

**GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)**  
**(Deemed to be University)**  
**VISAKHAPATNAM \* HYDERABAD \* BENGALURU**

**Accredited by NAAC with A<sup>+</sup> Grade**



**REGULATIONS AND SYLLABUS**  
**OF**  
**Bachelor of Architecture**

**(w.e.f. Admitted batch 2017-18)**

**SCHOOL OF ARCHITECTURE  
GITAM (Deemed to be University)**

**VISION**

To provide architectural education of global standards through effective teaching and research.

**MISSION**

1. To produce competent and professional architects with high sense of ethics and integrity.
2. To serve the society by imparting quality education and providing ethical, professional leadership quality to students to find sustainable solutions for societal problems.
3. To collaborate with the building industry in research and allied activities for a better industry-institute interaction.
4. To make the School as a Centre for Excellence in the thrust areas of research.

# **SCHOOL OF ARCHITECTURE**

## **GITAM (Deemed to be University)**

### **REGULATIONS**

#### **B.Arch. (Bachelor of Architecture)**

(w.e.f. 2017-18 admitted batch)

#### **1.0 ADMISSIONS**

- 1.1** Admissions into 5-year B.Arch. (Bachelor of Architecture) programme of GITAM (Deemed to be University) are governed by GITAM (Deemed to be University) admission regulations and as per norms of Council of Architecture (CoA), New Delhi.

#### **2.0 ELIGIBILITY CRITERIA**

- 2.1** A pass in National Aptitude Test in Architecture (NATA) conducted by Council of Architecture (CoA), New Delhi **(or)** a pass in Joint Entrance Examination (JEE) Main –Paper II (B.Arch.) conducted by the Central Board of Secondary Education (CBSE).

**(&)**

- 2.2** Council of Architecture has revised the eligibility criteria for admission to 1<sup>st</sup> Year of 5 year B.Arch degree course with effective from academic session 2019-20 as under:

“No candidate shall be admitted to architecture course unless he/she has passed an examination at the end of the 10+2 scheme of examination with at least 50% aggregate marks in Physics, Chemistry & Mathematics and also at least 50% marks in aggregate of the 10+2 level examination or passed 10+3 Diploma examination with Mathematics as compulsory subject with at least 50% marks in aggregate.”

**(&)**

- 2.3** Admissions into B. Arch. will be based on 50% weightage of marks in the qualifying examination and 50% weightage in National Aptitude Test in Architecture (NATA) / Joint Entrance Examination (JEE) Main –Paper II (B.Arch.)

#### **3.0 CHOICE BASED CREDIT SYSTEM**

- 3.1** Choice Based Credit System (CBCS) is introduced with effect from the admitted batch of 2017-18 based on UGC guidelines in order to promote:

- (i) Student centered learning
- (ii) Cafeteria approach
- (iii) Students to learn courses of their choice
- (iv) Learning at their own pace
- (v) Interdisciplinary learning

- 3.2** Learning goals/objectives and outcomes are specified, focusing on what a student should be able to do at the end of the program.

## **4.0 STRUCTURE OF THE PROGRAMME**

### **4.1** The Programme of instruction consists of:

- (i) A general core programme comprising Basics of Architecture, Building Materials, Building Construction, Architectural Design, Climatology in Architecture, etc.
- (ii) Structural design program fundamentals related to Surveying, Theory of Structures, Design of Steel and RCC, etc.
- (iii) Programme Electives which are supportive to the discipline and gives expanded scope of the course.
- (iv) Interdisciplinary Electives which gives interdisciplinary exposure and nurture the student skills.
- (v) Open Electives are of general in nature either related or unrelated to the discipline.
- (vi) Undergo Practical Training (PT) in which the student is exposed to practical design problems.
- (vii) Carryout design thesis approved by the faculty of architecture and submits a portfolio and report.

**4.2** Each academic year consists of two semesters. The curriculum and course content (syllabi) for the B.Arch. course is recommended by the Board of Studies in Architecture and approved by Academic Council.

**4.3** Each course is assigned certain number of credits which will depend upon the number of contact hours (lectures/tutorials) per week.

**4.4** The curriculum of B.Arch. programme is designed to have a total of 268 credits for the award of B.Arch. degree for the admitted batch of 2017-18. With the inclusion of Venture discovery course from 2020-21 admitted batch, the total number of credits shall be 270 for the award of degree from this batch onwards.

## **5.0 MEDIUM OF INSTRUCTION**

The medium of instruction (including examinations and project reports) shall be in English.

## **6.0 REGISTRATION**

Every student must register himself/herself for each semester individually at the time specified by the School / University.

## **7.0 ATTENDANCE REQUIREMENTS**

**7.1** A student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend the end - semester examination and he/she will not be allowed to register for subsequent semester of study. He/She have to repeat the semester along with his/her juniors.

**7.2** However, the Vice Chancellor on the recommendation of the Principal/Director of the Institute/School may condone the shortage of attendance of the students whose attendance is between 66% and 74% on genuine grounds and on payment of prescribed fee.

## 8.0 EVALUATION

- 8.1** The assessment of the student's performance in theory courses will be based on two components: Continuous Evaluation (50 marks) and Semester-end Examination (50 marks).
- 8.2** A student has to secure an aggregate of 45% in the two components of the course put together to be declared to have passed the course, subject to the condition that the student must have secured a minimum of 45% in the Semester-end Examination component of the respective course.
- 8.3** Practical courses, Design Thesis and Practical Training are completely assessed under Continuous Evaluation. A student must secure a minimum of 45% marks in each course to be declared to have passed the course.
- 8.4** The pass percentage shall not be less than 45% in any subject and shall not be less than 50 % in the aggregate.

Details of assessment procedure are furnished below in Table 1.

**Table 1: Assessment Procedure**

S.No.	Component of assessment	Marks allotted	Type of Assessment	Scheme of Examination
1	<b>Theory Course / Architectural Drawing &amp; Graphics (I &amp; II Semesters)</b>	50	Continuous Evaluation	i) Two mid semester examinations shall be conducted for fifteen (15) marks each. ii) Fifteen (15) marks are allotted for assignments. iii) Five (5) marks are allotted for attendance.
		50	Semester-end Examination	Fifty (50) marks are allotted for the semester-end examination.
	<b>Total</b>	<b>100</b>		
2	<b>Building Construction (II to V Semesters)</b>	50	Continuous Evaluation	i) Two mid semester examinations shall be conducted and averaged for fifteen (15) marks. ii) Twenty (20) marks are allotted for the portfolio. iii) Ten (10) Marks are for the Hands-on workshop/Site Visits. iv) Five (5) marks are allotted for attendance.
		50	Semester-end Examination	Fifty (50) marks are allotted for the semester-end examination.
	<b>Total</b>	<b>100</b>		

3	<b>Basic Design (I &amp; II Semesters)</b>	100	Continuous Evaluation	i) Ninety (90) marks are allotted for course work. ii) Ten (10) marks are allotted for attendance.
		100	Semester-end Examination	One Hundred (100) marks are allotted for the semester-end examination.
	<b>Total</b>	<b>200</b>		
4	<b>Architectural Design (III to VIII Semesters)</b>	200	Continuous Evaluation	i) One Hundred Eighty (180) marks are allotted for the course work evaluation. ii) Twenty (20) marks are allotted for the attendance
		200	External Viva-Voce	External Viva Voce on the design work done in the Semester by a Practicing Architect.
	<b>Total</b>	<b>400</b>		
5	<b>Practical Course (without viva- voce)</b>	<b>100</b>	Continuous Evaluation	i) Ninety (90) marks are allotted for course work. ii) Ten (10) marks are allotted for attendance.
6	<b>Practical Course (with viva-voce)</b>	<b>100</b>	Continuous Evaluation	i) Fifty (50) marks are allotted for course work. ii) Forty (40) marks are allotted for the external viva-voce. iii) Ten (10) marks are allotted for attendance
7	<b>Practical Training (IX Semester)</b>	<b>600</b>	Continuous Evaluation	i) Three Hundred and Sixty (360) marks are allotted for continuous evaluation of the project by the internal guide. ii) Two Hundred and Forty (240) marks are allotted for the external viva-voce.
8	<b>Design Thesis (X Semester)</b>	<b>600</b>	Continuous Evaluation	i) Three Hundred and Sixty (360) marks are allotted for continuous evaluation of the project by the internal guide. ii) Two Hundred and Forty (240) marks are allotted for the external viva-voce.

## **9.0 RETOTALLING, REVALUATION & REAPPEARANCE**

- 9.1** Retotaling of the semester-end examination answer script of a course is permitted on a request made by the student by paying the prescribed fee within fifteen days of the announcement of the result.
- 9.2** Revaluation of the semester-end examination answer script of a course is permitted on a request made by the student by paying the prescribed fee within fifteen days of the announcement of the result.
- 9.3** A student who has secured 'F' Grade in any course (which have semester-end examination component) shall have to reappear at the subsequent semester-end examination held for that course.
- 9.4** A student who has secured less than 45% of the maximum marks in the continuous evaluation component of any course is eligible to attend Special Instruction classes held during summer vacation, by paying the prescribed fee. However, a student is permitted to attend **"only once"** in that particular course during his/her entire program of study.
- 9.5** A student who has secured 'F' Grade in Design Thesis (AAR522) and Practical Training (AAR521) shall have to improve his/her port-folio and reappear for viva-voce at the time of special examination to be conducted in the summer vacation.

## **10.0 PRE-REQUISITES FOR ARCHITECTURAL DESIGN THESIS**

- 10.1** A candidate shall not be permitted to enroll for the tenth semester Architectural Design Thesis/dissertation/project course unless he/ she has successfully completed Practical Training/ Internship.

## **11.0 SPECIAL EXAMINATION**

- 11.1** A student who has completed his/her period of study and still has "F" Grade in not more than 6 courses, is eligible to appear for the special examination, which shall be conducted in the summer vacation.

## **12.0 BETTERMENT OF GRADES**

- 12.1** A student who has secured only a pass or second class and desires to improve his/her grades can appear for betterment examination only in theory courses of any semester of his/ her choice, conducted in summer vacation along with the special examination. Betterment of Grades is permitted **"only once"** immediately after completion of the program of study.

## **13.0 GRADING SYSTEM**

- 13.1** Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in Table 2.

**Table 2: Grades & Grade Points**

SL No	Grade	Grade points	Absolute Marks
1	O (Outstanding)	10	90 and above
2	A+(Excellent)	9	80 – 89
3	A (Very good)	8	70 – 79
4	B+ (Good)	7	60 – 69
5	B (Above Average)	6	55 – 59
6	C (Average)	5.5	50 – 54
7	P (Pass)	5	45 – 49
8	F (Fail)	0	Less than 45
9	Ab (Absent)	0	---

- 13.2** A student who earns a minimum of 5 grade points (P grade) in a course is declared to have successfully completed the course and is deemed to have earned the credits assigned to that course, subject to securing a GPA of 5.3 for a Pass in the semester.

#### **14.0 GRADE POINT AVERAGE**

- 14.1** A Grade Point Average (GPA) for the semester will be calculated according to the formula:

$$\text{GPA} = \frac{\sum [ C \times G ]}{\sum C}$$

Where C = number of credits for the course,

G = grade points obtained by the student in the course.

- 14.2** Semester Grade Point Average (SGPA) is awarded to those candidates who pass in all the courses of the semester.
- 14.3** To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used considering the student's performance in all the courses taken in all the semesters completed up to the point of time.
- 14.4** CGPA required for classification of class after the successful completion of the programme is shown in Table 3.

**Table 3: CGPA required for award of Degree**

Class	CGPA Required
First Class with Distinction	$\geq 8.0^*$
First Class	$\geq 7.0$
Second Class	$\geq 6.0$
Pass	$\geq 5.3$

\* In addition to the required CGPA of 8.0, the student must have necessarily passed all the courses of every semester in **first attempt**.



## **15.0 ELIGIBILITY FOR AWARD OF THE B.Arch. DEGREE**

### **15.1 Duration of the programme:**

A student is ordinarily expected to complete the B.Arch. programme in ten semesters of five years. However, a student may complete the programme in not more than seven years including study period.

**15.2** However, the above regulations may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.

**15.3** A student shall be eligible for award of the B.Arch. degree if he/she fulfills all the following conditions.

- a) Registered and successfully completed all the courses and projects.
- b) Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.
- c) Has no dues to the School, Hostels, Libraries, NCC, NSS etc, and
- d) No disciplinary action is pending against him/her.

## **16.0 DISCRETIONARY POWER**

Notwithstanding anything contained in the above sections, the Vice-Chancellor may review all exceptional cases, and give his decision, which will be final and binding.

## **RULES**

1. In respect of all theory examinations, the paper setting shall be done by an external paper setter having a minimum of three years of teaching experience. The panel of paper setters for each course is to be prepared by the Board of Studies of the school concerned and approved by the Academic Council. The paper setters are to be appointed by the Vice Chancellor on the basis of recommendation of Director of Evaluation / Controller of Examinations.
2. The theory papers of end-semester examination will be evaluated by internal/external examiner.
3. Panel of examiners of evaluation for each course is to be prepared by the Board of Studies of the department concerned and approved by the Academic Council.
4. The examiner for evaluation should have a minimum of three years teaching experience.
5. The appointment of examiners for evaluation of theory papers will be done by the Vice Chancellor based on recommendation of Director of Evaluation / Controller of Examinations from a panel of examiners approved by the Academic Council.
6. The attendance marks for each course shall be allotted as follows:

Percentage of Attendance	Marks for Attendance		
	50 Marks Continuous Evaluation Component Course	100 Marks Continuous Evaluation Component Course	200 Marks Continuous Evaluation Component Course
76% to 80%	1	2	4
81% to 85%	2	4	8
86% to 90%	3	6	12
91% to 95%	4	8	16
96% to 100%	5	10	20

## **Bachelor of Architecture (B.Arch.)**

### **PROGRAM EDUCATIONAL OBJECTIVES**

- PEO 01:** Graduates will demonstrate requisite skills for professional practice of architecture in an ethical manner and implement eco- friendly sustainable technologies for the benefit of industry and society.
- PEO 02:** Graduates will update themselves with new developments in the design tools, building materials, construction technology and application through continuous life-long learning.
- PEO 03:** Graduates will demonstrate requisite skills for career advancement by addressing the challenges of the building industry with innovative solutions.
- PEO 04:** Graduates will pursue research with critical thinking and interdisciplinary approach as per changing global and local needs of the society and built environment.

## Bachelor of Architecture (B.Arch.)

### PROGRAM OUTCOMES

The students of B.Arch. degree after completion of the program will be able to:

- PO 01      Knowledge of Architecture:** Apply the knowledge of Mathematics, Science, and Architecture Fundamentals, to solve complex architectural problems.
- PO 02      Problem Analysis:** Identify, formulate, research literature, and analyze architectural design problems reaching substantiated conclusions using principles of design and other relevant domains.
- PO 03      Design/Development of Solutions:** Design solutions for Complex architectural problems and design system components or processes that meet the specified needs with appropriate consideration for universal design approach and safety, inclusive of cultural, societal, and environmental considerations.
- PO 04      Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design data analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO 05      Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, with relevant Computer Aided Design, 3D modeling, building Information system and management tools with an understanding of the limitations.
- PO 06      The Architect and Society:** Apply acquired contextual knowledge which accords societal, environmental, vernacular, cultural, safety & security, universal design, legal issues etc., and the consequent responsibilities relevant to the professional practice.
- PO 07      Environment and Sustainability:** Understand the impact of the Professional Architectural solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO 08      Ethics:** Apply professional code of conduct and follow ethics in the architectural profession.
- PO 09      Individual and Teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10      Communication:** Communicate effectively on ongoing and proposed architectural developmental activities with the architectural community and with society to comprehend various issues and proposals, subsequently in preparation of reports, design documentation studies, effective presentations.

- PO 11 Project Management and Finance:** Demonstrate knowledge and understanding project management principles and apply these to one's own work, as a designer and member in a team, to manage projects in multi-disciplinary environments.
- PO 12 Lifelong Learning:** Recognize the need for lifelong learning and have the preparation and ability to engage in continuous learning process in the broadest context of built environment.

## **Bachelor of Architecture (B.Arch.)**

### **PROGRAM SPECIFIC OUTCOMES**

<b>PSO 01</b>	In addition to enhancing the standard skill set as stipulated by the COA, Students are further strengthened in developing Resilient and Sustainable design solutions for built environment suitable for local contexts.
<b>PSO 02</b>	Students are fine-tuned with Computer-based Architectural Design and Drawing abilities, advanced communication skills and personality development, to enhance their employability, Industry readiness and Research Acumen.

## Bachelor of Architecture (B.Arch.)

### PEO - PO MAPPING

Program Outcomes	Program Educational Objectives			
	PEO 01	PEO 02	PEO 03	PEO 04
PO 01	✓	✓	✓	✓
PO 02	✓	✓		
PO 03		✓	✓	✓
PO 04	✓	✓	✓	
PO 05	✓	✓	✓	✓
PO 06				✓
PO 07			✓	✓
PO 08			✓	✓
PO 09			✓	✓
PO 10	✓	✓	✓	
PO 11	✓		✓	✓
PO 12	✓	✓	✓	✓

## **Bachelor of Architecture (B.Arch.)**

### **CURRICULUM STRUCTURE**

1. The B.Arch. programme 5-year duration consists of:

1 <sup>st</sup> semester to 8 <sup>th</sup> semester	–	Theory, Practical, Studio
9 <sup>th</sup> semester	–	Practical Training
10 <sup>th</sup> semester	–	Theory, Thesis

2. The number of courses in the programme consists of:

i.	Professional Core	– 61
ii.	Program Electives	– 4
iii.	Open electives	– 2
iv.	Interdisciplinary electives	– 2



## COURSES

### I - SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AMT 101	Mathematics for Architects	2	0	0	2	50	50	100	3
2	AEG 101	Technical Communication	2	0	0	2	50	50	100	3
3	ACE 101	Engineering Mechanics	3	0	0	3	50	50	100	3
4	AAR 101	Introduction to Art and Architecture	3	0	0	3	50	50	100	3
5	AAR 103	Building Materials-I	3	0	0	3	50	50	100	3
6	AAR 105	Basic Design -I	0	6	0	4	100	100	200	5
7	AAR 107	Architectural Drawing and Graphics-I	0	6	0	4	50	50	100	5
8	AAR 121	Sketching Workshop	0	0	3	2	100	-	100	-
9	VDC 111	Venture Discovery#	2	0	0	2	100	-	100	-
<b>Total</b>			<b>15</b>	<b>12</b>	<b>3</b>	<b>25</b>	<b>600</b>	<b>400</b>	<b>1000</b>	
<b>Total Hrs. per week</b>			<b>30</b>							

# Introduced from the admitted batch of 2020-21

### II - SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	ACE102	Strength of Materials	3	0	0	3	50	50	100	3
2	AAR102	Theory of Architecture	3	0	0	3	50	50	100	3
3	AAR104	Building Materials-II	3	0	0	3	50	50	100	3
4	AAR106	Basic Design-II	0	6	0	4	100	100	200	5
5	AAR108	Architectural Drawing and Graphics-II	0	6	0	4	50	50	100	5
6	AAR110	Building Construction-I	0	6	0	4	50	50	100	5
7	AAR122	Visual Graphics	0	0	3	2	100	-	100	-
8	AAR124	Model Making Workshop	0	0	3	2	100	-	100	-
<b>Total</b>			<b>9</b>	<b>18</b>	<b>6</b>	<b>25</b>	<b>550</b>	<b>350</b>	<b>900</b>	
<b>Total Hrs. per week</b>			<b>33</b>							

### III – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AES201	Environmental Studies	3	0	0	3	50	50	100	3
2	ACE201	Theory of Structures - I	3	0	0	3	50	50	100	3
3	AAR201	Climatology in Architecture	4	0	0	4	50	50	100	3
4	AAR203	History of Western Architecture	3	0	0	3	50	50	100	3
5	AAR205	Building Materials-III	3	0	0	3	50	50	100	3
6	AAR207	Architectural Design-I	0	9	0	6	200	200	400	10
7	AAR209	Building Construction-II	0	6	0	4	50	50	100	5
8	AAR221	Computer Applications in Architecture-I	0	0	3	2	100	-	100	-
<b>Total</b>			<b>14</b>	<b>15</b>	<b>5</b>	<b>28</b>	<b>600</b>	<b>500</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>34</b>							

### IV – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	ACE202	Surveying for Architects	2	0	2	3	50	50	100	3
2	ACE204	Theory of Structures- II	3	0	0	3	50	50	100	3
3	AAR202	History of Eastern Architecture-I	3	0	0	3	50	50	100	3
4	AAR204	Water Supply & Sanitation	3	0	0	3	50	50	100	3
5	AAR206	Architectural Design-II	0	9	0	6	200	200	400	10
6	AAR208	Building Construction-III	0	6	0	4	50	50	100	5
7	AAR222	Computer Applications in Architecture-II	0	0	3	2	100	-	100	-
8	EOExxx	<b>Open Elective-I</b>	3	0	0	3	50	50	100	3
	EOE202	German for Beginners								
	EOE305	French for Beginners								
<b>Total</b>			<b>14</b>	<b>15</b>	<b>5</b>	<b>27</b>	<b>600</b>	<b>500</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>34</b>							

## V – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	ACE301	Concrete Structures	3	0	0	3	50	50	100	3
2	AAR301	Architectural Acoustics	3	0	0	3	50	50	100	3
3	AAR303	Mechanical & Electrical Services	3	0	0	3	50	50	100	3
4	AAR305	History of Eastern Architecture - II	3	0	0	3	50	50	100	3
5	AAR307	Site Planning & Landscape Design	3	0	0	3	50	50	100	3
6	AAR309	Architectural Design – III	0	9	0	6	200	200	400	15
7	AAR311	Building Construction - IV	0	6	0	4	50	50	100	5
8	EOExxx	<b>Open Elective-II</b>	3	0	0	3	50	50	100	3
	EOE206	Introduction to Music								
	EOE317	Personality Development								
	EOE	Digital Graphics and Arts								
	EOE	Becoming a Change Maker								
<b>Total</b>			<b>18</b>	<b>15</b>	<b>0</b>	<b>28</b>	<b>550</b>	<b>550</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>33</b>							

## VI – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	ACE302	Steel Structures	3	0	0	3	50	50	100	3
2	AAR302	Estimating, Costing & Specifications	3	0	0	3	50	50	100	3
3	AAR304	Building Economics and Sociology	3	0	0	3	50	50	100	3
4	AAR306	Contemporary Architecture	3	0	0	3	50	50	100	3
5	AAR308	Housing	3	0	0	3	50	50	100	3
6	AAR310	Architectural Design – IV	0	9	0	6	200	200	400	15
7	AAR322	Working Drawings - I	0	0	6	4	100	-	100	Viva
8	AARxxx	<b>Program Elective-I</b>	3	0	0	3	50	50	100	3
	AAR342	Barrier Free Architecture								
	AAR344	Vernacular Architecture								
	AAR346	Furniture Design								
	AAR348	Architectural Design with Glass								
<b>Total</b>			<b>18</b>	<b>9</b>	<b>6</b>	<b>28</b>	<b>600</b>	<b>500</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>33</b>							

## VII – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AAR401	Advanced Structural Systems	3	0	0	3	50	50	100	3
2	AAR403	Advanced Services	3	0	0	3	50	50	100	3
3	AAR405	Building Construction Management	3	0	0	3	50	50	100	3
4	AAR407	Architectural Design – V	0	9	0	6	200	200	400	20
5	AAR409	Introduction to Human Settlements & Town Planning	4	0	0	4	50	50	100	3
6	AAR421	Working Drawings - II	0	0	6	4	100	-	100	Viva
7	AARxxx	<b>Program Elective-II</b>	3	0	0	3	50	50	100	3
	AAR 441	Introduction to Architectural Conservation								
	AAR 443	Interior Design								
	AAR 445	Sustainable Architecture								
	AAR 447	Architectural Journalism								
<b>Total</b>			<b>16</b>	<b>9</b>	<b>6</b>	<b>26</b>	<b>550</b>	<b>450</b>	<b>1000</b>	
<b>Total Hrs. per week</b>			<b>31</b>							

## VIII – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AAR402	Urban Design	3	0	0	3	50	50	100	3
2	AAR404	Disaster Resistant Buildings & Management	3	0	0	3	50	50	100	3
3	AAR 406	Advanced Construction and Materials	3	0	0	3	50	50	100	3
4	AAR408	Architectural Design – VI	0	9	0	6	200	200	400	20
5	AAR422	Research Seminar	1	0	3	3	100	-	100	-
6	AAR 424	Building Information Modelling	0	0	3	2	100	-	100	-
7	AARxxx	<b>Program Elective-III</b>	3	0	0	3	50	50	100	3
	AAR 442	Energy Efficient Green Architecture								
	AAR 444	Appropriate Technology								
	AAR 446	Graphic & Product Design								
	AAR 448	Project Management								

8	<b>AIExxx</b>	<b>Interdisciplinary Elective-I</b>	2	0	2	3	50	50	100	3
	AIE 402	Basics of Geographic Information System								
	AIE 404	Traffic and Transportation Planning								
	AIE 406	Maintenance & Repair of Buildings								
<b>Total</b>			<b>15</b>	<b>9</b>	<b>8</b>	<b>26</b>	<b>650</b>	<b>450</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>32</b>							

## IX– SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AAR521	Practical Training	0	0	0	30	600	-	600	Viva
<b>Total</b>					-	<b>30</b>	<b>600</b>	<b>-</b>	<b>600</b>	

## X– SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AAR502	Professional Practice & Building Regulations	3	0	0	3	50	50	100	3
2	AAR 504	Entrepreneurship Skills for Architects	2	0	2	3	50	50	100	3
3	AAR522	Design Thesis	0	0	0	18	600	-	600	Viva
4	AARxxx	<b>Program Elective-IV</b>	3	0	0	3	50	50	100	3
	AAR542	Intelligent Buildings								
	AAR544	Research Methods in Architecture								
	AAR546	Professional Ethics and Human Values								
	AAR548	Real Estate Management								
	AAR550	Building Performance and Compliance								
<b>Total</b>			<b>08</b>	<b>00</b>	<b>02</b>	<b>27</b>	<b>750</b>	<b>150</b>	<b>900</b>	

# **Bachelor of Architecture (B.Arch.)**

## **COURSE SYLLABUS**

## I - SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AMT 101	Mathematics for Architects	2	0	0	2	50	50	100	3
2	AEG 101	Technical Communication	2	0	0	2	50	50	100	3
3	ACE 101	Engineering Mechanics	3	0	0	3	50	50	100	3
4	AAR 101	Introduction to Art and Architecture	3	0	0	3	50	50	100	3
5	AAR 103	Building Materials-I	3	0	0	3	50	50	100	3
6	AAR 105	Basic Design -1	0	6	0	4	100	100	200	5
7	AAR 107	Architectural Drawing and Graphics-I	0	6	0	4	50	50	100	5
8	AAR 121	Sketching Workshop	0	0	3	2	100	-	100	-
9	VDC 111	Venture Discovery#	2	0	0	2	100	-	100	
<b>Total</b>			<b>15</b>	<b>12</b>	<b>3</b>	<b>25</b>	<b>600</b>	<b>400</b>	<b>1000</b>	
<b>Total Hrs. per week</b>			<b>30</b>							

# Introduced from the admitted batch of 2020-21

## **I - SEMESTER**

### **AMT 101     MATHEMATICS FOR ARCHITECTS**

**Credits: 2**

#### **Course Objectives:**

- The prescribed topics would help students in applying mathematical tools and principles in solving various problems related to building physics and other related problems.

