power point presentation on a given topic, Reading- architecture manuals, Writing- writing a report, writing essays-descriptive essays, Vocabulary- adjectives of comparison, Grammar- collocations.		
UNIT IV	ANALYTICAL PRESENTATION	15
Listening- TED talks, Speaking- participating in group discussions, Reading- reading and interpreting visual information, Writing- writing analytical essays and argumentative, Vocabulary- suitable words to be used in analytical and argumentative essays, Grammar- subject-verb agreement.		
UNIT V	PROJECT PROPOSAL PRESENTATION	15
Listening- ink talks and longer talks, Speaking- talking about one's project proposal, Reading- reading essays on construction, buildings, different schools of architecture, Writing-writing proposals, Vocabulary- related vocabulary, Grammar- Cohesive devices.		

TOTAL: 60 PERIODS

OUTCOMES:

- Speak convincingly, express their opinions clearly, initiate a discussion, negotiate, and argue using appropriate communicative strategies.
- Read different genres of texts, infer implied meanings and critically analyze and evaluate them for ideas as well as for method of presentation.
- Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.
- Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.

TEXTBOOKS:

1. English for Architects and civil Engineers - Sharon Hendenreich Springer, 2014 ISBN 978-3-658-030-63- (e-book).
2. www.cambridgescholars.com
3. www.robertdwatkins.com/Englishworkbook.pdf
4. arkenglish.com

REFERENCES:

1. Chris Mounsey: **Essays and Dissertation** (Oxford University Press) February 2005.
2. Sidney Greenbaum: **The Oxford English Grammar** (Oxford University Press) March 2005.
3. Krishna Mohan and Meera Banerji: **Developing Communication Skills** (Mac Millan india Ltd)[2000].
4. Krishna Mohan and Meenakshi Raman: **Effective English Communication** (Tata Mc-Graw Hill)[2000].

OBJECTIVES:

- To develop presentation skills, visual expression and representation, imaginative thinking and creativity through a hands on working with various mediums and materials.
- To familiarize the students with the various mediums and techniques of art through which artistic expression can be achieved
- To involve students in a series of exercises which will look at graphic and abstract representations of art
- To sensitize students to the grammar of visual perception by involving them in a series of free hand exercises to understand form, proportion, scale, figure ground etc.,

UNIT I BASICS OF DRAWING 15

Introduction to Drawing through various period of History - Seeing (Observation / Proposition / Scale / Texture through study of still life and natural objects), Visualizing (Memory Drawing / Exploratory Drawing), Expressing (Qualities of Lines / Drawing tools and Quality of Expressions – Pen, Pencil, Charcoal, Marker) – Abstraction and communication (Sketching and Free hand perspective Drawing)

UNIT II DRAWING FROM OBSERVATION 15

The processes of seeing, Imagining and Representing - Observations on Line and Shape - Observation on Tone and Texture - Observations on Form and Structure - Observations on Space and Depth - Sketching Exercises related to the contents specified above.

UNIT III GRAPHIC DESIGN 15

Introduction to history of Graphic Design – Visual perception theory (Gestalts) – Principle of Compositions – Colour Theory – Type Design and Typography (Layouts / Format / Calligraphy) – Environmental Graphics (Signage / Logo / enhancing the built environment) – Exercises in environmental graphic design, color and composition

UNIT IV PAINTING 15

Introduction to Art / Artists' / Movements and Styles before and after industrial revolution and its implication on design and architecture – Mediums, Techniques and Tools (Water colours / Posters / Acrylic / Inks / Brushes / Knives / Mixed Media) - Exercises using various techniques and mediums

UNIT V CULTURE - CRAFT - TECHNOLOGY 30

Understanding Culture and Craft – Understanding Craft and Technology – Material exploration (Wood / Metal / Clay / Printing) - to be Explored as Workshop Modules - Print Making / Wood Carving / Clay Sculpting / Casting / Sheet Metal etc.,

TOTAL: 90 PERIODS**OUTCOMES**

- The students are exposed to various mediums, techniques and tools.
- The students gain mastery in sketching, visualizing and expression through manual drawing.
- Sensitized to culture, craft and context.
- Skill Development in Handling Materials and in Making Products.

REQUIRED READINGS

1. Webb, Frank, "The Artist guide to Composition", David & Charles, U.K., 1994.
2. Ching Francis, "Drawing a Creative Process", Van Nostrand Reinhold, New York, 1990.
3. Alan Swann, "Graphic Design School", Harper Collins, 1991.
4. Envisioning Architecture – an analysis of drawing , Iain Fraser & Rod Henmi, 1991

REFERENCES

1. Moivahuntly, "The artist drawing book", David & Charles, U.K., 1994.
2. Arundell (Jan) Exploring sculpture, Mills and Boon, London/Charles, T. Brand Ford Company, U.S.A.
3. The art of drawing trees, heads, colours, mixing, drawing, landscape and painting, water colour oil colour, etc. – The Grumbacher Library Books, New York, 1996.
4. Caldwell peter, "Pen and Ink Sketching", B.T. Bats ford Ltd., London, 1995.

AR8112

BASIC DESIGN

L	T	P/S	C
0	0	12	6

OBJECTIVES:

- To understand the elements and principles of Basic Design as the building blocks of creative design through exercises that will develop originality, expression, skill and creative thinking.
- To involve students in a number of exercises to understand the grammar of Design and Visual composition.
- To enable the understanding of 3D Composition by involving students in a number of exercises which will help generation of a form from a two dimensional / abstract idea.
- To understand architecture as a craft, of making and of putting together.
- To sensitize students to materials both planar and plastics and Processes involved in working with them.
- To draw inspiration and clues from nature.
- To introduce Drawing as an analytical tool.
- To introduce students to History of Design and craft.

CONTENT:

Introduction to Spatial Design, Form and Structures through Basic Design – Elements of Design: Properties, qualities and characteristics of point, line, direction shape, form, colour and texture – Principles of Design: Scale, Proportion, Balance, Harmony, Rhythm and Contrast. – Concepts of Visual perception – Material and processes.

The course shall be conducted by giving a number of exercises in the form of Design studios, Seminars and Creative workshops that are aimed at teaching the following:

- Elements and Principles of Visual Composition and Pattern making.
- Exploring Colour theories and their application in a Visual composition.
- Study of texture and schemes of texture both applied and stimulated and their application.
- Material and Form / Structures – Nature based enquiry into form both Linear and Planar, fluid and plastic forms using simple material like Mount Board, metal foil, box boards, wire string, thermocol, clay, plaster of Paris etc.
- Study of Solids and voids to evolve sculptural forms and spaces using specific process oriented methods like casting, mouldings etc.,
- Analytical appraisal of an iconic Design like a rietvelt chair, Eames chair etc., for form, function, visual characteristics, ergonomics etc. /evolution of a craft.
- Analytical appraisal of building form in terms of visual character, form and function, play of light and shade, solids and voids, colors and texture.

TOTAL: 180 PERIODS

OUTCOMES:

- An understanding of the qualities of different elements as well as their composite fusions.
- An ability to engage and combine the elements of design in spontaneous as well as intentional ways in order to create desired qualities and effects.
- Development of required skills – observation / analysis / abstractions / interpretation / representations / expressions through models and drawings.
- Understanding by making.

TEXTBOOKS:

1. Owen Cappleman & Michael Jack Jordon, Foundations in Architecture: An Annotated Anthology of Beginning Design Project, Van Nostrand Reinhold New York, 1993.
2. Charles Wallschlaggerm & Cynthia Busic-Snyder, Basic Visual Concepts and Principles for Artists, Architects and Designers, McGraw Hill, New York 1992.

REFERENCES:

1. V.S.Pramar, Design fundamentals in Architecture, Somaiya Publications Pvt. Ltd., New Delhi, 1973.
2. Francis D. K. Ching - Architecture - Form Space and Order Van Nostrand Reinhold Co., (Canada), 1979.
3. Elda Fezei, Henry Moore, Hamlyn, London, New York, Sydney, Toronto, 1972.
4. C. Lawrence Bunchy - Acrylic for Sculpture and Design, 450, West 33rd Street, New York, N.Y. 10001, 1972.
5. Exner. V, Pressel. D, Basics Spatial Design, Birkhanser, 2009.

AR8201

THEORY OF ARCHITECTURE

L	T	P/S	C
3	0	0	3

OBJECTIVES:

- To understand that architecture is a dynamic interface between man and his environment: through its constituent aspects and elements.
- To understand the various principles of architectural design, with which the above objective is attained.
- To understand that architecture is communicative medium involving aspects of expression and experience.
- To understand the various possibilities of approaching architectural design, through examples from historical and contemporary examples.

UNIT I ARCHITECTURE - ITS ELEMENTS

9

Defining Architecture; an overview of the complexities of various layers and factors involved in Architecture. - Architecture as an organic entity and its components - function, form, structure, skin, material, circulation, character etc. - Architecture as a building entity and its elements - floor, walls, columns, roof, openings, stairs, etc; - their definition, evolution, attributes and spatial roles - Form/space making and its elements - points, lines, planes and volume; Various configuration of these elements in space making.

UNIT II NATURE AND MAN - ARCHITECTURE AS AN INTERFACE 9

Nature - its five basic elements - earth (material, site, vegetation etc), water (rain, humidity etc), fire (light, temperature, radiation), wind (ventilation), sky (space); The dynamic interactions between elements of nature and elements of architecture - Human being - the five basic senses - their role in perception of built environment - vision (light, color, views etc), hearing (sound, noise, silence), tactility (texture, thermal and physical feeling), smell, spiritual. --- The Functional, psychological and aesthetic relevance in architecture - The demonstration of architecture as an experiential interface between human senses and his environment --- explained with relevant Architectural examples. Case studies of relevant architectural examples and exercises.

UNIT III ARCHITECTURAL DESIGN - ITS PRINCIPLES 9

Introduction to Design; A brief overview of design and its principles in other fields. (Arts, crafts, nature etc); Architectural design - its tools (elements), objectives (experience and expression) and means (principles) - Principles of Design - proportion, scale, order, repetition, rhythm, harmony, balance, emphasis, hierarchy, symmetry, axis, datum etc; Application of design principles at various levels - site level, building level and detail level - Evolution of architectural form - Basic 3d forms, Transformation of form, principles involved - space, spatial relationships and spatial organization, principles involved. --- Relevant examples from modern and traditional architecture. Case studies of relevant modern and traditional architectural examples and exercises.

UNIT IV EXPRESSION AND EXPERIENCE IN ARCHITECTURE 9

Architecture as an expressive medium, semiotics involved in various elements, aspects, and principles of architecture; Examples of spatial narratives - Experiencing architecture - Aspects influencing the experience and expression - place, people, society, culture, history, tradition, time etc. Case studies through works of architects.

UNIT V CONCEPTS IN ARCHITECTURE 9

Conceptualizing architecture, various approaches - Understanding Concepts behind the various architectural manifestations in relevant traditional, historical, vernacular examples - Understanding Concepts, ideas, philosophy behind the works of few architects choosing from the modern, post modern and contemporary periods in the context of the West and India.

TOTAL: 45 PERIODS

OUTCOMES:

- A thorough understanding on the definition of architecture; elements of architectures of form.
- An exposure to the principles of architecture and applications of the same in buildings and spaces.
- An understanding the meaning of character and style of buildings with examples.
- An exposure to students on ideologies and philosophies of architectures of contemporary.
- An exposure to analysis and experience of architecture through case studies and architects through examples.

TEXTBOOKS:

1. Francis D.K.Ching, Architecture-Form, Space and Order, Van Nostrand Reinhold Company, New York, 2007.
2. Simon Unwin, Analysing Architecture, Routledge, London, 2003.
3. Yatin Pandya, "Elements Of Space Making", Mapin Publishing Pvt. Ltd, 2014.
4. V.S.Pramar, Design Fundamentals in Architecture, Somaiya Publications Pvt. Ltd., New Delhi, 1997 - 3rd edition.

REFERENCES:

1. Eri J. Jenkins; Drawn to Design - Analyzing Architecture through Free Hand Drawing; BV GmbH Basel; 2013. (available in an EPVB ebook edition)
2. McCarter & Pallasmaa; Understating Architecture - A Prime on Architecture as Experience; Phaidon Press; 2012.
3. Clark and Pause; Precedents in Architecture - Analytic Diagrams, Formative Ideas & Parts; Wiley; 2012.
4. Juhani Pallasmaa; the Eyes of the skin: Architecture & the senses;Wiley 3rd edition; 2012.

AR8202	MECHANICS OF STRUCTURES I	L T P/S C 2 2 0 3
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OBJECTIVES:

- To make students aware of how structural resolutions are important in realization of architectural design concept. At this stage, students shall be exposed to forces, moments, and resolution of forces.
- To make the students understand basic properties of solids and sections which influence their behavior under the effect of various types of forces.

UNIT I FORCES AND STRUCTURAL SYSTEMS 16

Principles of statics- Forces and their effects-Types of force systems - Resultant of concurrent and parallel forces--Lami's theorem- principle of moments -Varignon's theorem - principle of equilibrium –Types of supports and loadings –Determination of reactions for simply supported beams - simple problems.

UNIT II ANALYSIS OF PLANE TRUSSES 12

Analysis of plane trusses - Introduction to Determinate and Indeterminate plane trusses - Analysis of simply supported and cantilevered trusses by method of joints and method of sections.

UNIT III PROPERTIES OF SECTION 12

Properties of section -Centroid- Moment of Inertia - Section modulus – Radius of gyration - Theorem of perpendicular axis - Theorem of parallel axis –simple problems.

UNIT IV ELASTIC PROPERTIES OF SOLIDS 10

Elastic properties of solids –concept of stress and strain –deformation of axially loaded simple bars-types of stresses- Concept of axial and volumetric stresses and strains. (excluding composite bar).

UNIT V ELASTIC CONSTANTS 10

Elastic constants –Elastic Modulus-Shear Modulus- Bulk Modulus-Poisson's ratio - Relation between elastic constants - Application to problems.

TOTAL: 60 PERIODS**OUTCOMES:**

- Apply the concepts of action of forces on a body and should be able to apply the equilibrium concepts.
- Students are taught basic geometric properties and the behavior of materials under effect of forces.

TEXTBOOKS:

1. R.K.Bansal – A text book on Engineering Mechanics, Lakshmi Publications, Delhi, 2005.
2. R.K.Bansal – A textbook on Strength of Materials, Lakshmi Publications, Delhi 2007.

REFERENCES:

1. P.C.Punmia, Strength of Materials and Theory of Structures; Vol. I, Lakshmi Publications, Delhi 1994.
2. S. Ramamrutham, Strength of Materials – Dhanpatrai & Sons, Delhi, 1990.
3. W.A.Nash, Strength of Materials – Schaums Series – McGraw Hill Book Company, 1989.
4. R.K. Rajput – Strength of Materials, S. Chand & Company Ltd. New Delhi 1996.

AR8221**ARCHITECTURAL DRAWING II**

L	T	P/S	C
1	0	4	3

OBJECTIVES:

- To involve students in a number of exercises that will help them develop the skill of representation in advance drawing techniques involving perspective and sciography.
- To involve students in a number of exercises that will help to understand the measured drawing method to document buildings of architectural interest using simple and advance techniques of representation.

UNIT I PERSPECTIVE METHODS**15**

Introduction to the concept of perspective drawing. One point and two point perspective of simple geometrical shapes like cube, prism, combination of shapes using picture plane method and measuring point method. Introduction to three point perspective.

UNIT II PERSPECTIVE: BUILDING INTERIOR**10**

Construction of one, two and three-point perspective grids - Construction of one and two point perspective of building interiors. Understanding the basic human proportion and scale. Adding of human figures, planters, furniture etc. in an interior perspective scene. Basic applications of shade and shadows and rendering techniques.

UNIT III PERSPECTIVE: BUILDING EXTERIOR**15**

Principles of shade and shadow – construction of shadow of simple geometrical shapes – construction of sciography on building, shadows of architectural elements. Introduction to short cut perspective method. Construction of one, two and three point perspective of building exterior. Adding of human figures, trees etc., Application of light and shadow and rendering techniques of building materials.

UNIT IV MEASURED DRAWING: HISTORIC DOCUMENT STUDY**20**

Documentation and drawing of a simple historic building along with the relevant study of the building based on its history, morphology and context. Measured drawing using pen and ink rendering technique.

UNIT V MEASURED DRAWING: BUILDING DOCUMENTATION**15**

Complete documentation of a building of special interest in terms of building construction, architectural excellence or technology using photographs, tapes etc. Measured drawing of plans, elevations, sections, isometric projections of building details etc. using pen and ink rendering technique.

TOTAL: 75 PERIODS

OUTCOMES:

- Ability to construct the 3d views and perspective drawings of the buildings.
- Understanding of advanced documentation and measured drawing techniques.

TEXTBOOKS:

1. Francis D. K. Ching; Design Drawing; John Wiley & Sons; 2010
2. Rerdow Yee; Architecture Drawing - A Visual Compendium of Types & Methods; John Wiley & Sons; 2012

REFERENCES:

1. John Montague; Basic Perspective Drawing - A Visual Approach; John Wiley & Sons; 5th edition 2010.
2. Mo Zell; The Architecture Drawing Course - Understand the principles & master the practices; Thames & Hudson; 2014

AR8222	BUILDING MATERIALS AND CONSTRUCTION I	L	T	P/S	C
		1	0	4	3

OBJECTIVES:

- To have an understanding of the properties, characteristics, strength and application of naturally occurring building materials such as Stone, Bamboo, Lime and Mud.
- To study the principles of designing components of load bearing structures – foundation, plinth, wall, openings etc. with naturally occurring building materials.

UNIT I BUILDING MATERIALS 10

Introduction to Building materials – Naturally occurring building materials such as Stone, Bamboo, Lime and Mud – Characteristics and Applications

UNIT II BUILDING COMPONENTS – 01 – FOUNDATIONS 20

Introduction to Building Components – Foundations – Foundations suitable for construction with stone, bamboo, lime and mud – Exercises on Foundations in History and Today’s context.

UNIT III BUILDING COMPONENTS – 02 - WALLS 20

Introduction to Building Components – Walls – Walls suitable for construction with stone, bamboo, lime and mud – Exercises on Walls in History and Today’s context.

UNIT IV BUILDING COMPONENTS – 03 – OPENINGS / FENESTRATIONS 15

Introduction to Building Components – Openings – Openings/Fenestrations suitable for construction with stone, bamboo, lime and mud – Exercises on Openings / Fenestrations in History and Today’s context.

UNIT V FINISHES 10

Introduction to Finishes – Paints, Plastering, Glazes and Varnishes – Exercises on different finishes in History and Today’s context for building components with stone, bamboo, lime and mud – Market survey of Paints, Plastering materials, Glazes and Varnishes.

TOTAL: 75 PERIODS

OUTCOMES:

- Students learn construction details using naturally occurring building materials such as stone, bamboo, mud and lime through drawing as well as doing a literature or live case study. Students are to submit drawing plates comprising of technical plan, elevation and section along with sketches and details showing method of construction.

TEXTBOOKS:

1. Arora S.P. and Bindra S.P., "Text book of Building Construction", Dhanpat Rai & Sons, New Delhi, 2012.
2. Klans Dukeeberg, Bambus – Bamboo, Karl Kramer Verlag Stuttgart Germany, 2000.
3. National Building Code Of India 2005- Part 6 Structural Design- Section 3 Timber and Bamboo.
4. Francis D.K. Ching, Building Construction Illustrated John Wiley & Sons 2000.

REFERENCES:

1. Ghanshyam Pandya, M.P. Ranjan, Nilam Iyer Bamboo and Cane Crafts of Northeast India; National Institute of Design (2004).
2. Don A. Watson Construction Materials and Processes McGraw Hill 1972.
3. WB Mckay Building construction, Vol 1,2, Longman UK 1981.
4. Barry, The Construction of Buildings; Affiliated East West press put Ltd New Delhi 1999.

AR8211	MODEL MAKING AND ARCHITECTURAL DELINEATION	L	T	P/S	C
		0	0	6	3

OBJECTIVES:

- To introduce students to analytical and illustrative drawing techniques as tools in the materialization and expression of thoughts.
- To introduce model making as a generative process, a tool in Design generation.
- To inculcate the dynamic act of constructing in thinking process.
- To understand the challenges of proper craftsmanship.

UNIT I LINE, RENDER AND MIXED MEDIA 16

Free hand sketching in architectural representation- pen, charcoal, ink, water colour, paints, mixed media, collages, lino cutting, print making as tools.

UNIT II DIAGRAMMING 18

Conceptual sketches - Plan, section, elevation, perspectives, isometric / oblique projections, axonometric /parallel projection, photography and montage as techniques in Architectural delineation from study till presentation.

Unit I & II can be explored by way of assignments that require study, analysis, documentation with weightage given to representational expression and techniques.

UNIT III DESIGN PROCESSES AND MODEL MAKING TECHNIQUES 18

Generative / geometry, fractals, parametrics / material explorations (both in traditional materials like mount, foam, thermacoel, clay, plaster of Paris, paper Mache, wood and new age materials like polystyrene, Aerocon blocks, plastics, meshes, and processes like carpentry, casting, moulding, welding ,laser cutting etc.

Unit III can be explored with exercises that involve research through a process for example nature to structure and the evolution of a structural system that can be fabricated to scale.

UNIT IV PRESENTATION MODELS**18**

Exploration in varying scales of models through instruction in techniques- Residential to urban - Historic / Contemporary buildings - Exercises involving topography, textures, landscapes, human elements etc.

UNIT V STUDY MODELS AS A TOOL IN ARCHITECTURAL DESIGN PROCESS 20

Exploration of the physical model as a tool through all phases of architectural design process, ranging from conceptual to specific design solutions- This Unit will integrate with the Architectural Design course in this semester.

TOTAL: 90 PERIODS**OUTCOMES:**

- Exploration of conventional and less conventional techniques of representation in an attempt to creative visualization and to understand drawings as vehicles of thinking.
- Versatility in making models ranging from study to presentation and in varying scales and materials.

TEXTBOOKS:

1. Mo Zell – The Architectural Design course, Understand the Principles and Master The Practices, Thames, and Hudson, 2008.
2. Neil Bingham – 100 Year of Architectural Drawings 1900 – 2000, Laurence King, 2013
3. Robert. W Gill – Rendering with Pen + Ink - Thames, and Hudson – 2007.
4. Leon Krier Drawing for Architecture – Michael God well - 2007

REFERENCES:

1. Marco Francari - Eleven Exercises in the art of Architectural Drawing, Routledge, 2011
2. Natascha Meuser, Construction and manual Architectural Drawings, DOM Publisher, 2012
3. Rendow Yee, Architectural Drawing A visual Compendium of Types and Methods, Wiley, 2013
4. David Dornie, Architectural Drawing, Laurence King, 2010.
5. Lorraine Farrelly, Representational Techniques, AVA, 2011.

AR8212**ARCHITECTURAL DESIGN I**

L	T	P/S	C
0	0	12	6

OBJECTIVES:

- To enable the conceptualization of form, space and structure through creative thinking and to initiate architectural design process deriving from first principles.
- To involve students in a design project(s) that will involve simple space planning and the understanding of the functional aspects of good design.
- To involve students in a small scale building project(s) which will sensitize them to intelligent planning that is responsive to the environmental context.
- To involve students in building case study by choosing appropriate examples to enable them to formulate and concretize their concepts and architectural program.
- To engage in discussion and analytical thinking by the conduct of seminars/ workshops.
- To enable the presentation of concepts through various modes and techniques that will move constantly between 2D representation and 3D modeling.

CONTENT:

Scale and Complexity: projects involving small span, single space, single use spaces with simple movement, predominantly horizontal, as well as simple function public buildings of small scale; passive energy.