#### **UNIT 1**

**Matrices:** Adjoin, transpose and inverse of matrices, orthogonal matrix, Rank of matrix, Consistency and inconsistency of linear equations.

#### **UNIT 2**

**Statistics & Probability:** Measures of Central Tendency and Measures of Dispersion. Kurtosis, Curve fitting, Method of Least Squares (Straight Line and Parabola), Correlation and Regression.

#### **UNIT 3**

**Differential Calculus:** Tangent and Normal, Curvature (Cartesian and parametric forms only), Taylor's and Maclaurin's expansion. Indeterminate forms, Maxima, Minima for a function of one variable.

#### **UNIT 4**

Partial differentiation, Euler Theorem, Total differential coefficient, Change of variables, Taylor's and Maclaurin's expansion for two variables, Maxima, Minima for a function of two variables.

#### **UNIT 5**

**Integral Calculus:** Reduction Formulae, Use of double and triple integrals, Calculation of areas using multiple integrals.

#### **Course Outcomes:**

- Students would be able to solve various architectural problems related to wind flow analysis, heat transfer through buildings, solar geometry etc., and apply statistical procedures for related problems.

#### **Reference:**

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi, 1998.
2. P. Kandasamy, K. Thilagavathy and K. Gunavathy, Engineering Mathematics Vol – I & II, S.Chand Publishers – 1998.



**Course Objectives:**

- To assist learners to use relevant Language Structures and vocabulary in writing.
- To train students to employ effective strategies for formal correspondence such as Letters and Resumes.
- To enable Students to develop skills both Professional and personal life.
- To help learners to record information in a structured manner, like writing Technical and general Reports.
- To improve students Skills in Academic writing such as drafting Technical proposals and writing Research Articles.

**UNIT 1**

Vocabulary: Words often confused, one word substitutes, Synonymous words, Pairs of words, Single word substitution

Grammar: Tenses and Aspects, Concord, Common Errors.

**UNIT 2**

Writing Skills: Letter writing, Information transfer- using charts, figures, tables, Official Correspondence-Memorandum, Notice, Agenda, Minutes, Circular letter, applying for a job, Resume writing and Cover letters.

**UNIT 3**

Business Correspondence-Types, sales letters; Social Correspondence- Invitation to speak, etc.

**UNIT 4**

Report writing; general and technical report, Definition, Types, structure.

**UNIT 5**

Technical proposals, Definitions, types and format. Research papers and articles.

**Course Outcomes:**

- At the end of the course a student will be able to write flawless sentences in English and use appropriate vocabulary as per the context.
- Effectively handle Academic writing tasks as well as formal correspondence.
- Communicate well in English in Professional and Social context.
- Will effectively handle Recording Information in the form of Reports.

- Will be able to draft technical proposals in relevant formats.

**Reference:**

1. Dictionary of Pronunciations.
2. Daniel Jones; *Phonetics (symbols and transcription)*

**ACE101**

**ENGINEERING MECHANICS**

**Credits: 3**

**Course Objectives:**

- To give students practice in applying their knowledge of mathematics, science, and engineering
- To develop an ability to identify, formulate, and solve engineering problems
- To prepare the students for higher level courses such as courses in Mechanics of Solids, Structural Analysis and Design of Steel Structures.

**UNIT 1**

**Force Systems in Plane:** Principles of Statics – Definitions and examples of various types of force systems – Definition of resultant – Composition and resolution of forces – Moment of a force – Principles of moments of force – Couples – characteristics of a couple – on Transformations of a couple – Resolution of a force into a force and couple.

**Equilibrium of a Rigid Body:** Free body diagrams – Equations of equilibrium of rigid bodies acted on by concurrent and non-concurrent coplanar system of forces.

**UNIT 2**

Introduction to plane trusses, Analysis of simple Plane Truss – Assumptions – Analysis of Truss by Method of joints - Method of sections

**UNIT 3**

**Centroids and Centres of Gravity:** Centre of gravity of parallel forces in a plane. Centroids and centre of gravity of composite areas and composite bodies – Distributed Loads on Beams.

**UNIT 4**

**Moments of Inertia:** Definition – Moments of inertia of areas by integrations. Radius of gyration – Parallel axis theorem– Perpendicular axis theorem - Moments of inertia of composite areas — Polar moment of Inertia-Mass moment of inertia of simple bodies like disc, cylinder, rod, sphere.

## UNIT 5

**Friction:** Introduction- Types of Friction- Laws of Dry Friction- Angle of Friction- Angle of repose- Cone of friction- Problems related to dry friction-Characteristics of dry friction – Problems involving dry friction

**Virtual Work:** Definition of work and virtual work – Principle of virtual work for a particle and a rigid body – Principle of virtual work for a system of connected rigid bodies.

### Course Outcomes:

- The student will be able to idealize the structures by using the applications of Engineering Mechanics.
- Better understanding of the higher level courses like mechanics of solids, Structural Analysis and Steel structures etc., by students.

### References:

1. Timoshenko and D.H. Young, Engineering Mechanics, McGraw Hill, Fourth edition
2. Engineering Mechanics by Singer, Prentice Hall India.
3. J.L. Meriam John Wiley & Sons, Engineering Mechanics
4. F.B. Beer and E.R. Johnston, Jr., Vector, Mechanics for Engineers Statics and Dynamics, Tata McGraw Hill, Fourth edition, 2002
5. I.B. Prasad, Applied Mechanics, Khanna Publishers, Delhi, Tenth edition 1984
6. A.K.Tayal, Engineering Mechanics
7. Engineering Mechanics by S.S.Bhavakatti, New age International

## AAR 101 INTRODUCTION TO ART AND ARCHITECTURE

**Credits: 3**

### Course Objectives:

- To give an introduction about the role of art in architecture
- To provide students with the understanding of various art forms and history of art and in relation to Architecture
- To provide an understanding of various artists and their style of Art.
- To provide basic understanding of various types of drawings and their application in construction.
- To give a brief idea about how architecture influenced from various factors and the study of time tested vernacular architecture of various regions.

## UNIT 1

Role and meaning of art; Different art forms – performing arts, commercial and industrial art. Examples of works by the impressionist artists like Claude Monet, Surrealism and abstract art,

works of Vassili Kandinsky and Henry Moore etc. Art in architecture. Examples from the works of Indian artists like Husein, Satish Gujral, etc.

## **UNIT 2**

Definitions and general understanding of architecture; Role of an architect in a building project and his relation with other consultants, contractor and client; Knowledge and skills required as inputs.

## **UNIT 3**

Various courses to be studied by an architect and their relevance to practice; Types of architectural drawings to be prepared by an architect; municipal drawings, presentations drawings, working drawings, etc.

## **UNIT 4**

Various factors influencing the architecture of a region; Architecture as a response to social, technological, cultural and environmental factors.

## **UNIT 5**

Evolution of shelter forms as a response to climate, materials and methods of construction. Examples of vernacular architecture in different regions of the world, with particular reference to India.

### **Course Outcomes:**

- The student will gain an understanding developing the art sensitivity in design.
- The student will learn about various national and international artists.
- The student will gain technical knowledge of the types of drawings and the factors influencing the design of the buildings.
- The student will gain an understanding of how people respond to the climate and various other factors influencing the outcome of various vernacular styles from different regions of the world

### **Reference:**

1. Craven, C.Roy. Indian Art, a Concise History.
2. Kumar, Raj (Ed.) Essays on Indian Art and Architecture. Discovery Pub., New Delhi, 2003
3. Fisher, E.Robert. Buddhist Art and Architecture. Thames and Hudson, London, 1993.
4. Ghosh, A (Ed) Jain Art and Architecture, Vol 1-3, BharatiyaJnanpith, New Delhi.
5. James C.Snyder and Anthony Y. Catanese, Introduction to Architecture, New York: McGraw Hill.
6. Rappoport, Amos, House, Form and Culture.
7. Khare , Ajay, Temple Architecture of Eastern India , Shubhi Publications, New Delhi , 2005

**Course Objectives:**

- To study about the classification of bricks and stones with their characteristic and applications.
- To understand properties and function of cement ingredients and its use in construction.
- To know about types of mortar their compositions and its selection for different construction work.

**UNIT 1**

**Brick:** Types of bricks according to their composition, classification of bricks, tests for bricks.

**UNIT 2**

**Stone:** Classification of stones. Common building stones used in India. Characteristics and use of stones. Dressing of stone. Artificial stones.

**UNIT 3**

**Sand:** Sources of sand, classification, tests for sand. Grades of sand and their uses in mortar and concrete.

**UNIT 4**

**Cement:** Composition of ordinary cement. Function of cement ingredients. Properties of cement – soundness, setting time, strength etc. Grades of cement and different types of cement along with use in construction. Cement packing (including their volume & weight).

**UNIT 5**

**Mortar:** Types of mortar – lime mortar, mud mortar, lime-surkhi mortar, cement mortar. Different grades of mortar, their compositions and properties. Use and selection of mortar for different construction work.

**Note:** All the students should do a Market Survey on above listed building materials and a detailed report of the study should be submitted.

**Course Outcomes:**

- To develop the conceptual knowledge in building material and helps to understand the materials of construction such as bricks, stone, cement, concrete with its application in the building industry.

**Reference:**

1. B. C. Punmia; Building Materials and Construction.
2. Bindra&Arora; Building Materials and Construction.
3. W.B. McKay, 'Building Construction', Vol. 1,2,3 Longmans, U.K. 1981.

**Course Objectives:**

- To give an introduction about the design and the basic fundamentals and methodologies in understanding design.
- To provide students with the understanding of elements and principles of design
- To provide an understanding of application of various principles involved in design basics such as product design furniture design and design of small spaces.
- Preliminary introduction of design of architectural elements such as doors, grills and openings.

Introduction to design; Importance of design; Study and appreciation of design examples from natural and manmade environments.

Exercises in elements of design: point, line, plane, volume, colour, texture, light and shade  
Principles of design: rhythm, harmony, contrast, symmetry, balance, emphasis and their application in architectural design.

Application of the principles of composition in two and three dimensions. Exercises in simple repetitive patterns using grids; flooring patterns and patterns for architectural elements like grills, gates etc, compositions with solids and voids.

**Course Outcomes:**

- The student will gain an understanding of application of design principles and usage of architectural elements at fundamental level of design thinking.
- The student will be able to design smaller spaces of architecture.
- The student will gain a knowledge of integrating functional and aesthetical requirements while designing an architectural project.

**Reference:**

1. Wucius, Wong. Principles of Two Dimensional Design. Van Nostrand Reinhold 1972.
2. Maier Manfred, Basic Principles of Design, Vol. 1, 2, 3, &4, Van Nostrand Reinhold, NY, (1977).
3. Ching, Francis D.K., Architecture: Form, Space and Order, 2<sup>nd</sup> ed. Van Nostrand Reinhold, New York, 1996.
4. Hanks, A.David. Decorative Designs of Frank Lloyd Wright, Dover Publications, Inc. New York 1999.
5. Hepler, E.Donald, Wallach, I.Paul. Architecture Drafting and Design, 3<sup>rd</sup> ed. McGraw-Hill Book Company, New York, 1977.
6. Itten, Johannes. Design and Form: The basic course at the Bauhaus, Thames and Hudson Ltd., London 1997.
7. Krier, Rob. Architectural Composition, Academy Editions, London, 1988.
8. Pipes, Alan. Drawing for 3-Dimensional Design. Thames and Hudson Ltd., London 1990.

**Course Objectives:**

- Familiarization of drawing equipment's and drafting techniques, learning fundamentals of architectural drawings.
- To represent various elements related to buildings, people, vegetation and vehicles.
- Imparting skills to develop scaled, measured, geometrical drawings, 3-D views for objects.
- Introduction to third dimension projection, drawing and construction.
- To introduce fundamentals of technical drawing and its practice.

**UNIT 1**

**Introduction:** Fundamentals of drawing and its practice, introduction to drawing equipment and its familiarization, use and handling.

**Drawing:** Drawing sheet sizes, layouts and composition. Simple exercises in drafting, line types, line weights, dimensioning, Typography- anatomy of type, styles. Free hand lettering, title panels and legends.

**UNIT 2**

**Architectural Symbols:** Representation of building elements, openings, materials, furniture and accessories, anthropometrics, vegetation, vehicles, terminology and abbreviations used in architectural representation.

**UNIT 3**

**Measured and Scale Drawing:** Scales and construction of plain scales, scaled drawings of simple objects, furniture, rooms, doors and windows etc. in plan elevation and section. Reduction and enlargement of simple objects, furniture, rooms in plan and elevation.

**UNIT 4**

**Geometrical Construction:** Constructing simple and complex geometrical shapes involving various drafting techniques. Methods of drawing regular polygons.

**UNIT 5**

Isometric, oblique and Axonometric projections of various solids and simple geometrical composition of solids.

**Course Outcomes:**

- Knowledge and practice of fundamentals in architectural drawing.
- Enhanced skills in architectural representation scaled geometrical drawings and 3-D views.
- Handling equipment, learning drafting skills and basic architectural representation.

- Learning Measured drawing and representation.

### Reference:

1. B. Gupta; *A Text Book of Engineering Drawing*
2. N.D. Bhatt; *Engineering Drawing*.
3. Hiram. E. Grant; *Engg Drawing*, , Mc. Graw Hill Book Company.
4. Sherley W, MORGAN; *Architectural Drawing*, McGraw Hill
5. Arthur L. Guptill, Watson ;*Rendering in Pen and Ink*,– Guptill Publications, New York.

## AAR 121 SKETCHING WORKSHOP

**Credits: 2**

### Course Objectives:

- To give an introduction about the skill and necessity of freehand drawing in design.
- To provide students with the understanding of various techniques involved in freehand sketching.
- To provide an understanding of application of sketching in the architectural presentation.

Introduction to Sketching & Its uses in architecture, Introduction & Exercises on Different mediums & Tools used in Sketching & Drawing, Understanding Strokes, Lines, Hatches & Rendering techniques, Showing variations in materials by using Different Methods of hatching , Understanding Background & Foreground for sketches.

The students should be made to sketch the following themes as studio exercises along with inputs like light, shade, proportion and scale:

- Human figures / Postures
- Furniture
- Street Furniture / Outdoor sculpture
- Objects: Pen, Television, Flowerpot, Tea-pot, Cups etc.
- Elements of nature
- Enclosed Spaces in courtyards, Plazas, Chowks
- Buildings
- Canteen & Restaurant.
- Indoor & Outdoor Object Sketching (Physical objects)

### Course Outcomes:

- The student will be trained in using freehand sketching in design
- The student will be able to use sketching as an effective tool in communicating ideas
- The student will gain technical knowledge of architectural sketching of various elements like furniture, landscapes and buildings etc.



## Reference:

1. Francis D.K. Ching Architectural Graphics
2. Rendering With Ink And Pen, Thames And Hudson

## VDC 111 VENTURE DISCOVERY

**Credits: 2**

### Course Description and Learning Outcomes:

India as part of its Make in India initiative has been focusing on creating incubation centers within educational institutions, with an aim to generate successful start-ups. These start-ups will become employment creators than employment seekers, which is the need of the hour for our country.

This common course for all the disciplines is a foundation on venture development. It is an experiential course that lets students venture and find out what is a business, financial and operating models of a business are. How to design and prototype a solutions that meets their customers' needs and generate revenue for the business.

### Course Objectives:

- Discover who you are – Values, Skills, and Contribution to Society.
- Gain experience in actually going through the innovation process.
- Conduct field research to test or validate innovation concepts with target customers.
- Understand innovation outcomes: issues around business models, financing for start-ups, intellectual property, technology licensing, corporate ventures, and product line or service extensions.

### UNIT 1

**Personal Values:** Defining your personal values, Excite & Excel, Build a Team, Define purpose for a venture. Four stages: Personal Discovery, Solution Discovery, Business Model Discovery, Discovery Integration.

### UNIT II

**Solution Discovery:** Craft and mission statement, Experience design, Gaining user insight, Concept design and positioning, Product line strategy, Ideation & Impact.

### UNIT III

**Business Model Discovery:** Prototyping solutions, Reality Checks, understand your industry, Types of business models, Define Revenue Models, Define Operating Models

### UNIT IV

**Discovery Integration:** Illustrate business models, validate business models, Define company impact

## **UNIT V**

**Tell a Story:** Can you make money, Tell your venture story.

### **Course Outcomes:**

- Know how to use online learning resources: G-Learn, online journals, etc.
- Communicate effectively using a range of media
- Apply teamwork and leadership skills
- Find, evaluate, synthesize & use information
- Analyze real world situation critically
- Reflect on their own professional development
- Demonstrate professionalism & ethical awareness
- Apply multidisciplinary approach to the context

### **Reference textbooks and journal papers:**

Personal Discovery Through Entrepreneurship, Marc H. Meyer and Chaewon Lee, The Institute of Enterprise Growth, LLC Boston, MA.

### **Suggested journals:**

Vikalpa, Indian Institute of Management, Ahmedabad

Journal of General Management, Mercury House Business Publications, Limited

Harvard Business Review, Harvard Business School Publishing Co. USA

## II - SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	ACE102	Strength of Materials	3	0	0	3	50	50	100	3
2	AAR102	Theory of Architecture	3	0	0	3	50	50	100	3
3	AAR104	Building Materials-II	3	0	0	3	50	50	100	3
4	AAR106	Basic Design-II	0	6	0	4	100	100	200	5
5	AAR108	Architectural Drawing and Graphics-II	0	6	0	4	50	50	100	5
6	AAR110	Building Construction-I	0	6	0	4	50	50	100	5
7	AAR122	Visual Graphics	0	0	3	2	100	-	100	-
8	AAR124	Model Making Workshop	0	0	3	2	100	-	100	-
<b>Total</b>			<b>9</b>	<b>18</b>	<b>6</b>	<b>25</b>	<b>550</b>	<b>350</b>	<b>900</b>	
<b>Total Hrs. per week</b>			<b>33</b>							

**Course Objectives:**

- To establish an understanding of the fundamental concepts of mechanics of deformable solids, including static equilibrium, geometry of deformation, and material constitutive behavior.
- To understand the concept of shear force and bending moment diagrams, to construct S.F.D and B.M.D for simply supported beams, cantilever beams and over hanging beams and to know the relationship between the load, shear force and bending moment.
- To understand the concept of transformation of stresses on the inclined planes, determination of principal planes and principal stresses.
- To determine flexural and shear stresses in beams.
- To analyze the shaft subjected to torsion and determination of stresses in the shaft.

**UNIT 1**

Introduction, stress, strain, stress- strain relationships for Mild steel bar, Hooke's law, Poisson's ratio; thermal strain and deformation; deformation of axially loaded bars. Relationship between modulus of elasticity and modulus of rigidity; dilatation and bulk modulus.

**UNIT 2**

**Shear Force and Bending Moment Diagrams:** Constructing Shear force diagrams and bending moment diagrams for simply supported beams; cantilever beams and over hanging beams

**UNIT 3**

Transformation of stresses in two dimensional problems; principal stresses in two –dimensional problems; Mohr's circle for two dimensional problems; construction of Mohr's circle by graphical method

**UNIT 4**

**Bending stresses in beams:** Introduction; basic assumptions; elastic flexure formula; application of flexure formula, combined direct and bending stresses.

**Shear stresses in beams:** Introduction; shear flow; shear stress formula for beams; Shear stress in beam flanges.

## UNIT 5

**Torsion:** Introduction; application of the method of sections; torsion of circular elastic bars – basic assumptions, the torsion formula, design of circular bars in torsion for strength, angle of twist of circular bars.

## COURSE OUTCOMES

By the completion of this course the student will be able to:

- Learn the concept of mechanical behaviour of deformable bodies under loads.
- Draw the Shear force diagram and bending moment diagram.
- Calculate the stresses on inclined planes and principal planes.
- Calculate the bending and shear stresses across the cross section of the beam.
- Calculate shear stress, diameter of the shaft and the power transmitted using torsional formula.

## Text Book(s)

1. R. Subramanian, Strength of Materials, 2/e, Oxford, 2010
2. E. Popov, Engineering Mechanics of Solids, 2/e, Pearson, 2009

## References

1. S.S. Rattan, Strength of Materials, 2/e, Tata McGraw Hill Education, 2011
2. Geriand Timoshenko, Mechanics of Materials, 4/e, CBS Publishers, 2006
3. Stephen Timoshenko, Strength of Materials, 3/e, CBS Publisher, 2002
4. R.K. Rajput, Strength of Materials, S.Chand Publications, 2007

## AAR 102      THEORY OF ARCHITECTURE

**Credits: 3**

### Course Objectives:

- To introduce various proportioning systems, organizing principles of architectural compositions.
- Study the use of various building materials for structural, aesthetical, ornamentation purposes.
- To analyze the architectural philosophies and concepts of famous architects in India, World.

## UNIT 1

Proportioning systems in Architecture- Vitruvian man and Golden Section, Le Modular of Corbusier and Japanese Ken Theory of Proportions, A brief introduction to fractal nature and self similarity in natural forms.

## UNIT 2

Organising principles of architectural composition – symmetry, hierarchy, datum and axis – different types of spatial organizations of masses linear, centralised, radial, clustered, grid organization illustrations of buildings

## UNIT 3

Use and need of ornamentation in architectural design, different types of ornamentation in buildings, polychromy in architecture.

## UNIT 4

Use of different materials like brick, timber, stone, concrete, glass for aesthetic and structural purposes

## UNIT 5

A brief introduction to the architectural philosophies behind the works of architects likes Frank Lloyd Wright, Corbusier and Mies Vander Rohe, etc. Organic architecture, functionalism, structuralism, purism, hi- tech. and concepts of sustainable architecture.

### Course Outcomes:

- Ability to identify the spatial organization and underlying proportioning system(s).
- Deeper understanding about use of spaces, materials, philosophies, to suit a specific context.

### Reference:

1. Francis D.K. Ching; Architecture: Form, Space and Order.
2. Prammar V.S.; Design Fundamentals in Architecture.
3. Sharma , B.K. An Introduction to Environmental Pollution, Goel Publication House , Meerut
4. Trivedi, P.R. Encyclopedia of Ecology and Environment , IIEE, New Delhi
5. Crosbie, Michael J., Green Architecture, Rockport Publisher, Massachusetts.
6. Kevin Lynch ;Site planning;MIT Press, Cambridge, MA – 1967

## AAR 104 BUILDING MATERIALS-II

**Credits: 3**

### Course Objectives:

- To gain knowledge of basic building materials, their properties and applications
- Understand different types of masonries and their application

## UNIT 1

**Ferrous Metals:** Pig iron, cast iron, wrought iron – types, properties, steel – properties, types and uses of steel in construction, properties of mild steel and hard steel, defects in steel.

**Nonferrous Metals and Alloys:** Aluminium, copper, lead, nickel, important alloys like brass, bronze, etc – brief description of uses. Corrosion of both ferrous and non-ferrous metals – types and preventive measures.

## **UNIT 2**

**Concrete:** Compositions and grades of concrete. Various steps in concrete construction – batching, mixing, transporting, compacting, curing, shuttering, jointing. Light weight concrete, ready-mix concrete, and precast concrete.

## **UNIT 3**

**Use of Additive and Mixtures in Concrete:** Water repellent, Waterproofing compounds, Accelerators, Air entraining agents. Hardeners, Workability increasing agent/plasticizer, Fly ash. Their availability and uses.

## **UNIT 4**

**Timber:** Structure, defects in timber, decay of timber, qualities of timber for construction. Seasoning, storage and preservation of timber.

## **UNIT 5**

**Clay Products and Mud:** Tiles, their properties and use - terra-cotta, earthenware, stoneware, porcelain, vitreous. Mud – its stabilization and uses.

**Lime:** Classification of lime. Fat and hydraulic lime – properties and use.

### **Course Outcomes:**

At the end of course Student should have learnt:

- To Understand relation between material properties and their structural form
- Ability to identify crucial problem areas in manufacture
- To identify various building materials and select a suitable type of building material for given situation.
- To be aware of various traditional building materials and also the emerging materials in the field Construction
- Understanding of the importance of experimental verification of material properties.

### **Reference:**

1. B. C. Punmia; Building Materials and Construction .Laxmi Publications Pvt Ltd, New Delhi,1993
2. Bindra&Arora; Building Materials and Construction.
3. W.B. McKay, 'Building Construction', Vol. 1,2,3 Longmans, U.K. 1981.
4. Arthur Lyons; Materials for Architects and Builders- An Introduction; Arnold, London 1997.

**Course Objectives:**

- Design of small objects with respect of function, structure and aesthetics
- Study and design of part of residential buildings, with respect to indoor and outdoor spaces of buildings.

Design of small objects with respect to function, structure and aesthetics.

- Importance of physical factors in architectural design e.g. orientation, ventilation, adequate protection from rain, dust, insects, etc. And the human dimensions in various postures, their relation to dimensioning of everyday utilities like the table, chair, sink etc., Concepts of Anthropometrics and Ergonomics.
- Design of small structures – street furniture, kiosks, clock towers, milk booth, cycle stand, shop etc. and objects of interest with respect to form and construction.
- Study and design of part of residential buildings, with respect to indoor and outdoor spaces of buildings. Detail layout with circulation pattern of residential components such as bathrooms, kitchen, bedroom etc.
- A small weekend cottage incorporating all the above concepts.
- Time problem should be of 7 hours duration.

**Course Outcomes:**

At the end of course Student should have learnt:

- To be able to design small structures like kiosks, milk booth etc.
- To be able to design a small residence.

**Reference:**

All books and journals on architecture.



**Course Objectives:**

- To enhance skills to represent building geometry in 2-D and perspective views.
- To introduce the study of shade and shadows on geometrical forms and buildings.
- To sensitize the rules of composition and perspectives for architectural rendering.

**UNIT 1**

**Building Geometry:** Projection of planes and solids, Interpenetration of solids. Study of isometric, axonometric and oblique views Reduction and enlarging of large forms such as site plans, etc.

**UNIT 2**

**Sciography:** Practical examples in the study of shade and shadows, points, lines, surfaces, geometrical solids of various forms and groups of forms leading to advanced examples of shades and shadows on buildings or parts of buildings.

**UNIT 3**

**Perspective:** Examples in one point or parallel perspective, two point or angular perspective, introduction to three-point perspective.

**UNIT 4**

**Rendering:** Introduction to the rules of composition and perspective in architectural rendering, colour study, values, tones and general approach to rendering with water colour, poster colour, pen and ink.

**UNIT 5**

- Spatial Depth cue- Use of varying line weights & detail to convey a sense of spatial depth in the drawing of Building Plans, Sections & Elevations
- Architectural Presentation Techniques - Selection of different mediums for Drawing Formatting & Composition, Different Styles of Text & Mediums, Choice of colors etc

**Course Outcomes:**

- Enhanced skills to represent architectural elements, their shades and shadows in 2-D and 3-D.
- Improved skills working with various rendering media and their application.

**Reference**

1. Francis D.K. Ching Architectural Graphics
2. Rendering With Ink And Pen, w gill
3. Interior design, Ahmed Kasu

**Course Objectives:**

- To gain an understanding of brick masonry, stone masonry and composite masonry.
- To understand partition walls and simple foundation and their types.

**UNIT 1**

**Brick masonry:** Various types of bonds, stopped ends, junctions, jambs, corbelling, damp proof course, window sills, thresholds, copings, mortar joints and pointing.

**UNIT 2**

**Stone masonry:** Stone walls, rubble work, ashlar work, masonry joints, window sills, plinth, cornices, surface finishes.

**UNIT 3**

**Composite masonry:** Brick backed ashlar, rubble backed ashlar, concrete backed masonry, hollow block masonry, ashlar faced concrete walls, marble faced masonry, tile faced concrete.

**UNIT 4**

**Partition walls:** Brick partition, reinforced brick partition, brick nogged partition, lath and plaster partition, precast concrete partition, glass block and glass Crete partition, and common wooden partition.

**UNIT 5**

**Simple foundations:** Simple foundation for masonry load bearing walls and piers.

Sessional work based on above topics.

**Course Outcomes:**

By the end of the course, student should have learnt:

- Brick, stone and composite masonry construction and application.
- To interpret simple partition walls and foundations.

**Reference:**

1. W.B. MacKay, 'Building Construction', Vol. 1,2,3,4 longmans, U.K. 1981.
2. B. C. Punmia; Building Materials and Construction .Laxmi Publications Pvt Ltd, New Delhi,1993.
3. Bindra&Arora; Building Materials and Construction.
4. Francis D. K. Ching, Building Construction Illustrated VNR, 1975.
5. R .Barry. The Construction of Buildings. Vol.I-IV, The English Language book society, Crosby Lockwood staples, London.

**Course Objectives:**

- Understanding the role of Visual graphics and its importance in design representation.
  - Understanding principles of visual design through Gestalt laws/theory.
  - Understanding Colour Theory and various colour compositions.
  - Understanding Massing in building design, integrated with study of light shade and shadow.
- 
- Gestalt theories of visual perception, figure and ground relationship and principles of grouping.
  - Significance of colour in architecture, Colour wheel, Colour shades and tints.
  - Composition with primary, secondary and tertiary colours.
  - Composition with complimentary, split and analogous colours.
  - Study of light and shade effects on simple objects.
  - Significance of textural quality of different materials.
  - Exercises in three dimensional massing, right angled massing, diagonal massing and spherical massing.

**Course Outcomes:**

- Understanding the importance of graphics in building design and representation, integrated with aspects of colour, massing and gestalt principles.

**Course Objectives:**

- Understanding Geometry in model making through paper and other mediums.
- Understanding the importance of model making by means of conceptual models, block models and massing models.
- Representation of texture in models through different mediums and materials, photography in model making.
- Understanding scale in model making.

**Introduction to model making:** need; role of scale-models in design; general practices.

**Essentials of model making:** Materials available for model making such as papers, mount boards, Plaster of Paris (POP), clay, thermocole, softwood etc. Understanding of various tools and machines employed. Introduction to various carpentry tools.

**Techniques of scale-modelling:** use of different scales; templates; measuring aids; conventions followed.

Techniques for preparation of presentation models, simulation of various materials and textures such as wood, glass, aluminium, steel, bricks, roofing tiles, flooring, corrugated sheets etc. production of simple joints used in joinery by using carpentry tools.

Photography in built models, using lighting and natural background.

**Course Outcomes:**

- Preparation of scaled models and presentation models.
- Photography in built models.

### III – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AES201	Environmental Studies	3	0	0	3	50	50	100	3
2	ACE201	Theory of Structures - I	3	0	0	3	50	50	100	3
3	AAR201	Climatology in Architecture	4	0	0	4	50	50	100	3
4	AAR203	History of Western Architecture	3	0	0	3	50	50	100	3
5	AAR205	Building Materials-III	3	0	0	3	50	50	100	3
6	AAR207	Architectural Design-I	0	9	0	6	200*	200	400	10**
7	AAR209	Building Construction-II	0	6	0	4	50	50	100	5
8	AAR221	Computer Applications in Architecture-I	0	0	3	2	100	-	100	-
<b>Total</b>			<b>14</b>	<b>15</b>	<b>5</b>	<b>28</b>	<b>600</b>	<b>500</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>34</b>							

NOTE:

\*AAR 207 Architectural Design-I, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with one external member.

\*\* Examination will be conducted for TWO days each of 5 Hrs. duration; the first day work of the students shall be retained in the sealed examination hall.

### **III - SEMESTER**

**AES 201 ENVIRONMENTAL STUDIES**

**Credits: 3**

#### **Course Objectives:**

- Damage and exploitation of natural resources.
- Concepts of ecosystems, biodiversity and solid waste management.
- Fundamentals of disaster management.
- Environmental ethics, climate changes, global warming etc.,
- Role of IT in environment and human health.

#### **UNIT 1**

**Multidisciplinary nature of environmental studies & Natural Resources:** Multidisciplinary nature of environmental studies Definition, scope and importance. Need for public awareness .Natural Resources: Renewable and non-renewable resources. Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. 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.

#### **UNIT 2**

**Ecosystems and Biodiversity and its conservation:** 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, types, characteristic features, structure and function of the following ecosystem :- .Forest ecosystem .Grassland ecosystem .Desert ecosystem. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)Biodiversity and its conservation Introduction – Definition : genetic, species and ecosystem diversity. Biogeographically 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.

### UNIT 3

**Environmental Pollution** Definition Cause, effects and control measures of:-Air pollution. Water pollution. Soil pollution. Marine pollution. Noise pollution. Thermal pollution. Nuclear hazards. Solid waste Management : Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Pollution case studies. Disaster management : floods, earthquake, cyclone and landslides

### UNIT 4

**Social Issues and the Environment** :From Unsustainable to Sustainable development Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case Studies. 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.

### UNIT5

**Human Population and the Environment and Environment Protection Act and Field work:**

Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education.

HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act Wildlife Protection Act Forest Conservation Act Issues involved in enforcement of environmental legislation. Public awareness. Field work. Visit to a local area to document environmental assets.

River/forest/grassland/hill/mountain. Visit to a local polluted site

Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc

### Course Outcomes:

Knowledge will be gained on

- Over exploitation of different resources.
- Identification of alternate resources.
- The concept of ecosystem and its structure.
- Create awareness about pollution prevention through individual participation.
- Values of biodiversity and adapting sustainable lifestyle.
- Various environmental legislations.

**Reference:**

1. Text book of environmental studies for undergraduates courses by ErachBharucha, Published by – University Grants Commission, Universities Press, India.
2. Text book of environmental studies for undergraduates courses by Benny Joseph Published by Tata McGraw Hill Publishing company limited.
3. Text book of environmental studies by Kaushik&Kaushik.
4. Agarwal,K.C.2001 Environmental Biology,NidiPubl.Ltd.Bikaner.
5. Brunner R.C., 1989,Hazardous Waste Incineration,McGraw Hill Inc.480p.

**ACE201      THEORY OF STRUCTURES - I****Credits: 3****Course objectives:**

- To determine the deformations in a statically determinate beams using moment area method and Macaulay's method.
- To analyze Fixed beams for different loading conditions.
- To analyze continuous beams using various techniques. (Theorem of three moments, and slope deflection method).
- To analyze continuous beams using various techniques. (Moment Distribution method).
- To find the buckling load of a column subjected to axial and critical load.

**UNIT 1**

**Deflection of Statically Determinate Structures:** Beams using Macaulay's method and moment – area method.

**UNIT 2**

Shear force and bending moment diagrams for fixed beams subjected to a) Uniformly Distributed loads b) Point loads

**UNIT 3**

Analysis of three span continuous beams using theorem of three moments and Slope deflection method.

**UNIT 4**

Analysis of three span continuous beams using Moment distribution method.

**UNIT 5**

**Columns and Struts:** Euler's theory –end conditions, Rankine - Gordon formula - eccentrically loaded columns - Secant formula.



**Course outcomes:**

The student will be able to

- Analyze the deformations in statically determinate beams.
- Analyze the statically indeterminate fixed beams.
- Analyze the statically indeterminate continuous beams using theorem of three moments and Slope deflection method.
- Analyze the statically indeterminate continuous beams and will gain the knowledge of distribution of moments.
- Compute the critical load in a column subjected to axial and eccentric load.

**Text Book(s)**

1. R. Subramanian, Strength of Materials, 2/e, Oxford University Press, 2010.
2. T.S. Thandavamoorthy, Structural Analysis, 2/e, Oxford University press, 2011.

**References**

1. C.K. Wang, Statically Indeterminate Structures, Tata McGraw-Hill, 2010.
2. R.C. Hibbeler, Structural Analysis, 6/e, Pearson, 2011.

**AAR 201 CLIMATOLOGY IN ARCHITECTURE****Credits: 4****Course Objectives:**

- To provide an understanding of global climate factors, climate elements and thermal comfort.
- To acquaint students with the principles behind the design of solar shading devices.
- To provide an understanding of principles of Heat Transfer through building materials.
- Principles of Ventilation and Day lighting.
- To provide an overview of design considerations in various climatic zones.

**UNIT 1****Climate and Thermal Comfort**

- Global climatic factors, elements of climate, classification & characteristics of tropical climates, site climate.
- Thermal balance of the human body, Thermal comfort indices.
- Relation of climatic elements to comfort, Bioclimatic chart.

**UNIT 2****Solar Geometry & Design of Solar Shading Devices**

- Apparent movement of the sun, and sun path diagram.
- Solar angles, Shadow angles, Solar shading masks.

- Significance of building orientation
- Effect of Landscaping on microclimate modification

### **UNIT 3**

#### **Heat Flow through Materials**

- Thermal quantities – heat flow rate, conductivity (k-value)& resistivity
- Conductance through a multi-layered body, surface conductance, transmittance – calculation of U- value
- Periodic heat flow, Time lag and decrement factor.

### **UNIT 4**

#### **Ventilation and Day lighting**

##### **VENTILATION**

- Air movement in and around buildings
- Basic objectives of ventilation
- Ventilation due to stack effect
- Ventilation due to pressure effect
- Combined ventilation due to pressure and stack effect

##### **DAYLIGHTING**

- Sources of light, significance of Day lighting
- Classification of Daylight, Daylight Factor and Sky Component.
- Day lighting in Tropics and hot dry climates and warm humid climates

### **UNIT 5**

#### **Design Principles for Different Climates**

Building design& lay out planning considerations for various climates

Climatic design criteria for:

- Hot and dry climate
- Warm and humid climate
- Composite climate

**Assignments:** Students to be shown various instruments used for Climatic data recording & Analysis. Practical Exercises using these instruments.

#### **Course Outcomes:**

- The student will gain an understanding of the various climate elements that affect the design buildings.
- The students will be able to design different types of shading devices and select appropriate building materials to reduce heat flow through buildings.

- Design buildings in various climates for human comfort.

### Reference:

1. O.H. Koenigsberger and others, Manual of Tropical Housing and Building – Part I – Climatic Design, Longmans, London, 1980.
2. B.Givoni, Man, Climate and Architecture, Applied Science, Banking, Essex, 1992.
3. Victor Olgyay, AladárOlgyay, Design with climate: bioclimatic approach to architectural regionalism, Princeton University Press, 1963.
4. M.Evans – Housing, Climate and comfort – Architectural Press, London, 1980.
5. Donald Watson and Kenneth Labs., Climatic Design – McGraw Hill Book Company – New York – 1983.

## AAR 203 HISTORY OF WESTERN ARCHITECTURE

**Credits: 3**

### Course Objectives:

- To understand the evolution of architectural form with reference to style, character, technology with reference to Ancient West Asiatic, Egyptian, Classical Greek, Roman and Medieval times.
- To develop an understanding of architecture as a manifested built environment responding to culture, religion, politics, climate, social factors etc.

### UNIT 1

#### Development of prehistoric and historic architecture

##### Egyptian Architecture

- a. Characteristic features
- b. Secular Architecture
- c. Mastabas.*Example: Mastaba of Thi, Sakkâra*
- d. Pyramids.*Example: Step pyramid of Djoser (Zoser), Sakkâra; Bent pyramid of Dahshur, Great pyramid of Cheops, Gizeh.*
- e. Temples. *Example: Temples of Khons and Karnak*

### UNIT 2

#### Ancient West Asiatic Architecture

- a. Characteristic features
- b. Sumerian Architecture, Ziggurats.*Example: White Temple Warka*
- c. Babylonian Architecture.*Example: City of Babylon*
- d. Assyrian Architecture.*Example: City of Khorsabad*
- e. Persian Architecture.*Example: City of Susa*

## **UNIT 3**

### **Classical Greek Period**

- a. Characteristic feature of Aegean Architecture
- b. Hellenic period and Hellenistic period
- c. Greek orders.*Example: Doric, Ionic and Corinthian*
- d. The Acropolis at Athens. *Example: Parthenon, Propylaea.*
- e. Theatre, Stadium and Agora

## **UNIT 4**

### **Classical Roman Period**

- a. Characteristic feature of Etruscan and Roman Architecture
- b. Roman Orders. *Example: Doric, Ionic, Corinthian, Tuscan and Composite*
- c. Temples.*Example: Temples of Saturn and Pantheon*
- d. Basilica of Trajan, Baths (Thermae) of Caracalla
- e. Amphitheatre.*Example: Coliseum*
- f. Forum, Circus, Triumphal arch, Aqueduct, Bridge, Road Sewer and Fountain

## **UNIT 5**

### **Early Christian period**

Characteristic feature

Basilican Churches.*Example: St. Peter, Rome*

### **Byzantine Period**

Characteristic feature,

*Example: Hagia Sophia*

### **Romanesque Period**

Characteristic feature

*Example: Pisa Cathedral complex*

### **Gothic Period**

Early Gothic style and Late Gothic style

*Example: Notre Dame, Paris*

### **Renaissance Architecture**

Introduction to Renaissance, Baroque Architecture, etc.

**Course Outcomes:**

The course sensitizes the evolution of built environment, various architectural styles, constructional technologies, experimented extreme engineering prototypes etc., thus inspiring in further research and development.

**Reference:**

1. Sir Banister Fletcher, A History of Architecture, University of London, the Antholone Press, 1986.
2. S. Lloyd and H.W. Muller, History of World Architecture – Series, Faber and Faber Ltd. London, 1986.
3. Hiraskar ;The Great Ages of World Architecture
4. Kenneth Frampton, Modern Architecture: A Critical History; Thames and Hudson, London, 1994.
5. Sigfried Gideon, Space Time and Architecture: The growth of a New Tradition, Hazard University Press, 1978.

**AAR 205 BUILDING MATERIALS - III****Credits: 3****Course Objectives:**

- Study of properties and uses of building materials such as Plastics, Laminates and Veneers, Glass, Paints and Distempers.

**UNIT 1**

**Plastics:** Polymer types, thermo setting and thermo plastics, resins, common types of mouldings, fabrication of plastics, polymerization and condensation, plastic coatings. Composite materials, classification, properties and uses - linoleum, plastic coated paper, polythene sheets, reinforced plastic, plastic laminates and Poly Vinyl Chloride (PVC).

**UNIT 2**

**Laminates and Veneers:** Resin bonded plywood, types of laminates, laminated wood, insulating boards and other miscellaneous boards, veneers from different varieties of timber, their characteristics and uses, Medium Density Fibre (MDF) and High Density Fibre (HDF) boards.

**UNIT 3**

**Glass:** Sheet glass, plate glass, float glass, wired glass, laminated glass, obscured glass coloured glass, heat absorbing glass, etched glass, stained glass, tinted glass, glass block - their sizes and uses. Glazing putty.

**UNIT 4**

**Paints and Distempers:** Compositions of paints and their uses. Writing specifications for whitewashing, distempering, cement-based paints, oil emulsion paints, enamel paints. Uses of tar paints, aluminium paints.

**Lacquers, Polishes and Varnishes:** Method of application for lacquers, polishes and staining varnishes.

## **UNIT 5**

**Miscellaneous Materials:** Properties and uses of Asbestos, cork, felt, mica, rubber, gypsum, sealants, heat and sound insulation materials.

**Note:** All the students should do a Market Survey on above listed building materials and a detailed report of the study should be submitted.

### **Course Outcomes:**

At the end of course, student should have learnt:

- Classification, Properties and Uses of Plastics as a building material
- Types, Properties and Uses of Laminates and Veneers as a building material
- Types, Properties and Uses of Glass as a building material
- Composition of Paints and their uses.
- Method of application of lacquers, polishes and staining varnishes
- Properties and Uses of some miscellaneous materials like asbestos, cork, felt etc.

### **Reference:**

1. B. C. Punmia; Building Materials and Construction .Laxmi Publications Pvt Ltd, New Delhi,1993
2. Bindra&Arora; Building Materials and Construction.
3. W.B. McKay, 'Building Construction', Vol. 1,2,3 Longmans, U.K. 1981.

## **AAR 207      ARCHITECTURAL DESIGN - I**

**Credits: 6**

### **Course Objectives:**

- To understand the importance of functional relationships of spaces for different user groups.
- To understand on the formulation of design concept.
- To understand the basic climatic data and its application in Design

### **The design issues to be addressed:**

- Formulations of concept.
- Analysis of space proximity studies with the help of Proximity charts
- Design methodology through bubble diagram.
- Application of anthropometrics in space planning.
- Interior volumes and space articulation through different sources.
- Integration of form and function.

The list of suggested topics to be covered as design problems:

**Major Design Problem:**

Residence for Professionals, Kindergarten school, Primary health centre etc.

**Minor Design/Time Problem:**

Doctor's clinic, Small cafeteria, Walk in Provisional store, etc.

**Viva voce**

Final external Viva-Voce on all the design assignments done in the semester

**Note:** At least one major design exercise and one minor design/time problems should be given. The final submission shall necessarily include a model for at least one of the design problems.

**Course Outcomes:**

- Understanding on the Concept evolution and design approach.
- To formulate the design by considering the proximity and activity analysis.

**Reference:**

1. Time savers standards, Neufert's Architects data.
2. All books and journals on architecture.

**AAR 209 BUILDING CONSTRUCTION - II**

**Credits: 4**

**Course Objectives:**

- To understand both in general and detail about various types of lintels and arches, respective applications.
- Orientation about wooden carpentry and joinery. To sensitize the ability to choose context applicable joinery type in various applications.
- To develop an understanding both in general and detail about the available typologies of doors, windows, shutters, staircases etc.

**UNIT 1**

**Lintels and Arches:** lintels of wood, stone, brick; arches: terms defined, forms of arches, arches classified on centres, shapes and materials i.e. segmental, semi – circular, elliptical, three centred, flat and relieving arch, etc. rough and gauged arch.

**UNIT 2**

**Doors:** Definition of terms, Types of doors, Battened/ledged/Braced door, Flush door, Panelled door, Venetian door, Glazed. etc. Collapsible doors, Revolving doors, Rolling shutters.

### UNIT 3

**Windows:** Types of windows, Details of window, Casement window, top and bottom hung glazed, pivoted, louvered window, corner, bay window, Glazed windows, Ventilators.

### UNIT 4

**Carpentry and joinery:** Terms defined, mitring, ploughing, grooving, rebating, veneering. Various forms of joints in wood work, such as lengthening joints, bearing joints, halving, dovetailing, housing, notching, tusk and tenon, etc.

### UNIT 5

**Staircases:** Layout and its construction details, Different elements of staircase, Types of staircase, Details of various types of staircase in wood, RCC and steel.