Areas of focus/ concern:

- Architectural form and space.
- Aesthetic and psychological experience of form and space in terms of scale, colour, light, texture, etc.
- Function and need: user requirements, anthropometrics, space standards, circulation.
- Image and symbolism.

Typology/ project: bedroom, bathroom, kitchen, shop, exhibition pavilion, children’s environment, snack bar, residence, petrol bunk, fire station.

TOTAL: 180 PERIODS

OUTCOMES:

- The students shall understand the basic functional aspect of designing simple building type and its relevant spatial organization.
- The students shall be learn to reciprocate and sensitize the design/concept to the environment and the design skill of the project.

TEXTBOOKS:

1. Joseph De Chiara, Michael J Crosbie, Time Saver Standards for Building Types, McGraw Hill Education; 4th edition, 2014..
2. Joseph De Chiara, Julius Panero, Martin Zelnik, Time Saver Standards for Interior Design and Space Planning, McGraw Hill 2011.
3. Ernst Neuferts Architects Data, Blackwell 2012.
4. Ramsey et al, Architectural Graphic Standards, Wiley 2008.

REFERENCES:

1. Will Jones; Architects Sketch books; Thames & Hudson; 2011.
2. Sam F.Miller, Design Process: A Primer for Architectural and Interior Design, VNR; 1995.

AR8301

HISTORY OF ARCHITECTURE AND CULTURE II

L T P/S C

3 0 0 3

OBJECTIVES

- To give an overall understanding of the architecture in India up to the colonial period as parallel and sequential productions rising from the cumulative effect of forces operating and intersecting in the Indian subcontinent.
- To inform about specific and prominent modes of architecture in terms of evolution, function, morphology and character.
- To give exposure to works that are architecturally exemplary and/or representative.
- To appreciate architecture as giver of particular and universal meaning.

UNIT I	EARLY INDIA AND ITS CULTURAL PRODUCTIONS	8
<p>Overview of early history of the Indian subcontinent bringing out different conjectures. Indus Valley Civilisation and its society, culture and urbanism. Vedic culture, settlements and architecture through textual and inscriptional sources as well as conjectures. Outline of textual sources related to architecture and town planning in ancient India.</p> <p>Political, religious and cultural history of India in the first millennium outlining various empires. Evolution of Hinduism, Buddhism and Jainism. Interrelationships among them and timelines.</p> <p>Architecture of early Mauryan empire. Buddhist architecture and art. Stupas, chaitya halls and viharas. Hindu temple form – principles, morphology, meaning, symbolism, iconography and rituals, classification. Early Hindu temple architecture and rock cut architecture of Guptas, Chalukyas and Pallavas. Influence of Buddhist architecture on them. Study of important monuments for all the above.</p>		
UNIT II	ARCHITECTURE OF SOUTHERN INDIA	11
<p>Outline history of South India with particular emphasis on Bhakthi movement and evolution of temple town urbanism and architecture. Art and architecture under the Pallavas, Cholas, Pandyas, Nayaks and Vijayanagara kingdom with specific focus on Hindu temple architecture. Influence of social and political history on them. Hoysala architecture. Study of important monuments for all the above.</p>		
UNIT III	ARCHITECTURE OF NORTHERN INDIA	8
<p>Architecture of Gujarat, Orissa, Madhya Pradesh and Rajasthan with specific focus on Hindu temple architecture. Study of important monuments. Architecture of step wells in Northern India and their socio-cultural importance.</p>		
UNIT IV	INTRODUCTION TO ISLAMIC ARCHITECTURE AND EARLY ISLAMIC ARCHITECTURE IN INDIA	8
<p>Brief history of Islam. Islamic architecture of the world as rising from Islam as a socio-cultural and political phenomenon. Evolution of building types in terms of forms and functions. Principles and characteristics of Islamic architecture - to include aspects of religion, geometry, structure, materials, decoration, light.</p> <p>Early political history of Islam in India. Evolution of Islamic architecture under the Delhi Sultanate - Slave, Khaji, Tughlaq, Sayyid and Lodi dynasties. Study of important monuments. Early Islamic architecture of Punjab.</p>		
UNIT V	REGIONAL ISLAMIC ARCHITECTURE, MUGHAL ARCHITECTURE AND AFTER	10
<p>Spread of Islam into other regions of India and their architectural expressions - Gujarat, Bengal, Malwa and the Deccan. Study of important monuments.</p> <p>Political History of the Mughals. Mughal architecture and urbanism under Humayun, Akbar, Shahjahan and Aurangzeb. Study of important monuments.</p> <p>Outline of Post Mughal Islamic architecture. Outline of architecture related to Islam in Tamil Nadu.</p>		

TOTAL:45 PERIODS

OUTCOME

- An understanding of the diversity of architecture in India and sensitivity towards its syncretic aspects.
- Ability to appreciate particular cultural, symbolic, spatial and material qualities in architecture and cities as givers of meaning and continuity.
- Ability to appreciate universal qualities of architecture and their effects.

TEXTBOOKS

1. Percy Brown, 'Indian Architecture (Buddhist and Hindu Period)', Taraporevala and Sons, Bombay, 2014.

2. Percy Brown, 'Indian Architecture (Islamic Period)', Taraporevala and Sons, Bombay, 2014.
3. Christopher Tadgell, 'The History of Architecture in India - From the Dawn of Civilization to the End of the Raj', Phaidon, 2002.
4. Robert Hillenbrand, 'Islamic Architecture - Form, Function and Meaning', Columbia University Press, 2004
5. Romila Thapar, 'The Penguin History of Early India', Penguin, 2015.
6. Burton Stein, A History of India, John Wiley & Sons, 2010.
7. K.A. Nilakanta Sastri, 'A History of South India: From the Prehistoric Times to the Fall of Vijayanagar', Oxford University Press, 2007.

REFERENCES

1. George Michell, 'The Hindu Temple', University of Chicago Press, 1988.
2. Stella Kramrisch, 'The Hindu Temple', Motilal Banarsidass, Vol I 2002, Vol II 1996.
3. Satish Grover, 'Buddhist and Hindu Architecture in India', CBS, 2008.
4. Satish Grover, 'Islamic Architecture in India', CBS, 2012.
5. Catherine Asher, 'Architecture of Mughal India', Cambridge University Press, 2001.
6. Ananda K. Coomaraswamy, 'The Dance of Siva: Essays on Indian Art and Culture', Rupa Publications, 2013.
7. A.L. Basham, 'The Wonder that was India', Picador, 2004.

AR8302

MECHANICS OF STRUCTURES II

L T P/S C
2 2 0 3

OBJECTIVES

- To enable understanding of the basic concepts of shear force and bending moment acting on beams subjected to different loading conditions.
- To give knowledge about how to determine stresses in beams and strength of sections.
- To give knowledge about how to calculate deflection of beams.
- To enable study of theory of columns.
- To give an understanding of the concept of indeterminate structure and its analysis.

UNIT I SHEAR FORCE AND BENDING MOMENT

12

Basic concepts. Shear force and bending moment diagrams for cantilever and simply supported beams subjected to different types of loadings - Point loads, uniformly distributed loads. Overhanging simply supported beams. Point of contra flexure.

UNIT II STRESSES IN BEAMS

12

Theory of simple bending. Bending stress distribution. Strength of sections. Shearing stress distribution in beam sections.

UNIT III DEFLECTION OF BEAMS

12

Slope and deflection at a point. Double Integration method and Macaulay's method for simply supported and cantilever beams.

UNIT IV COLUMNS

12

Short and long columns. Concept of elastic stability. Euler's theory. Assumptions and load carrying capacity of columns with different end conditions. Concept of effective length. Slenderness ratio. Limitations of Euler's theory. Rankine's formula.

UNIT V STATICALLY INDETERMINATE BEAMS**12**

Introduction. Determination of degree of statical indeterminacy for beams and frames. Analysis of propped cantilever using Moment Area method - central point load, uniformly distributed loads.

TOTAL:60 PERIODS**OUTCOME**

- Ability to apply the concepts/techniques of finding stresses.
- Ability to use simple bending theory to find deflection in beams.
- Ability to analyse and solve different types of columns.
- Ability to analyse the different types of indeterminate beams.

TEXTBOOKS

1. R.K. Bansal, 'A Text Book on Strength of Materials', Laxmi Publications, New Delhi, 2006.
2. B.C. Punmia et al, 'SMTS-I, Strength of Materials', Laxmi Publications, 2015.

REFERENCES

1. M.M. Ratwani & V.N. Vazirani, 'Analysis of Structures, Vol. 1', Khanna Publishers, Delhi, 2012.
2. Timoshenko, S.P. and D.H. Young, 'Elements of Strength of Materials', 5th edition, East West Press, 2011.
3. A.R. Jain and B.K.Jain, 'Theory and analysis of structures', Vol. 1, Nemchand and Bros, Roorkee, 1987.
4. R.K. Rajput, 'Strength of Materials', S.Chand, 2006.

AR8321**BUILDING MATERIALS AND CONSTRUCTION II**

L	T	P/S	C
1	0	4	3

OBJECTIVES

- To give an introduction to brick, clay and timber products in building construction.
- To enable an understanding of the principles, methods of construction and applications of the above for structural and non-structural building components.
- To enable design and detail using all these materials in simple buildings.

UNIT I INTRODUCTION TO BRICK AND CLAY PRODUCTS**10**

Brick and clay as basic building materials and brief history of their use through examples. Types of brick and clay products. Outline of their manufacture, characteristics and applications in building construction. Products to include different types of bricks for masonry, roofing products such as pot/pan tiles and Mangalore tiles, flooring tiles such as clay, ceramic and vitrified tiles, Hourdi tiles, current innovations.

Understanding of product literature. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT II BRICK AND CLAY IN BUILDING CONSTRUCTION**20**

Basic principles of brick bonding and its types. Mortar, plastering, pointing, finishes for brick. Construction principles and procedures for building components using brick and clay products. Components to include foundation, load bearing walls, partition walls, compound walls, parapet walls, roofs, arches, lintels, coping, steps, flooring, paving of different types. Principles for innovative and composite construction using brick and clay products. Products to include prefabricated brick panels,

precast curved brick arch panels, reinforced brick/ reinforced brick concrete slabs, prefabricated floor/ roof using structural clay units, Hourdi block roofing, current innovations. Drawings/ models of the principles. Understanding of detailed drawings/ published work. Site visits with documentation in the form of sketches/ photos.

UNIT III INTRODUCTION TO TIMBER AND TIMBER PRODUCTS 10

Timber as basic building material and brief history of its use with examples. Timber sources, classification, characteristics, defects, conversion, seasoning, storage, uses, preservation, finishes (including paint, varnish, enamel, special paints and coatings). Market forms of timber. Types of industrial timber products. Outline of their manufacture, characteristics and applications in building construction. Products to include plywood, particle board, block board, fibre board, cement bonded particle board, sustainable products, current innovations. Understanding of product literature. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT IV TIMBER IN BUILDING CONSTRUCTION 20

Joints in timber. Construction principles and procedures for timber wall, floor, roof trusses (to include lean to, couple, collar, king post, queen post and roof covering material), staircase. Construction principles and procedures for different types of timber doors, windows and ventilators. The types, whichever is applicable for each, will include materials (panelled, flush, glazed), swing, mechanisms of operation (fixed, openable, sliding, folding, sliding and folding, pivoted, revolving, top hung, bottom hung, louvred), nature - (french, corner, bay). Construction principles and procedures using timber/ industrial timber/ gypsum products for partitions (fixed, sliding, sliding and folding), panelling, false ceiling, flooring. Hardware and fixing for all the above as applicable. Drawings/ models of the principles. Understanding of detailed drawings/ published work. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT V DESIGN USING BRICK, CLAY, TIMBER AND TIMBER PRODUCTS 15

A design exercise involving use of brick, clay and timber products in appropriate structural and non structural components in a simple, small project of any basic typology. The project will integrate knowledge from all the previous units. Design and construction details in the form of drawings and models.

TOTAL: 75 PERIODS

OUTCOME

- Knowledge of properties and construction methods of brick, clay products and timber products.
- Ability to design and detail structural and non structural components of simple buildings using the above materials.
- Ability to integrate knowledge of properties and construction methods of basic building materials in the design of simple projects.

TEXTBOOKS

1. Don A. Watson, 'Construction Materials and Processes', McGraw Hill, 1972.
2. W.B. McKay, 'Building Construction', Person India, Vol, 1 2013, Vol II, 2012.
3. S.C Rangwala 'Building Construction' Charotar Publishing House, India, 2016.
4. S.K.Sharma, 'A Text book of Building Construction', S. Chand & Co Ltd., New Delhi, 1998.
5. S.K. Duggal, 'Building Materials', New Age International Publishers, 2016.
6. R.J. S. Spence and D.J. Cook, 'Building Materials in Developing Countries', John Wiley and sons 1983.
7. S. C. Rangwala, 'Engineering Materials', Charotar Publishing House India, 2015.
8. Roy Chudley, Roger Greeno, 'Building Construction Handbook', Routledge, 2010.

REFERENCES

1. American Institute of Timber Construction (AITC), 'Timber Construction Manual', Wiley Publishers, 2004.
2. Francis D.K Ching, 'Building Construction Illustrated', John Willey & Sons, 2008.
3. Willis H Wagner & Howard Bud Smith, 'Modern Carpentry', Good Heart–Wilcox Publishers, Portland, 2003.
4. Barry, 'Construction of Buildings, Volume 1&2', Blackwell Publishing Ltd., Oxford, 2005.

AR8322

SITE SURVEYING AND PLANNING

L T P/S C
2 0 2 3

OBJECTIVES

- To inform about the ways in which the characteristics of sites can be understood.
- To enable an understanding of the macro and micro impact of buildings on it.
- To give understanding of the potential/ limitations site offers to the design of buildings.
- To give exposure to different terminologies and techniques associated with site, site surveying, site analysis and site planning.
- To explore all the above through a project.

UNIT I INTRODUCTION TO SITE AND SITE SURVEYING

12

Definition of plot, site, land and region, units of measurements. Introduction to survey and need for surveying. Methods of surveying and context of use. Chain survey and Triangulation - instruments used, method of survey and plotting into survey drawing. Plain table, Compass and theodolite surveys - method, instruments used and application. Modern surveying Instruments such as EDMs and Total Stations and their application.

Understanding of administrative maps and site drawings, including FMB.

Introduction to measuring a site, drawing out a site plan from measurements and computing area by geometrical figures and other methods. Introduction to marking plans, layout plans and centerline plans. Importance and procedure for making these drawings and dimensioning. Procedure and precautions of setting out a plan on site.

Understanding the above through site visits to real projects.

UNIT II SITE ANALYSIS

12

Site as offering potential/ limitations to architectural design. Importance of site analysis. On site and off site factors. Analysis of natural, cultural and aesthetic factors. Factors to include topography, hydrology, soils, vegetation, climate and microclimate, surface drainage, accessibility, size and shape, infrastructure, sources of water supply and means of disposal system, visual aspects, context of built environment. Introduction to detailed analysis involving aspects like contours, slope analysis, grading process, grading criteria, functional and aesthetic considerations. Maps of matrix analysis & composite analysis methods. Understanding the above through real projects/ case studies.

UNIT III SITE CONTEXT AND REGULATIONS

10

Detailed understanding of context of the site. Introduction to master plans, land use for cities, development control rules. Site selection criteria for different building typologies. Impact of building developments on the surroundings including aspects such as traffic, noise, pollution, microclimate, etc., especially in the context of large scale projects.

Understanding the above through real projects/ case studies.

UNIT IV PRINCIPLES OF SITE LAYOUT AND DEVELOPMENT 12

Organisation of pedestrian and vehicular circulation. Geometric calculation for movement. Types of roads, hierarchy of roads, networks, road widths and parking regulations. Principles of positive drainage and grading for drainage. Location and design of sewage treatment plants. Methods to control soil erosion. Location of utility lines to simplify maintenance. Planning for rain water harvesting. Incorporation of services such as drinking water pipelines, fire hydrants, communication and networking facilities at site. Vegetation, landforms and water as modifiers of microclimate. Understanding the above through real projects/ case studies.

UNIT V EXERCISE IN SITE SURVEYING AND PLANNING 14

Application of all the knowledge gained in previous units through a real/ hypothetical project involving a real site. The process would involve choosing site for a building typology or vice versa, field exercise in measuring and drawing the site, detailed site analysis, schematic site layout and development. The project will be explored through analysis/ models/ sketches/ drawings.

TOTAL: 60 PERIODS

OUTCOME

- Sensitivity towards aspects of site at macro and micro contexts.
- Ability to exploit potential of site to design the built environment.
- Ability to measure, draw, analyse and plan a particular site for a specific purpose.

TEXTBOOKS

1. Kevin Lynch, 'Site Planning', Third Edition, MIT Press, 1984.
2. Edward. T. White, 'Site Analysis', Archi Basic Press, 2014.
3. B.C.Punmia et al, 'Surveying Vol.I', Seventeenth Edition, Laxmi Publications, 2016..

REFERENCES

1. Joseph De.Chiarra and Lee Coppleman, 'Urban Planning and Design Criteria', Van Nostrand Reinhold Co., 1982.
2. Strom Steven, 'Site Engineering for Landscape Architects', John Wiley & Sons, 2013.
3. P.B.Shahani, 'Text of Surveying Vol.I', Oxford and IBH Publishing Co, 1980
4. 'Development Control Rules', CMDA 2008.
5. Genevieve S. Baudoin, 'Interpreting Site: Studies in Perception, Representation, and Design', Routledge, 2015.

**AR8323 CLIMATE AND BUILT ENVIRONMENT L T P/S C
2 0 2 3**

OBJECTIVES

- To introduce the concepts of human heat balance and comfort.
- To inform about the movement of sun and understand its impact on building design.
- To inform about the effects of wind and air with respect to siting and design of buildings.
- To give exposure to design strategies for building in different types of climatic zones.

UNIT I CLIMATE AND HUMAN COMFORT 10

Climate and Civilisation. Factors that determine climate of a place. Components of climate. Classification of climate for building designers in tropics. Characteristics of climate. Human body heat balance and heat loss. Effects of climatic factors on human body heat loss. Effective temperature, human thermal comfort. Use of C. Mahony's tables. Exercise related to the above.

- UNIT II DESIGN OF SOLAR SHADING DEVICES 14**
 Movement of sun. Locating the position of sun. Sun path diagram. Overheated period. Solar shading. Shadow angles.
 Exercise in the design of shading devices through models/ calculations/ drawings/ software.
- UNIT III HEAT FLOW THROUGH BUILDING ENVELOPE- CONCEPTS 10**
 The transfer of heat through solids. Definitions– Conductivity, Resistivity, Specific heat, Conductance, Resistance and Thermal capacity. Surface resistance and air cavities. Air to air transmittance (U value). Time lag and decrement. Material qualities of envelopes.
 Exercise involving calculation/ software for design analysis.
- UNIT IV AIR MOVEMENT DUE TO NATURAL AND BUILT FORMS 12**
 The wind. The effects of topography on wind patterns. Air currents around building. Air movement through buildings. The use of fans. Thermally induced air currents – Stack effect, Venturi effect, use of court yard.
 Exercise exploring air movement in architecture with physical models/ simulation through software.
- UNIT V CLIMATE AND DESIGN OF BUILDINGS 14**
 Design strategies in warm humid climates, hot humid climates, hot and dry climates and cold climates. Climate responsive design exercise for different contexts through sketches/ drawings/ analysis/ detailing/ calculation.

TOTAL: 60 PERIODS

OUTCOME

- An understanding of heat balance in human beings.
- An understanding of the effect of sun and wind on buildings.
- An understanding of material effects in buildings.
- Ability to design buildings with respect to climate.

TEXTBOOKS

1. O.H. Koenigsberger and Others, 'Manual of Tropical Housing and Building- Climatic Design', Orient Longman, Madras, India, 2010.
2. Bureau of Indian Standards IS 3792, 'Hand book on Functional Requirements of Buildings other than Industrial Buildings- Part I – IV', New Delhi, 1987.

REFERENCES

1. Martin Evans, 'Housing Climate and Comfort', Architectural Press, London, 1980.
2. B. Givoni, Man, 'Climate and Architecture', Architectural Sciences Series, Applied Science Publishers Ltd., London, 1981.
3. B. Givoni, 'Passive and Low Energy Cooling of building', Van Nostrand Reinhold, New York, 1994.
4. Galloe Salam and Sayigh A.M.M, 'Architecture, Comfort and Energy', Elsevier Science Ltd., Oxford, 1998.
5. Arvind Krishnan, Szokolay et.al, 'Climate Responsive Architecture- A Design Handbook for Energy Efficient Buildings', Tata McGraw Hill, 2010.

OBJECTIVES

- To create understanding of human built environment as a holistic, living entity from macro to micro scales, and shaped by geographic and socio-cultural forces as well as by historic, political and economic factors, through study of and design within the context of rural settlements.
- To enable a comprehensive study of rural settlement and architecture in order to understand them as exemplar of collective design that evolved through various parameters.
- To observe changes in the above, analyse their nature and causes for them.
- If required, to explore possible policy and physical interventions towards positive changes within the context studied.
- To enable design process that engages context and community.

CONTENT

Rural settlements offer an opportunity to understand basic aspects of human built environment and what goes into its making/ influences it. The interrelationship between built form and society will be studied, understood and established, starting from either end as required. Study of specific modes of rural/vernacular/traditional architecture including their morphology, local materials and construction techniques, details, meaning, etc., will be done to give an insight into the particulars and universals of architecture.

Appropriate tools and processes can be used to aid the understanding. These include different methods of historical and socio-cultural study, oral history, discussions, information collection, surveys, maps, perceptual sketches, documentation through drawings, demographic study, assimilation and analysis.

Transformations across time need to be traced to understand constants and dynamics in human society. They will also be critically evaluated through discussions with experts. Rising from this, future changes can be projected/ envisaged and if found required, policy and physical interventions can be suggested/ explored. The physical interventions found necessary will be taken up as design situations. This could range from individual to community level and involve any aspect of the physical environment (including building projects) as the situation/viewpoint warrants.

If the context does not warrant a building need, a small community oriented building design will be given as a separate project in addition to the rural project. For building projects, the scale and complexity of planning and construction usually involved will be simple - small or medium span, ground plus two storeyed maximum, simple horizontal and vertical movement, simple/ local materials and construction, passive energy.

TOTAL: 210 PERIODS**OUTCOME**

- Ability to collect, assimilate and integrate knowledge in a holistic manner.
- Sensitivity towards the nature and values of unselfconscious and collective design as well as the interconnectedness of human society and environment.
- Ability to observe and analyse changes in the above.
- Ability to project future transformations and give possible/ appropriate ways to address issues, if any.
- Sensitivity in design approach in community oriented projects with respect to context, collective values and needs.

TEXTBOOKS

1. Amos Rapoport, 'House, Form and Culture', Prentice Hall, 1969.
2. Bernard Rudofsky, 'Architecture without Architects', MoMA, 1964.
3. Rajendra Kumar Sharma, 'Rural Sociology', Atlantic, 2011.
4. Joseph De Chiara, Michael J Crosbie, 'Time Saver Standards for Building Types', McGraw Hill Professional 2001.

REFERENCES

1. Ramachandran H, 'Village Clusters and Rural Development', Concept Publications, 1980.
2. Thorbeck D, 'Rural Design', Routledge, 2002.
3. Hassan Fathy, 'Architecture for the Poor', University of Chicago press, 1973.
4. R. C. Arora, 'Integrated Rural Development', S. Chand, 1979.

AR8401

DESIGN OF STRUCTURES I

L T P/S C
2 2 0 3

OBJECTIVES

- To get introduced to basic structural members in timber and steel.
- To give knowledge to design different timber components in a building.
- To enable an understanding of the types, efficiency and strength, advantages and disadvantages of rivet and welded joints in steel.
- To enable the design of tension (beams) and compression (columns) steel members in a building under different conditions.