#### Course Outcomes:

- The course provides necessary orientation about the basic understanding both in general and specific about the methods of construction, workmanship, of the topics discussed.
- The course sensitizes the students in choosing, crosschecking the appropriate construction technique while designing, detailing and monitoring in the process of execution.

#### Reference:

1. W.B. MacKay, 'Building Construction', Vol. 1,2,3,4 longmans, U.K. 1981.
2. B. C. Punmia; Building Materials and Construction .Laxmi Publications Pvt Ltd, New Delhi,1993.
3. Bindra&Arora; Building Materials and Construction.
4. Francis D. K. Ching, Building Construction Illustrated VNR, 1975.
5. R.Barry. The Construction of Buildings. VoI.1-Vol-IV, The English Language book society, Crosby Lockwood staples, London.

## AAR 221      COMPUTER APPLICATIONS IN ARCHITECTURE – I

**Credits: 2**

#### Course Objectives:

- Understanding of the power and precision of computer-aided modeling and drafting
- The course assists students to get complete understanding of the fundamentals and software tool to gain expertise in Architectural design.
- The course gives participants an unmatched overview of the 2D concepts
- Hands-on 2D CAD exercises throughout the course and explore how to implement these methods to increase productivity.



Creating two-dimensional architectural drawing with special emphasis on presentation and visualization using Computer Aided Design (CAD) applications.

- Introduction to CAD.
- Getting started with CAD.
- Starting with advanced sketching.
- Working with drawing aids.
- Editing sketched objects.
- Creating text and tables.
- Basic dimensioning, geometric dimensioning and tolerancing.
- Editing dimensions.
- Dimension styles, multi-leader styles and system variables.
- Adding constraints to sketches.
- Model space viewports, paper space viewports and layouts.
- Template drawings.
- Plotting drawings.
- Hatching drawings.
- Working with blocks.

Practice and preparation of 2D documentations based on class projects in the previous semester in Architectural Designs.

Details of task to be determined each semester by the individual instructor.

**Course Outcomes:**

- Use the CAD software program to create drawings from scratch and to modify, manipulate, copy, delete, save, and plot drawings.
- Ability to construct accurate 2D geometry
- Use the full range of CAD commands and options and employ shortcuts and time- saving strategies.
- Ability to assemble these drawings in industry-standard plan form and produce plotted hardcopies ready for distribution.
- Awareness of architectural drafting with a focus on industry standards.

## IV – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	ACE202	Surveying for Architects	2	0	2	3	50	50	100	3
2	ACE204	Theory of Structures- II	3	0	0	3	50	50	100	3
3	AAR202	History of Eastern Architecture-I	3	0	0	3	50	50	100	3
4	AAR204	Water Supply & Sanitation	3	0	0	3	50	50	100	3
5	AAR206	Architectural Design-II	0	9	0	6	200	200	400	10
6	AAR208	Building Construction-III	0	6	0	4	50	50	100	5
7	AAR222	Computer Applications in Architecture-II	0	0	3	2	100	-	100	-
8	EOExxx	<b>Open Elective-I</b>	3	0	0	3	50	50	100	3
	EOE202	German for Beginners								
	EOE305	French for Beginners								
<b>Total</b>			<b>14</b>	<b>15</b>	<b>5</b>	<b>27</b>	<b>600</b>	<b>500</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>34</b>							

NOTE:

\* AAR206 Architectural Design-II, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with one external member.

\*\* Examination will be conducted for TWO days each of 5 Hrs. duration; the first day work of the students shall be retained in the sealed examination hall.

## **IV - SEMESTER**

**ACE 202**

**SURVEYING FOR ARCHITECTS**

**Credits: 3**

### **Course Objectives:**

The purpose of this course is to

- obtain knowledge on basics of surveying and exposure to different techniques of surveying and associated equipment
- understand working principles of survey instruments and types of errors encountered in field and calculations.
- develop an understanding on advanced surveying equipment involved such as total station.

### **UNIT 1**

**Chain Surveying:** Principles of surveying, linear measurements, equipment required, obstacles in chaining, problems.

### **UNIT 2**

**Compass Surveying:** Prismatic compass, components and uses, reduced and whole circle bearings, magnetic declination, local attraction, compass traversing & balancing the closing error, problems

### **UNIT 3**

**Theodolite Surveying:** Theodolite its temporary adjustments, measuring of horizontal and vertical angles, Theodolite traversing, balancing the closing error

### **UNIT 4**

**Plane table Survey:** Equipment and methods of plane table survey

**Levelling:** Dumpy level, temporary adjustments, reduction of levels, height of instrument and rise & fall methods, errors in levelling, profile levelling, cross sectional levelling, problems

### **UNIT 5**

**Contouring:** Contouring, characteristics of contour lines, direct and indirect methods of contouring, interpolation of contours, uses of contours.

**Modern surveying equipment:** Total Station, GPS, and Auto-Levels. (Preliminary information and use).

### **Lab Experiments**

- Offsets and Obstacles in chaining.
- Distance between two inaccessible points using compass.
- Compass traversing-closing error.

- Determination of reduced levels – height of instrument method.
- Determination of reduced levels – rise & fall method.
- Measurement of horizontal angles by method of repetition.
- Determination of height of an object when base is accessible.
- Determination of height of an object when base is not accessible.
- Demonstration of total station, GPS and Auto Level.

### **Course Outcomes:**

The student will be able to

- Learn about basics involved in different types of surveying like tape, compass, levelling, and theodolite
- demonstrate skills in measuring of distances, angles, and levelling
- develop skills to apply error adjustment to the recorded reading to get an accurate surveying output

### **Reference:**

1. Surveying (Vol – 1, 2 & 3)”, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) Ltd., New Delhi, 2016
2. Surveying and Levelling” R. Subramanian, Oxford University Press, New Delhi, 2014
3. Surveying (Vol – 1 & 2)”, Duggal S K, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
4. Textbook of Surveying Vol. I”, P. B. Shahani – Oxford and IBH Publishing Co – 1980
5. Surveying Vol 1, 2 & 3”, Arora K R Standard Book House, Delhi, 2004

## **ACE 204**

## **THEORY OF STRUCTURES - II**

**Credits: 3**

### **Course Objectives:**

- To understand the concepts and structural behavior of indeterminate structures.
- To understand the concepts of elastic and plastic analysis.
- Attain the knowledge about stresses in thin and thick cylinders.

### **UNIT 1**

Arches: Introduction to arches, analysis of three hinged and two hinged arches subjected to concentrated loads and uniformly distributed loads (rolling loads and influence lines not included),

### **UNIT 2**

Suspension and Cable bridges: Stresses in loaded cables with supports at the same and different levels. Length of cable

### **UNIT 3**

Analysis of three span continuous beams using Kani’s method.

## UNIT 4

Thin Cylinders and Thick Cylinders: Thin cylinders: stresses in thin cylinders, circumferential and longitudinal stress, change in dimensions and volume of thin cylinders due to internal pressure. Thick cylinders: Lamé's theory, stresses in thick cylinders, compound thick cylinders.

## UNIT 5

Plastic Analysis: Introduction, upper and lower bound theorems, shape factor, collapse loads for beams (simply supported, fixed and two span continuous beams).

### Course Outcomes:

The student will be able to

- Analyze the two and three hinge arches
- Analyze the Cables in Suspension Bridges
- Analyze the statically indeterminate continuous beams using Kani's method .
- Attain the knowledge about stresses in thin and thick cylinders.
- Calculate shape factor for different sections & also collapse load for beams

### Text Book(s)

1. G.S. Pandit, S.P. Gupta, R. Gupta, Theory of Structures-Vol I and II, 2/e, Tata McGraw-Hill, 2003.
2. T.S. Thandavamurthy, Structural Analysis, 2/e, Oxford University Press, 2011.

### References

1. Vazirani and Ratwani, Analysis of Structures, Vol-II, 16/e, Khanna Publishers, 2015.
2. J.S. Kinney, Indeterminate Structural Analysis, 1/e, Naroja Publishing, 1987.
3. C.K. Wang, Statically Indeterminate Structures, Tata McGraw Hill, 2010.
4. Weaver and Gere, Matrix Methods of Framed Structures, 2/e, cbs publisher, 1990.

## AAR 202 HISTORY OF EASTERN ARCHITECTURE - I

Credits: 3

### Course Objectives:

- The course provides an orientation on historic evolution of various architectural styles in India with respect to construction technology and methods, socio-cultural factors, climate, material application etc.
- The course provides an orientation of synthesis of temple architecture in India with respect to the implied design principles, traditional anchorage, diversity etc

## UNIT 1

**Indus valley civilization:** Description, physical characteristics, ancient history, early culture, building resources, building techniques and processes.

## UNIT 2

**Buddhist architecture:** Evolution & golden age; Rock cut Architecture – Stupas, Chaitya, Vihara, Pillars, Ajanta, Ellora,,etc.

## UNIT 3

**Hindu Architecture:** Development of temple from example like Ladh Khan Temple at Deogarh, Kailasanath, Bhittargaon Temple, Mundeshwari Temple etc.

## UNIT 4

**North Indian Temple Architecture:** Architecture style of Orissan temple with examples. Khajuraho group of temples & Rajputana Temples at Gwalior and Vrindavan. Temple Architecture of Bihar and Bengal. Brick temples of eastern India.

## UNIT5

**South Indian Temple Architecture:** Pallava, (example Rathas) Chola, Pandyas, Madurai, Vijayanagar styles with few examples.

Emphasis should be on use of the structural techniques, stones, fine arts, and special features, use of landscape, water bodies and construction method employed.

Student to practice sketches and make a report and get it evaluated regularly.

### Course Outcomes:

- The course sensitizes the analogy and appreciation of the than architectural, structural manifestations in Indian temples from ages, also accords the sustained cultural privilege.
- The course gives necessary understanding of traditional parameters, work culture, aesthetic expressions of temple architecture to sensitize in designing and architectural conservation domains.

### Reference:

1. Brown, P. Indian Architecture (Buddhist Hindu) Vol. 1 Bombay 1942 & subsequent publications
2. Fergusson, J.A. A history of Indian and Eastern architecture, London 1876, revised 1891
3. Grover, S. The Architecture of India, Buddhist & Hindu, Sahibabad, 1980.
4. Michell, G, The Hindu Temple, London
5. Khare, Ajay, Temple Architecture of Eastern India, Shubhi Publications, New Delhi, 2005
6. Sterlin Henry, Architecture of World, India, Germany, ISBN-38228-9658-6.

**Course Objectives:**

- To study about sourcing, treatment of water, its distribution in low, medium, high-rise buildings.
- To study the methods and materials for sewerage and sanitation systems, suitable appliances.
- To equip the fundamentals to design plumbing systems for different sizes of buildings.

**UNIT 1**

**Water Supply:** Sources of water supply, standards of purity and treatment of water, qualities of potable water. Domestic water distribution system, various kinds of water meters, capacity of overhead tanks and pumping plants required, calculation of water consumption. Domestic water piping systems. Cold and hot water distribution within the building. Layout of water supply lines in a domestic house. Water supply to high rise buildings: problems encountered, and systems adopted.

**UNIT 2**

**Sewerage:** Characteristics of sewage, Quantity of sewage and storm water, infiltration, runoff calculation, Manning's formulae, partial flow diagram. Design of Sewers, shapes of sewers, factors affecting the design of sewers. Materials and joints used in sewer systems. Sewage treatment-(self- Purification), Disposal of sewage from isolated building, sewage breakdown. Details of a Septic tank, capacity calculation, spatial requirements.

**UNIT 3**

**Sanitation:** Basic principles of sanitation and disposal of various kinds of waste matter from building. Brief description of various systems of sewage disposal and their principles. Plumbing definitions and related terms, plumbing systems (one pipe, two pipe etc), House drainage system, Drainage of sub-soil water. Manholes, Sub drains, culverts, ditches and gutters, drop inlets and catch basins, roads and pavements, storm overflow/regulators.

**UNIT 4**

**Plumbing and Sanitary Appliances:** Specifications and sketches of sanitary fittings like wash basins, water closets, urinals, bidets, sinks, etc. for buildings. Uses of different valves like gate valves, float valves, flap valves, ball valves, flush valves, etc, different types of taps, faucets, stop cocks, bib cocks, and 'P', 'Q', 'S', floor and bottle traps used in buildings.

**UNIT 5**

**Design of Plumbing Systems:** Design considerations on drainage scheme. Preparation of plan, Planning of bathrooms, lavatory blocks and kitchen in domestic and multistoried buildings.

Indian standards for sanitary conveyance. Model bye laws regarding sanitation of buildings. House/service connection. Manholes and septic tanks in relation to buildings. Intercepting

chambers, inspection chambers and their proper location and ventilation of sewers. Laying and testing of sewer. Gradients used in laying of drains and sewers, and respective sizes.

NOTE: The treatment of the course will be mainly descriptive along with tutorial assignments related to the architectural designs already prepared by the students and also planning and layout of water supply and sewerage system plan.

### **Course Outcomes:**

- Enhanced understanding about water supply, drainage, sewerage and sanitation in habitats.
- Required basic skills to design plumbing systems suitable for different sizes of buildings.

### **Reference:**

1. B. C. Punmia; Water Supply and Sanitation.
2. S.C. Rangwala, Water Supply and Sanitary Engineering, Charotar Publishing House.
3. C.S, Shah; Water supply and Sanitation Engineering, Galgotia Publications.
4. B.S. Birdie, Water supply and Sanitary Engineering, Dhanpat Rai and Sons.
5. National Building Code of India.

## **AAR 206      ARCHITECTURAL DESIGN - II**

**Credits: 6**

### **Course Objectives:**

- To understand the importance of social and climatic aspects application on architectural design.
- To understand the integration of structural elements in to architectural design.
- To gain an understanding of regional building by-laws and National Building Code of India

### **The design issues to be addressed:**

- Organization of functional activities in relation to user requirements and the site.
- Relating the system of horizontal and vertical circulation, open spaces, parking, etc.
- Responding to socio-economic factors such as income levels, privacy, territoriality, interaction etc.
- Considering materials, structure and services in relation to the design proposal.
- Integration of plan forms and three dimensional compositions.



The list of suggested topics to be covered as design problems:

**Major Design Problem:**

Primary School, Youth hostel, Residential apartment complex, Shopping Complex etc.

**Minor Design/Time Problem:**

Artists' Exhibition Space, Fishermen's house, showrooms etc.

**Viva voce**

Final external Viva-Voce on all the design assignments done in the semester

**Note:** At least one major design exercise and one minor design/time problems should be given. The final submission shall necessarily include a model for at least one of the problems.

**Course Outcomes:**

- To conceptualize designs integrating basic structural elements.
- To conceptualize design according to behaviour and circulation of various user groups.
- To formulate the design according to regional and national building regulations.

**Reference:**

1. Time savers standards, Neufert's Architects data, National Building Code
2. All books and journals on architecture.

**AAR208 BUILDING CONSTRUCTION - III**

**Credits: 4**

**Course Objectives:**

- To understand the various parts of building elements from sub structure to super structure and their construction details.
- To expose the student to various types of foundation, flooring, Damp proofing, roofing and their construction details.

**UNIT 1**

**Foundation & Basement:** Wall foundation, isolated and combined foundation in RCC, Raft foundation, grillage foundation, pile foundation and its types. Construction detail of basement wall, Retaining wall, floor and foundation.

**UNIT 2**

**Damp-Proofing:** Definition, causes and effects of dampness. Materials, general principles and methods of damp-proofing.

**Water-Proofing:** Definition, reasons and preventive measures for water leakage. water-proofing of flat roofs. Methods for water-proofing: finishing, bedding concrete and flooring, mastic asphalt and jute cloth, use of water-proofing compounds.

**Termite-Proofing:** Definition, general principles and methods of termite-proofing.

### UNIT 3

**Flooring:** Types of flooring, methods of laying, furnishing of floors with different floor finishes like cement, coloured cement, mosaic, terrazzo, tiles etc. special consideration for rubber, linoleum and PVC flooring, flag stone Flooring, parquet flooring.

### UNIT 4

**Roofs:** Types of roofs, parts of roof and roof truss. Flat roof with wood and RCC, simple jack arch roof, various types and spans of timber and steel roof truss.

**Roof Coverings:** Technical terms, classification, various types of roof coverings. Rainwater gutter details.

### UNIT 5

**Wood Framing Detail:** Details of joist, Girder, Bridging, Floor platform, Truss joints, different connections.

### Course Outcomes:

- The course provides necessary orientation about the basic understanding both in general and specific about the various types, materials, methods of construction, workmanship of the topics discussed.

### Text Books:

1. S.C.Rangwala, Building Construction, Charotar Publishing House Pvt. Ltd, India, 2010.

### Reference:

1. W.B. MacKay, 'Building Construction', Vol. 1,2,3 Longmans, U.K. 1981.
2. B. C. Punmia; Building Materials and Construction .Laxmi Publications Pvt Ltd, New Delhi, 1993.
3. Bindra&Arora; Building Materials and Construction.

## AAR 222      COMPUTER APPLICATIONS IN ARCHITECTURE - II

**Credits: 2**

### Course Objectives:

- To introduce concepts of 3d to the students who are already proficient in 2D
- To learn advance concepts and commands in CAD
- Make them understand how to draw views in term of objects and building as a whole
- It incorporates advanced features, commands, and techniques for creating and managing drawings in a more productive way.

- Hands-on exercises throughout the courseware and explore how to implement these methods to increase productivity

Working on basic operations of three-dimensional architectural drawing with special emphasis on advanced Computer Aided Design (CAD) applications.

- Defining block attributes.
- External references.
- Advanced drawing options.
- Grouping and advanced editing of sketched objects.
- Data exchange & object linking and embedding.
- Technical drawing with CAD.
- Isometric drawings.
- The user coordinate system (UCS).
- Three-dimensional (3D) Modelling in CAD.
- Creating solid models.
- Modifying 3D objects.
- Editing 3D objects.

Practice and preparation of 2D documentations based on class projects in the previous semester in Architectural Designs.

Details of task to be determined each semester by the individual instructor.

#### **Course Outcomes:**

- Using 3D viewing techniques.
- Working with simple and composite solids and surfaces.
- Modifying objects in 3D space.
- Creating 2D drawings from 3D models.
- Creating sections, camera perspectives, and animations.
- Converting 3D objects.
- Setting up a rendering with materials and lights.
- Working with the User Coordinate System.
- Collaborating with others using the Cloud.

**Course Objectives:**

- To introduce basic knowledge about German Language.
- To encourage preliminary conversation in German.
- To educate basic grammar, speaking & reading skills in German.

**UNIT 1**

Introduction to the German language, grammar and pronunciation. Language: Greetings; Introducing oneself, asking the way, giving directions. Grammar: The nouns, gender distinctions, cases, definite and indefinite articles. Pronunciation: Vowels.

**UNIT 2**

Language: Asking for and giving information; Discussing home and the household. Grammar: Conjugation of verbs, verbs with separable and inseparable prefixes, modal verbs. Pronunciation: Vowels.

**UNIT 3**

Language: Describing people and their qualities, describing shape, size and colour of objects. Grammar: Personal pronouns, possessive pronouns, reflexive pronouns. Pronunciation: Consonants.

**UNIT 4**

Language: The Working World: Returning faulty goods to a shop, asking someone to repeat something; Refusing or declining politely. Grammar: Cases: nominative, accusative, dative. Pronunciation: Diphthongs.

**UNIT 5**

Language: Making Comments and Suggestions: Asking for and giving opinions. Grammar: Structure of sentence and categories of sentences; subordinate clause - causative and conditional sentences. Pronunciation: Umlaut.

**Course Outcomes:**

- Students are equipped to listen, understand German language.
- Sufficient skills to converse in German Language are established.

**Reference:**

1. Deutsch als Fremdsprache IA Grundkurs
2. Ultimate German Beginner - Intermediate (Coursebook), Living Language, 2004.
3. Paulina Christensen, Anne Fox , Wendy Foster: German For Dummies

**Web Reference:**

1. <https://www.deutschalsfremdsprache.ch/>

**Course Objectives:**

- To introduce basic knowledge about French Language.
- To encourage preliminary conversation in French.
- To educate basic grammar, speaking & reading skills in French.

**UNIT 1**

Asking for and giving personal information, asking for and giving directions, gender and number. Grammar: Verbs "avoir" and "etre", present tense, questions, vocabulary: countries and nationalities, professions, family, food

**UNIT 2**

Asking and giving the time, asking when something is open or someone is available, asking for prices and describing what one wants. Grammar: Alphabet and numbers, possessive adjectives, negative sentences. Vocabulary: Days of the week, months, money.

**UNIT 3**

Asking for information related to travel and accommodation, expressing one's wants/needs. Grammar: Present tense for verbs in -er, -ir and -re, present tense of irregular verbs. Verbs: to be able to, to want, to know. Vocabulary: Food, shops, packaging and measures.

**UNIT 4**

Talking about daily routine and the working day, describing things, expressing oneself when buying things. Grammar: Possessive pronouns, reflexive verbs. Vocabulary: Clothes, colours and shapes, weather.

**UNIT 5**

Describing places; visiting the doctor, reading short advertisements, describing places, feelings and symptoms. Grammar: Using avoir aller, etre faire, vouloir pouvoir. Vocabulary: Parts of the body, rooms and features of interior spaces.

**Course Outcomes:**

- Students are equipped to listen, understand French language.
- Sufficient skills to converse in French Language are established.

**Reference:**

1. LE NOUVEAU SANS FRONTIÈRES - Textbook
2. LE NOUVEAU SANS FRONTIÈRES - Workbook CD and selected passages/ exercises

## V – SEMESTER\*

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	ACE301	Concrete Structures	3	0	0	3	50	50	100	3
2	AAR301	Architectural Acoustics	3	0	0	3	50	50	100	3
3	AAR303	Mechanical & Electrical Services	3	0	0	3	50	50	100	3
4	AAR305	History of Eastern Architecture - II	3	0	0	3	50	50	100	3
5	AAR307	Site Planning & Landscape Design	3	0	0	3	50	50	100	3
6	AAR309	Architectural Design – III	0	9	0	6	200	200	400	15
7	AAR311	Building Construction - IV	0	6	0	4	50	50	100	5
8	EOExxx	<b>Open Elective-II</b>	3	0	0	3	50	50	100	3
	EOE206	Introduction to Music								
	EOE317	Personality Development								
<b>Total</b>			<b>18</b>	<b>15</b>	<b>0</b>	<b>28</b>	<b>550</b>	<b>550</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>33</b>							

### NOTE:

\*Study tour of minimum two weeks duration is to be arranged to places of Architectural interests in India or abroad. Two staff members shall be deputed for this tour.

\*\* AAR309 Architectural Design-III, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with one external member.

\*\*\* Examination will be conducted for THREE days each of 5 Hrs. duration; the first & second days work of the students shall be retained in the sealed examination hall.

## V - SEMESTER

ACE 301

CONCRETE STRUCTURES

Credits: 3

### Course Objectives:

- To study the stress strain behavior of steel and concrete
- To understand the concept of working stress and limit state methods
- To gain the knowledge of limit state design for flexure, shear, torsion, bond and anchorage
- To understand the behavior of slabs when subjected to transverse loads.
- To understand the behavior of columns subjected to eccentric load and the design of isolated foundation.

### UNIT 1

Loading standards as per IS 875, grades of steel and concrete, introduction to working stress, ultimate load and limit state methods.

**Working stress method:** Assumptions, flexure of RCC beams of rectangular section, under reinforced, balanced and over-reinforced sections, analysis and design of singly reinforced beams of rectangular sections using working stress method.

### UNIT 2

**Limit State Method:** RCC beams of rectangular sections under flexure, under reinforced, balanced and over-reinforced sections, analysis and design of singly and doubly reinforced beams of rectangular sections.

### UNIT 3

**Shear and Bond:** Limit state of collapse in shear, types of shear failures, calculation of shear stress, types of shear reinforcement, design for shear in beams.

### UNIT 4

**Slabs:** Classification of slabs, design of one way simply supported slab, analysis and design of two way slabs using IS code method.

### UNIT 5

**Columns:** Short columns, minimum eccentricity, column under axial compression, analysis and design of axial columns.

**Footings:** Introduction of Isolated Square Footings

**Course Outcomes:**

Student will be able to

- Acquire knowledge on different design philosophies & design the RCC rectangular beam using Working Stress Method (WSM).
- Design the RCC rectangular beam using Limit State Method (LSM).
- Design for shear & learn concept of bond, development length & anchorage
- Design one-way and two-way slab design.
- Design the short column & isolated square footings.

**Text Book(s)**

1. Pillai and Menon, Reinforced Concrete Design, 3/e, Tata McGraw Hill, 2009.
2. N. Subramanian, Design of Reinforced Concrete Structures, Oxford University, 2014.

**References**

1. P.C. Varghese, Limit State Design of Reinforced Concrete, 2/e, Prentice Hall of India, 2013
2. A.K. Jain, Reinforced Concrete – Limit State Design, 7/e Standard book house, 2012.

**List of IS Codes**

1. IS 456:2000: Plain and Reinforced concrete code of practice
2. SP-16: For Design of Columns only



**Course Objectives:**

- To give an introduction about architectural acoustics and effects of sound on humans.
- To understand acoustics and acoustical environment with behaviour of sound in an enclosed space.
- To give an introduction of electro-acoustical systems and its use in enclosed and open areas.
- To understand propagation of sound in free field areas.
- To understand types of noise sources and design principles for reduction of noise.
- To expose the student to the implication of acoustical materials in indoor and outdoor areas.
- To make students able to design efficient enclosed and outdoor space for music and speech.

**UNIT 1****Sound Engineering**

Introduction to architectural acoustics - Characteristic and measurement of sound, frequency, intensity, decibel scale, auditory range, effects of sound on humans, loudness.

**Room Acoustics**

Acoustics and acoustical environment. Behavior of sound in an enclosed space. Principles of geometrical acoustics, reverberation and reverberation time calculations – Sabine's formula and its interpretation, dead and live rooms.

**UNIT 2****Design of Auditorium**

Size, shape, sitting arrangement design criteria for speech and music, acoustical defects in an auditorium, sound foci and dead spots, acoustical correction design and modification techniques.

**Open air Acoustics**

Free field propagation of sound, absorption from air and natural elements, effect of barriers, effect of landscape elements, thermal and wind gradient. Design of open-air theatre and planning of building. Reduction of noise by screening.

**UNIT 3****Electro-acoustics**

Introduction of Electro-acoustical systems, Unidirectional and Stereophonic sound system, Digital and Surround-sound systems, Design criteria for Theatres, Motion picture halls, Multiplexes, Home Theatre System, Conference Room.

## UNIT 4

### Environmental Noise Control

Noise sources, air borne and structure borne sound, NC curve, Propagation of noise of mechanical operation and impact noise, sound transmission through wall and partition, Vibration isolation – control of mechanical noise, floating floor, wall, ceiling treatment.

Design Principles- reduction of noise at the source, Reduction of noise near the source. Application of sound absorption material, Reduction of noise by Town Planning and Regional Planning consideration.

## UNIT 5

### Acoustical Material

General description of acoustical materials - acoustical tiles, fibreboard, resonator absorption unit absorber, carpets, acoustical plaster, resilient packing composite materials, etc. – Their use, selection criteria and construction.

### Course Outcomes:

- The students are exposed to fundamentals of acoustics and its applications in buildings including code requirements.

### Reference

1. A. B. Wood; A Text book of sound.
2. T. M. Yarwood; Acoustics.
3. Duncan Templeton; Acoustics in The Built Environment.
4. J E Moore; Design for good Acoustics and noise control.
5. K.A. Siraskar; Acoustics in Building Design.

## AAR 303 MECHANICAL AND ELECTRICAL SERVICES

**Credits: 3**

### Course Objectives:

- To introduce the basics of electricity and wiring systems within domestic and commercial buildings.
- To introduce the fundamentals of lighting and lighting design.
- To explain the fundamentals of ventilation & various air- conditioning systems .
- To introduce the basics of thermal insulation & types of materials.
- To explain the various means of vertical transportation system and their functioning.

## UNIT 1

### Electrical Services:

**Electrical systems**-Basics of electricity- single/three phase supply-protective devices in electrical installations-Earthing for safety-Types of earthing-Types of wires, wiring systems &

their choice -Planning electrical layout for a building-Main and distribution boards. Layout of substation.

## **UNIT 2**

### **Lighting & Illumination:**

**Lighting:** Classification of lighting, artificial light sources, Spectral energy distribution, luminous efficacy, Design of modern lighting- Lighting for stores, schools, hospitals and house lighting, Permanent Supplementary Artificial Lighting of Interiors (PSALI), Energy Efficient Lighting Systems as per ECBC recommendations.

**Illumination:** Principles of illumination- visual tasks- Factors affecting visual tasks-Luminous flux, Candela, solid angle illumination-utilization factor-depreciation factor-Laws of illumination.

## **UNIT 3**

### **Ventilation:**

Definition and necessity, Requirements of air changes for different building occupancies, Functional requirements of Ventilation systems, Systems of Ventilation, Mechanical/Artificial Ventilation.

## **UNIT 4**

### **Air-Conditioning and Thermal Insulation:**

Thermal insulating materials and their coefficient of thermal conductivity, general methods of thermal insulation: Thermal insulation of roofs, exposed walls. Thermal insulation materials as per ECBC Recommendations

Principles of air conditioning, air cooling, different systems of ducting and distribution, essentials of air-conditioning system.

## **UNIT 5**

### **Vertical transportation:**

Building design and vertical transportation, Demand for vertical transportation

- Lift and Escalators types, uses, functioning, automatic control system.
- Plans & sections to explain different parts of lifts and escalators.
- Planning for vertical transportation, industry standards and capacity calculations.

**Exercise:** Preparation of electrical layout of a simple residential building.

### **Space requirements for Various Electrical and mechanical Services**

- Substation & DG Sets
- Air Conditioning
- Fire fighting and water Supply Pump
- Telephone & Internet
- Shafts & Various Ducts

### **Course Outcomes:**

- The students understand the basics of Electricity and wiring system.
- The students understand Fundamentals of Lighting and Lighting design.
- The students understand various types of ventilation systems.
- The students understand various air conditioning systems and their applications.
- The students understand various types of thermal insulation.
- An understanding of vertical transportation system in a building.

### **Reference:**

1. Derek Philips; Lighting in Architectural Design.
2. G.K.Lal, Elements of Lighting, 3-D Publishers.
3. R.G. Hopkinson and J.D.Kay, The lighting of buildings, Faber and Faber, London, 1969.
4. Philips Lighting in Architectural Design, McGraw Hill, New York, 1964.
5. I.E.S. Handbook.
6. International Lighting Review – Quarterly Journal.
7. E.R. Ambrose, Heat Pumps and Electric Heating, John Wiley and Sons Inc, New York, 1968.
8. Handbook for Building Engineers in Metric Systems, NBC, New Delhi, 1968

## **AAR 305 HISTORY OF EASTERN ARCHITECTURE - II**

**Credits: 3**

### **Course Objectives:**

- The course provides an orientation on influence of Islamic art and architectural style in India with respect to socio-cultural factors, construction technology and methods, material application etc.
- The course provides an orientation of synthesis of Indo-Islamic architectural form with respect to the traditional anchorage, cultural juxtaposition, diversity etc

### **UNIT 1**

#### **Introduction – Rise of Indo-Islamic Architecture**

- Special features of Mosque
- Special features of Tomb
- Influences of Indo-Islamic Architecture in India

- Use of arches, vaults, domes, squinches, pendentives, jaalis, minarets, etc.
- Special features – use of landscape, water bodies and gardens.

## **UNIT 2**

### **Sultanate Architecture**

- Slave Dynasty
- Tughlaq Dynasty
- Lodhi Dynasty

## **UNIT 3**

### **Provincial Styles of Sultanate Period**

- Punjab, Bengal, Jaunpur, Gujarat, Malwa, Bijapur and Golconda with examples

## **UNIT 4**

### **Mughal Style prevalent during the reign of**

- Babur
- Humayun
- Akbar
- Jahangir
- Shah Jahan

## **UNIT 5**

### **Nawabi Architecture of the Post Mughal Period,**

- Awadh (Lucknow)
- Hyderabad
- Punjab

Rajputana Architecture and Indo-Saracenic Architecture, revival of Indian architecture under British patronage.

### **Course Outcomes:**

- The course gives necessary understanding of parameters such as socio-cultural factors, work culture, aesthetic expressions, and design approach of Islamic architecture in India.
- The course provides the necessary information about various typical Islamic building elements which accords the strong inherent cultural fabric.

### **Reference:**

1. Asher Catherine, Architecture of Mughal India
2. Sterlin Henry, Architecture of World, India ( Islamic ), Germany ISBN– 38228-9658-6
3. Tadgell Christopher, The History of Architecture in India, London 1990

4. George Michell ;Architecture of the Islamic World — (its history and social meaning), Thames and Hudson, London, 1978.
5. Robert Hillenbrand,;Islamic Architecture, Form, Function and Meaning, Edinburgh University Press, 1994.
6. Brown Percy, Indian Architecture (Islamic Period) VolIII ;Taraporevala and Sons, Bombay, 198; and subsequent publications
7. G.H.R. Tillotson – The tradition of Indian Architecture Continuity, Controversy – Change since 1850, Oxford University Press, Delhi, 1989.

## **AAR 307 SITE PLANNING AND LANDSCAPE DESIGN**

**Credits: 3**

### **Course Objectives:**

- To acquaint the students with site planning process and site analysis.
- To provide students with an overview of the evolution and principle of various gardens around the world.
- Environmental regulation with trees and methods of landscaping for microclimate modification and resource conservation.
- Principles of planting design and plant selection criteria.
- To acquaint students with Hard and Soft Landscaping elements street furniture and indoor landscaping methods.

### **UNIT 1**

Site Planning Process: Need, Definition, scope and relationship in between site planning & landscape Architecture. Site Analysis, Analysis of all natural and man-made factors of site.

### **UNIT 2**

Evolution of Garden Design: A brief study of different garden types: Principles of Persian gardens, Mughal gardens, Spanish Gardens, Italian Gardens, French Gardens, English Gardens, Japanese gardens.

### **UNIT 3**

Visual and Function role of trees in Landscape design, Landscaping design for microclimate modification, Role of water in landscape design. Principles of Xeriscape, Landscaping for water conservation, Berms and landforms, Roadside plantation and planting for noise reduction.

### **UNIT 4**

Plant selection criteria, Plant characteristics: Structure, form and foliage of various trees and shrubs, climbers and groundcovers. Study and identification of tropical plants and trees through field studies.

## UNIT 5

Manmade Elements of Landscape: Hard and soft landscaping, street furniture, lighting fixtures, signage and sign boards, fences, paving materials, surface drainage, design of rock garden and terrace garden, Indoor landscaping.

Exercise: Landscape Design for any one of the Architectural Design problems.

### Course Outcomes:

- Students will get an understanding of the design principles of gardens in history.
- Students will be able to select appropriate plants for landscaping
- Apply various landscaping techniques for modifying the micro climate and conserve water and other natural resources.

### Reference:

1. Kevin Lynch ;Site planning ;MIT Press, Cambridge, MA – 1967
2. J. O. Simonds; Landscape Architecture; McGraw Hill.
3. J. E. Ingels; Landscaping – Principles and Practice.

## AAR 309 ARCHITECTURAL DESIGN - III

**Credits : 6**

### Course Objectives:

- To understand the importance of social and climatic aspects application on architectural design.
- To understand integration of basic building services.
- To gain an understanding of regional building by-laws and National Building Code of India

### The design issues to be addressed:

- Design theory and application in more complex problems covering functional relationship, climatic condition, social aspects along with structural considerations and **basic building services**.
- Design Programme prepared by the students should take into account relevant building bye-laws and provision of **National Building Code**.

The list of suggested topics to be covered as design problems:

### Main Design Problem

Commercial cum Residential complex, Exhibition Pavilion, Nursing Home etc.

**Design (Time) Problem (12 hrs.)**

Club house, Highway Restaurant, Tourist Information Centre etc.

**Viva voce**

Final Viva-voce on all the design assignments done in the semester.

**Note:** At least one major design exercise and one minor design/time problems should be given. The final submission shall necessarily include a model for at least one of the problems.

**Course Outcomes:**

- To conceptualize and coordinate designs, addressing socio-cultural, environmental and technological aspects of commercial and residential buildings.
- To conceptualize and coordinate designs addressing structural considerations and building services.
- To formulate the design according to regional bye laws and National Building Code.

**Reference:**

1. Time savers standards, Neufert's Architects data, National Building Code.
2. All books and journals on architecture.

**AAR 311 BUILDING CONSTRUCTION – IV****Credits: 4****Course Objectives:**

- To familiarize students about the various support systems for erection of a structure.
- To develop an understanding on the different forms of arches, domes, various geometrical forms of shell and plate structure.
- To familiarize students about the various types of suspended ceiling, wall cladding & large span structures.
- To introduce various types of joints, their materials and provision of these joints at various locations of the buildings and their methods of construction.

**UNIT 1****Formwork, Shoring, Underpinning, Scaffolding:**

Types of formwork, Formwork for various construction elements, Removal of formwork, Types of Shoring, Methods of underpinning, Types of Scaffolding.

**UNIT 2**

**Domes and Shells:** Various form of domes, various geometrical forms of shell and plate structures, construction detailing and methods of centering.



### UNIT 3

#### **Suspended Ceilings:**

Methods of suspended framing materials like – timber, pressed steel, aluminum, different covering materials – acoustical board, gypsum board, PVC tiles etc. special consideration of fire and acoustical insulation.

**Building Cladding:** Details of cladding of wall with stone, tiles, timber and steel framing.

### UNIT 4

**Large Span Structures:** Types and forms of roofing in steel and RCC, their applications to factories sheds, halls, Hangers, canopies, North light roofing in steel and RCC, Patent Glazing, Coffered Slab.

### UNIT 5

#### **Expansion and Construction Joints:**

Provision of joints in buildings, types of joints: expansion joints, isolation joints, contraction joints, sliding joints, construction joints, and floor joints; materials and methods for provision of these joints at various locations of the buildings.

#### **Course Outcomes:**

- The course provides necessary orientation about the basic understanding both in general and specific about the various types, materials, methods of construction, workmanship of the topics discussed.

#### **Text Books:**

1. S.C.Rangwala, Building Construction, Charotar Publishing House Pvt. Ltd, India, 2010.

#### **Reference:**

1. W.B. MacKay, 'Building Construction', Vol. 1,2,3longmans, U.K. 1981.
2. B. C. Punmia; Building Materials and Construction .Laxmi Publications Pvt Ltd, New Delhi,1993.
3. Bindra&Arora; Building Materials and Construction.

## EOE 206 INTRODUCTION TO MUSIC

**Credits: 3**

#### **Course Objectives:**

The objectives of this course are:

- to introduce learners to the basic elements of music
- to expose learners to forms of Indian Classical Music- Hindustani and Carnatic
- to help learners develop a sense of appreciation for various compositional forms
- to improve learners' ability in technical aspects of music

- to enable learners understand the relationship between music, culture and society

## UNIT 1

**Introduction to Indian Classical Music:** Heritage-Contribution of various races and tribes to the evolution of music in India, technical aspects of Indian classical music, influences Persian music especially on hindustani music, significance of music in bringing about social change.

## UNIT 2

**History of Indian Music:** Origin-Vedas, scriptures and Bharata's Natyasastra, traditions-hindustani and Carnatic, basic elements, shruthi, swara, raaga and taala, similarities and variations in hindustani, Carnatic and western classical music, octave, semitones, introduction to shruthi, swara, raaga and taala, fundamental ragas, importance of taala in Indian music, introduction to pallavi, anupallavi and charana.

## UNIT 3

**Hindustani Music:** Brief history of hindustani music, concepts of raaga and taala, introduction to various gharanas, classification of music (folk, semi-classical, bhajans, light), appreciation of music.

## UNIT 4

**Carnatic Music:** History of Carnatic music, traditions, the musical trinity, Tyagaraja, Thyagaraja, Muthuswami Dikshitar, introduction to technical terms in Carnatic music, compositional forms/strategies.

## UNIT 5

**Connections-Music, Art and Culture:** Musical oral tradition as a transmitter of culture, music as an expression of societal change, music as a means of communication across cultures.

### Course Outcomes:

At the end of the course, the student will be able to

- understand the basic components and elements of music
- identify important gharanas in Hindustani music and traditions in Carnatic music
- develop an ability to distinguish the nuances of compositional forms in Hindustani and Carnatic music
- understand the technical terms in music
- identify the relationship between arts and culture and how music becomes a means of communication across cultures

**Reference:**

1. Rangaramanuja Iyengar R., History of South Indian Carnatic Music: From Vedic Times To The Present, Wilco Publishing House, 1972.
2. Beni Madhab Barua, Swami Prajnanananda, The Historical Development of Indian Music: A Critical Study, Buddh Gaya, India, 1973.
3. G.H. Ranade, Hindustani Music, Popular Prakashan, 1971.

**EOE 317      PERSONALITY DEVELOPMENT****Credits: 3****Course Objectives:**

The objectives of this course are:

- to sensitize a student on the importance of self awareness.
- to train the students in self discipline.
- to help build confidence among them through self motivation.
- to impart the skills of managing one's own self in diverse environments.
- to aid them in developing interpersonal skills for a better career and life.

**UNIT 1**

**Self Awareness:** Know yourself, have a snapshot of yourself, assess your personal traits, discover natural potential. Activities and Tasks: Class discussion, questionnaires, Johari Window, SWOC analysis (strengths, weaknesses, opportunities and challenges).

**UNIT 2**

**Self Discipline:** Importance of self discipline, characteristics of a self-disciplined achiever, self discipline in personal life and career. Activities and Tasks: Viewing short videos followed by discussion and analysis, brainstorming in small groups, creating an action plan to realize academic and career goals.

**UNIT 3**

**Motivating Oneself:** Self motivation, confidence building, goal setting, decision making. Activities and Tasks: Discussion and analysis of case studies, completing self-assessment questionnaires.

**UNIT 4**

**Managing Oneself:** Handling emotions, time management, stress management, change management. Activities and Tasks: Discussion and analysis of case studies, completing self-assessment questionnaires.

**UNIT 5**

**Interpersonal Behavior:** Attitude towards persons and situations, teamwork, leadership skills,

problem solving skills, interpersonal adaptability, cultural adaptability. Activities and Tasks: Team-building games and activities.

**Course Outcomes:**

At the end of the course, the student will be able to

- understand one's own self to face challenges of life.
- practice self discipline in order to realize the set goals.
- develop self confidence through concerted efforts.
- realise and value the importance of managing time; and handling emotions in different situations.
- build interpersonal and adaptability skills for a contented life.

**Reference:**

1. Hurlock Elizabeth B., Personality Development, McGraw Hill Education, India, 1979.
2. Covey, Stephen R., The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change, Free Press, 2004.
3. Carnegie, Dale, Levine, Stuart. R., The Leader In You: How to Win Friends, Influence People and Succeed in a Changing World, Pocket Books, 1995.
4. Swami Vivekananda, Personality Development, Advaita Ashrama, 1993.

## VI – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	ACE302	Steel Structures	3	0	0	3	50	50	100	3
2	AAR302	Estimating, Costing & Specifications	3	0	0	3	50	50	100	3
3	AAR304	Building Economics and Sociology	3	0	0	3	50	50	100	3
4	AAR306	Contemporary Architecture	3	0	0	3	50	50	100	3
5	AAR308	Housing	3	0	0	3	50	50	100	3
6	AAR310	Architectural Design – IV	0	9	0	6	200	200	400	15
7	AAR322	Working Drawings - I	0	0	6	4	100	-	100	Viva
8	AARxxx	<b>Program Elective-I</b>								
	AAR342	Barrier Free Architecture	3	0	0	3	50	50	100	3
	AAR344	Vernacular Architecture								
<b>Total</b>			<b>18</b>	<b>9</b>	<b>6</b>	<b>28</b>	<b>600</b>	<b>500</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>33</b>							

### NOTE:

\* AAR310 Architectural Design-IV, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with one external member.

\*\* Examination will be conducted for THREE days each of 5 Hrs. duration; the first- & second-days' work of the students shall be retained in the sealed examination hall.

\*\*\* AAR322 Working Drawings - I, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with one external member.

## **VI - SEMESTER**

**ACE 302**

**STEEL STRUCTURES**

**Credits: 3**

### **Course Objectives:**

- To learn IS 800-2007 code of practice for the design of Compression, Tension and Flexural members using various cross-sections
- To study the design of bolted and welded connections and arranging field visit to industries
- To study the behaviour and design of compression and tension members using simple and built-up sections
- To understand behaviour of flexural members and the design laterally restrained beams

### **UNIT 1**

**General:** Fundamental concepts of design of structures, different types of rolled steel sections available to be used in steel structures, stress strain relationship for steel.

**Bolted connections:** Failure of a joint, Strength and efficiency of a joint, Lap Joint, Butt joint.

### **UNIT 2**

**Welded Connections:** Types of welds, stresses in welds, Design of welded joints subjected to axial load.

### **UNIT 3**

**Tension Members:** Allowable stress in axial tension, net effective sectional area for angle and Tee sections, Design of tension members.

### **UNIT 4**

**Compression Members:** Effective length, radius of gyration and slenderness of compression members, Allowable stresses in compression, Design of axially loaded compression members.

### **UNIT 5**

**Beams:** Allowable stresses in bending, shear and bearing, Effective length of compression flange, laterally supported beams.

\* All the designs confirming to latest revised code of IS-800 (2007).

### **Course Outcomes:**

At the end of the course, the student will be able to

- Understand fundamentals concepts of steel structures and Design of bolted connection

- Design of welded connection.
- Design of tension members.
- Design of compression members.
- Design of beam members.

### **Recommended books:**

1. S.K. Duggal, Limit state of steel structures, 2/e, Tata McGraw Hill, 2014.
2. N. Subramanyam, Design of Steel Structures, 1/e, Oxford University Press, 2014

### **References:**

1. V.L. Shah and Veena Gore, Limit State Design of steel structures IS: 800-2007, Structures Publications, 2012.
2. M.L. Gambhir, Fundamentals of Structural Steel Design, McGraw Hill Education, 2013.
3. R. Narayanan, Teaching Resource on Structural Steel Design, INSDAG, Ministry of Steel Publications, 2002.
4. Ramachandra and V. Gehlot, Design of Steel Structures, Scientific Publishers, 2009

## **AAR 302 ESTIMATING, COSTING AND SPECIFICATIONS**

**Credits: 3**

### **Course Objectives:**

- Importance of estimation, type of estimates, mode of measurements, etc.
- To prepare different methods of approximate estimation.
- To prepare different methods of detailed estimation and write the bill of quantities.
- To calculate the exact quantities of items of civil works in different methods.
- Study of local SR rates, market rates.
- Rate analysis of building items as per current schedule of rate (CRS) of local PWD.
- To have thorough idea of specifications for different items. Different types of tenders.

### **UNIT 1**

#### **Introduction to Estimation & Costing For Building**

1. Definition of “Building estimate”
2. Purpose of Estimating.
3. Different Types of Estimate.

#### **Approximate Estimate**

1. Importance & purpose of Approximate / Rough estimation
2. Different methods of approximate estimate

## **UNIT 2**

### **Detailed Estimate**

1. Preparation of Detailed estimate.
2. Function of “Measurement form” & “Abstract of estimate form”.
3. Description & significance of Item in BOQ.

## **UNIT 3**

### **Methods of Measurement of Works**

1. Different methods estimating building works.
2. Estimation of a simple building at different stages:
  - Foundation up to plinth
  - Superstructure
  - Finishing works
3. Reinforcement Quantities for RCC Works.  
Calculation of quantity for Reinforced concrete(RC) for:  
Column, Lintel, Slab & Beam.

## **UNIT 4**

### **Analysis of Rate & Quantity of Materials**

1. Purpose of Rate analysis.
2. Quantity of Materials.
3. Different components of rate

## **UNIT 5**

### **General Specifications& Types of Contract**

1. General idea of specifications of composite works in a building.
2. Specifications of various building work as per NBC and ECBC.
3. Types of Tender / contract and their reflection in BOQ.
4. Writing Items for BOQ for Item rate contract.

### **Course Outcomes:**

- Techniques of estimating, costing and writing specifications related to building construction.

### **Reference:**

1. M. Chakraborty; *Estimating, Costing, Specification & Valuation*.
2. B.N. Dutta; *Estimating & Costing*.
3. P. N. Khanna. *Handbook of Civil Engineering*.



**Course Objectives:**

- Introducing fundamentals of micro and macro economics, their effect on national development.
- To sensitize various economic aspects and financing related to large-scale, social projects.
- To study sociological concepts, social structure, and character of life in urban and rural India.
- To understand decision-making processes in the society and their impact on social change.

**ECONOMICS****UNIT 1**

**Micro Economics:** The market, budget constraint, choice, demand and supply, concept of demand factors for building, uncertainties, equilibrium, technological constraints, profit maximization and cost minimization, monopoly and oligopoly, production welfare and public good.

**Macro Economics:** Gross Domestic Product (GDP), Gross National Product (GNP), Net National Product (NNP), demand and supply, inflation, interest rate, employment, saving and investment, monetary and fiscal systems and policies.