UNIT I **TIMBER STRUCTURES - DESIGN OF BEAMS AND COLUMNS** **12**

Grading of timber. Permissible stresses. Design of solid timber beams. Design of solid timber columns.

UNIT II **STEEL STRUCTURES - BOLTED AND WELDED JOINTS** **12**

Assumptions. Failure of bolted joints. Strength and efficiency of bolted joints. Types. Design of bolted joints for axially loaded members (excluding eccentric connections). Types of welded joints and their advantages and disadvantages. Design of fillet welds (excluding eccentric connections).

UNIT III **STEEL TENSION MEMBERS** **12**

Introduction. Net sectional area. Permissible stresses. Design of axially loaded tension member. Lug angle, tension splice.

UNIT IV **STEEL COMPRESSION MEMBERS** **12**

Introduction. Different sections. Built up section. Design of columns (excluding lacing, battening and other connections).

UNIT V **STEEL BEAMS** **12**

Introduction. Laterally supported and unsupported beams. Design of laterally supported beams.

TOTAL: 60 PERIODS

OUTCOME

- Ability to design timber beams and columns by applying the code provisions.
- Ability to design steel joints for maximum efficiency and strength.
- Ability to design tension and compression members for different conditions by applying the code provisions.
- Ability to design different types of laterally unsupported & supported beams for different conditions.

TEXTBOOKS

1. M.R. Shiyekar, 'Limit State Design in Structural Steel', PHI Learning Private Limited, 2010.
2. N. Subramanian, 'Design of Steel Structures', Oxford Higher Education, 2008.

REFERENCES

1. S.K. Duggal, 'Limit State Design of Steel Structures', McGraw Hill Education, Private Limited, 2010.
2. Dr. V. L. Shah & Prof. Veena Gore, 'Limit State Design of Steel Structures', Structures Publications, Pune, 2012.
3. S.S. Bhavikatti, 'Design of Steel Structures by Limit State Method as per IS800-2007', I.K. International Publishing House Pvt, Ltd, 2012.

AR8402

ENVIRONMENTAL SCIENCE FOR THE BUILT ENVIRONMENT

L T P/S C
3 0 0 3

OBJECTIVES

- To enable understanding of the environment, and its interrelationship with living organisms.
- To help understand the importance of environment by assessing its impact on humans and to envision the surrounding environment, its functions and its value.
- To give understanding of dynamic processes and features of the earth's interior and surface.
- To give awareness about integrated themes and biodiversity, natural resources, pollution control and waste management.
- To inform about scientific, technological, economic and political solutions to environmental problems.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

10

Definition, scope and importance of environment. Need for public awareness. Concept of an ecosystem. Structure and function of an ecosystem – producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction to types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Introduction to biodiversity. Definition and types- genetic, species and ecosystem diversity. Bio geographical classification of India. Value of biodiversity - consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity - habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity - In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds. Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION

9

Definition. Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards. Soil waste management. Causes, effects and control measures of municipal solid wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management - floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban/ Rural/ Industrial/ Agricultural.

UNIT III NATURAL RESOURCES

9

Forest resources - Use and over-exploitation, deforestation, timber extraction, case studies. Mining, dams and their effects on forests and tribal people. Water resources - Use and overutilization of surface and ground water. Floods, drought, conflicts over water. Dams-benefits and problem. Mineral resources - Use and exploitation, environmental effects of extracting and using mineral resources,

case studies. Food resources - World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources - Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies. Land resources - Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river/ forest/ grassland/ hill/ mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; problems and concerns, case studies. Role of non-governmental organisations. Environmental ethics - Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. Wasteland reclamation. Consumerism and waste products. Environment protection act, Air (Prevention and Control of Pollution) act, Water (Prevention and control of Pollution) act, Wildlife protection act, Forest conservation act. Enforcement machinery involved in environmental legislation. Central and state pollution control boards. Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 8

Population growth, variation among nations. Population explosion. Family welfare programme. Environment and human health. Human rights. Value education. HIV/AIDS awareness. Women and child welfare. Role of information technology in environment and human health. Case studies.

TOTAL: 45 PERIODS

OUTCOME

1. Sensitivity towards the environment as a totality and knowledge about its importance.
2. An understanding of the role of public awareness and participation with respect to environmental issues, apart from laws.

TEXTBOOKS

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

REFERENCES

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopaedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental Law', Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

AR8421	BUILDING MATERIALS AND CONSTRUCTION III	L T P/S C
		1 0 4 3

OBJECTIVES

- To give an introduction to metals as material for building construction.
- To give knowledge about the principles, methods of construction and applications of metals for structural and non-structural building components.
- To provide familiarity with market forms of metals and finishes for them.
- To enable design and detail using metals in buildings.

UNIT I FERROUS METALS IN BUILDING CONSTRUCTION 10

Iron and steel as building materials and brief history of their use through examples. Types of iron and their uses in building. Outline of manufacture of steel and steel alloys. Their properties, types, uses, protection and finishes. Corrosion of ferrous metals and its prevention. Fire protection of steel. Steel sections and products for structural and non structural use including current innovations. Joints in steel- welding, riveting, bolting. Stainless steel. Understanding of product literature. Site visits.

UNIT II STEEL IN NON STRUCTURAL BUILDING COMPONENTS 18

Construction principles and procedures for non structural building components using steel. Components to include doors, windows, ventilators, rolling shutters of different types as applicable - openable, sliding, pivoted, fixed, louvred. Glazing, hardware and fixing for components. Sketching/ drawing/ models of the principles. Understanding of product literature/ shop drawings. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT III STEEL IN STRUCTURAL BUILDING COMPONENTS 20

Construction principles and procedures for structural building components using steel. Components to include foundations, columns, beams, staircases, roofs (different types of trusses, space frames, etc), total structures such as geodesic dome. Connections between the different components and fixing. Materials for glazing, cladding, roof covering, etc., as required for particular components, and their fixing. Prefabrication in steel. Drawings/ models of the principles. Understanding of product literature/ shop drawings. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT IV NON FERROUS METALS IN BUILDING CONSTRUCTION 12

Aluminium and aluminium alloys in building construction. Brief history of their use through examples. Their manufacture, properties, durability, finishes and uses. Aluminium products such as extrusions, foils, castings, sheets, current innovations. Construction principles and procedures for non structural building components using aluminium. Components to include door, window, ventilator of different types - openable, sliding, pivoted, fixed, louvred, etc., as applicable. Aluminium for interior components such as panelling, partitions and false ceiling. Glazing, hardware and fixing for components. Introduction to Aluminium curtain wall glazing. Sketching/ drawing/ models of the principles. Understanding of product literature/ shop drawings. Site visits with documentation in the form of sketches/drawings/photos. Introduction to other non-ferrous metals such as copper, lead, zinc. Their manufacture, properties, uses and finishes.

UNIT V DESIGN AND DETAILING USING METALS 15

A design and detailing exercise involving metals, predominantly steel, as primary construction material in an appropriate typology involving a simple scale project. The project will integrate knowledge from all the previous units. Design and construction details in the form of sketches, drawings, models.

TOTAL: 75 PERIODS

OUTCOME

- Knowledge of properties of ferrous and non ferrous metals as materials for buildings.
- An understanding of possibilities of steel as an important building construction material.
- Ability to design and detail structural and non structural components of simple buildings using metals.
- Ability to use metal innovatively in building projects.

TEXTBOOKS

1. P.C Vargheese, 'Building Materials', Prentice Hall of India, 2015.
2. S.K. Duggal, 'Building Materials', New Age International Publishers, 2016.

3. B.C.Punmia et al, 'Building Construction', Laxmi Publications, 2016.
4. Roy Chudley, Roger Greeno, 'Building Construction Handbook', Routledge, 2010.

REFERENCES

1. Gorenc, Tinyou, Syam, 'Steel Designer's Handbook', CBS Publishers and Distributors, New Delhi, Bangalore, 2005
2. Alan Blanc, 'Architecture and Construction in Steel', E&FN Spon, London, 1993
3. Allan Brookes, 'Cladding of Buildings', E&FN Spon, London, 1998.
4. Mark Lawson, Peter Trebilcock, 'Architectural Design in Steel', Taylor and Francis, 2004.
5. Terri Meyer Boake, 'Understanding Steel Design', Birkhauser, 2011.

AR8422

BUILDING SERVICES I

L T P/S C
2 0 2 3

OBJECTIVES

- To give information about water supply source, treatment and distribution.
- To give information about waste water disposal and sewerage systems.
- To give information about drainage system, refuse collection and disposal.
- To give exposure to sustainable practices in all the above contexts.
- To give an overall understanding of how to plan for all the above in small buildings, campuses and neighbourhoods.

UNIT I WATER QUALITY, TREATMENT AND DISTRIBUTION

14

Sources of water supply. Water Quality. Water requirements for all type of residential, commercial, industrial buildings and for town. Water treatment methods – screening, aeration, sedimentation, filtration, disinfection, softening. Conveyance of water. Distribution of water. Water piping systems in all type of buildings. Choice of pipe materials. Types of fixtures and fittings. Water consumption calculations for various contexts. Water meters. Design and calculations of OHTs, UG Sumps and fire fighting storage. Related mechanical equipment. Automation systems. Water heating systems, solar water heaters. Energy efficient systems. Green and sustainable concepts in the above where relevant.

Understanding of service drawings. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT II SULLAGE AND SEWAGE DISPOSAL

14

Sewage and sullage. Their disposal. Primary treatment. Types of sewer systems. Secondary treatment. Biological treatment. Modern types of sewage treatment plants - neighbourhood and site level. Related mechanical equipment. Sewer line, gradients, manholes, inspection chambers, septic tank, leach pits, traps. Byelaws for sanitation. Sanitary fittings and their requirements. Green and sustainable concepts in the above where relevant.

Understanding of service drawings. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT III STORM WATER DRAINAGE AND RAIN WATER HARVESTING

10

Basic principles of storm water drainage. Drain pipes and type of pipe. Storm water gutter. Rain water harvesting principles, Storage sumps. Different types of pavements and details for water percolation. Current ideas of sustainability in the above.

Understanding of service drawings. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT IV SOLID WASTE MANAGEMENT 10

Solid waste types, segregation and refuse collection. Disposal - Incinerator, composting, vermicomposting, sanitary land filling, bio gas system, modern renewable energy system. Current ideas of sustainability in the above.

Understanding of service drawings. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT V DESIGN OF SERVICES 12

Schematic design of water supply, sewage, drainage and solid waste services in the context of a small building/ campus/ neighbourhood. The project will integrate knowledge from all the previous units. Design in the form of choice, details of system and layout/ drawings.

TOTAL: 60 PERIODS

OUTCOME

- Understanding of water supply, sewage, drainage and waste systems in buildings.
- Ability to conceptually plan/ design the above for a given simple context.
- Awareness of sustainable principles and best practices.

TEXTBOOKS

1. 'Manual of Water Supply and Treatment', second edition, CPHEEO, Ministry of works and housing, New Delhi, 1977.
2. AFE Wise, JA Swaffied Water, 'Sanitary & Waste Services in buildings', V Edition, Mitchell Publishing, Co. Ltd., 2002.
3. Punmia B.C., 'Waste Water Engineering', Laxmi Publications, 2009.
4. Arceivala S.J., 'Waste Water Treatment for Pollution Control', Tata McGraw Hill, 2008.
5. National Building Code - Bureau of Indian Standards.
6. Indian Standard Code of Practice for Water Supply in Buildings, IS :2065 – 1983'.

REFERENCES

1. G.M. Fair, J.C. Geyer and D.Okin, 'Water and Waste water engineering Volume II', John Wiley & Sons, Inc. New York, 1968.
2. S.C.Rangwala, 'Water Supply and Sanitary Engineering', Charotar publishing house,
3. 'Renewable Energy, Basics and Technology, Supplement Volume on Integrated energy systems', Solar Agni systems, Sri Aurobindo Ashram, Pondicherry 605002.

**AR8423 COMPUTER-AIDED VISUALIZATION L T P/S C
1 0 4 3**

OBJECTIVES

- To introduce computer operation principles and explore image editing through a graphical composition.
- To impart training in computer aided 2D drafting and 3D modelling through projects.
- To enable the use of computer applications to develop a design from the initial stages to the final outcome.
- To enable the rendering of a building so as to create a photo realistic image.

UNIT I INTRODUCTION TO COMPUTER AND IMAGE EDITING 12

Technology of small computer system. Computer terminology. Operation principles of P.C. Introduction to application software, graphic system, use of printers, scanner, plotter, file management, etc. Understanding bitmap images and vector graphics, image size and resolution. Basic tools for editing and creating graphics.

Exercise in creating visual compositions using digital graphics (pixels/vector).

UNIT II THE BASICS OF BUILDING MODELLING 15
 Creating a basic floor plan. Temporary dimensions. Adding and modifying walls. Working with compound walls. Using editing tools. Adding and modifying doors. Adding and modifying windows
 2D Drafting exercise of a simple building.

UNIT III VIEWING THE BUILDING MODEL 15
 Understanding the drawing unit's settings, scales, limits, drawing tools, drawing objects, object editing, and text, dimensioning. Transparent overlays, hatching utilities, line type, line weight and colour. Multiline, polyline, etc. Styles, blocks and symbol library.
 Drafting exercise on the above.

UNIT IV INTRODUCTION TO 3D MODELLING 15
 Slide facilities script attributes, V-port, editing session. Introduction to 3D-modelling technique and construction planes, drawing objects, 3D surfaces setting up elevation thickness and use of dynamic projections. Solid modelling with primitive command and Boolean operation.
 3D sculpture exercise using 3D primitives (cubes, spheres etc.)

UNIT V 3D RENDERING AND SETTING 18
 Rendering and scene setting to create a photo realistic picture, understanding material mapping, environment setting and image filling.
 Exercise on visualising a building and exploring the potential of lights and camera.

TOTAL: 75 PERIODS

OUTCOME

- Ability to express using digital tools in the realm of visual composition, drafting, 3D visualisation and rendering.

TEXTBOOKS

1. Deke McClelland, 'Photoshop 7 Bible Professional Edition', Wiley John & Son INC, New York, 2000.
2. Aouad, 'Computer Aided Design guide for Architecture, Engineering and construction', Spon process, 2012.
3. Mohammed Saleh Uddin, 'Digital Architecture – 3D Computer Graphics from 50 top designers', 1999.

REFERENCES

1. Scott Onstott, 'AutoCAD 2015 and AutoCAD LT 2015 Essentials', AutoDesk Official press, 2014.
2. Fiorello. J. A., 'CAD for Interiors beyond the basics', Wiley publications, 2011.
3. Ryan Duell and Tobias Hathorn, 'AutoDesk Revit Architecture 2015: No Experience Required', AutoDesk Official Press, 2014.

AR8411

ARCHITECTURAL DESIGN III

L T P/S C
0 0 14 7

OBJECTIVES

- To enable an understanding of the fundamental possibilities of architectural form and space in relation to human experience and use within the context of the immediate living environment.
- To get the above understanding through personal, first hand exploration as well as through theoretical and literature studies.
- To use this understanding to create meaningful built environment in the context of small scale projects that involve simple function and experience.

CONTENT

Designing a built environment requires the development of individual capacity for thought with respect to subjective and objective aspects. Studying and designing projects of small scale that involve a more immediate and basic experience is important in this context. The study and project exploration will involve the following aspects from first principles as well as through live studies and theory – human behaviour, activities and needs for various purposes, role of specific form/space in creating particular experiences and effects, built form-open space relationships, spatial organisation, environment behaviour aspects (especially those relating to children), site as a positive tool in all scales, potential of materials and construction. Through this, both the qualitative and quantitative attributes of design can be understood and engaged. This would give training in the ingenious use of architecture to fulfil goals towards a responsive and stimulating environment.

The techniques used for study and presentation can align themselves towards the above, such as cognitive maps, sketches, manual drawings, physical models with simple materials.

The scale and complexity of projects will be commensurate with this - small to medium size projects involving buildings/ small campuses with simple circulation, passive energy, multiples of single unit space, single use buildings. Some suggestive projects are small buildings or small campuses involving civic/ cultural use, uses related to children such as schools, facilities for people with special requirements. The number of projects is left to the discretion of the faculty based on scale and complexity.

TOTAL: 210 PERIODS

OUTCOME

- Ability to perceive, understand and represent fundamental attributes of form- space with respect to human experience and use.
- Ability to ideate, innovate and create meaningful built environment in basic human situations.

TEXTBOOKS

1. Joseph De Chiara, Michael J Crosbie, 'Time Saver Standards for Building Types', McGraw Hill Professional, 2001.
2. Kevin Lynch, 'Site Planning', MIT Press, Cambridge, 1967.
3. Steen Eiler Rasmussen, 'Experiencing Architecture', MIT Press; 1959.
4. Kent C. Bloomer and Charles W. Moore, 'Body, Memory, and Architecture', Yale University Press, 1977.
5. Juhani Pallasmaa, 'The Eyes of the Skin - Architecture and the Senses', John Wiley: New York, 2005.

REFERENCES

1. Julius Panero, Martin Zelnik, 'Human Dimension and Interior Space', Whitney Library of Design, 1975.
2. Richard P. Dober, 'Campus Planning', Reinhold Book Corporation, 1963.
3. Sam F. Miller, 'Design Process: A Primer for Architectural and Interior Design', Van Nostrand Reinhold, 1995.
4. Dudek M, 'Schools and Kindergartens', Birkhauser 2007.

AR8501

DESIGN OF STRUCTURES II

L T P/S C
2 2 0 3

OBJECTIVES

- To inform about structural design through working stress and limit state methods.
- To enable use of the above two methods for the design of concrete beams and slabs under different conditions.
- To enable use of limit state method for design of a concrete staircase.

UNIT I	DESIGN OF CONCRETE MEMBERS AND WORKING STRESS DESIGN OF CONCRETE BEAMS	14
Concept of elastic method, Ultimate load method and limit state method. Advantages of limit state method over other methods. Analysis and design of singly reinforced rectangular beam for bending.		
UNIT II	LIMIT STATE DESIGN OF CONCRETE BEAMS	14
Analysis and design of singly and doubly reinforced rectangular and flanged beams for bending.		
UNIT III	LIMIT STATE DESIGN OF CONCRETE SLABS	12
Behavior of one way and two way slabs. Design of one way and two way slabs for various edge conditions. Corner effects.		
UNIT IV	DESIGN OF CONCRETE CIRCULAR SLABS	10
Design of simply supported and fixed circular slabs subjected to uniformly distributed loads.		
UNIT V	DESIGN OF CONCRETE STAIRCASE BY LIMIT STATE METHOD	10
Types of staircases. Design of dog legged staircase.		

TOTAL: 60 PERIODS

OUTCOME

- Ability to understand the different concepts of WSM and LSD methods using the code provisions.
- Ability to design RCC beams and slabs by applying the above concepts.
- Ability to design RCC dog legged staircase design using LSD.

TEXTBOOKS

1. S.N. Sinha, "Reinforced Concrete Design", Tata McGraw Hill , 2002.
2. Shah H.J. , 'Reinforced Concrete', Charotar, Vol. 1 2016, Vol.2 2014.

REFERENCES

1. P.Dayaratnam, 'Design of Reinforced Concrete Structures', Oxford and IBH Publishing Co.,1983.
2. C. Sinha and S.K. Roy, 'Fundamentals of Reinforced Concrete', S.Chand & Co., New Delhi,1983.
3. Dr. B.C. Punmia, 'Reinforced Concrete Structures' Vol, 1 & 2', Laxmi publication, Delhi, 2004.
4. IS 456 'Indian Standard, Plain and Reinforced Concrete, Code of Practice', Bureau of Indian Standards, 2000.
5. S.Unnikrishnan Pillai and Devados Menon, 'Reinforced Concrete Design', Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1999.

AR8502	HISTORY OF ARCHITECTURE AND CULTURE III	L T P/S C
		3 0 0 3

OBJECTIVES

- To introduce the condition of modernity and outline its impact on society, cities and architecture.
- To give a detailed understanding of modern architecture as new expression with different strands rising from various aspects and effects of modernity.
- To create an overall understanding of the architectural developments in India rising out of colonial modernity and nationalism.

UNIT I	MODERNITY AND ARCHITECTURE	10
<p>Overview of modernity as a historical phenomenon and its various aspects and manifestations, encompassing social, cultural, technological, economic and political changes. Outline of various strands of modernity in architecture. Enlightenment ideals, Neo Classical architecture and its types. Outline of Industrial Revolution and associated changes. Urban transformations in Europe and America. Housing projects. New building types and spaces. Industrial material of steel, glass and concrete. New construction techniques and standardisation. Split of design education into architecture and engineering streams. Industrial exhibitions. Chicago School, skyscraper development and Louis Sullivan.</p>		
UNIT II	REACTIONS TO INDUSTRIALISATION	7
<p>Reactions to industrialisation in design. Arts and Crafts in Europe and America. Works of Morris and Webb. Art Nouveau. Works of Horta, Van De Velde, Gaudi, Guimard and Mackintosh. Vienna Secession.</p>		
UNIT III	EVOLUTION OF MODERN ARCHITECTURE - IDEOLOGIES, MOVEMENTS AND STYLES	10
<p>Early modernism in Europe and America. Critique of ornamentation and Raumplan of Adolf Loos. Peter Behrens and Werkbund. Modern art and architecture - Expressionism, Futurism, Constructivism, Cubism, Suprematism and De–Stijl. Art Deco. Functionalism. Bauhaus. CIAM. International Style. Outline of works and architects associated with all the above.</p>		
UNIT IV	MODERNIST ARCHITECTS AND THEIR WORKS	8
<p>Ideas, works and evolution of Gropius, Corbusier, Aalto, Wright, Mies, Neutra.</p>		
UNIT V	ARCHITECTURE OF COLONIALISM, MODERNITY AND NATIONALISM IN INDIA	10
<p>Colonial rule in the Indian subcontinent and ambiguous modernity through colonialism. Colonial architecture and urbanism- forts, bungalows, cantonments, colonial urbanism, civic buildings, buildings of infrastructure, education, power, trade and other typologies. Characteristics and styles of colonial architecture based on chronology and changing intent/typology - Neo-Classicism, Gothic Revival and Indo-Saracenic. Influence of colonial modernity on Indians and their architecture. Building of New Delhi showcasing imperial power. Diverse directions and searches in early 20th century architecture of India. Art Deco and modern architecture in pre-independence India.</p>		

TOTAL: 45 PERIODS

OUTCOME

- An understanding of modernity as a fundamental transformation in Western society that spread across the world and the resultant architectural production.
- An insight into the development of modern architecture.
- An understanding of architecture in India under influence of colonialism and colonial modernity.

TEXTBOOKS

1. Kenneth Frampton, 'Modern Architecture: A Critical History', Thames & Hudson, London, 2007.
2. William J. Curtis, 'Modern Architecture since 1900', Phaidon Press, 1996.
3. Manfredo Tafuri, 'Modern Architecture', Harry N. Abrams Inc, 1980.
4. Leonardo Benevolo, 'History of Modern Architecture Vol 1 & 2', Reprint, MIT Press, 1977.
5. G. H. R. Tillotson, 'The Tradition of Indian Architecture: Continuity, Change, and the Politics of Style since 1850', Yale University Press, 1989.
6. Miki Desai et. al., 'Architecture and Independence: The Search for Identity- India 1880 to 1980 ', Oxford University Press, 2000.