**UNIT 2**

General discussions on various economic issues such as public versus private participation, equity, labour intensive versus capital intensive projects.

General economics of the basic inputs into building construction- land, labour, capital and materials. Financing for projects, sources costs and utility in financing. Agencies and institutions directly and indirectly influencing economic aspects of project.

**SOCIOLOGY****UNIT 3**

Definition, scope and use of sociology. Relation between sociology and architecture and its application.

Basic concepts of sociology: society, groups, community, association, institution, culture, civilization and personality in terms of their characteristics and types.

## **UNIT 4**

Social structure of India: Caste and class, family and marriage, their characteristics.

Rural and Urban societies – their characteristics, features and problems like crime, slum and poverty.

## **UNIT 5**

Social change: Biological, technological and cultural factors of social change.

Social aspects of housing and neighbourhood in the context of changing society and growing population.

Structure of decision making processes related to community projects.

### **Course Outcomes:**

- Clarity about various aspects of society and their effect on economic development of the nation.
- Deeper understanding about the sociological aspects of a society on architecture of that place.
- To develop adaptability to identify the changing needs of the society with time and context.

### **Reference:**

1. Amos Rapoport, House Form and Culture
2. Wallis, Wilson D and Willey, M.M, Textbook of Sociology, 1st ed., KhelSahitaya Kendra, New Delhi, 2001.
3. Charon, Joel M. The Meaning of Sociology, 6th ed., Prentice Hall, New Jersey, 1999.
4. Thio, Alex. Sociology: a brief introduction, 4th ed. Allyn and Bacon, Boston, 2000.
5. Schaefer, Richard T. Sociology: a brief introduction, 4th ed. McGraw Hill, Boston, 2002.
6. Bilton, Tony and Oth. Introductory Sociology, 3rd ed. Palgrave, New York, 1997.
7. Stone, P.A. Building Economy: Design Production and Organisation a synoptic view, 2nd ed., Pergamon Press, Oxford, 1976.
8. Koutsoyiannis, A. Modern Microeconomics, 2nd ed., ELBS with MacMillan Press, 1994.
9. Nobbs, Jack and Hopkins, Ian. Economics: a core text, 4th ed. McGraw-Hill, London, 1995.
10. Teck, HoonHian and Oth. Economics: theory and applications, McGraw-Hill, Taiwan, 1998.
11. Dewett, K.K. Modern Economic Theory, ShyamLal Charitable trust, New Delhi, 2005.

**Course Objectives:**

- To gain an understanding of significant developments in Modern Architecture.
- To provide an introduction to various architectural philosophies and works of contemporary architects in India and abroad.

**UNIT 1****Introduction, Advent of Steel , Glass and Ferro-concrete**

- Advent of Steel: James Bogardus, Henry Labrouste
- Great Exhibitions and their contributions
- Gustave Eiffel
- Development of Ferro concrete: Auguste Perret, Tony Garnier

**UNIT 2****Development of ‘New Art & Architecture’**

- Art Nouveau movement: Victor Horta, Otto Wagner, Antonio Gaudi
- H.P. Berlage, H. H. Richardson and ‘True Construction’
- Balloon Frame Structure and Plane Surfaces in America

**Chicago School & Organic Developments**

- Chicago School: Louis Sullivan
- Organic Architecture: Frank Lloyd Wright

**UNIT 3****Functionalism in Architecture**

- Walter Gropius and Bauhaus
- Le Corbusier

**Development of International Style**

- Mies van der Rohe
- Philip Johnson
- Louis I Kahn

**UNIT 4****20th Century World Architecture**

- Works of some master architects like, Eero Saarinen, Alvar Aalto, Oscar Niemeyer, Richard Neutra, Norman Foster, Frank O. Gehry, I. M. Pei, Kenzo Tange.

**UNIT 5****Indian Architecture since Independence**

- B. V. Doshi
- Charles Correa
- Raj Rewal

- A. P. Kanvinde
- Laurie Baker
- Iconic Buildings in India

### **Course Outcomes:**

By the end of the course, student should have learnt about:

- Significance of building materials in architectural design.
- Contemporary philosophies and schools of thought in architecture and works of related Architects.

### **Reference:**

1. Sigfried Giedion ;Space, time and Architecture.
2. Vincent Scully Jr; Modern Architecture.
3. Vikram Bhatt and Peter Sciver; After the masters (Contemporary Architecture of India).
4. Kenneth Frampton; Modern Architecture.
5. Library of Contemporary Architects.

## **AAR 308      HOUSING**

**Credits: 3**

### **Course Objectives:**

- Develop orientation to understand scenario of housing sector and affordable housing in India.
- Inculcate the ability to understand contemporary issues regarding housing demand and supply in India acquainted with various socio-economic groups.
- Introduction to various housing policies in India as well other countries.
- Introduction to relevant housing standards and methodology adopted in preparation of housing layouts.

### **UNIT 1**

**Housing need & Demand** - Review of different forms of housing globally, Housing Density, Calculation of future need. Housing resources and options available in housing.

### **UNIT 2**

**Housing Agencies and Policies:** Housing Agencies and their contributions to housing development - HUDCO, State Housing Boards, Housing Co-operatives and Banks. Housing Policies in India and other countries like UK & USA.

### **UNIT 3**

**Socio Economic Aspects:** Social factors influencing Housing Design, affordability, economic factors and housing concepts - Slum upgradation, and sites and services schemes, Public Private Partnerships related to Housing.

## UNIT 4

**Housing standards:** Different types of Housing standards - Methodology of formulating standards - Relevance of standards in Housing Development.

## UNIT 5

**Housing design process:** Different stages in project development - Layout design including utilities and common facilities - Housing design as a result of environmental aspects, development of technology and community interests.

Case studies of Public Sector housing, Government housing, Private and Co-operative housing - their advantages and disadvantages.

Project Report and Appraisal.

### Course Outcomes:

- The course enhances the analytical inclination towards various socio-economic-cultural concerns affecting housing sector.
- The course builds competence to understand and address various contemporary challenges in built environment.

### Reference:

1. Babur Mumtaz and Patweikly, Urban Housing Strategies, Pitman Publishing, London, 1976
2. Geoffrey K. Payne, Low Income Housing in the Development World, John Wiley and Sons, Chichester, 1984
3. John F. C. Turner, Housing by people, Marison Boyars, London, 1976
4. Martin Evans, Housing, Climate and comfort, Architectural Press, London, 1980
5. Forbes Davidson and Geoff Payne, Urban Projects Manual, Liverpool University Press, Liverpool, 1983.
6. Beareu of Public Enterprises.

## AAR 310 ARCHITECTURAL DESIGN - IV

**Credits: 6**

### Course Objectives:

- To understand the importance of functional relationships of spaces and influence of social and climatic aspects on architectural design.
- To understand various building services required for modern buildings.
- Introduction to Barrier free aspects of building design.

### The design issues to be addressed:

- Design theory and application in the problems covering functional relationship, climatic condition and social aspects. along with structural considerations.
- Design should include the aspects of barrier free.

- Design Programme prepared by the students should take into account relevant building bye-laws and provision of National Building Code.
- The project should also include all types of building services required for modern buildings.
- Incorporation of structural elements and their details in design.

The list of suggested topics to be covered as design problems:

### **Main Design Problem**

Sports Complex, Holiday resort, Auditorium(1000 Capacity), Three star Hotel, Bus Terminal

### **Minor Design (Time) Problem (12 hrs.)**

Skill Development Center, Museum, SOS village

### **Viva voce**

Final Viva-vice on all the design assignments done in the semester

Note: At least one major design exercise and one minor design/time problems should be given. The final submission shall necessarily include a model for at least one of the problems.

### **Course Outcomes:**

- Students will demonstrate through design their understanding of site context, climate responsiveness, building services, applicable codes, structural detailing and barrier free aspects.

### **Reference:**

All books and journals on architecture.

## **AAR322 WORKING DRAWINGS - I**

**Credits: 4**

### **Course Objectives:**

- To enable students to understand the basics in working drawings, study of process and symbols, labelling and dimensioning of working drawings.
- To enable students to understand and appreciate the challenges in construction detailing and to train them in the aspects of detailing buildings with allied requirements namely structure, building services, Furniture, Fittings & Equipment along with the installation methods.

**Prerequisites:** Sessionals, Architectural Detailing

**Mode of Drawings: Manual and Mechanical.**

- Layout plan of the whole building and excavation plan of one building
- Foundation plan
- Floor plans along with schedule of internal finishes
- Terrace / roof plan including roof drainage
- All 4 side elevation with labelling
- Minimum 2 sections including one through staircase.
- Door, window and hardware schedule.
- Municipal Submission Drawings.

**Course Outcomes:**

- An understanding of the principles of design detailing as applicable to various situations.
- The students are also exposed to various materials, furniture's, fittings and the equipments that are needed in buildings.
- The students are also exposed to integration of Structure and Services components and to deal with the project as a whole rather than just its parts.

**AAR342      BARRIER FREE ARCHITECTURE****Credits: 3****Course Objectives:**

- Develop orientation to understand types of disabilities, barriers, mobility devices and Principles of Universal design.
- Introduction to the fundamentals of construction and maintenance standards, classification of buildings and access controls for barrier free environment.
- Understanding of design elements within buildings, entrance, exit, approach to plinth, corridors, toilets, staircase, lifts, flooring materials, etc to create Universal accessibility.
- Understanding of design elements outside buildings, site, parking, entrance, kerb, road crossings, public toilets, signage's etc to create universal accessibility.
- An insight into modern building bye-laws in making Built environment Barrier Free and Accessible to all.

**UNIT 1**

Types of disability, mobility devices and controls.

**UNIT 2**

Construction and maintenance standards, classification of buildings and access provisions. Provisions in residential building, auditorium, parks, restaurants, railway station. Modern building bye-laws.

### **UNIT 3**

Design elements within buildings, site planning, parking, approach to plinth levels, corridors, entrance and exit, windows, stairways, lifts, toilets, signage, guiding and warning systems, floor materials.

### **UNIT 4**

Design elements outside the building – kerb at footpath, road crossing, public toilet, bus stop, toilet booth, and signage.

### **UNIT5**

Accessibility audit & its importance. Conducting accessibility audit at building, site and neighborhood level.

#### **Course Outcomes:**

- The course gives a direction to a well-designed environment which is safe, convenient, comfortable, and readily accessible which benefits everyone.
- It inculcates accessibility programs that include good facility design and broad-spectrum approaches that avoid stigmatizing or discriminating against persons with disabilities.
- The general goal of the course is to overcome, as much as possible, the disability's effects and to enable the disabled to participate in all areas, so as to ensure the specific environment created are suitable for all categories of people.
- The course also strengthens the fact that BARRIER FREE DESIGN or UNIVERSAL DESIGN or DESIGN FOR ALL, can be achieved without economic burden.

#### **References:**

1. Building without barriers for the disabled, Harkness, Sarh P/690.554 HAR/B
2. Disability and rehabilitation Handbook/ Goldenson, RM/362.2002 DIS/M

## **AAR344      VERNACULAR ARCHITECTURE**

**Credit: 3**

#### **Course Objectives:**

- Introduction to vernacular Architecture, its evolution, process, methodology and overview to cultural and contextual responsiveness of vernacular architecture.
- An understanding into climate responsive vernacular architecture.
- An insight into planning and construction aspects in vernacular settlements.
- An overview of vernacular architecture in various regions of the world and India.



## UNIT 1

**Introduction to Vernacular architecture:** Evolution of traditional shelter forms, Vernacular architecture as a process – Survey and study of vernacular architecture: methodology- Cultural and contextual responsiveness of vernacular architecture: an overview

## UNIT 2

**Climate responsive Vernacular architecture:** Traditional examples from hot and dry climates, cold climates, warm and humid climates and composite climates. Examples like the Igloo, Taos and Acoma Pueblo buildings. Sustainability in Vernacular Architecture.

## UNIT 3

**Planning and Construction Aspects:** Influence of Spatial planning in vernacular settlements, cultural aspects, symbolism, colour, art, materials of construction and techniques of construction in vernacular buildings.

## UNIT 4

**Vernacular architecture in various regions of the world:** underground dwellings in China and Troglodyte buildings and earth sheltered building. Proportioning systems such as Ken in Japanese Vernacular Architecture Significance of religion in the shaping of vernacular settlements and buildings. Role of Vastu shastra and FengShui.

## UNIT 5

**Vernacular architecture India:** Western influence on vernacular architecture in India, Colonial influence on traditional houses Goa and the evolution of traditional bungalows. Vernacular settlement patterns of homogenous communities such as fishing settlements etc. Examples of vernacular architecture from different states in India.

### Course Outcomes:

- This course explores examples of building types for the purpose of identifying and analyzing geographic patterns of world folk architecture
- The course is meant to introduce students to vernacular architecture and the skills needed to analyze individual sites.
- It inculcates within Students to define and use the basic vocabulary of vernacular architecture studies.
- The student is expected to master the skills of visual literacy: how to think critically, to analyze creatively, and to write clearly about the vernacular built environment

### Reference:

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, 1987.
4. V.S. Pramar, Haveli – Wooden Houses and Mansions of Gujarat, Mapin Publishing Pvt. Ltd., Ahmedabad, 1989.
5. Kulbushanshan Jain and Minakshi Jain – Mud Architecture of the Indian Desert, AadiCentre, Ahmedabad 1992.63

6. G.H.R. Tillotsum – The tradition of Indian Architecture Continuity, Controversy – Change since 1850, oxford University Press, Delhi, 1989.
7. Carmen Kagal, VISTARA – The Architecture of India, Pub: The Festival of India, 1986.
8. S. Muthiah and others: The Chettiar Heritage; Chettiar Heritage 2000
9. Architecture without Architects: A Short Introduction to Non-Pedigreed Architecture by Bernard Rudofsky, University of New Mexico Press; Reprint edition (15 July 1987).

## VII – SEMESTER\*

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AAR401	Advanced Structural Systems	3	0	0	3	50	50	100	3
2	AAR403	Advanced Services	3	0	0	3	50	50	100	3
3	AAR405	Building Construction Management	3	0	0	3	50	50	100	3
4	AAR407	Architectural Design – V	0	9	0	6	200	200	400	20***
5	AAR409	Introduction to Human Settlements & Town Planning	4	0	0	4	50	50	100	3
6	AAR421	Working Drawings - II	0	0	6	4	100	-	100	Viva
7	AARxxx	<b>Program Elective-II</b>	3	0	0	3	50	50	100	3
	AAR 441	Introduction to Architectural Conservation								
	AAR 443	Interior Design								
	AAR 445	Sustainable Architecture								
<b>Total</b>			<b>16</b>	<b>9</b>	<b>6</b>	<b>26</b>	<b>550</b>	<b>450</b>	<b>1000</b>	
<b>Total Hrs. per week</b>			<b>31</b>							

### NOTE:

\*Study tour of minimum two weeks duration is to be arranged to places of Architectural interests in India or abroad. Two staff members shall be deputed for this tour.

\*\* AAR407 Architectural Design-V, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with one external member.

\*\*\* Examination will be conducted for FOUR days each of 5 Hrs. duration; the first, second- & third-days' work of the students shall be retained in the sealed examination hall.

\*\*\*\* AAR421 Working Drawings - II, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with one external member.

## **VII - SEMESTER**

**AAR 401**

**ADVANCED STRUCTURAL SYSTEMS**

**Credits: 3**

### **Course Objectives:**

- To introduce various structural forms suitable for architectural expression.
- To impart knowledge on the simple structural systems used in regular construction of buildings and their structural behavior.
- To explain the action of structural elements with singly and doubly curved structures.
- To introduce recent structural developments suitable for architectural built environment.
- To create awareness on combination of different types of structural elements as forms of architectural built environment.

### **UNIT 1**

Structure and Form, Classification of structural forms, Equilibrium under simple tension or compression. Relation between structure and architecture, Geometry of form and structural function, Aesthetic theories of the expression of structural function in architectural form.

### **UNIT 2**

Beams and Slabs, Portal Frames-Plane, Space Frames/Trusses (only structural action of the element, BMD and SFD calculations not included), single- and double-layer grids, Braced and folded grid structures.

### **UNIT 3**

Arches and catenaries; vaults, domes - braced domes, ribbed domes, Network domes, Lamella domes, Geodesic domes (only structural action of the element, BMD and SFD calculations not included).

### **UNIT 4**

Folded plates, shells, cycloidal shells, the domical shell, Hyperbolic paraboloids, free forms – balloon structures.

### **UNIT 5**

Curved membrane Structures, Singly curved suspended roofs, Combination of cables and struts, Fabric structures. One model submission.

### Course Outcomes:

- Students will be able to identify various structural forms suitable for architectural expression.
- Students will be able to understand about simple structural systems used in regular construction of buildings and their structural behavior.
- Student will be able to understand the action of structural elements with singly and doubly curved structures.
- Students will be familiar with recent structural developments suitable for architectural built environment.
- Students will be able to understand the combination of different types of structural elements as forms of architectural built environment.

### Reference:

1. Candela, Felix. Architecture and Structuralism. 1963.
2. Lane, Allen. Developments in Structural Form. Penguin Books Ltd, London, 1975.
3. Macdonald, J. Angus. Structure and Architecture, 2nd ed. Architectural Press, Oxford, 2003.
4. Michaels, Leonard. Contemporary Structures in Architecture. 1950.
5. Schall, Rolf. Curtain Walls: Design Manual. Reinhold Pub., New York, 1962.
6. Siegel, Curt. Structure and Form in Modern Architecture. Crosby Lockwood and son Ltd., London, 1962.
7. Subramanian, N. Principles of Space structures. Wheeler and Co., Allahabad, 1983.
8. Zannos, Alexander. Form and Structure in Architecture: The role of statical function. Van Nostrand
9. Reinhold Co., New York, 1987.

## AAR 403      ADVANCED SERVICES

**Credits: 3**

### Course Objectives:

- To introduce about fire safety systems & its design in buildings.
- To familiarize about various electronic systems for safety & communication in Buildings.
- To introduce design of swimming pools in built environment and its allied services.
- To familiarize about the specialty services required in various category of hospitality industry.
- To sensitize students with Environmental management issues in buildings.
- To Orient students on Special Services necessary in High rise Buildings.

### UNIT 1

**Fire Safety in buildings:** portable firefighting equipment, NBC standards, built in wet riser system, sprinkler system, fire hydrant, class of fire and occupancy, Fire safety design, planning for fire protection, Fire detection & fire fighting, Different firefighting methods to be adopted in buildings.

## UNIT 2

**Electronic Systems in Buildings:** Telephone and communication, networks in buildings EPABX, Security systems, Burglar alarms, video surveillance, access control, design of computer labs, access flooring, server rooms, DTH Internet and Television Network.

## UNIT 3

**Swimming Pools:** Pool tank design, patio, finishes, Water circulation, cascades, channels, filtration and water treatment, Water quality and disinfection, balancing tank.

**Hotel services:** Specialty services required for hospitality industry, Laundry services, Kitchen services, Channeled Music, Internet.

## UNIT 4

**Environmental services:** waste generation in buildings, various types of waste, solid, liquid, gas, treatment and disposal facilities, waste management in hospital buildings.

**Alternative energy sources for buildings:** hot water solar energy system, applications of photo voltaic cells, biomass digesters, wind energy.

## UNIT 5

**Special services in High rise buildings:** vertical transportation, plumbing and sanitary systems, Lightning arresters, Electrical distribution, Garbage Chutes, Cooking gas distribution in High-rise buildings.

### Course Outcomes:

- Students would be able to understand about fire safety systems & its design in buildings.
- Students would be familiar about various electronic systems for safety & communication in buildings.
- Students would understand about various elements in the design of swimming pools in built environment and its allied services.
- Students would be familiar about the specialty services required in various category of hospitality industry.
- Students would be aware about environmental management issues in buildings.
- Students would understand about Special Services necessary in High rise Buildings.

### Reference

1. Faber, Oscar and Kell, J.R. Heating and Air-Conditioning of Building. Architectural Press, Surrey, 1945.
2. Prasad, Manohar. Refrigeration and air-conditioning, 5<sup>th</sup>ed. New Age Intl. Pub., New Delhi, 1996.
3. Tiwari, Satish. Water and Energy resources.

**Course Objectives:**

- To introduce about various processes of management of building construction.
- To familiarize about various scientific methods to manage construction projects.
- To sensitize about various existing optimization methods to manage project resources.
- To explain the process of updating during the construction progress.
- To introduce about computer-based construction management tools.

**UNIT 1**

Introduction to Construction Industry, building construction practices, current management practices, Project planning and project scheduling and project controlling, Role of Decision in project management, Method of planning and programming, Human aspects of project management, work breakdown structure, Life cycle of a project, disadvantages of traditional management system.

**UNIT 2**

**Elements of Network & Critical Path Method and PERT analysis:** Event, activity, dummy, network rules, graphical guidelines for network, numbering of events. CPM network analysis & PERT time estimates, time computation & network analysis.

**UNIT 3**

**Project time reduction and optimization:** Project cost, Indirect project cost, direct project cost, slope of the direct cost curve, Total project cost and optimum duration, contracting the network for cost optimization, steps in cost-time optimization

**UNIT 4**

**Project updating:** Frequency of updating of project schedules, Data required for updating, steps in the process of updating.

**Resource allocation:** Resource usage profile: Histogram, Resource smoothing and Resource leveling, Computer applications in project management.

**UNIT 5**

**Project Management Tools:** Introduction to Project Management Tools like Primavera, Theory and their uses. Case-Study of a construction project using these software tools.

**Course Outcomes:**

At the end of course, student should have learnt:

- Students would be aware of various processes of management of building construction.
- Students would be familiar about various scientific methods used in managing construction projects.
- Students would be aware about various existing optimization methods effective in managing project

resources.

- Students would understand the need and process of updation during the construction progress.
- Students would be aware about existing computer-based construction management tools

### **Reference:**

1. Dr. B.C.Punmia et al. Project planning and control with PERT and CPM, Laxmi Publications, New Delhi
2. S.P.Mukhopadhyay, Project management for Architect's and civil Engineers, IIT, Kharagpur, 1974
3. Jerome D.Wiest and Ferdinand K.Levy, A Management Guide to PERT, CPM, prentice Hall of India Pub, Ltd., New Delhi, 1982
4. R.A. Burgess and G.White, Building production and project Management, The construction press, London, 1979.

## **AAR 407      ARCHITECTURAL DESIGN-V**

**Credits: 6**

### **Course Objectives:**

- To introduce and impart training in understanding the process of site planning having multiple buildings scenario.
- To sensitize about the importance of functional relationships of spaces and their influence on social and climatic aspects on macro level of the built environment.
- To introduce and create awareness about various building services required for modern & more complex services-oriented buildings at micro and macro level.
- To impart training about various structural elements, user-behavior aspects, and barrier-free measures in the design of built environment.
- To introduce about applicable building byelaws and their impact on architectural design.

### **The design issues to be addressed:**

- Design theory and application in more complex problems covering functional relationship, climatic condition, behavioral aspects.
- The project should include basic structural elements, barrier free measures etc.
- The project should also include all types of building services required for modern buildings at micro and macro level.
- Design Program prepared by the students should take into account relevant building bye-laws and provision of National Building Code

The list of suggested topics to be covered as design problems:

### **Main Design Problem**

Campus Planning, Group Housing, Mixed use occupancy buildings, Specialist Hospital, Convention Center, Shopping Mall cum Multiplex, etc.

### **Minor Design (Time) Problem (15 hrs.)**

Any internal block of Major Design Exercise to be detailed out in Minor Design (Time Problem)



**Viva voce.**

Final Viva-vice on all the design assignments done in the semester. Note: At least one major design exercise and one minor design/time problems should be given. The final submission shall necessarily include a model for at least one of the problems.

Note: At least one major design exercise and one minor design/time problems should be given. The final submission shall necessarily include a model for at least one of the problems.

**Course Outcomes:**

- Students are trained in the process of site planning having multiple buildings scenario.
- Students can assess the importance of functional relationships of spaces and their influence on social and climatic aspects on macro level of the built environment.
- Students are familiar about various building services required for modern & more complex services-oriented buildings at micro and macro level.
- Students can explain about various structural elements, user-behavior aspects and barrier-free measures and their impact on the design of built environment.
- Students are familiar about applicability of relevant building byelaws and their impact on architectural design.
- Students will demonstrate through design their understanding of site context, site zoning, climate responsiveness, building services & applicable codes.

**Reference:**

1. Time savers standards, Neufert's Architects data, National Building Code, URDPFI,
2. Urban design Guidelines,
3. Development Control Regulations- as per requirements.
4. Relevant case examples of Designed or executed projects.
5. All books and journals on architecture and urban design.