REFERENCES

1. Thomas Metcalf, 'An Imperial Vision', Oxford University Press, 2002.
2. Christian Norburg-Schulz., 'Meaning in Western Architecture', Rizzoli, Revised Edition, 1993.
3. Bill Risebero, 'Modern Architecture and Design: An Alternative History', MIT Press, 1985.
4. Norma Evenson, 'The Indian Metropolis: A View Toward the West', Yale University Press, 1989.
5. Francis D. K. Ching, Mark M. Jarzombek, Vikramaditya Prakash, 'A Global History of Architecture', John Wiley & Sons, 2017.
6. K.R.Sitalakshmi, 'Architecture of Indian Modernity- The Case of Madras', Palaniappa Brothers, 2015.

AR8521

BUILDING MATERIALS AND CONSTRUCTION IV

L T P/S C
1 0 4 3

OBJECTIVES

- To give an introduction to cement and concrete as materials for building construction.
- To help understand the principles, types, methods of construction and applications of concrete for structural and non-structural building components.
- To enable design and detail using concrete in buildings.

UNIT I INTRODUCTION TO CEMENT AND CONCRETE

12

Cement and concrete as building materials. Brief history of their use through examples. Composition, manufacture, properties, types and uses of cement. Tests for cement. Introduction to cement mortar and plastering and their composition. Concrete and its composition. Mix design. Nature of aggregates for mix including classification, sources, shape, size, grading, sampling and analysis. Proportioning, water-cement ratio, workability. Stages in concrete construction- formwork, mixing, placing, curing. Cement and concrete finishes including roughcast, dry dash, textured, stucco. Water proofing and damp proofing of concrete.

Understanding of product literature. Site visits with documentation in the form of sketches/ photos.

UNIT II CAST IN-SITU CEMENT CONCRETE IN BUILDING CONSTRUCTION

21

Construction principles and procedures for building components using cast in situ cement concrete (plain and reinforced). Components to include different types of foundations, columns, beams, slabs, walls, lintels and sun shades, staircases, sump, water tank, flooring.

Drawings/ models of the principles. Understanding of detailed drawings/ published work. Site visits with documentation in the form of sketches/ photos.

UNIT III PRECAST CONCRETE PRODUCTS IN BUILDING CONSTRUCTION

15

Types and characteristics of simple precast concrete products. Construction principles and procedures for structural and non structural building components using precast concrete. Components to include different types of blocks/ tiles for walls, floors and roof, jali, parapet, paving. Outline of manufacture, laying/constructing and finishing.

Sketching/ drawing/ models of the principles. Understanding of product literature/ published work. Site visits with documentation in the form of sketches/ photos.

UNIT IV SPECIAL CONCRETES AND INNOVATIONS IN CONCRETE

12

Types of special concretes, to include lightweight concrete, aerated concrete, no-fines concrete, polymer concrete, pre-stressed concrete, fibre-reinforced concrete, ready-mixed concrete, ferrocement. Building materials and components developed by research organisations like CBRI, SERC, NBO, and BMTPC. Techniques for renovation and retrofitting. Basic principles for seismic design in concrete.

Understanding of product literature/ published work. Site visits with documentation in the form of sketches/ photos.

UNIT V DESIGN AND DETAILING USING CONCRETE

15

Design and detailing exercise involving concrete as primary construction material in an appropriate typology involving a simple scale project. The project will integrate knowledge from all the previous units. Design and construction details in the form of drawings, sketches and models.

TOTAL: 75 PERIODS

OUTCOME

- Ability to use concrete as a versatile material in different contexts.
- An understanding of the concepts of concrete as a building construction material.
- Ability to design and detail specific components in concrete where there is scope for architectural design.
- Ability to use concrete innovatively in simple projects.

TEXTBOOKS

1. M.S.Shetty, 'Concrete Technology', S.Chand, 2005.
2. S.K. Duggal, 'Building Materials', New Age International Publishers, 2016.
3. B.C.Punmia et al, 'Building Construction', Laxmi Publications, 2016.
4. T.D Ahuja and G.S. Birdie, 'Fundamentals of Building Construction', Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 1996
5. S.P Arora and S.P Bindra, 'A Text Book of Building Construction', Dhanpat Rai Publishing Company Pvt. Ltd, 2010.
6. Roy Chudley, Roger Greeno, 'Building Construction Handbook', Routledge, 2010.

REFERENCES

1. Arthur Lyons, 'Materials for Architects and Builders - An Introduction', Arnold, London, 1997.
2. Don A.Watson, 'Construction Materials and Processes', McGraw Hill Co., 1986.
3. S.N Sinha, 'Reinforced Concrete Design', Tata-McGraw Hill, New Delhi, 2002
4. Howard Kent Preston, 'Prestressed Concrete for Architects and Engineers', McGraw Hill, New York, 1964.
5. Alan Blanc, 'Stairs, Steps and Ramps', Butterworth, Heinemann Ltd., 1999
6. R. Chudley et al, 'Construction Technology', Heinemann, 2011.
7. 'Standards and Specifications for Cost Effective Innovative Building Materials and Techniques", BMPTC Publication, New Delhi.
8. Pamphlet and Manuals of SERC, BMPTC, HUDCO and other research organisations.

AR8522

BUILDING SERVICES II

L T P/S C
2 0 2 3

OBJECTIVES

- To inform about the principles and laws of electricity and wiring systems in buildings.
- To inform about the principles and laws of lighting systems in buildings.
- To inform about the principles and laws of acoustics in buildings.
- To give exposure to the design of electrical, lighting and acoustic systems in buildings of small scale.

UNIT I GENERATION OF ELECTRICITY AND DISTRIBUTION IN BUILDINGS

12

Generation of electricity. Ohms and Kirchoffs Laws. Units: watt, volt, amps. Distribution from grid to facilities. Two phase and three phase systems. Substation, transformers, generators. Wires and conduits, types and applications. Lightning conductors and earthing. Distribution boards, meters, switch boards, earthing. Energy efficient systems and renewable energy resources.

Understanding of service drawings. Site visits with documentation in the form of sketches/ drawings/ photos. Design of electrical layout for buildings of small scale through drawings.

UNIT II INTRODUCTION TO LIGHTING 10

Electromagnetic spectrum. Sources of light. Laws and terminologies of lighting. Daylight. Considerations for designing with daylight - typology, room dimensions, openings. Daylight Factor. Light from artificial sources, quantity and quality. Types of lamps and luminaires. Applications and choice of luminaires. Energy efficient systems.

Understanding of product literature/ service drawings. Site visits with documentation in the form of sketches/ drawings/ photos.

UNIT III LIGHTING DESIGN FOR BUILDINGS 12

Lighting level for different uses in outdoor and indoor environment. Lighting calculations. Lighting simulation and performance analysis using software.

Design exercise involving lighting design for appropriate projects of simple scale through choice, calculations, layout, drawings, simulations, physical models.

UNIT IV FUNDAMENTALS OF ACOUSTICS 9

Fundamentals – sound waves, frequency, intensity, wave length, measure of sound, decibel scale, speech and music frequencies. NC curves. Permissible noise limits. Material property - absorption, reflection, scattering, diffusion, transmission. Absorption co-efficient, NRC, Sound Transmission Class (STC), Impact Insulation Class (IIC).

Understanding acoustic properties of materials/ products through study of product literature/ site visits.

UNIT V ENVIRONMENTAL ACOUSTICS 17

Environmental noise and its control. Structure borne and air borne noise control. Site selection. Sound in enclosed space: Reverberation time, optimum reverberation time, echo, early decay time. Architectural acoustics. Importance of shape volume, treatment for interior surfaces, etc. Basic principles in designing classroom, lecture and conference hall, offices, open air theatre, auditorium, concert hall, theatre, cinema, recording studio.

Understanding of drawings/ details related to real acoustic design projects. Site visits with documentation in the form of sketches/ drawings/ photos. Simple problems based on reverberation time and absorption coefficients. Acoustic design for simple and small projects including planning, constructional measures and sound reinforcement systems through calculations, conceptual sketches, drawings, models.

TOTAL: 60 PERIODS

OUTCOME

- Knowledge of basics of electrical, lighting and acoustic systems in buildings.
- Ability to design buildings satisfying electrical, lighting and acoustic principles.
- Ability to design basic electrical, lighting and acoustic systems for buildings.

TEXTBOOKS

1. Phillips, 'Lighting in Architectural Design', McGraw Hill. New York, 1964.
2. David Egan, Victor Olgay 'Architectural Lighting', McGraw-Hill, 2001.
3. Gary Gordon, 'Interior Lighting for Designers', 5th Edition, John Wiley & Sons Inc., New York, 2015.
4. David Egan, 'Architectural Acoustics', J.Ross Publishing, 2007.
5. David Lee Smith, 'Environmental Issues for Architecture', Wiley, 2011.
6. National Building Code - Bureau of Indian Standards.

REFERENCES

1. 'The Lighting Handbook', IES, 2011.
2. National Lighting Code 2010.
3. Descottes, Herve and Cecilia E. Ramos, 'Architectural Lighting: Designing with Light and Space', Princeton Architectural Press, Princeton, 2011.
4. A.K.Mittal, 'Electrical and Mechanical Services in High Rise Building: Design and Estimation Manual', CBS, 2009.

AR8511

ARCHITECTURAL DESIGN IV

L T P/S C
0 0 14 7

OBJECTIVES

- To introduce the challenges involved in the design of projects related to diverse needs and ways of contemporary urban life.
- To enable exploration of the above projects with perception, socio-cultural awareness and innovation.

CONTENT

Urban environment is synonymous with heterogeneity of populace and their diverse needs and lifestyles. Private and public spaces for varied programmes such as living, working and socio-cultural needs bring individuals and groups in intersection or proximity to each other. Further, current transformations in urban society have led to many changes in buildings. The challenge within the discipline of architecture is not only to create conducive spaces for contemporary ways of life within particular contexts, but also to identify issues and programmes and address them in innovative ways. These would include urban living, urban working, socio-cultural life, urban recreation, etc., Achieving comfort without sacrificing on density would also be a concern, along with exposure to building byelaws and barrier free environment. The approach and projects will be directed towards one or more of these aspects.

The tools and techniques engaged for study and design can be those which are best suited to study the above, including mapping of urban patterns/ways of life and needs, demographics, socio-cultural aspects, densities, land use, etc.,

Projects will address specific situations/scenarios characteristic of urban life and context, either single or mixed use. They will be of medium to large scale, involving repetitive or unique spaces, low or mid rise buildings with passive/active energy. The number of projects is left to the discretion of the faculty based on scale and complexity.

TOTAL: 210 PERIODS

OUTCOME

- Ability to understand the nature, needs and ways of contemporary urban society as well as relate the existing built environment as a reflection of this.
- Ability to draw from this understanding and identify issues/ challenges involving contemporary urban life and the built environment.
- Ability to give appropriate/ innovative design solutions in the above context.

TEXTBOOKS

1. Joseph De Chiara, Michael J Crosbie, 'Time Saver Standards for Building Types', McGraw Hill Professional, 2001.
2. 'Ernst Neuferts Architects Data', Blackwell ,2002.
3. Stephen A. Klimont, Editor 'Building Type Basics' Series, Wiley.
4. Wolfgang Preisler, Korydon H. Smith, 'Universal Design Handbook', 2nd Edition, McGraw-Hill, 2010.

REFERENCES

1. Rem Koolhaas et al, 'Project on the City II: The Harvard Guide to Shopping', Taschen, 2001.
2. Peter Coleman, 'Shopping Environments: Evolution, Planning and Design', Routledge, 2006.
3. LMVRDV, 'FARMAX- Excursions on Density', 010 Publishers, 2006.
4. Jos Boys, 'Disability, Space, Architecture: A Reader', Routledge, 2017.
5. Emily Talen, 'Design for Diversity', Routledge, 2012.
6. Luis Alexandre Casanovas Blanco (Ed), 'After Belonging: Objects, Spaces, and Territories of the Ways We Stay in Transit', Lars Muller Publishers, 2016.
7. Manuel Gausa, 'Housing: New Alternatives, New Systems', Birkhäuser Basel 1999
8. Mark Hutter, 'Experiencing Cities (The Metropolis and Modern Life)', Routledge, 2015.

AR8601

DESIGN OF STRUCTURES III

L T P/S C
2 2 0 3

OBJECTIVES

- To enable use of limit state design for the analysis and design of columns.
- To enable the learning of design of structural elements like footings, retaining walls and masonry walls.
- To give understanding of the principle, methods, advantages and disadvantages of pre stressed concrete.

UNIT I LIMIT STATE DESIGN OF COLUMNS

13

Types of columns. Analysis and design of short columns for axial, uniaxial and biaxial bending. Use of design aids.

UNIT II DESIGN OF FOOTINGS

13

Types of footings. Design of wall footings. Design of axially loaded square & rectangular footings (pad and sloped).

UNIT III FLAT SLABS

13

Design principles of flat slabs. Code provision. Simple design problems.

UNIT IV DESIGN OF MASONRY WALLS

11

Analysis and design of masonry walls. Use of nomograms. Code requirements.

UNIT V INTRODUCTION TO PRESTRESSED CONCRETE

10

Principle of prestressing. Methods of prestressing, advantages and disadvantages. Simple analysis problems.

TOTAL: 60 PERIODS

OUTCOME

- An understanding of the different concepts in designing footings and columns and masonry walls using LSD methods.
- An understanding of the concepts and applications of prestressed concrete.

TEXTBOOKS

1. B.C. Punmia, 'Reinforced Concrete Structures- Vol. 1 & 2', Laxmi Publications, Delhi, 2004.
2. 'IS 456, Indian Standard, Plain and Reinforced Concrete, Code of Practice', Bureau of Indian Standards, 2000.
3. 'SP – 16, Design Aids for Reinforced Concrete to IS 456 National Building Code of India', 1983
4. 'IS 1905, Code of Practice for Structural Safety of Buildings', 1987.
5. Ashok K.Jain, 'Reinforced Concrete: Limit State Design', Nemchand, Bros Roorkee 1983.

REFERENCES

1. P. Dayaratnam, 'Design of Reinforced Concrete Structures', Oxford and IBH Publishing CO.,1983.
2. N.C.Sinha and S.K.Roy, 'Fundamentals of Reinforced Concrete', S.Chand and Co., New Delhi, 1983.
3. Krishna Raj, 'Prestressed Concrete Structures', 3rd Edition, Tata McGraw Hill, 2005.

AR8602

HISTORY OF CONTEMPORARY ARCHITECTURE

L T P/S C
3 0 0 3

OBJECTIVES

- To introduce the large scale changes from 1960s as context for new thought in architecture.
- To give exposure to the critiques of modern architecture.
- To study in detail the different post modern directions in architecture.
- To give an outline of architectural approaches across the world from late 20th century.
- To give an understanding of the trajectory of post independence architecture of India till the present.

UNIT I MODERN ARCHITECTURE – SPREAD AND LATER DIRECTIONS 10

Brutalism. Team X. Ideas, works and evolution of Philip Johnson, Louis Kahn, Paul Rudolph, Eero Saarinen, SOM, Eames, I.M.Pei. Modern architecture and postindependence India - national building, institutions and PWD architecture. Chandigarh. Outline of evolution of the architectural profession in India, influences on architects. Works of Kanvinde, Habib Rehman. Corbusier and Kahn in India. Evolution and early works of Raje, Correa and Doshi.

UNIT II AFTER MODERNISM I 9

Outline of changes in society after the 1960s characterised as condition of postmodernity, to include the realms of economics, technology, culture, society and environment. Critique of modernist cities by Jane Jacobs. Theories and works of Christopher Alexander. Aldo Rossi's ideas on the city. Neorationalism. Semiology and Postmodernism. Writings of Venturi. Works of Venturi Scott Brown, Graves and Moore.

UNIT II AFTER MODERNISM II 9

Urban ideas/works of Soleri, Archigram and Metabolism. High Tech architecture, works of Stirling, Rogers and Piano. Deconstructivism as new architectural movement. Ideas and works of Eisenmann, Hadid, Gehry, Libeskind, Tschumi.

UNIT III AFTER MODERNISM III 9

Critical Regionalism as a category of architecture. Ideas and works of Fathy, Ando, Bawa, Barragan, Siza. Outline of contextual approaches in Indian architecture after the 60s. Works of Raje, Doshi, Correa, Raj Rewal. Philosophy and works of Nari Gandhi, Laurie Baker.

UNIT V CONTEMPORARY ARCHITECTURE

8

Overview of larger changes in society from late 20th century and their influence on architecture. Outline of architecture related to parametric design and digital processes, sustainability, globalisation, phenomenology, complexity. Ideas and works of ZHA, contemporary Dutch architecture, Bjarke Engels and BIG, OMA and Rem Koolhaas, Steven Holl, McDonough, Yeong, Zumthor, Pallasma, Murcutt. Outline of contemporary architecture in the non Western world. Large scale changes in India from the 90s. Outline of post 1990s architecture of India.

TOTAL: 45 PERIODS

OUTCOME

- An awareness of the spread and varied later directions of modern architecture across the world.
- An understanding of architectural production from the 1960s as driven by large scale changes across the world.
- Familiarity with contemporary forces and directions in architecture across the world.
- An understanding of postindependence architecture in India contemporaneous with the rest of the world, along with its own particular influences.

TEXTBOOKS

1. Kenneth Frampton, 'Modern Architecture: A Critical History', Thames & Hudson, London, 2007.
2. William J. Curtis, 'Modern Architecture since 1900', Phaidon Press, 1996.
3. Diane Ghirardo, 'Architecture after Modernism', Thames & Hudson, London, 1990.
4. Elie G. Haddad, David Rifkind, 'A Critical History of Contemporary Architecture: 1960-2010', Routledge, 2016.
5. Bhatt and Scriver, 'Contemporary Indian Architecture- After the Masters', University of Washington Press, 1991
6. Bahga et al, 'Modern Architecture in India - Post Independence Perspective', Galgotia, 1993
7. Miki Desai et. al., 'Architecture and Independence', Oxford University Press, 2000.
8. Harry Francis Malgrave and David Goodman, 'An Introduction to Architectural Theory 1968 to the Present', Wiley Blackwell, 2011.
9. Rahul Mehrotra, 'Architecture in India since 1990', Hatje Cantz, 2011.

REFERENCES

1. Jane Jacobs, 'Deaths and Life of Great American Cities', Vintage, 2003.
2. Christopher Alexander, 'A Pattern Language', Oxford University Press, Oxford, 1977.
3. Robert Venturi, 'Complexity and Contradiction in Architecture', 1977.
4. Kate Nesbitt, Ed, 'Theorising a New Agenda for Architecture', Princeton University Press, 1996.
5. Jagan Shah, 'Contemporary Indian Architecture', Lustre, 2008.
6. Francis D. K. Ching, Mark M. Jarzombek, Vikramaditya Prakash, 'A Global History of Architecture', John Wiley & Sons, 2017.
7. 'Architecture in India', Exhibition Catalogue, Electa Moniteur, 1985.
8. 'Vistara- The Architecture of India', Festival of India, 1986.
9. K.R.Sitalakshmi, 'Architecture of Indian Modernity- The Case of Madras', Palaniappa Brothers, 2015.
10. Bipin Chandra et al, 'India After Independence', Penguin, 1999.

AR8621

BUILDING MATERIALS AND CONSTRUCTION V

L T P/S C
1 0 4 3

OBJECTIVES

- To give an introduction to paints and special finishes in buildings.
- To give an introduction to glass, plastic and related materials in building construction.
- To provide familiarity with advanced building construction techniques and materials as well as design with them.

UNIT I	GLASS	15
<p>Glass as a building material. Brief history of its use through examples. Manufacture, properties and uses of glass. Types of glass - float glass, cast glass, glass blocks, foamed glass, decorative glass, solar control, toughened glass, wired glass, laminated glass, fire-resistant glass, glass blocks, structural glass. Glass and energy efficiency in buildings. Application of glass in building industry. Introduction to curtain wall glazing. Current innovations.</p> <p>Understanding of product literature/ shop drawings. Site visits with documentation in the form of sketches/ photos.</p>		
UNIT II	PLASTICS	15
<p>Plastic as a building material. Brief history of their use through examples. Manufacture. properties, types, uses and application of plastics in building industry. Different types of adhesives and sealants. Plastic joints. Specific materials such as polycarbonate sheet and teflon. Introduction to plastic based products in building construction such as such as doors, windows, ventilators, partitions, floors, walls, roofs, handrails. Current innovations.</p> <p>Understanding of product literature/ shop drawings. Site visits with documentation in the form of sketches/ photos.</p>		
UNIT III	FINISHES	12
<p>Paints and finishes in buildings. Their different types, composition, characteristics and uses. Types to include enamels, distemper, plastic emulsion, polyurethane, special paints such as fire retardant, luminous and bituminous paints. Preparation of surface and application for different paints/ finishes. Gypsum and POP finishes. Current innovations.</p> <p>Understanding of product literature. Site visits with documentation in the form of sketches/ photos.</p>		
UNIT IV	ADVANCED CONSTRUCTION TECHNIQUES AND MATERIALS	18
<p>Advanced concrete building components and construction techniques. To include folded plates, shell structures, vaults, domes. Their composition, construction and finishing. Insulated concrete forms (ICF). Recent trends in roofing materials like corrugated GI Sheets, pre-coated metal sheets. Composite walls, pneumatic structures, tensile structures, corrugated hyparshells, single layer reticulated shells, tension hybrid membranes, sustainable steel (preco beams, cellular beams, composite slim floor beam).</p> <p>Drawings/ sketches/ models of the principles. Understanding of detailed drawings/ published work. Site visits with documentation in the form of sketches/ drawings/ photos.</p>		
UNIT V	DESIGN USING ADVANCED CONSTRUCTION TECHNIQUES AND MATERIALS	15
<p>Design and detailing exercise involving advanced construction techniques and materials outlined in the previous unit. The emphasis would be on innovative ways to use their principles in an appropriate typology involving a simple scale project. Design and construction details in the form of sketches and models.</p>		
		TOTAL: 75 PERIODS
OUTCOME		
<ul style="list-style-type: none"> • Knowledge of glass, plastics, paints and finishes in building construction. • Familiarity with advanced materials and construction techniques. • Ability to use advanced materials and construction techniques in innovative ways. 		
TEXTBOOKS		
<ol style="list-style-type: none"> 1. S.K. Duggal, 'Building Materials', New Age International Publishers, 2016. 2. B.C.Punmia et al, 'Building Construction', Laxmi Publications, 2016. 3. S.P Arora and S.P Bindra, 'A Text Book of Building Construction', Dhanpat Rai Publishing Company Pvt. Ltd, 2010. 4. M.S.Shetty, 'Concrete Technology', S.Chand, 2005. 		

5. Arthur Lyons, 'Materials for Architects and Builders- An Introduction' Arnold, London, 1997.
6. Pamphlet and Manuals supplied or published by SERC, BMPTC, HUDCO and other research organisations.
7. Roy Chudley, Roger Greeno, 'Building Construction Handbook', Routledge, 2010.

REFERENCES

1. R.M. Davis, 'Plastics in Building Construction', Battersea College of Technology, Blackie, London, 1966
2. Ralph Monletta, 'Plastics in Architecture– A Guide to acrylic and Polycarbonate', Marcel Dekker Inc, New York, 1989
3. 'IS 7883. Code of Practice for the Use of Glass in Buildings ', Bureau of Indian Standards, 2013.
4. Gorenc, Tinyou, Syam, 'Steel Designer's Handbook', CBS Publishers and Distributors, New Delhi, Bangalore, 2005.
5. Alan Blanc, 'Architecture and Construction in Steel', E&FN Spon, London, 1993.
6. Billie Faircloth, 'Plastics Now: On Architecture's Relationship to a Continuously Emerging Material', Routledge, 2015.

AR8622

BUILDING SERVICES III

L T P/S C
2 0 2 3

OBJECTIVES

- To give exposure to the science behind air-conditioning systems, the different types and applications.
- To enable understanding of architectural aspects related to air-conditioning systems and take appropriate design decisions.
- To inform about fire protection, fire safety and fire fighting in buildings and how to plan for the same
- To inform about mechanical transportation systems for buildings and how to plan for the same.

UNIT I AIR CONDITIONING – PRINCIPLES AND SYSTEMS

14

Thermodynamics. Transfer of heat. Refrigeration cycle components. Vapor compression cycle. Refrigerant, Compressor, condenser, evaporator, refrigerant control devices, electric motors, air handling units, cooling towers. Air conditioning systems for buildings of different scales and their requirements- window type, split system, package unit, direct expansion system, chilled water system, fan coil unit, district cooling systems. Energy efficient systems, environmental aspects and latest innovations.

Understanding all the above through product literature/ field visits.

UNIT II DESIGN ASPECTS OF AIRCONDITIONING SYSTEMS

10

Design criteria for selection of air conditioning. Configuring/ sizing of mechanical equipment, equipment and spaces for them. Horizontal and vertical distribution of services for large buildings. Exercise on the above through choice, calculations, layout, drawings.

UNIT III FIRE AND SAFETY

12

Causes of fire in buildings. Stages of fire and how it spreads. Fire drill. Heat/ fire/ smoke detection. Alarm and extinguisher systems. Fire safety standards. General guidelines for egress design for multi-storey buildings.

Understanding all the above through product literature/ field visits. Exercise on design of fire safety systems for different building types through choice, calculations, layout and drawings.

UNIT IV MECHANICAL TRANSPORTATION SYSTEMS IN BUILDINGS 12

Lifts and escalators - types and applications. Round trip time for lifts. Design of lift lobby and vertical transportation core. Conveyors, travelators, dumb waiters. Standards for all. Latest technologies in vertical transport systems. Integration of lifts and escalators with building automation systems. Understanding all the above through product literature/ field visits. Design exercise on the above through choice, calculations, layout and drawings.

UNIT V INTEGRATION OF SERVICES INTO ARCHITECTURAL DESIGN 12

Principles of grouping and integrating of horizontal and vertical distribution of all services in a multi-storeyed building/ large building. Services to include vertical transportation, electrical, communication, air conditioning and fire safety.

Integrating service requirements into architectural design in an appropriate typology involving a simple scale project through sketches/ drawings.

TOTAL: 60 PERIODS

OUTCOME

- Familiarity with different air conditioning systems, their context of use and basics of planning involved.
- An understanding of fire safety, fire fighting, fire prevention and installations in buildings.
- An understanding of mechanical transportation systems in a building.
- Ability to integrate services in buildings.

TEXTBOOKS

1. William H. Severns and Julian R Fellows, 'Air conditioning and Refrigeration', John Wiley and Sons, London, 1988.
2. National Building Code - Bureau of Indian Standards.
3. 'ASHRAE Handbook for Refrigeration', 2015.
4. George R. Strakosch (Editor), Robert S. Caporale, 'The Vertical Transportation Handbook' 4th Edition, Wiley and Sons, 2010.
5. David Lee Smith, 'Environmental Issues for Architecture', Wiley, 2011.

REFERENCES

1. A.F.C. Sherratt, 'Air Conditioning and Energy Conservation', The Architectural Press, London, 1980.
2. Andrew H Buchanan; 'Structural Design for Fire Safety', Wiley, 2001.
3. Swenson S. Don, 'Heating, Ventilating and Air Conditioning', American Technical Publishers, 1995.
4. ASHRAE, 'All about AHUs- Air Handling Units'.
5. CIBSE Guide D, 'Transportation Systems in Buildings', 2010.
6. A.K.Mittal, 'Electrical and Mechanical Services in High Rise Building: Design and Estimation Manual', CBS, 2009.

OBJECTIVES

- To introduce buildings as consumers of resources for human needs and to enable responsible, creative addressing of this fact through design choices.
- To enable an understanding of architectural design as integrating diverse functional concerns in a building through analysis and innovation.
- To impart training in the resolving of spatial considerations with other physical aspects such as structures, services and climate.

CONTENT

Architecture is a man made addition to the world and is resource intensive. The questions in this regard are how to simplify needs and means. Further, architecture today is also required to integrate several physical concerns in a building as human needs in built environment have become more complex with respect to intensity, distribution and interdependency of activities/ programmes. Here the challenge is to address complex needs in an efficient manner so as to conserve/ optimise resources without compromising on quality of life. The approach and projects will be directed towards one or more of these concerns.

Appropriate tools and techniques related to the above can be used in study and design, especially in terms of technical aspects.

The nature of projects can be either or both of these- 1) simple scale, ordinary or special use projects examining design through resources of different types 2) large, complex projects (multi storeyed buildings, office complexes, buildings for healthcare, performing art centre, etc.,) that need technical resolution and/or balance of various aspects. Aspects to be addressed can be urban land as resource, planning integration and detailing, sustainable building practices, green issues, alternative energy, intelligent building techniques and service integration, advanced building practices, appropriate materials and construction, sensitive and optimal use of resources. The number of projects are left to the discretion of the faculty based on scale and complexity.

TOTAL: 210 PERIODS**OUTCOME**

- Ability to critically understand and address issue of resources.
- Ability to balance diverse aspects/concerns of buildings by making informed choices and innovative design in the context of buildings with intense or complex programmes.
- Ability to apply knowledge intensively in realms such as sustainable built environment, services.

TEXTBOOKS

1. Daniel Williams, 'Sustainable Design, Ecology, Architecture & Planning', John Wiley & Sons Inc, NJ, 2007.
2. Mili Mazumdar, 'Energy Efficient Buildings in India', TERI, New Delhi, 2012.
3. 'Sustainable Building Design Manuals I & II', TERI, 2004.
4. Derek Clements-Croome, 'Intelligent Buildings: An Introduction', Routledge, 2013.
5. Stephen A. Klimont, Editor 'Building Type Basics' Series, Wiley.

REFERENCES

1. Lara Menzel, 'Office - Architecture + Design', Braua Publishers, 2009.
2. Sheri Koonos, 'Prefabulous+Sustainable, Building and Customizing an Affordable, Energy Efficient Home', ABRAMS, 2010.
3. Edward Ng, 'Designing High-density Cities for Social and Environmental Sustainability, Routledge, 2009.
4. Robin Guenther, Gail Vittori, 'Sustainable Healthcare Architecture', 2nd Edition, Wiley 2013.
5. Marian Keeler, Bill Burke, 'Fundamentals of Integrated Design for Sustainable Building', Wiley, John Wiley & Sons, 2009.

OBJECTIVES

- To introduce the various aspects of outdoor design and site planning in enhancing and improving the quality of built environment, functionally and aesthetically.
- To stress on the role of landscape design in sustainability, to provide an overview of ecological balance and impacts of human activities and the need for environmental protection and landscape conservation.
- To provide familiarity with the various elements of landscape architecture and the principle of landscape design.
- To give an outline of the evolution of landscape and garden design across history.
- To help develop and strengthen competence in dealing with the analytic, artistic and technical aspects of designing open spaces at different scales.

UNIT I INTRODUCTION**7**

Introduction to landscape architecture. Basic concepts of ecology and the impact of human activities on them. Bio, Geo, chemical cycles including water cycle, carrying capacity of an ecosystem. Environmental impact assessment. Reclamation and restoration of derelict lands.

UNIT II ELEMENTS IN LANDSCAPE DESIGN**10**

Introduction to hard and soft landscape elements. Different types of hard landscape elements. Plant materials, water and landform - classification, characteristics, use and application in landscape design.

UNIT III GARDEN DESIGN IN HISTORY**10**

Japanese, Italian Renaissance, Mughal and English gardens. Outline of landscape and garden design in Indian history. Gardens depicted in Sanskrit literature, Nandavanams and residential gardens of South India. Moghul gardens. Public parks and residential gardens of the colonial period. Contemporary public landscape projects. Study of notable examples. Spatial development in landscape design.

UNIT IV SITE PLANNING**10**

Organisation of spaces in the outdoor environment. Role of circulation and built form in shaping the environment. Role of landscape design in design of neighbourhood parks, children's play area and campus development.

UNIT V LANDSCAPING OF FUNCTIONAL AREAS**8**

Urban open spaces and principle of urban landscape. Street landscaping, landscape design for waterfront areas and functional areas in urban centres. Green infrastructure including green roofs and walls.

TOTAL: 45 PERIODS**OUTCOME**

- Awareness of the role of landscape design with respect to macro scale of sustainability and ecology as well as in the micro scale of shaping of outdoor environments.
- Knowledge about the elements of landscape design and their scope.
- Sensitivity towards evolution of different garden and landscape design across time and context.
- An understanding of landscape design with respect to site planning and different functional typologies of spaces.

TEXTBOOKS

1. Motloch, J.L., 'An Introduction to Landscape Design', US: John Wiley and Sons, 2001.
2. Michael Laurie, 'Introduction to Landscape Architecture', Elsevier, 1986.
3. Sauter D; 'Landscape Construction', Delmar Publishers; 2000.
4. Geoffrey And Susan Jellicoe, 'The Landscape of Man', Thames And Hudson, 1987.

REFERENCES

1. 'Time Saver Standards for Landscape Architecture', McGraw Hill, Inc, 1995.
2. Grant W Reid, 'From Concept to Form in Landscape Design', Van Nostrand Reinhold Company, 1993.
3. Albert J. Rutledge, 'Anatomy of a Park', McGraw-Hill Book Company, 1971.
4. Richard P. Dober, 'Campus Landscape', John Wiley and Sons; 2000.
5. Strom Steven, 'Site Engineering for Landscape Architects', John Wiley and Sons Inc., 2004.
6. Brian Hacket, 'Planting Design', Mc Graw Hill Inc, 1976.
7. T.K. Bose and Chowdhury, 'Tropical Garden Plants in Colour', Horticulture And Allied Publishers, Calcutta, 1991.
8. Rahoul B Singh, 'Gardens of Delight- Indian Gardens through the Ages', Lustre Press, Roli Books, 2008.

AR8702

URBAN DESIGN

L T P/S C
3 0 0 3

OBJECTIVES

- To create an understanding of urbanism and urban morphology as rising from various forces through history.
- To introduce the components of the modern city and their interdependencies.
- To introduce the scope and nature of urban design as a discipline
- To introduce key theories associated with urbanism and cities.
- To create awareness of contemporary urban issues and how they are addressed.
- To give exposure to ways of perceiving, documenting and analysing cities.

UNIT I URBANISM IN HISTORY

10

Outline of forces shaping urbanism. Urbanism of river valley civilisations. Morphology of pre-industrial European cities to include Greek and Roman cities, medieval European towns, Renaissance urbanism and ideal cities. Outline of historic cities of India. Temple town urbanism of Tamil Nadu. Mughal city form. Medieval cities of India. Colonial urbanism in India.

UNIT II MODERN URBANISM

10

Industrialisation and impact on urbanism. American grid iron planning. Theories, ideas and practice of good urban planning/cities/urbanism in early 20th century. Outline of modernist cities and urbanism across the world. Morphology of Indian modernist cities of Chandigarh, Bhuvaneshwar and Gandhi Nagar. Components of modern urbanism such as blocks, density, neighbourhood, streets etc., and their interdependencies. Evolution of urban design as a discipline, its scope and objectives.

UNIT III CITIES AND URBANISM THROUGH TEXTS AND THEORIES

10

Introduction to and discussion of key texts and theories of cities and urbanism - Imageability and Lynch, Townscape and Cullen, Genius Loci and Schulz, historic city and Rossi, social aspects of urbanism and the works of Jane Jacobs, William Whyte and Jan Gehl, Collage City and Colin Rowe, current theories and texts.

UNIT IV CONTEMPORARY URBANISM AND URBAN INTERVENTIONS

7

Understanding aspects, issues and solutions related to urbanism today through study of literature and best practices/case studies in urban design. Topics to include urban decay, change and renewal, place making, heritage, conservation, identity, suburban sprawl, gated communities, generic form, privatisation of public realm, role of real estate, transportation, zoning, globalisation, technology, digital age, sustainability, community participation, gender, class, power.

UNIT V URBAN STUDIES

8

Introduction to study and interpretation of cities (especially Indian) through understanding published studies/ analysis. The focus will be on components/aspects as well as tools/ methods. Tools and methods to include different types of maps/mapping, drawings, sketches, photo documentations, reading, data collection, analysis. Aspects to include topography, geology, hydrology, micro climate, vegetation, urban density, growth, city limits/boundaries, history, urban architecture, typologies, infrastructure, land parcels, public space, demographics, patterns of usage, land use.

TOTAL: 45 PERIODS

OUTCOME

- Awareness of the evolution and characteristics of urban forms, their components and interdependencies.
- Understanding of urbanism through theories, aspects, issues and solutions.
- Knowledge of ways to look at and interpret urbanism today.

TEXTBOOKS

1. A.E.J. Morris, 'History of Urban Form before the Industrial Revolution', Prentice Hall, 1996.
2. Edmund Bacon, 'Design of Cities', Penguin, 1976.
3. Gordon Cullen, 'The Concise Townscape', The Architectural Press, 1978.
4. Michelle Provoost et al., 'Dutchtown', NAI Publishers, Rotterdam, 1999.
5. 'Time Saver Standards for Urban Design', Donald Natson, McGraw Hill, 2003.
6. Kevin Lynch, 'The Image of the City' MIT Press, 1960.
7. Rithchie. A, 'Sustainable Urban Design: An Environmental Approach', Taylor & Francis, 2000.
8. Tridib Banerjee, Anastasia Loukaitou-Sideris, Editors, 'Companion to Urban Design', Routledge, 2014.

REFERENCES

1. Jonathan Barnett, 'An Introduction to Urban Design', Harper Row, 1982.
2. Lawrence Halprin, 'Cities', Reinhold Publishing Corporation, New York, 1964.
3. Gosling and Maitland, 'Concepts of Urban Design', St. Martin's Press, 1984.
4. Malcolm Moor, 'Urban Design Futures', Routledge, 2006.
5. Geoffrey Broadbent, 'Emerging Concepts in Urban Space Design', Taylor & Francis, 2003.
6. Anuradha Mathu, 'Deccan Traverses', Rupa, 2006.

AR8703

SPECIFICATION, ESTIMATION AND VALUATION

L T P/S C

3 0 0 3

OBJECTIVES

- To enable understanding with respect to quality and quantity of materials, quantity and classes of skilled and unskilled labours, and tools and plants required for projects.
- To give an understanding of how to draw up specifications for the different items of a building project and also to prepare the schedule of programming of the project.
- To give knowledge on how to prepare approximate as well as detailed estimates and to have a clear picture of the project expenditure.
- To help calculate the exact quantities of items of work done for effecting payment especially when direct measurements are difficult and also to determine the quantities of different materials required for various items of work.
- To give understanding of how to prepare valuation report of real and landed property.
- To give exposure to budgeting in projects.

- UNIT I SPECIFICATION AND SPECIFICATION WRITING 9**
 Necessity of specification, importance of specification. How to write specification. Types of Specification. Principles of Specification writing. Important aspects of the design of specification. Sources of information. Classification of Specification. Brief Specification for 1st class, 2nd class, 3rd class building. Detailed specification for earthwork excavation, plain cement concrete, reinforced concrete, first class and second class brickwork, damp proof course, ceramic tiles/marble flooring and dado, woodwork for doors, windows frames and shutters, cement plastering, painting & weathering course in terrace.
- UNIT II ESTIMATION 9**
 Types & purpose. Approximate estimate of buildings. Bill of quality, factors to be considered. Principles of measurement and billing. Contingencies. Measurement of basic materials like brick, wood, concrete and unit of measurement for various items of work. Abstract of an estimate. Costs associated with constructed facilities. Approaches to cost estimation. Type of construction cost estimates. Cost Indices. Applications of cost indices to estimating. Estimate based on engineer's list of quantities. Estimation of operating costs.
- UNIT III DETAILED ESTIMATE 11**
 Deriving detailed quantity estimates for various items of work for a single storied building. To include earthwork excavation, brick work, plain cement concrete, reinforced cement concrete works, wood work, iron works, plastering, painting, flooring, weathering course.
- UNIT IV VALUATION 8**
 Valuation. Explanation of terms. Types of values. Sinking fund. Years of purchase. Depreciation. Types of depreciation. Valuation of real properties. Types, methods and purpose of valuation.
- UNIT V BUDGETING 8**
 Elements of cash flow. Time value of money. Capital investment decision. Types of business firms. Budget and Budgetary Control. Types of Budgets. Preparation of financial budget.

TOTAL: 45 PERIODS

OUTCOME

- An understanding of the art of building construction through specification writing.
- Ability to work out the approximate estimate and detailed estimate for small scale building projects and low cost housing.
- An understanding of valuation and budgeting.

TEXTBOOKS

1. Rangwala. S.C, 'Estimating, Costing and Valuation (Professional practice)', Charotar Publishing House, 1984
2. M.Chakraborti, 'Estimating, Costing, Specification and Valuation in Civil Engineering, Chakraborti, 2010.
3. B.N. Dutta, 'Estimating and Costing' UBS Publishers and Distributors, 2000.
4. S.Sanga Reddi and P.L.Meiyappan, 'Construction Management', Kumaran Publication, Coimbatore.
5. Gurcharan Singh and Jagdish Singh, 'Estimating Costing and Valuation', Standard Publishers Distributors, 2012.

REFERENCES

1. 'I.S.1200-1968 Methods of Measurements of Buildings and Civil Engineering works'.
2. Latest schedule of rates of P.W.D.
3. Latest Data book of P.W.D.
4. PWD Standard Specifications. Govt Publication.

OBJECTIVES

- To introduce various aspects involved in the construction of buildings through the understanding of different types of architectural and technical drawings.
- To enable the understanding of architectural design as integrating spatial and technical concerns.
- To enable development of an architectural design project into schematic drawings through integrating concerns of structure, construction and services.
- To create architectural drawings for construction and as a base for structures and services drawings.
- To design, incorporate and detail architectural and interior components of the architectural design project.

UNIT I UNDERSTANDING ARCHITECTURE THROUGH BUILDING DRAWINGS 12

Understanding architecture as a physical, workable product through study of comprehensive set of drawings for any live building project, interpreting them and presenting their characteristics through seminars/ assignments. The drawings to be studied should include architectural working drawings from macro to micro scale- site plan, building plans, staircase details, kitchen and toilet detail of joinery, etc., structural drawings and service drawings to include electrical, plumbing, mechanical and HVAC details.

UNIT II SCHEMATIC DESIGN INTEGRATING ARCHITECTURAL DESIGN WITH STRUCTURAL AND SERVICE CONSIDERATIONS 18

Evolving a conceptual design project into schematic design, balancing different technical considerations. Considerations to include appropriate structural, plumbing, electrical, mechanical and HVAC systems. Working out schemes to decide and finalise on the best possible design that integrates everything together. Scale of the project could be small to medium and include any typology, involving a newly created, quick, simple design or an older design from previous academic years.

UNIT II ARCHITECTURAL WORKING DRAWINGS 18

Preparation of architectural working drawings for the resolved schematic design. Drawings to include site plan, centre line drawings, building drawings, detailed drawings of specific areas like staircases and wall sections, dimensions explaining the various components, joinery schedule.

UNIT IV DETAILED DRAWINGS OF ROOMS AND ARCHITECTURAL COMPONENTS 15

Design and preparation of detailed drawings of joinery including doors, windows and ventilators. Design and preparation of layouts of service intensive rooms like kitchens and toilets. Design and detailing out of floor, wall and ceiling finishes/ construction/ laying.

UNIT V DETAILED DRAWINGS OF BUILT IN COMPONENTS 12

Design and preparation of detailed drawings of built in furniture and components based on the room/ typology to include counters, cabinets, wardrobes, storage, fittings and fixtures, display units, workstation.

TOTAL: 75 PERIODS**OUTCOME**

- An understanding of all the aspects that go into the making of a building through study of drawings related to construction.
- Ability to resolve spatial concerns with technical aspects of a building.
- Ability to design and detail components within a building.

TEXTBOOKS

1. Joseph De Chiara, Michael Crosby, 'Time Saver Standards for Building Types', McGraw Hill Co, 2001.
2. Richardson Dietruck, 'Big Idea and Small Building', Thames and Hudson, 2002.
3. Edward D Mills, 'Planning–The Architect's Handbook, Butterworths, 1985.
4. Roy Chudley, Roger Greeno, 'Building Construction Handbook', Routledge, 2010.

REFERENCES

1. Susan Dawson, 'Architect's Working Details -Volume 1-10', E- Map Construct, 2004.
2. Nelson L Burbank, 'House Carpentry Simplified', McGraw Hill, 1985.
3. David Sauter, 'Landscape Construction', Delmar Publishers, 2010.
4. Grant W. Reid, 'Landscape Graphics', Whitney Library of Design, 1987.
5. Francis. D. K. Ching, 'Building Construction Illustrated', John Wiley & Sons, 2011.

AR8711

ARCHITECTURAL DESIGN VI

L T P/S C
0 0 16 8

OBJECTIVES

- To enable an understanding of architecture as having the capacity to critically interpret and transform status quo in the built environment and society through the act of design.
- To guide in the taking of critical/ philosophical/ ideological positions relating to specific design situations in the current world and to explore architectural morphology as an expression of those positions.

CONTENT

Architecture as a discipline balances many concerns in the creation of buildings. However, it also represents ideas and production reacting to/ reinforcing/ anticipating/ transforming specific aspects of the existing world towards a more desirable future. This could spring from individual perspectives as well as through concerted efforts which then become movements. Architecture can thus seek to understand, reflect, strengthen, question, change status quo. The process of design can thus offer a possible, intended future.

Projects/ design situations will be given in this regard which address issues/ programmes of current society with a larger impact in terms of scale or importance. Different realms/ aspects of contemporary life can be explored. Some possible projects/ area of inquiry are institutional campuses of significance, mixed use projects involving diverse user groups, culturally and socially important buildings, urban life, technological developments, culture, globalisation, place, meaning, identity, appropriate architecture, etc.,

Suitable processes can be engaged for critical and creative thinking which could include wide and interdisciplinary reading to take critical positions, contemporary processes such as mapping and diagramming, methods related to social, technical or empirical aspects, etc.,

The particular line of thought will be taken through to completion through the processes. It is preferable to have one major project with small exercises under it if required.

TOTAL: 240 PERIODS

OUTCOME

- Ability to understand the wider implication of design decisions and their interdependency with larger processes of society.
- Ability to take creative, critical and informed decisions in the context of significant projects that could shape society in positive ways.

TEXTBOOKS

1. Kate Nesbitt, 'Theorizing a New Agenda for Architecture', Princeton Architectural Press, 1996.
2. Neil Leach, 'Rethinking Architecture', Routledge, 2000.
3. Harry Francis Mallgrave and David Goodman, 'An Introduction to Architectural Theory- 1968 to the Present', Wiley Blackwell, 2011.
4. Stephen A. Kliment, Editor 'Building Type Basics' Series, Wiley.

REFERENCES

1. Mitchell WJ, 'Imagining MIT: Designing a campus for the 21st century', MIT Press, 2007.
2. Himanshu Burte, 'Space For Engagement', Seagull Books, 2008.
3. Mark Garcia, 'The Diagrams of Architecture', Wiley 2010.
4. Bjarke Ingels, 'Yes is More', Taschen, 2009.
5. Steven Holl, Juhani Pallasmaa, Alberto Pérez Gómez, 'Questions of perception: Phenomenology of Architecture', William Stout, 2006.

AR8801

HUMAN SETTLEMENTS PLANNING

L T P/S C
3 0 0 3

OBJECTIVES

- To introduce the vocabulary, elements and classification of human settlements.
- To give exposure to planning concepts at different scales of settlements.
- To give an understanding of planning addressing current issues.