**Course Objectives:**

- To introduce the process of human settlements growth & decay.
- To study the history of Indian Town Planning system from ancient times to Post independence Era.
- To introduce the concept of town planning and its process of preparation.
- To study and understand the implications of various planning concepts and theories.
- To study the zoning & development control regulations at various levels of planning.

**UNIT 1**

**Introduction to Human Settlements:** Evolution of human settlements- man, environment and built structure. Community and settlement patterns. Characteristics of settlements. Growth patterns. Ancient rural and urban settlements, Settlement patterns and birth of early and medieval cities. Theories related to growth and decay of settlements by Lewis Mumford, Geddesian triad, Ekistics.

**UNIT 2**

**History of settlement planning in Ancient, Medieval, and contemporary India:** Ancient systems of town planning in India, Indus valley civilization - Mohenjodaro, Harappa. Town planning as per Vastu-shashtra, extracts from Chanakya Manasara. Morphology of pre-medieval to post-independence cities in India –Varanasi, Srirangam, Jaipur, Shahjanabad, Lyuten's Delhi, Navi Mumbai.

**UNIT 3****Introduction to Planning & its Process:**

Definitions related to Planning, levels of planning in India, scope, and components. Types of planning, elements, and scope. Characters of a town, census definition of urban area, Concept of master plan, its elements, preparation and implementation, Perspective plans, structure plans, advocacy plans, zonal plans, Participatory and inclusive planning. Survey techniques.

**UNIT 4****Regional and Metropolitan Planning theories and concepts:**

Zoning Theories, City beautiful movement, Garden cities, neighbourhood concept and Radburn city. Utopian Planning theories by FLWright, Soriya Y Mata.

Contribution of Le coubusier to town Planning. Selected examples to include concentric city, radiant city, CIAM, linear industrial city and Chandigarh.

**UNIT 5**

**Zoning & Development control:** Urban and Regional Development Plan Formulation and Implementation (URDPFI) Guidelines on land use zoning, land subdivision regulations. Development control, the comprehensive role of urban design in town planning process.

**Contemporary issues and strategies in urban planning:** Urban decay, redevelopment strategies, urban renewal, Transit Oriented Development.

**Course Outcomes:**

- Understand the factors influencing origin, growth and decay of human settlement.
- Ability to understand the factors influencing morphology of town forms from ancient to post independence times in India.
- Ability to understand and analyze the concept of preparation of master plan for a town and its comprehensive process in the formulation and implementation.
- Ability to understand and review various planning concepts and theories and respective implications in case examples across the globe.
- Ability to understand, analyze and review zoning and developmental control regulations in the process of town planning. Be able to identify and analyze contemporary planning issues and applicable strategies to deal with.

**Reference:**

1. John Radcliffe, An Introduction to Town and Country Planning, Hutchinson 1981
2. Arthur B Gallion and Simon Eisner, The urban Pattern – City Planning and Design, Van Nostrand Reinhold Company
3. Rangwala, Town Planning, Charotar Publishing House
4. Rame Gowda, Urban and Regional Planning
5. C.L.Doxiadis, An Introduction to the Science of Human Settlements; Ekistics Hutchinson, London, 1968.
6. Aniruddha Ray, Towns and Cities of Medieval India, Manohar Publishers and Distributors, 2015
7. DK Bubbar, The Spirit of Indian Architecture, Rupa & Co, 2005
8. Andrew D.Thomas, Housing and Urban Renewal, George Allen and Unwin; Sydney, 1986.
9. Sustainable Human Settlements by R. S. Sandhu; Asian Experience, Rawat publications, 2001.
10. URDPFI Guidelines Vol I, II A, II B-2014. (<http://moud.gov.in/URDPFI>)

**AAR421      WORKING DRAWINGS - II**

**Credits: 4**

**Course Objectives:**

- To introduce about the basics in working drawings, study of process and symbols, labeling and dimensioning of working drawings.
- To impart detailed knowledge about various external finishes applicable in buildings and their representations in architectural drawings.
- To introduce about the details of sanitary and plumbing systems for buildings and their representation in architectural drawings.
- To introduce about the details of electrical layouts and their preparation.
- To sensitize about integration of above aspects and furniture layout.

**Prerequisites:** Sessional, Architectural Detailing

**Mode of Drawings:** Manual and Mechanical.

- External finishes of all types including all details required. Development of 'skin sections'.
- Details of toilets including plan, elevation, sections.
- Details of kitchen including plan, elevation, sections.
- Layout of sanitary and plumbing lines on site and connection with the main sewer/ septic tank.
- Electrical layout of a typical floor including specification of fixtures.

**Course Outcomes:**

- Students can explain about the basics in working drawings and can prepare them.
- Students are well-versed about various external finishes applicable in buildings and their representations in architectural drawings.
- Students can prepare detailed architectural drawings of sanitary and plumbing systems for buildings.
- Students would be able to prepare simple electrical layouts for regular buildings.
- Students can integrate the spatial aspects and necessary building services and prepare the detailed working drawings good for construction.

**AAR 441 INTRODUCTION TO ARCHITECTURAL CONSERVATION Credits: 3**

**Course Objectives:**

- To introduce need and purpose of Architectural conservation, types of Architectural conservation practices and ethics of Architectural conservation.
- Introduce the philosophy and science of Architectural conservation by study of charters & legislations.
- To make understand the importance of appropriate methodologies of Research & Documentation in Architectural Conservation.
- To make understand various traditional and modern techniques and methods in Architectural conservation practice.
- To introduce urban conservation, its need, planning, legislative & management practices adopted.

**UNIT 1**

**Introduction to conservation:**

Understanding Heritage. Types of Heritage. Heritage conservation- Need, Debate, and purpose. Defining Conservation, Preservation, restoration, and Adaptive reuse. Concepts and approach's to conservation in India and other countries. Distinction between Architectural and Urban Conservation. Ethics of conservation, Significance and Value Assessment and Authenticity of Buildings.

**UNIT 2**

**Development of Theory of Conservation:**

History & development of Theory of Architectural Conservation, International agencies like

ICCROM, ICOMOS, UNESCO, International conservation charters (Venice & Burra) and their role in Conservation, Selection Criteria of World Heritage Sites, Conservation Acts & Legislation in India (Center and State acts), Archaeological Acts (ASI) etc.

### UNIT 3

#### Documentation:

**Part A:** Importance of Research in conservation, Sources of information like books, archival photographs and maps, folklores, mythology, oral tradition and memories, Structuring and interpretation of collected information.

**PART B:** Introduction to Heritage Database and Surveys for conservation [Building survey (Architectural & Authenticity), Condition Survey(Material & Structural), Intervention Survey, Site Survey ( Context & Precinct) etc.], Listing & Grading of buildings, Measured Drawing(Techniques of Measurement, Drawing and Presentation), Photographic Documentation . Overview of latest scanning technologies like LIDAR.

### UNIT 4

#### Building Analysis & Design Intervention:

**Part A:** Introduction to Decay in Historical buildings, Materials and Structural failures, Internal and External environment of historic buildings, Climatic causes of decay, Botanical, biological and microbiological causes of decay, Man-made causes of decay.

**Part B:** Prevention of deterioration, Preservation of the existing state, Consolidation of the fabric, Restoration, Rehabilitation, Reproduction, Reconstruction.

Study of case examples: Hampi, Qutub Shahi tombs, Mahabalipuram etc.

### UNIT 5

#### Urban Conservation:

Introduction to historic settlements; historic layering of the city and its values and meaning for the community; the role of urban systems and their inter-relational dynamics which give historic cities a distinctive and legible form; the agents and patterns of transformation.

Study of Case examples of Bologna, Cairo etc.

Approaches to integrated conservation in India with select examples explaining urban conservation tools and methods: Inner city regeneration, Adaptive reuse, Infill development etc., Institutional framework for urban conservation and renewal strategies in India (HRIDAY, Heritage component in SMART Cities and Master Plans) Study of Case examples: walled city of Ahmadabad, Mumbai, Hyderabad, Varanasi etc.

#### Course Outcomes:

- To **understand** the philosophy and science of Architectural conservation.
- Ability to **classify** and **analyze** various conservation ethics and charters specific to architectural and heritage conservation. Ability to **understand** the role of various national and international agencies.
- To **learn** the appropriate methodologies and tools for recording, documentation and inventorying of

- heritage structures, to **acquire** skills for documentation photography, surveys, research etc
- To **critically evaluate** and make assessment of heritage components and **apply** suitable methodology with reference to given context.
  - To **understand** the approach to **effectively implement** Urban Conservation in Proposals of Master Plans, HRIDAY schemes and SMART city schemes.

#### Reference:

1. Conservation of Historic Buildings by Fielden, Bernard, 2003, Architectural Press.
2. Guidelines for Conservation by Fielden, Bernard, 1989, INTACH, New Delhi.
3. Historic England, Practical Building Conservation: Conservation Basics, 2013, Routledge.
4. B.K. Singh, "State and Culture", Oxford, New Delhi
5. A.G.K. Menon ed. "Conservation of Immovable Sites", INTACH Publication, N.Delhi., 1988
6. Croci, G. (1998). The Conservation and Structural Restoration of Architectural Heritage. Southampton, UK: WIT Press.
1. Fitch, J.M. (Reprint edition 1990). Historic Preservation: Curatorial Management of the Built World. Virginia: University Press of Virginia.
2. Cullinane, J. J. (2012). Maintaining and Repairing Old and Historic Buildings. Wiley-Blackwell.
3. Basu, S., Mukerji A (Eds.) (2017). Integrated Urban Conservation: An Approach towards Development, IIT, Kharagpur.
4. Donald Appleyard, "The Conservation of European Cities", M.I.T. Press, Massachusetts, 1979.
5. Urban Heritage in Indian Cities –Pearl – NIUA
6. INTACH Publications on Case Studies mentioned in Syllabus.

## AAR 443 INTERIOR DESIGN

**Credits: 3**

### Course Objectives:

- Develop orientation to understand the profession of interior design, role of interior designer, process, elements and principles of interior design.
- Introduction to the fundamentals of interior design, interior space planning and human dimensions.
- An understanding of colours-symbolism and psychology, interior lighting, indoor landscaping and accessories.
- An overview of historic perspective of furniture and styles.
- An insight into business perspective of interior design

### UNIT 1

The profession of Interior Design; Role of an Interior Designer- past and present; Scope of services; Interior Design Process. Interior Design and Concepts: Elements and Principles of design- an overview and their applications in interior designing. Business perspectives of Interior design – an overview of practice of interior design in India.

### UNIT 2

Interior Space planning and human dimensions. Focuses on physical, psychological behavioural

and human factors, study of proxemics, behavioural settings.

Introduction to the fundamentals of Interior Design such as Lighting, Furniture, Space, Materials, Furnishings, Art etc.

### **UNIT 3**

Colours in interiors – Colour Theory, Effect of light on colour, various colour schemes like analogues, complementary, triadic etc. Colour symbolism. Psychology of colour, Industrial colour codes. International standards.

### **UNIT 4**

Introduction to Furniture and Accessories: An overview of historical perspective of furniture and styles, accent pieces and accessories from Egyptian period to the present. Basic Furniture vocabulary.

### **UNIT 5**

Interior lighting – direct and indirect lighting, location and light grid systems, types of luminaries, quality of lighting. Ambient, task and accent lighting. Exposure to eminent interior designers' works- Indian and international. Indoor plants and interior landscaping.

### **Course Outcomes:**

- The course makes informed design decisions based on aesthetics, building technologies, human needs and the health, safety, and the welfare of the public.
- The course transforms conceptual design ideas into a detailed solution that considers existing building constraints, user needs, cost, building codes and standards, and a program of spaces.
- It inculcates strong professional communication skills and present their design ideas and solutions with confidence.
- Students will be globally conscious interior designers.

### **Reference:**

1. Archi World. Interior Best Collection: Residence, Commerce, Office, Restaurant Asia I-IV. Archi World Co., Korea, 2003.
2. Friedmann, Arnold and Others. Interior Design: An Int. to Architectural Interiors. Elsevier, New York, 1979.
3. Miller, E. William. Basic Drafting for Interior Designers. Van Nostrand Reinhold, New York, 1981.
4. Kurtich, John and Eakin, Garret. Interior Architecture, VanNostrand Reinhold, New York, 1993.
5. Rao, M. Pratap. Interior Design: Principles and Practice, 3<sup>rd</sup> ed. Standard Pub., 2004.

**Course Objectives:**

- To introduce the concept of sustainability in Architecture and its impact on global environment.
- To explain about various aspects of sustainable practices related to built environment.
- To sensitize students about the need for conservation of natural resources and their impact.
- To familiarize about existing renewable energy systems suitable for built environment.
- To enhance understanding about application of sustainable practices in built-environment by studying of efficient projects through case-studies.

**UNIT 1**

Introduction to the ideas, issues and concepts of sustainable architecture, global environment and the built environment, principles of environmentally and ecologically supportive architecture.

**UNIT 2**

Study of sustainable architecture, use of energy, materials, health, and global environment as related to the construction and operation of buildings.

**UNIT 3**

Sustainable and conservation practices- water conservation, solid waste treatment, economics, and management.

**UNIT 4**

Integration of PV and wind systems in buildings, wind, solar and other non-conventional energy systems, solar and thermal applications for heating and cooling, electricity generation.

**UNIT 5**

Case studies of contemporary sustainable architecture.

**Course Outcomes:**

- Students are familiar about the concept of sustainability in Architecture and its impact on global environment.
- Students can explain about various aspects of sustainable practices related to built environment.
- Students are sensitive to the need for conservation of natural resources and their impact.
- Students are familiar about existing renewable energy systems suitable for built-environment.
- Students can assess the application of sustainable practices in built-environment by studying of efficient projects through case-studies

**Reference:**

1. Books and manuals from TERI and other organizations.
2. Givoni .B, "Passive and Low Energy Cooling of Buildings", Van Nostrand Reinhold, New York, 1994
3. Patrick Waterfield, "The Energy Efficient Home: A Complete Guide", Crowood press ltd, 2011.
4. Dean Hawkes, "Energy Efficient Buildings: Architecture, Engineering and Environment", W.W. Norton & Company, 2002
5. Majumdar M, "Energy-efficient Building in India", TERI Press, 2000.



## VIII – SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AAR402	Urban Design	3	0	0	3	50	50	100	3
2	AAR404	Disaster Resistant Buildings & Management	3	0	0	3	50	50	100	3
3	AAR 406	Advanced Construction and Materials	3	0	0	3	50	50	100	3
4	AAR408	Architectural Design – VI	0	9	0	6	200	200	400	20
5	AAR422	Research Seminar	1	0	3	3	100	-	100	-
6	AAR 424	Building Information Modelling	0	0	3	2	100	-	100	-
7	<b>AARxxx</b>	<b>Program Elective-III</b>	3	0	0	3	50	50	100	3
	AAR 442	Energy Efficient Green Architecture								
	AAR 444	Appropriate Technology								
	AAR 446	Graphic & Product Design								
8	<b>AIExxx</b>	<b>Interdisciplinary Elective-I</b>	2	0	2	3	50	50	100	3
	AIE 402	Basic of Geographic Information System								
	AIE 404	Traffic and Transportation Planning								
	AIE 406	Maintenance & Repair of Buildings								
<b>Total</b>			<b>15</b>	<b>9</b>	<b>8</b>	<b>26</b>	<b>600</b>	<b>500</b>	<b>1100</b>	
<b>Total Hrs. per week</b>			<b>32</b>							

NOTE:

\* AAR408 Architectural Design-VI, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with one external member.

\*\* Examination will be conducted for FOUR days each of 5 Hrs. duration; the first, second- & third-days' work of the students shall be retained in the sealed examination hall.

## **VIII - SEMESTER**

### **AAR 402      URBAN DESIGN**

**Credits: 3**

#### **Course Objectives:**

- To introduce urban design's importance in understanding the city as a context to architecture.
- To introduce various theories, elements, principles and dimensions of urban design and understanding respective roles.
- To create awareness that any building impacts the street and public space and is, in turn, constrained by the framework of urban building regulations.
- To introduce various methods and techniques used in interpretation of city in different ways and layers.
- The subject will be taught in congruence with the Design studio, and assignments for the subject will be linked to the design exercises to achieve higher level of learning and understanding the practical application of the same.

#### **UNIT 1**

##### **Introduction to Urban Design**

- Importance and emergence of Urban Design as a discipline.
- A brief Analysis of urban spaces in history.
- The West (Greek, Roman, Medieval and Renaissance towns) and The East (Vedic, temple towns, medieval and Islamic towns)
- Relevance of the historical concepts in the present context; Concepts of urban design- Urban design theories of Gordon Cullen and Kevin Lynch.
- Elements and dimensions of Urban Design.

#### **UNIT 2**

##### **The Morphological and Perceptual Dimensions**

- Key Concepts – Land use, Building Structures, Plot Pattern, and The Street Pattern;
- The Public Space Network; Buildings in Space and Buildings Defining Space; Traditional Urban Space;
- Urban block Patterns and Road Networks; Pod Development; The return to streets;
- Human sensory perception of environment; Meaning and symbolism in urban form; Sense of Place and Placeless-nests; Territoriality and personalization;
- Place Identity; Key Attributes of Successful places; Invented places and Superficiality.

## **UNIT 3**

### **The Social Dimension**

- Relationship between people (Society) and (Urban) space; Necessary, Optional and Social activities.
- The function of the Public Realm and its Decline.
- The Physical and Socio-Cultural Public Realm.
- Neighborhood Unit- Size, Boundaries, Social relevance and Meaning, Social mixed and Balanced Communities.
- Safety and Security; Accessibility and Exclusion; Equitable Environments.

## **UNIT 4**

### **The Visual and Functional Dimension:**

- Aesthetics Preferences; Patterns and Aesthetic Order; the Kinesthetic Experience; Positive and Negative Space;
- Streets and Squares; Townscape and Urban Architecture; Criteria for Harmonious Integration;
- Hard and soft Landscaping; Street Furniture; Public Private Interface – Comfort, Relaxation, Passive & Active Engagement, Discovery Social use of Space Movement; Privacy- Visual and Oral; Land use, Density and Urban Form;
- Environmental Design- Microclimate, Wind shading, designing for Sun and Shade, Natural Lighting, Parking, Servicing, and Infrastructure; Growth of Car free Streets and Squares.

## **UNIT 5**

### **Renewal, Redevelopment and Formulating Urban Design Policies:**

- Methodology for conducting an Urban Design Survey.
- Understanding urban renewal and the need for it; Scope, challenge and Implementation methods; Public participation;
- Townscape policies and urban design guidelines for new developments- Case studies.[C5].

### **Course Outcomes:**

- The course gives a clear understanding of role of urban design as a discipline bridging functional, aesthetical supplements in between micro, meso and macro-built environments.
- The course helps in knowing the process of critical appraisal for any given urban precinct as well for any new development so that issues shall be effectively dealt.

### **Reference:**

1. Public Places-Urban Spaces: The Dimensions of Urban Design by Carmona, Matthew; Heath, Tim; Oc, Taner; Tiesdell, Steven; 2003
2. The Concise townscape- Gordon Cullen, The Architecturalpress
3. Image of the city - KevinLynch

4. Architecture of town and cities - Paul D. Speriregon, The MITpress
5. Urban design - Ornament and decoration, Cliff Moughtin, BathPress
6. Urban design - street and square, Cliff Moughtin, BathPress
7. Town and square - PaulZucker
8. The urban pattern - Arthur B Gallion, CBSpublishers
9. Architecture and the urban experience - Raymond J Curran. Van Nostrand Reinhold Company
10. Indian city in the arid West - Kulbashan Jain, AadiCentre.

## **AAR 404      DISASTER RESISTANT BUILDINGS AND MANAGEMENT      Credits: 3**

### **Course Objectives:**

- To provide students with an overview of natural eco-systems and natural disasters and their mitigation and management.
- To familiarize students about the causes and impacts of natural calamities like earthquakes, cyclones, floods, droughts etc.
- To sensitize students about the impact of climate change, sea level rise and adverse impacts of illumination.
- To help students gain an understanding of Retrofitting of earthquake affected buildings.
- To encourage students to study about various aspects of past natural disasters in India.

### **UNIT 1**

Basic understanding of fragile Eco-systems and factors that cause global climatic changes. Overview of major natural disasters, design and planning solutions for disaster mitigation, organizational and management aspects.

### **UNIT 2**

**Introduction to Natural Disasters:** Understanding the effects of natural calamities such as floods, tropical cyclones, earthquakes, landslides, forest fires, draughts, and Tsunami.

### **UNIT 3**

**Factors Causing Disasters:** Climate changes, global sea rise, coastal erosion, environmental degradation, large dams & earth tremors, roads buildings & landslides, urbanization & desertification, cyclone effects on coastal towns.

### **UNIT 4**

**Design and Retrofitting of Buildings for Earthquake resistance:** Design, construction and detailing of buildings, materials and methods to be adopted for earthquake resistant buildings and retrofitting of earthquake affected buildings.

## UNIT 5

**Case studies of natural disasters in India:** Earthquakes at Bhuj, Latur, etc., Cyclones in coastal Andhra Pradesh & Orissa, Landslides in Uttarakhand, Nilgiris, Himachal etc, Floods in Bangladesh, and Droughts in Rajasthan & Tsunami in Tamil Nadu.

### Course Outcomes:

- Students are familiar about natural eco-systems, impact due to various natural disasters and their mitigation and management.
- Students exhibit an understanding of the paradigm shift in disaster management from response and recovery to prevention, preparation, mitigation and response and recovery.
- students are aware about the impact of climate change, sea level rise and adverse impacts of illumination.
- students can assess various aspects of Retrofitting of earthquake affected buildings.
- students can assess and explain about the process of prevention, preparation, mitigation, and management by studying past natural disasters in India.

### Reference:

1. S.Rajagopal - Problems of housing in cyclone prone areas - SERC, Vol.2, Chennai, 1980
2. Office of the UN Disaster Relief Coordinator - Disaster prevention and mitigation, Vol 12, Social and Sociological aspects - UNO, NY, 1986
3. F.C.Conny et.al - Issue and problems in the prevention of disaster and housing - A review of experiences from recent disasters - Appropriate reconstruction and training information centre, 1978 S.Ramani, Disaster management - Advanced course on modern trends in housing - SERC, Vol 2, Chennai, 1980.

## AAR 406      ADVANCED CONSTRUCTION AND MATERIALS

**Credits: 3**

### Course Objectives:

- Introduction of advanced construction materials, adaptation in various architectural buildings.
- Introduction to pre-engineered Concrete structures, adaptation in large span structures.
- Introduction and study of pre-engineered Steel structures, adaptation in steel frames/space frames and their components.
- Study of Glass systems and their adaptation in buildings.
- Study of advanced building materials and their application in building industry.

## UNIT 1

**Advanced Construction Methods:** Pre-stressed concrete beams slabs frames, lift slab construction, post tensioning, multi-storied building frames, circular slabs and beams.

## UNIT 2

**Pre-Engineered (Pre-Cast) Concrete:** Folded plates like V-type, trough type, pyramidal, prismatic and RCC geometrical staircases, hyperbolic paraboloids.

## UNIT 3

Study of space frames, suspended roofs, membrane structures, cable structures. Study of Pre-engineered building systems (steel), various components, forms and their advantages.

## UNIT 4

**Curtain walls:** types of curtain walls, components, structural solutions, construction and erection. glass wall system-glass; sheet metal wall systems sheet metal cladding, architectural skins.

## UNIT 5

**Advanced Building Materials:** Synthetic boards, fire proof/ resistant boards/tiles, acoustic materials, composite panels and their applications, non- load bearing gypsum blocks, Polycarbonate sheets, Aluminum Composite Panels, Stainless Steel, High Density Fibre boards, Ready-Mix Concrete, Lightweight Concretes, Green Building construction materials.

### Course Outcomes:

- students are familiar with advanced construction materials and their adaptation in various architectural buildings.
- students are familiar with pre-engineered Concrete structures, and their adaptation in large span structures.
- students are familiar about pre-engineered Steel structures, and their adaptation in steel frames/space frames and their components.
- students have knowledge about various Glass systems and their adaptation in buildings.
- students have an understanding about various advanced building materials and their application in building industry.

### Reference

1. James Ambrose, Building Construction Enclosure System.
2. Andrea Deplazes (Ed), Constructing Architecture: Materials processes structures- A Handbook Second Extended edition.
3. Robert E Fischer, Engineering for Architecture 1989.
4. R Barry, The construction of Buildings Volume 4, 4th Edition.
5. Schall, Rolf. Curtain Walls: Design Manual. Reinhold Pub., New York, 1962.