UNIT I INTRODUCTION TO HUMAN SETTLEMENTS

9

Introduction to planning as a discipline and brief evolution of the profession. Elements of human settlements. Human beings and settlements. Nature, shells and net works- their functions and linkages. Anatomy and classification of human settlements- locational, resource based, population size and occupational structure.

UNIT II FORMS OF HUMAN SETTLEMENTS

9

Structure and form of settlements - linear, non- linear and circular, combinations. Reasons for development. Advantages and disadvantages. Case studies. Factors influencing the growth and decay of human settlements.

UNIT III RURAL AND REGIONAL DEVELOPMENT IN INDIA

9

Rural development plans, programmes and policies from case studies. Regional Plan. Area delineation, land utilisation plan, hierarchical system of settlements, their sizes and functions.

UNIT IV URBAN PLANNING AND URBAN RENEWAL

9

Introduction to urban planning in India. Scope, content and limitations of master plan. Structure plan, DDP/ZDP, planned unit development. Development control rules. Urban renewal, redevelopment, rehabilitation and conservation. Urban development projects – case studies.

UNIT V ASPECTS IN CONTEMPORARY URBAN PLANNING IN INDIA

9

Globalisation and its impact on cities. Sustainable planning concepts. New forms of developments, to include self sustained communities, SEZ, transit oriented development (TOD), integrated townships, smart cities. Case studies.

TOTAL: 45 PERIODS

OUTCOME

- Ability to understand morphology of settlements and their generating forces and characteristics.
- An understanding of the role of planning processes in making positive changes to settlements.
- Awareness of planning interventions with respect to the current world.

TEXTBOOKS

1. C.L.Doxiadis, Ekistics, 'An Introduction to the Science of Human Settlements', Hutchinson, London, 1968.
2. Thooyavan K R, 'Human Settlements- A Planning guide to Beginners', M.A.Publications, 2005.
3. Ministry of Urban affairs and Employment, Government of India, New Delhi, 'Urban Development Plans: Formulation and Implementation-Guidelines', 1996.
4. Andrew D Thomas, 'Housing and Urban Renewal', Harper Collins, 1986.

REFERENCES

1. S. B. Golahit, 'Rural Development Programmes In India', Neha Publishers & Distributors, 2010.
2. 'CMDA Second Master Plan for Chennai Metropolitan Area 2026: Vision, Strategies and Action Plans (Vol.I, II &III)', Chennai, India, 2008.
3. V. Nath, 'Regional Development And Planning In India', Neha Publishers & Distributors, 2009.
4. Government of India, 'Report of the National Commission on Urbanisation', 1988.
5. Hansen N., 'Regional Policy and Regional Integration', Edward Elgar, UK, 1996.

AR8802

PROFESSIONAL PRACTICE AND ETHICS

L T P/S C
3 0 0 3

OBJECTIVES

- To give an introduction to the architectural profession and the role of professional bodies and statutory bodies as well as ethics of the profession.
- To give familiarity with basic aspects of running an architectural practice.
- To give exposure to the processes involved in taking up and completing an architectural project.
- To inform about legal aspects and legislations associated with the profession.
- To give exposure to the larger implications of professional practice in the globalised world today.

UNIT I INTRODUCTION TO ARCHITECTURAL PROFESSION CODE OF CONDUCT AND ETHICS

9

Architectural profession and role of architects in society. Registration of architects. Role of the Indian Institute of Architects. Architects Act 1972- intent, objectives, provisions with regard to architectural practice. Council of Architecture- role and functions. Importance of ethics in professional practice. Code of conduct for architects. Punitive action for professional misconduct of an architect. Architecture as a professional service towards clients. Architect's office and its management - organisational structure, infrastructure requirement, skills required, elementary accounts, tax liabilities. Setting up architectural practice.

UNIT II ARCHITECT'S SERVICES, SCALE OF FEES & COMPETITIONS

9

Mode of engaging an architect. Comprehensive services, partial services and specialised services. Scope of work of an architect. Schedule of services. Scale of fees - Council of Architecture norms. Mode of payment. Terms and conditions of engagement. Letter of appointment. Importance of Architectural competitions. Types of competitions - open, limited, ideas competition, single and two stage competitions. Council of Architecture guidelines for conducting architectural competitions. National and international Competitions. Case studies.

UNIT III PROJECT MANAGEMENT - TENDER & CONTRACT 12

Tender - Definition. Types of Tenders - open and closed tenders. Conditions of tender. Tender notice. Tender documents. Concept of EMD. Submission of tender. Tender scrutiny. Tender analysis. Recommendations. Work order. E-tendering - advantages, procedure, conditions. Contract – definition. Contract agreement and its necessity. Contents - articles of agreement, terms and conditions, bills of quantities and specifications, appendix. Certification of contractors. Bills at different stages. New trends in project formulation and different types of execution - BOT, DBOT, BOLT, BOO, etc., Role of architect in project execution stage.

UNIT IV LEGAL ASPECTS 6

Arbitration - definition and advantages. Sole and joint arbitrators. Role of umpires, award. Arbitration clause in contract agreement -role of architect, excepted matters. Easement – meaning, types of easements. Copy rights and patenting – provisions of copy right acts in India, copy right in architectural profession. Consumer Protection Act - intent, architects responsibility towards his clients.

UNIT V IMPORTANT LEGISLATIONS AND CURRENT TRENDS 9

Planning parameters at various scales. DTCP rules. Second Master Plan CMDA as case study. Chennai Corporation Building Rules 1972. Panchayat Rules. Building rules in National Building Code. Factories Act. Persons with Disabilities Act. Barrier Free Environment. Coastal Regulation Zone. Heritage Act. Globalisation and its impact on architectural profession. Preparedness for international practice. Entry of foreign architects in India. Information technology and its impact on architectural practice. Emerging specialisations in the field of architecture -architect as construction/ project manager, architectural journalism, architectural photography.

TOTAL: 45 PERIODS

OUTCOME

- Knowledge of the role of professional and statutory bodies.
- An understanding of the provisions in Architects Act 1972.
- An understanding of code of conduct.
- Familiarity with the process and role of an architect in project execution.

TEXTBOOKS

1. Architects Act 1972.
2. Publications of Council of Architecture
3. Roshan Namavati, 'Professional Practice', Lakhani Book Depot, Mumbai, 2016.
4. Ar. V.S. Apte, 'Architectural Practice and Procedure', Mrs. Padmaja Bhide, 2008.
5. Madhav Deobhakta, 'Architectural Practice in India', COA, 2007.

REFERENCES

1. J.J.Scott, 'Architect's Practice', Butterworth, London 1985.
2. Development Regulations of Second Master Plan for Chennai Metropolitan Area-2026. (Second Master plan of CMA).
3. Chennai City Corporation Building Rules 1972.
4. T.N.D.M. Buildings rules, 1972.
5. Consumer Protection Act, 1986.
6. Arbitration Act, 1996.
7. Factories Act, 1948.
8. Persons with Disabilities Act, 1995.
9. Tamil Nadu Cinematography Act. DTCP Act.

OBJECTIVES

- To introduce housing in the Indian context and the various agencies involved in the production of housing.
- To outline factors, aspects and standards related to housing.
- To inform about the various housing design typologies and the processes involved in housing project development.
- To inform about current issues and aspects in housing.

UNIT I INTRODUCTION TO HOUSING AND HOUSING ISSUES IN INDIA 9

Housing and its importance in architecture, its relationship with neighborhood and city planning. Housing demand and supply. National Housing Policy. Housing agencies and their role in housing development. Impact of life style. Rural Housing. Public and private sector housing.

UNIT II SOCIO-ECONOMIC ASPECTS 9

Economics of housing. Social economic factors influencing housing affordability. Formal and informal sector. Equity in housing development. Sites and services. Slum housing, upgradation and redevelopment. Low Cost Housing. Health principles in housing. Legislation for housing development. Cost-effective materials and technologies for housing. Case studies in India and developing countries.

UNIT III HOUSING STANDARDS 8

UDPFI guide lines, standard and regulations.DCR. Performance standards for housing.

UNIT IV SITE PLANNING AND HOUSING DESIGN 11

Site Planning for housing. Selection of site for housing, consideration of physical characteristics of site, location factors, orientation, climate, topography, landscaping. Integration of services and parking. Housing design relating to Indian situations – traditional housing, row housing, cluster housing, apartments, high-rise housing. Case studies in India of the various types.

UNIT V CURRENT ASPECTS AND ISSUES IN HOUSING 8

Green building and sustainable practices. Disaster resistance and mitigation. Prefabrication Community participation.

TOTAL: 45 PERIODS**OUTCOME**

- Knowledge of various issues concerning housing & housing development in Indian & global context covering a cross section of income groups.
- Ability to appreciate socio-economic aspects in housing.
- An understanding of housing standards, site planning principles, housing concepts and types.
- An understanding of key issues in housing today.

TEXTBOOKS

1. Christopher Alexander, 'A Pattern Language', Oxford University press, New York 1977.
2. Leuris S, 'Front to back: A Design Agenda for Urban Housing', Architectural Press, 2006.
3. S.K.Sharma, 'Mane A New Initiative in Public Housing', Housing & Urban Development Corporation, 1991.

REFERENCES

1. Richard Kintermann and Robert Small, 'Site Planning for Cluster Housing', Van Nostrand Reinhold Company, London/New York, 1977.
2. Joseph de Chiara et al, 'Time Saver Standards for Housing and Residential Development', McGraw Hill Co, New York, 1995.

3. Forbes Davidson and Geoff Payne, 'Urban Projects Manual', Liverpool University Press, Liverpool 1983.
4. HUDCO Publications, 'Housing for Low Income, Sector Model'.
5. 'Sustainable Building Design Manual: Vol 1 and 2', The Energy Research Institute, 2004.
6. A.K.Lal, 'Handbook of Low Cost Housing', New Age International Private Limited, 1995.

AR8811

ARCHITECTURAL DESIGN VII

L T P/S C
0 0 16 8

OBJECTIVES

- To enable an understanding of urbanism as a continuous experience involving the interrelated disciplines of architecture, urban design and town planning.
- To understand architecture as influenced by and influencing the dynamics of cities.
- To facilitate the taking of architectural design decisions in the context of the urban environment.

CONTENT

Urbanism is a dynamic phenomenon involving many aspects - urban growth, landuse distribution and change, urban form, demographics including gender and class, cultural aspects such as place and heritage, physical infrastructure such as roads and transportation nodes, public spaces, etc., Architecture is an integral and large part of urbanism, shaping and being shaped by it. It can serve to include/ gather society and enrich the urban environment in a seamless manner.

Understanding of this aspect of architecture will be achieved by architectural projects involving interdependencies between architecture and the city. Some of the issues and areas that could be addressed are- transportation nodes, heritage areas, adaptive reuse, suburban sprawl, place making, identity, collective memory, mixed use programming, large scale urban interventions, revitalisation and renewal of urban fragments, urban waterfront development, urban nodes, multi-use urban complexes.

The tools and techniques can include contemporary ways/ tools of perceiving, gathering and analysing data, inclusive, collaborative and participatory approaches, etc.,

It is preferable to have one major project with small exercises under it if required.

TOTAL: 240 PERIODS

OUTCOME

- Ability to perceive and design buildings as contributing to/ transforming the urban fabric.
- Ability to bring inclusivity into the architectural design process.

TEXTBOOKS

1. Jonathan Barnett, 'An Introduction to Urban Design', Harper and Row; 1982
2. Cavallo, R. et al, 'New Urban Configurations', IOS Press, 2014.
3. Henriette Steiner & Maximilian Sternberg, 'Phenomenologies of the City: Studies in the History and Philosophy of Architecture', Routledge 2015.
4. Jan Gehl, 'Life between Buildings- Using Public Space', Arkitektens Forleg 1987.
5. 'Time Savers Standard for Urban Design', Donald Watson, McGraw Hill, 2005.
6. Malcolm Moore & Jon Rowland Eds, 'Urban Design Futures', Routledge, 2006.

REFERENCES

1. Michelle Provoost et al., 'Dutchtown', NAI Publishers, Rotterdam, 1999.
2. Lawrence Halprin, 'Cities', Reinhold Publishing Corporation, New York, 1964.
3. Gosling and Maitland, 'Urban Design', St. Martin's Press, 1984.
4. Kevin Lynch, 'Site Planning', MIT Press, Cambridge 1967.
5. Jeremy Till et al, 'Spatial Agency: Other Ways of Doing Architecture', Routledge, 2011.

AR8911

PRACTICAL TRAINING

L T P/S C

- - - 12

OBJECTIVES

- To introduce the challenges of architectural practice.
- To enable overall understanding of different stages in real life architectural projects in practice.
- To create involvement in these stages as much as possible within the scope of a specific architectural practice - initiation of project, development of concepts into schematic drawings, approval process, presentations and working drawings, involvement in office discussions and client meetings, integrating structural and service concerns, estimation and tendering processes, site supervision and coordination in the construction process.

CONTENT

Practical Training will be done in offices/ firms in India, empanelled by the institution, in which the principal architect is registered with the Council of Architecture. The student will attempt to learn as much of aspects outlined in the objectives, either first hand or indirectly.

The progress of practical training will be assessed periodically internally through submission of log books along with work done by the students in terms of drawings, reports, etc., along with the regular progress report from the employers.

The students will be evaluated based on the criteria related to their contribution in the office some of which are given below.

- Understanding and involvement in the process of architectural practice as mentioned in the objectives within the scope of the specific office in which training is undertaken.
- Adherence to time schedule, overall responsibility and professional conduct.
- Ability to carry out the instructions on preparation of schematic drawings, presentation drawings, working drawings and skill in this regard.
- Ability to work as part of a team in an office and contribute to related activities.
- Ability to participate in client meetings and discussions.
- Involvement in supervision at project site.
- Involvement/ initiative/ participation in any other aspects during the course of the training.

At the end of the Practical Training, a portfolio of work done during the period of internship along with certification from the office should be submitted for evaluation through a viva voce examination.

OUTCOME

- An overall idea of the nuances of architectural practice.
- An understanding about the total process that goes into the making of a building.
- Maturity in using the experience gained from internship in the thesis project.

OBJECTIVES

- To ensure consolidation and application of the knowledge gained in preceding years of the programme in the context of a design project of the student's choice.
- To enable addressing of specific projects through key, identified issues inherent in the project or to enable development of thought processes in specific areas/aspects into a project.
- To facilitate development of ability to complete and handle projects independently as a precursor to professional life.

CONTENT

Students should choose a topic of their choice in terms of design potential and/ or idea exploration to be taken up for completion. The topic could be project based with specific areas of study/ approach or study/ approach based leading to a project. If the latter, care should be taken to choose topics that can lead to sufficient architectural design component.

Students should submit the topic for approval with a rough outline of the nature of the project, area of interest, study and design scope, challenges, possible case studies, methodology and outcome. The areas of study/research/design can include any of the broad areas of the discipline - contemporary needs of society, history, theory, sustainability, structural or service oriented design, projects that involve complex planning and integration of several aspects, appropriate architecture, urban design, contemporary processes, social housing, urban oriented architectural design, conservation oriented architectural design, etc.

The progress of work will be reviewed periodically throughout the semester. At the end of the semester, students should submit the final thesis project for the viva voce exam. The final submission will comprise of study sheets, optional study models, design approach sheets, optional design process models, design presentation sheets, final model, detailed drawings of an important part of the project, project report summarising the entire thesis work and soft copy of all the work.

TOTAL: 540 PERIODS

OUTCOME

- Skill, knowledge and expertise in the domain of architectural design.
- Ability to handle a major architectural project independently through all stages.

TEXTBOOKS

1. Linda Grant and David Wang, 'Architectural Research Methods', John Wiley & Sons, 2002.
2. Joseph De Chiara, Michael J Crosbie, 'Time Saver Standards for Building Types', McGraw Hill Professional, 2001.

REFERENCES

1. Stephen A. Klimont, Editor 'Building Type Basics' Series, Wiley.
2. Igor Marjanovi , Katerina Rüedi Ray, Lesley Naa Norle Lokko, 'The Portfolio - An Architecture Student's Handbook', Routledge, 2003.

ELECTIVES

AR8001

THEORY OF DESIGN

L T P/S C
3 0 0 3

OBJECTIVES

- To give understanding of design as a broader field and the changing role of designer in society.
- To give exposure to methodologies, theories and models of the design process.
- To give deeper understanding of the process of creativity as well as to introduce techniques which will enable creative thinking.
- To help understand creativity with respect to the discipline of architecture.
- To introduce participatory approach to design.

UNIT I INTRODUCTION TO DESIGN

7

Definition and understanding of design. History of design process from earliest times through Renaissance, Beaux Arts, Bauhaus. Different classifications of design according to scale, process, mode of production, etc., - selfconscious/ unselfconscious, design through drawing/ design through craft, pragmatic/ iconic/ analogic/ canonic or syntactic, hand made/ machine made, product design to city design, functional/ aesthetic, nature vernacular/ technological.

UNIT II DESIGN METHODOLOGY MOVEMENT

10

Context for the rise of the design methodology movement from the 1950s with the critique of modernism. Theories of the first generation and the second generation design methodologists. Design as wicked problem. Escalation and regression in design. Summary by Johnson of various models of the design process - parametric or analysis/ synthesis/ evaluation, conjecture-refutation, paradigmatic, hermeneutical.

UNIT III CREATIVE THINKING

10

Understanding the term creativity. Theories on thinking - left brain/ right brain, convergent/ divergent thinking, lateral/ vertical thinking. Broadbent's idea of the design spectrum - from the logical to chance. Blocks in creative thinking. Techniques to generate creativity as put forth by Broadbent, Bono.

UNIT IV ARCHITECTURAL CREATIVITY

8

Types of architectural concepts - programmatic, analogic, metaphor, essence, etc., Channels to creativity in architecture as put forth by Antoniades. Personal philosophies and strategies of individual designers.

UNIT V PROCESS AND DESIGN

10

People and design process- concept of pattern language by Christopher Alexander, participatory approach to design, design as process involving time and people. Introduction to contemporary processes in design including diagramming, mapping, parametric exploration, etc.,

TOTAL: 45 PERIODS

OUTCOME

- Ability to think about architecture as one of the many fields under the broader ambit of design as a fundamental human activity.
- Self awareness with respect to the creative process.
- Ability to engage different processes to give creative output.

TEXTBOOKS

1. Geoffrey Broadbent, 'Design in Architecture - Architecture and the Human Sciences', John Wiley & Sons, New York, 1981.
2. Bryan Lawson, 'How Designers Think', Architectural Press, 2005.
3. Anthony Antoniades, 'Poetics of Architecture- Theory of Design', VNR,1992.

4. Edward De Bono, 'Lateral Thinking- Textbook of Creativity', Penguin Books, 1990.
5. Christopher Alexander, 'A Pattern Language', Oxford University Press, 1977.
6. James C. Snyder, Anthony J. Catanese, Timothy L. McGinty, 'Introduction to Architecture', McGraw Hill, 1979.
7. Mark Garcia, 'The Diagrams of Architecture', Wiley 2010.
8. C. Thomas Mitchell, 'Redefining Designing: From Form to Experience', Van Nostrand Reinhold, 1992.

REFERENCES

1. Victor Papanek, 'Design for the Real world, Human Ecology and Social Change', Chicago Review Press, 2005.
2. Paul Alan Johnson, 'Theory of Architecture- Concepts, Themes, Practices', VNR; 1994.
3. Christopher Jones, 'Design Methods', John Wiley and Sons; 1980.
4. Tom Heath, 'Method in Architecture', John Wiley & Sons, New York, 1984.
5. Nigel Cross, 'Developments in Design Methodology', John Wiley & Sons, 1984.
6. James L. Adams, 'Conceptual Blockbusting', Basic Books, 2001.
7. Jeremy Till et al, 'Spatial Agency: Other Ways of Doing Architecture', Routledge, 2011.

AR8002

VERNACULAR ARCHITECTURE

L T P/S C
3 0 0 3

OBJECTIVES

- To introduce the study of vernacular architecture as a process and not a product.
- To provide an overview of the different approaches and concepts to the study of vernacular architecture.
- To study the various vernacular architecture forms in the different regions of the country.
- To look at the impact of colonial rule on the vernacular architecture of India.

UNIT I INTRODUCTION

7

Definition and classification of vernacular architecture. Vernacular architecture as a process. Methodology for survey and study of vernacular architecture. Overview of cultural and contextual responsiveness of vernacular architecture.

UNIT II APPROACHES AND CONCEPTS

9

Overview of different approaches and concepts to the study of vernacular architecture. Aesthetic, architectural and anthropological studies in detail.

UNIT III VERNACULAR ARCHITECTURE OF THE WESTERN AND NORTHERN REGIONS OF INDIA

11

Forms, spatial planning, cultural aspects, symbolism, colour, art, materials of construction and construction technique of the vernacular architecture of the deserts of Kutch and Rajasthan (including havelis of Rajasthan), rural and urban Gujarat (including wooden mansions/ havelis in general and that of the Bohra Muslims) and geographical regions of Kashmir (including house boats).

UNIT IV VERNACULAR ARCHITECTURE OF SOUTH INDIA

8

Forms, spatial planning, cultural aspects, symbolism, art, colour, materials of construction and construction technique, proportioning systems, religious beliefs and practices in the vernacular architecture of Kerala (including houses of the Nair & Namboothri community, Koothambalam and Padmanabhapuram palace) and Tamil Nadu (including houses and palaces of the Chettinad region, agharams).

UNIT V WESTERN INFLUENCES ON VERNACULAR ARCHITECTURE OF INDIA 10

Colonial influences on the traditional Goan house. Evolution of the bungalow from the traditional bangla, Victorian villas. Planning principles and materials and methods of construction of the bungalow. Settlement pattern and house typologies of Pondicherry and Cochin.

TOTAL: 45 PERIODS

OUTCOME

- An understanding of Indian vernacular architecture as a process and to also provide an overview of various approaches and concepts towards its study.
- Knowledge of vernacular architectural forms in different regions.
- An understanding of the impact of colonial rule on vernacular architecture in India.

TEXTBOOKS

1. Paul Oliver, 'Encyclopedia of Vernacular Architecture of the World', Cambridge University Press, 1997.
2. Amos Rapoport, 'House, Form & Culture', Prentice Hall Inc. 1969.
3. R W Brunskill, 'Illustrated Handbook on Vernacular Architecture', Faber & Faber; 1970.

REFERENCES

1. V.S. Pramar, 'Haveli – Wooden Houses and Mansions of Gujarat', Mapin, 1989.
2. Kulbushanshan Jain and Minakshi Jain, 'Mud Architecture of the Indian Desert', Aadi Centre, Ahmadabad, 1992.
3. G.H.R. Tillotson, 'The Tradition of Indian Architecture: Continuity, Controversy, Change since 1850', Oxford University Press, Delhi, 1989.
4. Carmen Kagal, 'Vistara- The Architecture of India', The Festival of India, 1986.
5. S. Muthiah et al, 'The Chettiar Heritage', Chettiar Heritage 2000.
6. Weber.W & Yannas.S, 'Lessons from Vernacular Architecture', Routledge, 2014.
7. Bernard Rudofsky, 'Architecture without Architects', MoMA, 1964.

AR8003

ART APPRECIATION

**L T P/S C
3 0 0 3**

OBJECTIVES

- To introduce art as a fundamental human activity, its characteristics and ways in which it can be understood.
- To introduce the vocabulary of art and to enable the appreciation of art.
- To understand different productions of art as manifestations within particular contexts.

UNIT I INTRODUCTION TO ART

7

Definition of art, need for art, role of art. Art, reality, perception, representation. Categories of art in terms of media and technique. How to appreciate art in terms of form, content and context.

UNIT II VOCABULARY OF ART

7

Introduction to the vocabulary of art constituted by elements (line, shape, form, space, colour, light, value, texture) and principles (unity, variety, harmony, rhythm, balance, proportion, emphasis, contrast, movement). Appreciation of art with respect to all the above through examples.

UNIT III BEGINNINGS OF WESTERN ART TO MODERN ART 11

Outline of art in the West from the beginnings to the birth of modern art. Important works from the following art traditions will be understood and appreciated in terms of their form, content and context: Prehistoric Art, Egyptian and Mesopotamian art, Greek and Roman art, Medieval art, Renaissance and Baroque art, Neoclassicism, Romanticism, Realism.

UNIT IV MODERN ART AND AFTER 11

Outline of the context for the major changes in art from late 19th century and the birth of modern art. Important works from the following movements will be understood and appreciated in terms of their form, content and context: Impressionism, Post Impressionism, Fauvism, Expressionism, Modern art, Abstract/ Non Objective art, Cubism, Dadaism, Surrealism, Futurism, Constructivism, Suprematism, De Stijl, Abstract Expressionism, Pop art, Op art. Outline of new forms and media in art from mid 20th century.

UNIT V INDIAN ART 9

Outline of art in India over history. Important works from the following art traditions and movements will be understood and appreciated in terms of their form, content and context: Indus Valley art, Hindu, Buddhist and Jain art, Mughal and Rajput miniature art, art during the colonial period, modern Indian art, contemporary directions.

TOTAL: 45 PERIODS

OUTCOME

- An understanding and appreciation of art as basic and varied human creation related to cognition and experience.
- Awareness of important art productions in the West and India.
- Sensitivity towards collective and individual cultural productions as unique expressions of historical and geographic context.

TEXTBOOKS

1. Fred, S. Kleiner, 'Gardener's Art through Ages', Wadsworth Publishing, 2012.
2. Bernard S. Myers, 'Understanding the Arts', Holt Rinehart and Winston Inc, 1964.
3. H.H. Arnason, 'History of Modern Art', Thames and Hudson, 1977.
4. Partha Mitter, 'Indian Art', Oxford University Press, 2001.
5. Edith Tomory, 'A History of Fine Arts in India and the West', Orient Blackswan, 1989.

REFERENCES

1. Peter and Linda Murray, 'The Penguin Dictionary of Art and Artists', Penguin, 1989.
2. E.H. Gombrich, 'The Story of Art', Phaidon, 2002.
3. E.H. Gombrich, 'Art and Illusion', Phaidon, 2002.
4. 'Indian Art since the early 1940s- A Search for Identity', Artists Handicrafts Association of Cholamandal Artists Village, Madras, 1974.
5. A.K.Coomaraswamy, Fundamentals of Indian Art, Historical Research Documentation Programme, Jaipur, 1985.

AR8004

INTERIOR DESIGN

**L T P/S C
3 0 0 3**

OBJECTIVES

- To provide familiarity with the characteristics of interior spaces and furniture across history.
- To introduce the profession of interior design and bring out its role.
- To inform about the various components of interior space and give an understanding of the design aspects involved in each.

UNIT I INTERIOR SPACES AND FURNITURE ACROSS HISTORY 11

Outline of the characteristics of representative/ exemplary interior spaces, interior decoration and furniture in the Western world from the beginnings to twentieth century. Outline of characteristics of representative/ exemplary interior spaces, interior decoration and furniture in India across the ages, including living folk traditions.

UNIT II INTRODUCTION TO INTERIOR DESIGN 7

Introduction to the professions of interior decoration, interior design and furniture design, bringing out their origin, evolution and current scope of work. Definition and process of interior design. Introduction to the design of interior spaces as related to typology, function and themes. Vocabulary of design in terms of elements (point, line, shape, form, space, colour, light, pattern, texture) and principles (balance, proportion, scale, rhythm, hierarchy, unity, contrast, harmony, emphasis, movement) with specific reference to examples from interior design.

UNIT III COMPONENTS OF INTERIOR SPACE - I 9

Role of interior treatment and finishes in the experience of interior spaces. Outline of the design of components such as floors, ceilings, walls, partitions, window treatments and accessories based on parameters such as context, function, ambience, materials, properties, methods of construction, colour, texture. Study of representative examples.

UNIT III COMPONENTS OF INTERIOR SPACE - II 9

Role of lighting in the experience of interior spaces. Outline of different types of interior lighting systems and fixtures based on their effects and suitability in different contexts. Study of representative examples.

Role of landscaping in the experience of interior space. Outline of interior landscaping elements such as rocks, plants, water, flowers, fountains, paving, artefacts. Their physical properties and effects on spaces. Study of representative examples.

UNIT V COMPONENTS OF INTERIOR SPACE - III 9

Introduction to furniture design as related to parameters such as human comfort and function (including anthropometrics and ergonomics), built in or freestanding, materials and methods of construction, cultural particularities, changing trends and lifestyles, innovations and design ideas. Study of representative examples.

TOTAL: 45 PERIODS

OUTCOME

- An understanding of interior design as an integral part of architecture and as an interdisciplinary and allied field related to architecture.
- An overall exposure to the ways in which interior spaces can be enriched through the design of specific interior components.

TEXTBOOKS

1. Francis D.K.Ching, 'Interior Design Illustrated', John Wiley & Sons, 2012.
2. Joseph DeChiara, Julius Panero, Martin Zelnik, 'Time Saver's Standards for Interior Design', McGraw-Hill Professional, 2001.
3. John F. Pile, 'Interior Design', Pearson Prentice Hall, 2007.
4. Jan Pieper, George Michell, 'The Impulse to Adorn- Studies in Traditional Indian Architecture', Marg Publications, 1982.
5. Aronson J, 'The Encyclopaedia of Furniture', Potter Style, 1965.
6. Pat Kirkham, Susan Weber, Editors, 'History of Design: Decorative Arts and Material Culture, 1400-2000', Yale University Press, 2013.
7. John F.Pile, Judith Gura, 'A History of Interior Design', Wiley, 2013.

REFERENCES

1. Helen Marie Evans, 'An Invitation to Design', Macmillan Pub Co, 1982.
2. Julius Peneo and Martin Zelnik, 'Human Dimensions and Interior Space', Whitney Library of Design, 1979.
3. Kathryn B. Hiesinger and George H. Marcus, 'Landmarks of Twentieth Century Design; Abbey Ville Press, 1995.
4. Susanne Slesin and Stafford Cliff, 'Indian Style', Thames and Hudson, 1990.
5. Rosemary Kilmer, W. Otie Kilmer, 'Construction Drawings and Details for Interiors: Basic Skills', John Wiley & Sons, 2009.

AR8005

STRUCTURE AND ARCHITECTURE

L T P/S C
3 0 0 3

OBJECTIVES

- To outline the evolution of structural systems through history.
- To introduce concepts of structural design through works of architects/ engineers.
- To create understanding about the relationship between architectural expression/ form and structure.

UNIT I STRUCTURAL DESIGN IN THE PRE INDUSTRIAL ERA 8

Development of monolithic and rock cut structures. Trabeated construction, arcuate construction, vaults and flying buttresses. Tents and masted structures. Bridges through ancient and medieval history.

UNIT II STRUCTURAL DESIGN IN THE POST INDUSTRIAL PERIOD 8

Post Industrial modular construction of large span and suspension structures in steel and concrete - projects of Pier Luigi Nervi, Maillart, Candella, Buckminster Fuller and Eero Saarinen. Structure in Deconstructivism – Structure and aesthetics. Parametric/ digital processes and structure.

UNIT III CONTEMPORARY STRUCTURAL EXPRESSION THROUGH CASE STUDIES - I 10

The select case studies would include KCR Terminal at Hung Hom, Hong Kong, B3 Offices in Stockley Park, Sainsbury Centre for Visual Art, Renault Centre and Swindon UK by Norman Foster and Standsted Airport Terminal, London, UK by Fosters/Arup British Pavilion EXPO1992, Seville, Spain and Waterloo International Terminal by Nicholas Grimshaw.

UNIT IV CONTEMPORARY STRUCTURAL EXPRESSION THROUGH CASE STUDIES – II 10

The select case studies would include Inmos Microchip Factory, Centre Commercial St. Herbtain, PA Technology, Princeton and Fleetguard, Quimper UK by Richard Rogers Athens Olympic Stadium and Village, Bridges and Public Bus Stop in St. Gallen , Railway Station, Lyon, France and Stadelhofen Railway station, Zurich Schweiz by Santiago Calatrava Kansai International Airport, UNESCO Workshop, the Jean-Marie Tjibaou Cultural Center, Menil Museum, Thomson Optronics Factory, IBM Traveling Exhibition Pavilion, Columbus International Exposition, Genoa Italy and Lowara Officers, Montecchio Maggiore Italia by Renzo Piano Building Workshop. Contemporary examples with respect to parametric/ digital processes and innovative new materials.

UNIT V SEMINAR**9**

Seminar to present a study of architectural form and structural expression through select cases which will aid understanding of structural philosophy and analysis, building envelope and services and construction sequence.

TOTAL: 45 PERIODS**OUTCOME**

- Familiarity with concepts of structural design and its influence on the functional and aesthetic domains of architectural design relating to historic and contemporary periods.
- Understanding of architectural expression and its relation to form, structure and changing technology.

TEXTBOOKS

1. Shigeru Ban, McQuaid, Matilda, 'Engineering and Architecture: Building the Japan Pavilion', Phaidon Press Ltd, UK, 2008.
2. 'Cox Architects'(The Millennium Series), Images Publishing Group, 2001.
3. James B Harris, Kevin Li, 'Masted Structures in Architecture', Routledge,2012

REFERENCES

1. Patrizio Bertelli et al, 'Herzog & De Meuron: Prada Aoyama Tokyo', Fondazione Prada, 2004
2. Christopher Beorkrem, 'Material Strategies in Digital Fabrication', Routledge, 2012
3. Angus J. Macdonald, Structure and Architecture, Architectural Press, 2001.

AR8006**EVOLUTION OF HUMAN SETTLEMENTS**

L	T	P/S	C
3	0	0	3

OBJECTIVES

- To introduce the origins, determinants and elements of human settlements.
- To give an overview of the evolution of human settlements across history.
- To introduce planned cities as expressions of specific intent.
- To give exposure to changes in human settlements today.

UNIT I ORIGIN OF HUMAN SETTLEMENTS AND EARLY SETTLEMENTS**9**

Origins of civilizations. Elements and determinants of human settlements. Human settlements in the pre-historic period. Ancient river valley civilisations of Indus valley, Mesopotamia, Egypt and China with emphasis on the layout and patterns of the settlements and the influence of resources on them.

UNIT III PRE INDUSTRIAL CITIES**9**

Greek and Roman civilisations and their settlements - role of defence, politics, trade and other factors in the development of settlement planning. Medieval and Renaissance cities in Europe. City plans of Vienna, Amsterdam, Paris. Cities as expression of political power- Washington DC, Pretoria. Industrial revolution and its influence on cities.

UNIT IV CITIES IN INDIA**9**

Ancient town planning principles of India. Medieval Indian cities and factors that led to their development. Islamic and Mughal cities. Colonial urbanism including presidency towns, hill towns and cantonments. New Delhi as imperial power.

UNIT IV MODERN AND POSTMODERN CITIES 9

Contributions of Ebenezer Howard, Lewis Mumford, Patrick Geddes, C.A. Doxiadis. Visionary/ Utopian city concepts by Le Corbusier, Frank Lloyd Wright. Modern town planning principles and examples including Manhattan and New Town movement in Britain. Planning of the capital cities of Brasilia and Chandigarh. Post modern Utopian vision of Archigram, Metabolism and Paolo Soleri.

UNIT V HUMAN SETTLEMENTS IN A CHANGING WORLD 9

Changing nature of human settlements today through case studies. Topics to include impact of global economy, trade, information and communication technology, sustainability.

TOTAL: 45 PERIODS

OUTCOME

- Awareness of the nature and characteristics of human settlements.
- An understanding of the evolution of human settlements and their shaping forces.
- Familiarity with current aspects of settlements.

TEXTBOOKS

1. Mumford L, 'The City in History', Harcourt Brace International, 1968.
2. Morris A E J, 'History of Urban form before the Industrial Revolution', Routledge, 1994.
3. Spiro Kostof, 'The City Shaped: Urban Patterns and Meaning through History', Thames and Hudson, 1999.
4. Dutt B.B, 'Town Planning in Ancient India', Thacker Spink & Co., Calcutta, 1995.
5. 'Cities in a Globalizing World: Global Report on Human Settlements', United Nations Center for Human Settlements. London: Sterling, VA: Earthscan Publications, 2001.

REFERENCES

1. Spiro Kostof, 'The City Assembled: Elements of Urban form through History', Thames, and Hudson, 2005.
2. Simon Eisner, Arthur Gallion, Stanley Eisner, 'Urban Pattern', John Wiley & Son, 1999.
3. Comhaire J, 'How Cities Grew', Florham Park Press, 1971.
4. Kosambi D.D, 'The Culture and Civilisation of Ancient India in Historical Outline', Vikas, 1997.

AR8007	CONTEMPORARY BUILDING MATERIALS	L T P/S C
		3 0 0 3

OBJECTIVES

- To introduce current materials and products in architecture that are eco-friendly, composite, durable, advanced, smart.
- To inform about innovations in materials and practices in building industry.
- To focus on materials and systems, their properties and connections, intrinsic relationship with structural systems and environmental performance.

UNIT I INTRODUCTION 7

Introduction and need for ultra-performance materials in building design as a substitute to conventional materials. Newer application for special performance, thermal/ sound/ moisture protection, fitting, equipment and furnishing. Properties of contemporary materials – multidimensional, repurposed, recombinant, intelligent, interfacial, transformant, etc.

UNIT II ADVANCED CONCRETE AND COMPOSITE REINFORCEMENT 10

Types of advanced concrete and its applications. Workability and mechanical properties, durability and reliability of advanced concrete materials. Manufacturing and application in buildings. Bendable concrete, light transmitting concrete, translucent concrete, pervious concrete, eco-cement, etc., Introduction to manufacture, types, properties and performance of new reinforcement materials in concrete - Aramid fibres, bio-steel, carbon (Graphite) Fibres and fibre glass etc.

UNIT III COMPOSITE MATERIALS 10

Types, terminology and classification of composite materials based on particle reinforced, fiber reinforced, structural and composite benefit in building construction. Composite materials manufacturing process. Use of composite materials namely Polymer Matrix Composites (PMCs) and Fibre- Reinforced Polymers (FRPs) along with cement, steel, aluminium, wood, glass, etc., for thermal insulation, fire protection, coating, painting and structural monitoring, etc.

UNIT IV NANO-MATERIALS AND NANO-COMPOSITES 9

Definition, manufacture and types of nano materials. Properties, performance of nano materials in building construction, types and application of nano-materials like carbon, nanotubes etc., Nano composite used with cement, steel, aluminium, wood, glass for thermal insulation, fire protection, coating and painting and structural monitoring etc.. Nano technologies in building and construction.

UNIT V DIGITAL AND TENSILE MATERIALS 9

Types of materials and its constitution, manufacturing and construction technology requirement for 3D printed buildings structure and Extraterrestrial printed structures. Tensile fabric structure by digital printing. Translucent fabric, thin-film photovoltaics, texlon foil, PVC (poly vinyl chloride) coated polyester cloth and PTFE (poly tetra fluoro ethylene) (teflon) coated glass cloth.

TOTAL: 45 PERIODS**OUTCOME**

- Exposure to the need and use of various contemporary materials in creating innovation and ultra-performance in building design.
- An understanding of characteristics and performance of the newer materials in terms of detailing and application to the context.

TEXTBOOKS

1. Christiane Sauer, 'Made of...New Materials Sourcebook for Architecture and Design', Prestel Pub, 2010.
2. Mel Schwart, 'Encyclopaedia of Smart Materials -Vol 1,2', Wiley-Interscience, 2001.
3. Senem Özgönül İnsan, 'Smart Materials and Sustainability: Application of Smart Materials in Sustainable Architecture', LAP Lambert Academic Publishing, 2010.
4. Axel Ritter, 'Smart Materials in Architecture, Interior Architecture and Design', Birkhäuser Architecture, 2002.

REFERENCES

1. Michelle Addington, & Daniel LSchodek, 'Smart Materials and New Technologies: for the Architecture and Design Professions, Architectural Press, 2005.
2. Michael. F. Ashby, Paulo Ferreira, Daniel L. Schodek, 'Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers and Architects', Butterworth- Heinemann, 2009.
3. Blaine Brownell, 'Transmaterial 2', Princeton Architectural Press, 2008.
4. John Fernandez, 'Material Architecture: Emergent Materials for Innovative Buildings and Ecological Construction', Taylor & Francis, 2006.

OBJECTIVES

To introduce latest advances in the field of glass in architecture.

To enable right selection and usage of right glass for appropriate purposes.

To give understanding of use of glass in contemporary architecture as well as its role in green design and improving building performance.

UNIT I GLASS AS BUILDING MATERIAL 10

Evolution & importance of glass in modern architecture. Applications of glass in buildings (façade/interior applications). Understanding the production & properties of glass. Value additions including coating technology (importance & necessity) and processing (tempering, heat strengthening, DGU, laminated, ceramic fritting). Types of Glass- mirror, lacquered, fire resistant. Modern glass with different applications. Glass for hospitals, green homes, airports, offices, other buildings. Glass and human safety compliances. Role of glass in fire safety considerations - Class E, EI & EW. Role of glass in acoustics. International standards & codal provisions.

UNIT II GLASS AND GREEN ARCHITECTURE 10

Building Physics. Theory of electromagnetic radiation. Understanding of internal and external reflections. Day-lighting in Buildings - introduction and basic concepts (VLT). Solar Control and thermal insulation (SF, UV, SHGC). Need for green Buildings. Energy efficient buildings. Achieving energy efficiency using glass. Factors of energy efficient material selection. Performance parameters. Energy codes and Green ratings - ECBC, IGBC, GRIHA. Approaches of energy efficiency - prescriptive method, trade off method. Accommodating passive architecture. Whole Building Simulation.

UNIT III CASE STUDY 10

Case study of green building designed predominantly with energy efficient materials. Calculations involving basic factors in glass design. Optimization of Glass - for wastage reduction and standardisation of Design. Construction site/ green building visit report.

UNIT IV DESIGN WORKSHOPS I 15

Analysing and creating building using interactive modelling. Analysing of sun path, solar exposure building orientation, daylight, acoustics, site shadow analysis.

UNIT V DESIGN WORKSHOPS II 15

Analysis of thickness for safety, consideration of aesthetics, economy, optimisation and wastage, air-conditioning load calculations and payback analysis.

TOTAL: 60 PERIODS**OUTCOME**

- An understanding of glass and its potential in contemporary usage
- An understanding of tools and software currently in practice with respect to the use of glass in buildings.

TEXTBOOKS

1. Christian Schittich, 'Glass Construction Manual', Birkhauser Basel, 2007.
2. 'Architectural Glass Guide', Federation of Safety Glass, 2013.

REFERENCES

1. 'LEED 2011 For India - Green Building Rating System', Indian Green Building Council, 2011
2. 'Energy Conservation Building Code. User Guide', Bureau of Energy Efficiency, 2009.

3. 'IS 875 (Part -3) Reaffirmed 1997. Code of Practice for Design loads', Bureau of Indian Standards,1998.
4. 'IS 7883. Code of Practice for the Use of Glass in Buildings', Bureau of Indian Standards, 2013.
5. Training Manuals & E- Learning, Glass Academy.

AR8009

STEEL ARCHITECTURE AND DESIGN

L T P/S C
3 0 0 3

OBJECTIVES

- To introduce the design potential of steel as a material in building construction and its inherent structural benefits.
- To inform about the various components of steel as structural and aesthetic design through case studies.
- To provide familiarity with the best practices of steel as a construction material.

UNIT I INTRODUCTION TO STEEL AS BUILDING MATERIAL 8

Materiality of steel, structural properties of steel, advantages of steel in construction. History of metal in construction – Iron to Steel. Steel and tension. Industrialization and mass fabrication of steel. Casting of steel in historic and contemporary examples. Invention of hollow structural sections. Hot rolled steel shapes, various hollow structural sections.

UNIT II STEEL IN HIGH TECH MOVEMENT, CONTEMPORARY ARCHITECTURE 10

Introduction to High Tech movement. Understanding of various typologies of high tech movement – Extruded, Grid/Bay, Diagrids, arched/ curved structures, tensile. Advantages of diagrids over standard frames. Curved steel – creating curves in steel buildings, limitations in curving steel. Evolution of AESS (architecturally exposed structural steel) through High Tech movement.

UNIT III STRUCTURAL EXPRESSION OF STEEL 10

Introduction to AESS (architecturally exposed structural steel), standard structural steel versus AESS. Factors that define AESS. Characteristics and categories of AESS. Connection types for AESS – bolted, welded and cast connections. Member types for AESS – Tubular and standard sections. Various steel frame design, basic connection strategies, basic understanding of steel floor systems, truss systems and braced systems.

UNIT IV SUSTAINABILITY, STEEL AND OTHER MATERIALS 9

Introduction to steel as a sustainable material. Recycled, reuse and adaptive reuse of steel. Steel and glazing systems, support systems for glazing. Technical aspects of combining steel with glass. Various steel and glass envelope systems - curtain wall system, wind braced support systems, cable net walls, spider steel connections with structural glass, simple and complex cable systems. Handling curves and lattice shell construction. Advanced framing system – Steel and Timber. Low carbon design strategies.

UNIT V FABRICATIONS, ERECTION AND IMPLICATIONS ON DESIGN 8

Study on transformation of architectural design into fabricated elements. Study of process profile through case studies. Role of physical and digital models in fabrication. Steel in temporary/ exhibit buildings. Need for corrosion and fire protection. Various finishes and coating systems of steel. Detailed study on corrosion protection and fire protection systems. Transportation, site issues and erection on site. Erection of beams and columns. Effects of climate and weather on erections. Other issues relating to practical implication of design on site.

TOTAL: 45 PERIODS

OUTCOME

- An understanding of steel as a structural, functional and aesthetic material in design and construction practice.

TEXTBOOKS

1. Terrimeyer Buake, 'Architectural Design in Steel', SPON, 2004.
2. Peter Silver et al, 'Structural Engineering for Architects', Laurence King, 2013.

REFERENCES

1. Victoria Ballard Bell & Patrick J Rand; 'Materials for Architectural Design', Lawrence King, 2006.
2. Ettinger J. Van et al(Editor), 'Modern Steel Construction in Europe', Elsevier,1963.
3. Leonardo Benevolo, 'History of Modern Architecture Vol 1 & 2', Reprint, MIT Press, 1977.
4. 'Handbook of Steel Construction', Canadian Institute of Steel Construction, 2010.
5. John Leckie, 'Steel and Other Materials', Canadian Institute of Steel Construction, 2007.
6. INSDAG Publications and Brochures.

AR8010	CONTEMPORARY PROCESS IN ARCHITECTURAL DESIGN	L	T	P/S	C
		3	0	0	3

OBJECTIVES

- To introduce theories of media and its influence on the perception of space.
- To enable study of the various aspects of digital architecture and its exploration through emerging phenomena that relies on abstraction of ideas.
- To give understanding of the works of contemporary architects who have illustrated the influence of the digital media in architecture.

UNIT I	INTRODUCTION	7
Investigation of contemporary theories of media and their influence on the perception of space and architecture. Technology and art. Technology and architecture. Digital technology and architecture.		
UNIT II	ASPECT OF DIGITAL ARCHITECTURE	8
Aspects of digital architecture. Design and computation. Difference between digital process and non-digital process. Architecture and cyberspace. Qualities of the new space. Issues of aesthetics and authorship of design. Increased Automatism and its influence.		
UNIT III	CONTEMPORARY PROCESS	10
Emerging phenomena such as increasing formal and functional abstractions. Diagrams, diagrammatic reasoning, diagrams and design process. Animation and design. Digital hybrid.		
UNIT IV	GEOMETRIES AND SURFACES	9
Fractal geometry. Shape grammar. Hyper surface. Liquid architecture. Responsive architecture.		
UNIT V	CONTEMPORARY PROCESS AND ARCHITECTURAL WORKS	11
Ideas and works of architects related to contemporary processes. The architects to include Greg Lynn, Reiser + Umemotto, Lars Spuybroek / NOX Architects, UN studio, Diller Scofidio, Dominique Perrault, Decoi, Marcos Novak, Foreign Office Architects, Asymptote, Herzog and de Meuron, Neil Denari, Serie Architects, BIG Architects. Study to be undertaken in the form of assignments/discussions/seminars/presentations.		

TOTAL: 45 PERIODS

OUTCOME

- An understanding of the effect of contemporary theories of media on contemporary architectural design.
- Insight into contemporary design process/theories and their relation to computation.
- Ability to understand specific aspects of contemporary processes appropriate to a design situation.
- Familiarity with architectural works derived from contemporary processes.

TEXTBOOKS

1. Walter Benjamin, 'The Work of Art in the Age of Mechanical Reproduction', in Illuminations, Schocken Books, New York, 1969
2. Ignaci de Sola Morales, 'Differences: Topographies of Contemporary Architecture', MIT Press, 1997.
3. William J Mitchell, 'The Logic of Architecture: Design, Computation and Cognition', MIT Press, 1995.
4. Ali Rahim, 'Contemporary Process in Architecture', John Wiley & Sons, 2000.
5. Ali Rahim (Ed), 'Contemporary Techniques in Architecture', Halsted Press, 2002.
6. Peter Eisenmann; Diagram Diaries, Universe, 1999.
7. Grey Lynn, 'The Folded, The Pliant and The Supple, Animate form', Princeton Arch. Press, 1999.

REFERENCES

1. Gillian Hunt, 'Architecture in the Cyberspace II', John Wiley & Sons, 2001.
2. L. Convey et al, 'Virtual Architecture', Batsford, 1995.
3. Rob Shields (ed.), 'Cultures of the internet: Virtual Spaces, Real Histories, Living bodies', Sage, London, 1996.
4. John Beckman, 'The Virtual Dimension, Architecture, Representation and Crash Culture', Princeton Architecture Press, 1998.
5. William J Mitchell, City of Bits: Space, Place and the Infobahn', MIT Press, Cambridge, 1995.
6. Marcos Novak, 'Invisible Architecture: An Installation for the Greek Pavilion', Venice Biennale, 2000.

AR8011

ENERGY EFFICIENT ARCHITECTURE

L T P/S C
3 0 0 3

OBJECTIVES

- To inform about the need to use alternative sources of energy in view of the depleting resources and climate change.
- To provide familiarity with simple and passive design considerations.
- To inform about the importance of day lighting and natural ventilation in building design.
- To create awareness of future trends in the design of sustainable built environment.

UNIT I PASSIVE DESIGN

10

Significance of energy efficiency in the contemporary context. Simple passive design considerations involving site conditions, building orientation, plan form and building envelope. Heat transfer and thermal performance of walls and roofs.

UNIT II PASSIVE HEATING

10

Direct gain. Thermal storage of wall and roof. Roof radiation trap. Solarium. Isolated gain.

UNIT III	PASSIVE COOLING	8
Evaporative cooling. Nocturnal radiation cooling. Passive desiccant cooling. Induced ventilation. Earth sheltering. Wind tower. Earth air tunnels.		
UNIT IV	DAY LIGHTING AND NATURAL VENTILATION	7
Daylight factor. Daylight analysis. Daylight and shading devices. Types of ventilation. Ventilation and building design.		
UNIT V	CONTEMPORARY AND FUTURE TRENDS	10
Areas for innovation in improving energy efficiency such as photo voltaic cells, battery technology, thermal energy storage, recycled and reusable building materials, nanotechnology, smart materials, energy conservation building code.		

TOTAL: 45 PERIODS

OUTCOME

- Knowledge of alternative sources of energy and passive design considerations.
- An understanding of day lighting and natural ventilation in design.
- Familiarity with future trends in creating sustainable built environment.

TEXTBOOKS

1. 'Manual on Solar Passive Architecture', IIT Mumbai and Mines New Delhi, 1999.
2. Arvind Krishnan et al, 'Climate Responsive Architecture A Design Handbook for Energy Efficient Buildings', Tata McGraw Hill Publishing Company Limited, New Delhi, 2001.
3. Majumdar M, 'Energy-efficient Building in India', TERI Press, 2000.
4. Givoni .B, 'Passive and Low Energy Cooling of Buildings', Van Nostrand Reinhold, New York, 1994.

REFERENCES

1. Fuller Moore, 'Environmental Control Systems', McGraw Hill Inc, New Delhi, 1993.
2. Sophia and Stefan Behling, 'Solpower The Evolution of Solar Architecture', Prestel, New York, 1996.
3. Patrick Waterfield, 'The Energy Efficient Home: A Complete Guide', Crowood pressLtd, 2011.
4. Dean Hawkes, 'Energy Efficient Buildings: Architecture, Engineering and Environment', W.W. Norton & Company, 2002.
5. David Johnson and Scott Gibson, 'Green from the Ground Up: Sustainable, Healthy and Energy Efficient Home Construction', Taunton Press, 2008.

AR8012	ARCHITECTURAL CONSERVATION	L T P/S C
		3 0 0 3

OBJECTIVES

- To introduce the various issues and practices of conservation in architecture.
- To provide familiarity with the status of conservation in India and the various agencies involved in the field of conservation worldwide and their policies.
- To outline the status of conservation practice in the country and the various guidelines for the preservation, conservation and restoration of buildings.
- To inform about the character and issues in Indian heritage towns through case studies.

UNIT I	INTRODUCTION TO CONSERVATION	12
Understanding heritage. Defining conservation, preservation and adaptive reuse. Heritage conservation- need, debate and purpose. History of conservation movement. International agencies like ICCROM, ICOMOS, UNESCO and their role in conservation. Charters. principles and ethics of conservation.		

UNIT II CONSERVATION IN INDIA**7**

Museum conservation. Monument conservation and the role of ASI, SDA, INTACH. Central and state government policies and legislations. Inventories and projects. Selected case studies of sites such as Hampi, Golconda, Mahabalipuram. Craft Issues of conservation.

UNIT III CONSERVATION METHODS AND MATERIALS**10**

Investigation techniques and tools. Behaviour of historic materials and structures. Problems with masonry, foundation. Repair methods, traditional and modern methods. Seismic retrofit, services additions and disabled access to historic buildings. Moisture and pollution problems.

UNIT IV CONSERVATION PRACTICE**7**

Listing of monuments. Documentation of historic structures. Assessing architectural character. Historic structure report. Guidelines for preservation, rehabilitation and adaptive re-use of historic structures. Case studies of palaces in Rajasthan, dwellings in Chettinad and Swamimalai. Heritage site management.

UNIT V URBAN CONSERVATION AND CONSERVATION PLANNING**9**

Understanding the character and issues of historic towns. Selected case studies. Historic districts and heritage precincts. Conservation as a planning tool. Financial incentives and planning tools such as TDR. Urban conservation and heritage tourism. Case studies of sites like Cochin, Pondicherry French town. Conservation project management.

TOTAL: 45 PERIODS**OUTCOME**

- An understanding of the importance of heritage, issues and practices of conservation through case studies.
- Familiarity with historic materials and their properties, different technologies for investigating masonry, foundation and also traditional and modern repair methods.

TEXTBOOKS

1. Bernard Fielden, 'Conservation of Historic Buildings', Architectural Press, 2003.
2. Bernard Fielden, 'Guidelines for Conservation - A Technical Manual', INTACH, 1989.
3. MS Mathews, 'Conservation Engineering', Universitat Karlsruhe, 1998.
4. J. Kirk Irwin, 'Historic Preservation Handbook', McGraw Hill, 2003.
5. Donald Appleyard, 'The Conservation of European Cities', M.I.T. Press, Massachusetts, 1979.
6. Publications of INTACH

REFERENCES

1. James M. Fitch, Historic Preservation: Curatorial Management of the Built World by University Press of Virginia; Reprint Edition, 1990.
2. Robert E. Stipe, 'A Richer Heritage: Historic Preservation in the Twenty-First Century, University of North Carolina Press, 2003.
3. B.P. Singh, 'India's Culture- The State, The Arts and Beyond', Oxford University Press, 2000
4. A.G. K. Menon (Ed), 'Conservation of Immovable Sites', INTACH Publication, N. Delhi.
5. John H. Stubbs and Emily G Makas; Architectural Conservation in Europe and the Americas, John Wiley & Sons, 2011.

OBJECTIVES

- To give an understanding of the loss of pre- stress and design requirements for determinate beams.
- To provide familiarity with the concept of industrial structures and high rise structures.
- To enable the study of concepts of tensile structures, domes, shells and folded plates.

UNIT I PRESTRESSED CONCRETE**10**

Losses of Prestress. Design requirements. Design of determinate beams.

UNIT II INDUSTRIAL STRUCTURES**8**

Classification, planning and layout requirements, functional requirements. Types of industrial structures- power plants, bunkers and silos, cooling towers, containment structures, chimneys. Merits.

UNIT III HIGH-RISE BUILDINGS**7**

Introduction. Load action in high rise buildings. Various structural systems. Waffle slab. Approximate analysis of frames for gravity and horizontal loadings.

UNIT IV TENSILE STRUCTURES**10**

Concept, development, laws of formation, merits and demerits of pneumatic structures. Basic principles, forms, merits and demerits of cable structures.

UNIT V SHELLS, DOMES AND FOLDED PLATES**10**

Shells of translation. Shells of revolution. Classification of shells and different forms. Domes. Types of folded plates. Space frames.

TOTAL: 45 PERIODS**OUTCOME**

- An understanding of concepts and applications of pre-stressed concrete.
- An understanding of concepts and application of industrial structures and sky scrapers.
- Familiarity with the theory and applications of tensile structures, grids, domes, shells and folded plates.

REQUIRED READING

1. B.C. Punmia, 'Reinforced Concrete Structures, Vol. 1 & 2', Laxmi Publications, New Delhi, 1994.
2. N. Subramanian, 'Principles of Space Structures', Wheeler, 1998.
3. Thandavamoorthy T.S, 'Advanced Structures of Architecture', Eswar Press, 2008.
4. Council on Tall Buildings and Urban Habitat, 'Structural System for Tall Buildings', McGraw Hill, 1995.
5. Milo.S.Ketchum and Mark.A. Ketchum, 'Types and Forms of Shell Structures, 1997.

REFERENCES

1. P. Dayaratnam, P.Sarah, 'Prestressed Concrete Structures', Medtech, 2017.
2. Wolfgang Schueller, 'High Rise Building Structures', John Wiley & Sons, 1976.
3. Frei Otto, 'Tensile Structures Volume 1 & 2' The MIT Press, 1973.
4. Bryan Stafford Smith, Alex Coull, 'Tall Building Structures - Analysis & Design', John Wiley, 1991.
5. Thomas Herzog, 'Pneumatic Structures', Crosby Lockwood Staples, London, 1977.
6. Bandyopadhyay J.N, 'Thin Shell Structures: Classical and Modern Analysis', New Age International, 2007.
7. Ramaswamy G.S, 'Design and Construction of Concrete Shell Roofs', CBS, 2005.

OBJECTIVES

- To give an understanding of the concept of sustainability and sustainable development.
- To inform about issues like climate change, ecological footprint, etc.
- To provide familiarity with low impact construction practices, life cycle costs and alternative energy resources.
- To give exposure to the different rating systems for building practices with case studies.
- To enable understanding of the concept of sustainable communities and associated socio-economic dimensions through case studies.

UNIT I INTRODUCTION TO SUSTAINABILITY 7

Concept of sustainability. Carrying capacity, sustainable development. Bruntland report. Ethics and visions of sustainability. Circles of sustainability. Sustainable economy and use. eco systems, food chain and natural cycles or cradle to cradle concept.

UNIT II CLIMATE CHANGE AND SUSTAINABILITY 10

Overview of climate change and its impact on a global and regional scale. Principles of energy systems. Energy crisis and global environment. Study on vernacular techniques and technological advancements in climate control in different climatic zones.

UNIT III SITE AND SUSTAINABILITY 8

Sustainable site selection and development. Introduction to Green building concepts. TERI, LEED, GIRHA and BREEAM. Ecology and sustainability. Different sources of energy, recyclable products and embodied energy.

UNIT IV SUSTAINABLE MATERIALS 10

Selection of materials Eco building materials and construction. Low impact construction – bio mimicry, zero energy buildings, nano technology and smart materials.

UNIT V SUSTAINABLE CITIES 10

Dimensions of sustainable community- social, cultural and economic factors. Urban ecology, urban heat island effects, smog etc. Case studies of eco city or communities.

TOTAL: 45 PERIODS**OUTCOME**

- An understanding of the concepts of ecosystem, carrying capacity, ecological footprint, sustainability and sustainable development.
- Awareness of emerging vulnerabilities of global warming and climate change and an understanding of the contribution of building industry towards the same.
- Familiarity with approaches to achieving sustainable buildings and communities.
- Knowledge of incentives and evaluation systems for green buildings.

TEXTBOOKS

1. Dominique Gauzin–Muller, 'Sustainable Architecture and Urbanism: Concepts, Technologies and Examples', Birkhauser, 2002.
2. Catherine Slessor, 'Eco-Tech: Sustainable Architecture and High Technology', Thames and Hudson 1997.
3. Ken Yeang, 'Ecodesign- A Manual for Ecological Design', Wiley Academy, 2006.

REFERENCES

1. Arian Mostaedi, 'Sustainable Architecture: Low Tech Houses', Carles Broto, 2002.
2. Sandra F. Mendler & William Odell, 'HOK Guidebook to Sustainable Design', John Wiley and Sons, 2000.
3. Richard Hyder, 'Environmental Brief: Pathways for Green Design', Taylor and Francis, 2007.
4. Brenda Vale and Robert Vale, 'Green Architecture: Design for a Sustainable Future', Thames and Hudson, 1996.

AR8015

DISSERTATION

L T P/S C
0 0 6 3

OBJECTIVES

- To inculcate the spirit of research in architecture.
- To enable the acquisition of in-depth knowledge in a specific aspect/ issue in the discipline of architecture as well as develop perspectives on the same through reading, study, analysis and thought.
- To facilitate the development of a coherent line of thinking and express it through clear writing.
- To serve as prelude to Thesis.

CONTENT

Design studio emphasises on explaining and understanding architecture primarily through the mode of making. However, architecture as a field itself is driven by explicitly stated or implicitly understood ideas/ points of view of particular society and individuals. Dissertation offers an opportunity to look at architecture, history and design through ideas, texts and intent behind works. It involves process of observation, reflection and abstraction. Students are encouraged to choose any topic of their interest. Topics may range from analysing the works of an architect, history, typological changes, writing, design process and many more. They could involve research based on primary sources in terms of doing actual field studies and/or secondary sources through reading. The dissertation proposal in about 1500 words stating the topic, issues to be explored and the scope must be submitted for approval. Work on the approved topic should start from the beginning of the semester and would be periodically reviewed. At the end of the semester, a well written report of a minimum 10,000 words should be submitted in the prescribed format, if any, provided by the University. The suggested structure for the report can be - outline/ background of the area of study, statement of objectives or research questions within the area of study, outline of methodology/ way to achieve the objectives or answer the questions of research, core section with necessary content such as documentation, analysis, arguments, etc., final conclusion. The report will be presented in the viva-voce exam and defended.

TOTAL: 90 PERIODS

OUTCOME

- A dissertation report which is based on accepted norms of technical writing.
- Ability to research deeply into a subject and develop a coherent line of thought based on point of view, observation, analysis and study.
- Ability to look at architecture from an informed, analysed and well thought out critical perspective which would help strengthen the thesis process.

TEXTBOOKS

1. Iain Borden and Kaaterina Ruedi; 'The Dissertation: An Architecture Student's Handbook', Architectural Press, 2000.
2. Linda Grant and David Wang, 'Architectural Research Methods', John Wiley Sons, 2001.

REFERENCES

1. Wayne C Booth, Joseph M Williams, Gregory G. Colomb, 'The Craft of Research', 2nd Edition, University of Chicago Press, 2008.
2. Ranjith Kumar, 'Research Methodology- A Step by Step Guide for Beginners', Sage Publications, 2005.
3. John W Creswell, 'Research Design: Qualitative, Quantitative and Mixed Methods Approaches', Sage Publications, 2002.

AR8016

ARCHITECTURAL JOURNALISM AND PHOTOGRAPHY

L T P/S C
3 0 0 3

OBJECTIVES

- To introduce general skills necessary for the practice of professional journalism.
- To introduce the fundamentals of writing, explain different strategies and their criticism.
- To give particular exposure to architectural journalism.
- To introduce photojournalism, bring out importance/ contributions of photography in the architectural profession and to help develop proficiency in modern photography techniques.

UNIT I INTRODUCTION

9

Introduction to journalism, key concepts and objectives of journalism. Specialised 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.

UNIT II TECHNOLOGIES IN JOURNALS

9

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.

UNIT III CONTEMPORARY ARCHITECTURAL JOURNALISM

9

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.

UNIT IV DISCUSSIONS AND ISSUES

9

Regional, national and international discussion forums. Changes in contemporary and historical design practices. Discussions on topics needed in an architectural journal and current issues. Types of journals. Works of key architectural journalists. Public discourse on the internet. Mass media and public opinion. Critique on selected pieces of journalism.

UNIT V ARCHITECTURAL PHOTOGRAPHY**9**

Introduction to architectural photography and role of the photographic image in the global world. Equipment - cameras and lenses. Techniques- film speed, exposure measurement, gray scale, photo-finishing and editing digital images. Perspectives- single point, two- point, three- point and methods of correcting distortions. Lighting - external and interior

TOTAL: 45 PERIODS**OUTCOME**

- An ability to critically think and analyse about the effects of architecture on society as well as the tools to enable recording of the same.

TEXTBOOKS

1. Edward Jay Friedlander and John Lee, 'Feature Writing for Newspapers and Magazines', 4th edition, Longman, 2000.
2. David Fuller & Patricia Waugh, eds., 'The Arts and Sciences of Criticism', Oxford: Oxford University Press, 1999.
3. James Foust, '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

REFERENCES

1. Martin Huckerby, 'The Net for Journalists: A Practical Guide to the Internet for Journalists in Developing Countries'. UNESCO/Thomson Foundation/ Common wealth Broadcasting Association, 2005.
2. S. J. A.Ward, 'Philosophical Foundations of Global Journalism Ethics', Journal of Mass Media Ethics, Vol. 20, No. 1, 3-21, 2005.
3. M. Heinrich, 'Basics Architectural Photography', Birkhauser Verlag AG, 2008.
4. Gerry Kopelow, 'Architectural Photography: The Professional Way', Princeton Architectural Press, 2007.

AR8017**CONSTRUCTION AND PROJECT MANAGEMENT**

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OBJECTIVES

- To introduce different management techniques suitable for planning and construction projects.
- To enable understanding of management systems for accomplishing the task efficiently in terms of quality, time and cost.

UNIT I INTRODUCTION TO PROJECT MANAGEMENT**7**

Project management concepts. Objectives, planning, scheduling. Controlling and role of decision. Inproject management. Traditional management system. Gantt's approach. Load chart. Progress chart. Development of bar chart, merits and demerits. CPM networks, merits and demerits. PERT network. Introduction to the theory of probability and statistics.

UNIT II PROJECT PROGRAMMING AND CRITICAL PATH METHOD**11**

Project network. Events activity. Dummy. Network rules. Graphical guidelines for Network. Numbering the events. Cycles. Development of network-planning for network construction. Models of network construction. Steps in development of network. Work break down structure. Hierarchies. Critical path method - process, activity time estimate, earliest event time, latest allowable occurrence time, start and finish time of activity, float, critical activity and critical path problems.

UNIT III RESOURCE PLANNING 7
 Cost model- project cost, direct cost, indirect cost, slope curve, total project cost. Optimum duration contracting the network for cost optimization. Steps in cost optimization, updating, resource allocation, resource smoothing, resource leveling.

UNIT V COMPUTERIZED PROJECT MANAGEMENT 11
 Creating a new project, building task. Creating resources and assessing costs, refining project. Project tracking, recording actual. Reporting on progress. Analysing financial progress. Introduction to BIM.

UNIT V CONCEPT TO COMMISSIONING 9
 Project feasibility study. Real estate & regulatory strategies. Facility programming and planning. Design management. EPC. testing & commissioning.

TOTAL: 45 PERIODS

OUTCOME

- Ability to understand a project from concept to commissioning, feasibility study & facility programme, design, construction to commissioning.
- Ability to apply project management techniques in achieving objectives of a project like client needs, quality, time & cost.
- An understanding of principles of management, construction scheduling, scope definition and team roles.

TEXTBOOKS

1. Dr. B.C. Punmia and K.K. Khandelwal, 'Project Planning and Control with PERT and CPM', Laxmi Publications, 2018.
2. Elaine Marmel, 'Microsoft Project 2010 Bible', Wiley, 2010.
3. Sam Kubba, 'Green Construction Project Management and Cost Oversight', Elsevier, 2010.

REFERENCES

1. Jerome D. Wiest and Ferdinand K. Levy, 'A Management Guide to PERT/CPM', Prentice Hall of India, 1982.
2. Bert Bielefeld, 'Basics Project Management Architecture', Birkhauser, 2013.

AR8018 EARTHQUAKE RESISTANT ARCHITECTURE L T P/S C
3 0 0 3

OBJECTIVES

- To enable an understanding of the fundamentals of earthquake and the basic terminologies.
- To give basic knowledge of earthquake resistant design concepts.
- To provide familiarity with design codes and building configuration
- To enable understanding of the different types of construction details to be adopted in a seismic prone area.
- To give knowledge for applying earthquake resistant principles in an architectural design project.

UNIT I FUNDAMENTALS OF EARTHQUAKES 7
 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, epicentre, focal depth etc.

- UNIT II SITE PLANNING, PERFORMANCE OF GROUND AND BUILDINGS 10**
 Historical experience, site selection and development. Earthquake effects on ground, soil rupture, liquefaction, landslides. Behaviour of different types of building structures, equipments, lifelines, collapse patterns. Behaviour of non-structural elements like services, fixtures in earthquake-prone zones
- UNIT III SEISMIC DESIGN CODES AND BUILDING CONFIGURATION 10**
 Seismic design code provisions. Introduction to Indian codes. Building configuration - scale of building, size, horizontal and vertical plane, building proportions, symmetry of building - torsion, re-entrant corners, irregularities in buildings like short storeys, short columns, etc.
- UNIT IV DIFFERENT TYPES OF CONSTRUCTION DETAILS 11**
 Seismic design and detailing of 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.
- UNIT V URBAN PLANNING AND ARCHITECTURAL DESIGN 7**
 Vulnerability of existing buildings, facilities planning, fires after earthquake, socio-economic impact after earthquakes. Conceptual design for earthquake resistance involving institutional masonry building with horizontal spread and height restriction, multi-storeyed RC framed apartment/commercial building.

TOTAL: 45 PERIODS

OUTCOME

- Ability to understand the formation and causes of earthquakes
- An understanding of the factors to be considered in the design of buildings and services to resist earthquakes.

REQUIRED READING

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.

REFERENCES

1. Ian Davis, 'Safe Shelter within Unsafe Cities: Disaster Vulnerability and Rapid Urbanization', Open House International, UK, 1987
2. 'Socio-economic developmental record'- Vol.12, No.1, 2005.
3. 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.