**Course Objectives:**

- To expose students to urban scale problems by enabling them to visualize the contextual part of a built form.
- To make them understand, as to what goes beyond the premise of a single building or an area and where its boundaries merge into surrounding built form with different land uses and activities.
- The design problem of Urban design scale is to be introduced, example; Redesigning of existing Urban area by studying and identifying the problems associated with it. The project would be a medium sized urban design intervention with an aerial specification of 500m-1000m limit.
- To understand the process of conducting physical, socio-economic, and traffic analysis: data collection, analysis and presentation as a prerequisite to the main design issues.
- The project should be substantiated by detailed site surveys and reading about urban design principles.

**The design issues to be addressed:****I. Area establishment within the given Objectives**

- Identification of the project through reconnaissance survey.
- Visualize the existing urban environment with objectives.

**II. Delineation of the study area**

- Initial data Collection.
- Prepare brief questions for responses.
- Reading the area for commonalities.
- Take response from the users.

**III. Detailed data collection and analysis**

- Mapping of collected data using techniques and methods Co-relating the various data for interrelationship.
- Use of both qualitative and quantitative data.
- Analyzing interrelationships of various identified factors.
- Examining the data for overall understanding of the information.
- Using different methods for analyses.
- Micro-level assessment of the study areas.
- Prepare activity wise layers.

**IV. Extraction of inferences for interventions**

- Picking up issues for addressing.
  - Thinking about developing sensitive responses to the identified issues.
  - Take case examples for better understanding (Readings through books or studying similar projects undertaken elsewhere)
  - Prepare models for spatial analysis.
-

- Prepare quantitative data for existing and future proposals.

#### **V. Formulation of the design programme and strategies for intervention**

- Prepare the vision statement.
- Phasing of the project.
- Before and after images.
- Public private participation.
- Implementation of the design solutions.

#### **VI. Design Demonstration & Viva voce**

Final Viva-voce on all the design assignments done in the semester.

*\*Note: Only one major design exercise should be given. The final submission shall necessarily include a model for at least one of the problems.*

#### **Course Outcomes:**

- Apply the experience gained during the previous semester design studios in current design projects
- To compare the built and un-built environment around.
- Organize to work in a team.
- Plot an appropriate program for a project.
- Formulate and Highlight the issues.
- Justifies the environment for sensitivity.

#### **Reference:**

1. Graphics in Urban design by BalllyMeeda, Neil Parkyn and David StuartWalton.
2. Responsive Environments by Ian Bentley.
3. Watson Donald;others,(2003) Time saverstandards for urban design, McGraw Hill, NY
4. Paddison Ronan Ed, (2001), Handbook of urban studies, Sage Publications, London
5. Hillier Bill ;Hanson Julienne, (1990), Social logic of space, Cambridge University press, NY
6. Local Master Plans or Development Plans.
7. Development Control Regulations- as per requirements.
8. Relevant case examples of Designed or executed projects.

### **AAR 422 RESEARCH SEMINAR**

**Credits: 2**

#### **Course Objectives:**

- To equip tools and methods needed to handle the scale of a project suitable for design thesis.
- To clarify relevance of topics suitable for thesis, process necessary for evolution of solutions
- To appreciate the process of research and make the students aware of its potential in the field of architecture
- To add effective skills for report writing, study of current practices and conventions.

The course provides students with a framework to understand some emerging concepts in architecture and projects of design complexity and equip the student with adequate architectural design research methods for the realization of thesis concept. During the course of study, the course of the thesis is developed, and the project articulated.



Introduction to architectural thesis Project, Difference between design thesis and design studio, selection of topics for architectural design thesis, design thesis topics based on building typologies, preparation of synopsis, Methodology of design thesis

Emerging concepts in architecture due to changes in social, economic, technological variables. Review of design projects related to real world instances and relevant to community at large. Review of projects of design complexity, involving themes, sub themes and architectural expression.

Research in architecture: Tools and Methods required to handle a design project. Scientific methods of research with special emphasis on architectural research methods. Architectural enquiry visual, observations, questionnaire formats of enquiry, Literature Review and case studies. Data analysis techniques interpretation of data.

Thesis report writing and presentation:

- Formats for presentation of data, case studies and analysis.
- Formats for presentation of thesis design- media appropriate in the architectural profession such as two-dimensional drawing, physical models, three-dimensional computer models.
- Report Writing: Techniques in report writing, presentation of contextual information relevant to interpretation of the data collected and design; reporting the design development from concept to design solution, explain the relation of the design to existing knowledge on the topic in the form of coherently written thesis report.

The inputs to the students on various design thesis topics would be in the form of Expert /Guest Lectures.

Each student should select a topic related to any architectural design/research area, and collect necessary data, review literature on the chosen topic and present a written paper and seminar at the end of the semester.

#### **Course Outcomes:**

- Ability to select the right project and techniques of data interpretation to derive solutions.
- Enhanced ability to use tools, methods and enquiry to identify and analyze project needs.
- Ability to understand some emerging concepts in architecture and projects of design complexity and equip the student with adequate architectural design research methods for the realization of thesis concept.
- Research process as effective tool of study, formulation of idea, data collection, Analysis, synthesis and conclusion culminating into report writing as documented Academic resource.

**Reference:**

1. Mukhi, H.R. Technical Report Writing: Specially prepared for Technical and Competitive Examinations, New Delhi: SatyaPrakashan, 2000.
2. Barrass, Robert. Writing At Work \b a guide to better writing in administration, business and management, London: Routledge, 2003.
3. Seely, John. The Oxford guide to effective writing and speaking, 2nd ed., Oxford ; New York : Oxford University Press, 2005.
4. Jo Ray McCuen, Anthony Winkler. Readings for writers, 9th ed., Fort Worth : Harcourt Brace College Publishers, 1998.
5. Treece, Malra. Effective reports, 2nd ed., Boston: Allyn and Bacon, 1985.

**AAR 424****BUILDING INFORMATION MODELLING****Credit: 2****COURSE OBJECTIVES:**

- To introduce the concept of Building Information Modelling (BIM) and its application.
- To discuss about the role and impact of BIM in Design.
- To train on the BIM software tools for design of architectural projects.
- To explain building elements and modeling techniques in BIM.

**UNIT 1:**

Introduction to BIM: Definition of BIM, Evolution and development of BIM. BIM Vs. 3D CAD. BIM Modelling basics. Various applications of BIM. BIM Modelling basics.

**UNIT 2:**

Introduction to 2D and 3D drafting softwares. BIM platforms and BIM software and tools. Getting familiar to the User Interface and basic operations in BIM software.

**UNIT 3:**

Construction of a simple project. Mass and concept modelling. Creating Plans, elevations, sections, details, toposurface etc. Interiors, fixtures, fittings and furniture database. Managing views.

**UNIT 4:**

Creating, importing and modifying families of objects and elements. Documentation-Text, callout, dimension, annotation, schedules. Creating , tagging and modifying rooms and areas.

**UNIT 5:**

Working with materials and lights in BIM models. Generation of different Views and

visualization. Development of various Layouts and preparation of presentations.

### **COURSE OUTCOMES:**

Students will be able to

- Understand the concept of Building Information Modelling (BIM) and its application.
- Understand the impact of BIM in Design.
- Make use of BIM families and its application
- Develop the design of projects with BIM software tools.

### **References:**

1. Kymmel, W. (2007). Building Information Modelling: Planning and Managing construction projects with 4D.
2. Krygiel, E., & Niles, B. (2008). Green BIM: Successful sustainable design with building information modeling. John Wiley & Sons.
3. Issa, R.R., & Olbina, S. (Eds). (2015). Building Information Modelling: Applications and Practices, American Society of Civil Engineers.
4. Duell, R., Hathorn, T, and Hathorn, T.R. (2015). Autodesk Revit Architecture 2016 Essentials. Wiley Publications.

**AAR 442**

**ENERGY EFFICIENT GREEN ARCHITECTURE**

**Credit: 3**

### **Course Objectives:**

- To introduce the concept of energy efficiency and its need and importance in the field of architecture.
- To help comprehend various passive heating techniques which can be implemented at site or building level.
- To help comprehend various passive cooling techniques which can be implemented at site or building level.
- To introduce existing green building rating systems and explaining their evaluation process.
- To help analyze contemporary and innovative strategies to make the built environment energy efficient.

### **UNIT 1**

**Introduction to Energy Efficiency in Buildings:** Definition of energy and its uses in buildings, Renewable and Non-Renewable energy sources. Significance of Energy Efficiency in the contemporary context, Simple passive design considerations involving Site Conditions, Building Orientation etc.

### **UNIT 2**

**Solar Passive Architecture- Passive Heating:** Plan form and Building Envelope -Heat transfer and Thermal Performance of Walls and Roofs, Direct Gain Thermal Storage of Wall and Roof - Roof Radiation Trap - Solarium - Isolated Gain

### UNIT 3

**Passive Cooling:** Evaporative Cooling - Nocturnal Radiation cooling - Passive Desiccant Cooling – Induced Ventilation - Earth Sheltering - Wind Tower - Earth Air Tunnels

### UNIT 4

**Green Buildings and Rating Systems:** Efficient use of daylighting, energy reduction in artificial illumination, use of compact fluorescent lamps, use of grey water, waste recycling, reduction and reuse of water, Green building concepts and brief introduction to green rating systems such as LEED, GRIHA, etc.

### UNIT 5

**Contemporary and future trends:** Areas for innovation in improving energy efficiency such as Photo Voltaic Cells, Thermal Energy Storage, Recycled and Reusable Building materials, Nanotechnology, smart materials and the future of built environment,

#### Course Outcomes:

- Ability to understand the concept of energy efficiency and its need and importance in the field of architecture.
- Ability to recall various passive heating techniques which can be implemented at site or building level.
- Ability to recall various passive cooling techniques which can be implemented at site or building level.
- Ability to interpret existing green building rating systems and explaining their evaluation process.
- Ability to analyze contemporary and innovative strategies to make the built environment energy efficient.

#### References:

1. Manual on Solar Passive Architecture, IIT Mumbai and Mines New Delhi, 1999
2. Arvind Krishnan & Others, “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
5. Fuller Moore, “Environmental Control Systems”, McGraw Hill INC, New Delhi - 1993
6. Sophia and Stefan Behling, Solpower, “The Evolution of Solar Architecture”, Prestel, New York, 1996
7. Patrick Waterfield, “The Energy Efficient Home: A Complete Guide”, Crowood press ltd, 2011.
8. Dean Hawkes, “Energy Efficient Buildings: Architecture, Engineering and Environment”, W.W. Norton & Company, 2002
9. IGBC Code books for new constructions
10. GRIHA Code books for new buildings.
11. Ching, F. (2020). Green Building Illustrated, John Wiley & Sons.
12. Sayigh, A. (2014). Sustainability, energy and architecture. Oxford, UK: Academic Press

**Course Objectives:**

- to introduce about the utilization of natural and availability of raw materials and use of simple tools and techniques for their utilization.
- to introduce to the use to sustainable and appropriate technology construction is based mainly on uses of different methods.
- to impart knowledge about Indigenous and migrant techniques and using in construction of Vaults, Domes, etc.
- to help explore and study the modern construction techniques of bamboo in the construction of building elements.
- to enhance understanding about the properties of Ferro Cement and materials used in the construction.

Introduction to the concept of appropriate building technology suitable to the Indian context, for both rural and urban applications. The course shall endeavour to enrich the conventional knowledge with alternative/ innovative material and construction techniques. The course shall involve both theoretical and practical aspects of alternative materials and construction materials developed in the recent past.

**UNIT 1**

Study of soil and its composition and properties, suitability of soil for mud walls, stabilized soil blocks, block making machines.

**UNIT 2**

Wattle and daub walls, rammed earth walls, adobe walls, Waterproofing of mud walls.

**UNIT 3**

Walls, vaults and domes using soil cement blocks, Nubian vault roof.

**UNIT 4**

Use and applications of bamboo as an alternative material for walling and roofing.

**UNIT 5**

Ferro-Cement/ Micro-concrete, Fire-resistant thatch for roofing.

**Course Outcomes:**

- students understand the availability, ecological sustainability, economically viable, durable, environmental impact, strength and construction techniques of indigenous materials like rammed earth, soil cement blocks, bamboo, etc.
- students are familiar about the utilization of natural and availability of raw materials and

use of simple tools and techniques for their utilization.

- students have knowledge about the use of sustainable and appropriate construction technology.
- students are aware about Indigenous and migrant techniques and using in construction of Vaults, Domes, etc.
- students can explain about various modern construction techniques of bamboo in the construction of building elements.
- students are familiar about the properties of Ferro Cement and materials used in the construction.

#### **Recommended Books**

1. VenuBharati, by Vinoo Kale, AproopNirman Nagpur.
2. Research notes and digests by CBRI Roorkee Burnt clay roofing, ferrocement roofing units.
3. Auroville Publications.
4. BMTPC Manuals.

### **AAR 446 GRAPHIC AND PRODUCT DESIGN**

**CREDITS: 3**

#### **Course Objectives:**

- To develop an understanding the methods and techniques involved in product and furniture design with focus on integration of the design, graphics and manufacturing process for product design
- To understand various aspects of design in graphics. Understand presentation skills, logos and ad making with Computer graphics.

#### **The design issues to be addressed:**

- A brief introduction to product designing and its various elements. History of product design.
- Understanding of product development cycle and phases. Introduction to applied anthropometry, human activities, their nature application of human factors data. (Ergonomics)
- To understand the visual display, process of seeing, visual discrimination. Study visual perception & graphical thinking. Study of tools of graphic expression. Study printing, lettering & typography. Exercises on design of books, posters, and logos.

#### **Design Problems**

Design of household elements kitchen racks, cabinets, furniture like chairs/computer table, etc.

To design industrial products- watch, automobile headlights etc.

Design of books, posters, promotional materials, stationery, trademarks & corporate logos. Evolve comprehensive corporate identity program Developing environmental graphics / signage Brand promotion, packaging design & ad making for both the print & electronic media.

#### **Viva voce**

Final Viva-vice on all the design assignments done in the semester.

**Course Outcomes:**

Ability to comprehend human dimensions and body movement to arrive at a usable product.

Develop use of graphics as tool of presentation and 3D visualization in architectural works and product design.

**Reference:**

1. Elements of Design by Anderson, Donald M., Holt- Rinehart and Winston, New York (1961)
2. Ergonomic for beginners by Jan Dul, B. A. Weerdmeester, - CRC (1993)
3. Kathy Baxter and Catherine Courage, Understanding your users: A practical guide to user requirements methods, tools, and techniques
4. Karen O'Reilly, Ethnographic Methods
5. John Chris Jones, Design Methods,
6. Chris Lefteri, Materials for Design
7. Andrew H. Dent and Leslie Sherr, Material Innovation: Product Design
8. Any book on Anthropometric data in Indian context.

**AIE402 BASICS OF GEOGRAPHIC INFORMATION SSYSTEM****Credits: 3****Course Objectives:**

- To explain the concept of GIS, its components, along with its advantages.
- To teach about different types of available data formats in GIS.
- To develop knowledge of spatial data structures details and input, management, and output processes
- To explain various technical aspects about GIS and its application.
- To help explore different possible areas of GIS application.

**UNIT 1**

**Basic Concept of GIS** Introduction, Information systems, spatial and non-spatial information, geographical concepts and terminology, advantages of GIS, basic components of GIS, commercially available GIS hardware and software, organisation of data in GIS.

**UNIT 2**

**GIS Data:** Input data, field data, statistical data, maps, aerial photographs, satellite data, points, lines and areas features, vector and raster data, advantages and disadvantages, data entry through keyboard, digitizers and scanners, digital data, GIS data formats and standards.

**UNIT 3**

**Data Management:** Data management, data base management system (DBMS), various data models, run length encoding, quad trees, data analysis, data layers, analysis of spatial and non-spatial data, data overlay and modelling, smart features of DBMS.

## UNIT 4

**Applications of GIS:** Applications of GIS in map revision, landuse, agriculture, forestry, archaeology, municipal, geology, water resources, soil erosion, land suitability analysis, change detection.

## UNIT 5

**Case Study:** A case study in GIS implementation, the consultant, the client, the initial applications, types of GIS analysis used for case study.

### Course Outcomes:

- Students can explain the concept of GIS, its components, terminology along with its advantages.
- Students have developed the skills in collecting, editing different types of GIS data.
- Students can demonstrate expertise on database management in GIS.
- Students can explain various technical aspects about GIS and its application.
- Students can analyze and explore different possible areas of GIS application.

### Reference:

1. P.A. Burrough, Principles of Geographic Information System for Land Resources Assessment, Monograph on Soil Resources Survey No, 12, Claredon, Press, Oxford, 1988.
2. E.T. Engaman, and R.J. Gurney, Remote Sensing in Hydrology, Chapman and Hall, London, 1991.

## AIE404 TRAFFIC AND TRANSPORTATION PLANNING

**Credits: 3**

### Course Objectives:

- Familiarize basic concepts and methods of urban transportation planning in India.
- Explain concepts of geometric design related to roads along with their applications
- Explain methods of designing, conducting, and administering surveys to provide the data required for transportation planning.
- Impart knowledge on trip generation and trip distribution models, Mode Choice Modeling and Traffic Assignment Modeling.
- Understand principles of landscaping, policies related to transportation.

## UNIT 1

**Land use and Transportation System:** Introduction-Urban system Components-Concepts and definitions-Criteria for measuring urban sprawl— Location theory-urban growth or decline.

**Transportation Planning Process:** Introduction-Definition-Factors to be considered; Land use transportation planning; systems approach-Stages-Inventory of Existing Conditions-Difficulties in implementation.



## UNIT 2

**Geometric Design:** Highway cross-sectional elements, stopping sight distance, overtaking sight distance, intermediate sight distance, camber, super elevation, extra widening, setback distance at horizontal curves, design of horizontal curves, transition curves, vertical curves.

**Traffic Engineering:** Objectives and scope of traffic engineering. Components of road traffic - vehicle, driver, and road. Road user characteristics; human and vehicle characteristics, factors affecting road traffic. Concept of passenger car units for mixed traffic flow. Traffic Manoeuvres. Traffic Stream Characteristics - Relationship between Speed, Flow and Density, capacity, level of service concept.

## UNIT 3

**Traffic Engineering Studies and Analysis:** Sampling in traffic studies; adequacy of sample size; application of sampling methods for traffic studies, objectives, methods of traffic study, equipment, data collection, analysis and interpretation (including case studies) of (i) Spot speed (ii) Speed and delay (iii) Volume (iv) Origin - destination (v) Parking

**Transport Surveys:** Basic Movements- Study Area-Zones-Surveys- Planning of different types of surveys and interpretation, Travel demand; Traffic surveys for mass transit system planning.

## UNIT 4

**Trip Generation and Distribution:** Factors governing trip generation and attraction –Methods of trip distribution

**Modal Split and Assignment:** Factors affecting modal split; Modal split in transport planning; Principles of traffic assignment; assignment techniques.

## UNIT 5

**Road Design and Environment:** traffic control devices: signs, signals and markings and traffic islands, intersection: introduction to un-channelized and channelized intersections and rotary intersections.

**Landscaping and Policy:** Landscaping, Evaluation and design of road lighting, National Level Policies and Studies, ITS.

### Course Outcomes:

- Develop and conduct surveys to provide the data required for transportation planning
- Develop and calibrate trip generation rates for specific types of land use developments
- Categorize highway geometrics for different conditions
- Acquire knowledge on traffic characteristics, traffic studies, traffic control devices and intersections
- Understand principles of landscaping, policies related to transportation.

**Textbook(s):**

1. Kadiyali, L.R., Traffic Engineering and Transport Planning, 9/e, Khanna Publishers, 2018
2. Khisty C. J and Lall B. K, Transportation Engineering: An Introduction, 3/e, Prentice Hall India, 2017

**References:**

1. Hutchinson, B.G., Principles of Urban Transport System Planning, 1/e, Taylor & Francis Inc, 1987.
2. NPTEL Web Course on Urban Transportation Planning. <https://nptel.ac.in/courses/105107067/>.

**AIE406 MAINTENANCE AND REPAIR OF BUILDINGS****Credits: 3****Course Objectives:**

- To impart building maintenance standards.
- To train in examining various damages to concrete structures.
- To help in assessing the damage to buildings.
- To familiarize with various types of repair materials.
- To enable evaluation and repair of cracks.

**UNIT 1**

**Maintenance of Buildings:** Introduction, Classification of maintenance works- Preventive, Remedial, Routine, and Special maintenance, Necessitation of the maintenance, Inspection periods, background of maintenance, maintenance processes.

**UNIT 2****Durability and Deterioration of Concrete:**

Factors influencing durability of concrete, causes of distress in concrete structures, shrinkage and creep in concrete, honey combing in concrete, Corrosion- Basic principle of corrosion, parameters influencing corrosion process, Damages due to corrosion.

**UNIT 3****Damage Assessment:**

**Investigation of Damage-** Observation, Assessment Procedure

**Non-Destructive Testing Methods:** Introduction, Non-Destructive Testing Methods, Surface Hardness Test, Ultrasonic Pulse velocity test,

**Semi-Destructive Testing Systems:** Core Sampling and Testing, Half -Cell potential survey.

**UNIT 4****Repair Materials**

Introduction, Materials selection – criteria for selection of repair materials, methodology for the selection of repair materials, Classification of repair materials, cementitious materials, polymer concrete and mortar, epoxy mortar, Bonding agents-Cement based slurries, Epoxies, Latex emulsions.

## **UNIT 5**

### **Evaluation and Repair of Cracks:**

Symptoms and Diagnosis of Distress, Evaluation of cracks, Selection of Repair Procedure, Repair of cracks-Preparation of Surface, Repair Techniques, Common types of repairs: Sealing of cracks, Flexible sealing, Providing additional steel, Stitching of cracks, Repair by jacketing, Auto-genous Healing..

### **Course Outcomes:**

- Examine the building maintenance works
- Summarize the causes for deterioration of concrete
- Assess the extent of damage
- Select appropriate repair material
- Decide the appropriate repair technique

### **Reference:**

1. B.Vidivelli, Rehabilitation of Concrete Structures, 1/e, Standard Publishers Distributors, 2018.
2. M.L.Gambhir, Concrete Technology: Theory and Practice, 4/e, Tata McGraw Hill Education Private Limited, 2013.
3. References:
4. P.K.Guha, Maintenance and Repair of Buildings, 1/e, New Central Book Agency(P) Ltd, 2011.
5. S.Mahaboob Basha, A textbook of Concrete Technology, 1/e, Anuradha Publications, 2011.
6. J.Bhattacharjee, Concrete Structures Repair Rehabilitation and Retrofitting, 1/e, CBS, 2017.
7. P.C.Varghese, Maintenance Repair and Rehabilitation and Minor works of Buildings, 1/e, Prentice Hall India Learning Private Limited, 2014.

## IX– SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AAR521	Practical Training	0	0	0	30	600*	-	600	Viva
Total					-	30	600	-	600	

NOTE:

\* AAR521 Practical Training, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with an external member.

Students are eligible to undergo Practical Training at Architectural Firms, run by a Chief Architect, having at least FIVE years of Practical Experience. Registration Details of the Chief Architect with the Council of Architecture India, should be furnished by the Student.

Staff members are to be deputed once to the Architecture firms where the students are undergoing Practical Training, to have interaction with the Chief Architect and assess the performance of the students.

Students should submit the following particulars at the end of the Practical Training Programme:

1. Training Certificate given by the Chief Architect.
2. Work Log Book & Type of Works involved, duly certified by the Chief Architect.
3. Attendance Report and Leave Report.
4. Performance Certificate in sealed envelope given by the Chief Architect, rated in terms of the Student's (a) Punctuality, (b) Leadership qualities, (c ) Communication Skills, (d) Technical understanding level, and (v) Site Supervision performance.
5. Set of Municipal Drawings made by the Student during practical training.
6. Set of Working Drawings made by the Student during practical training.
7. Set of Presentation Drawings made by the student during practical training.
8. Report of Estimation and Costing done by the Student
9. Report of Project Site Visits made by the Student.

Method of evaluation for 600 marks should be made available to the students before leaving for the practical training.

## **IX - SEMESTER**

### **AAR 521 PRACTICAL TRAINING**

**Credits: 30**

#### **Course Objectives:**

- To bridge the transformation in between theoretical and practical domains by providing scope to get trained and interact with an experienced professional.
- To equip the students with required/basic technical knowledge on various aspects being involved in architectural practice.
- To make student expose and understand the required set of drawings and documents to be produced for appropriate execution of project.
- To introduce how to critically analyze the project cycle inclusive of post occupancy.
- To expose student to practical issues in a project during construction phase by involving the student in site visits and supervision practices.

Each candidate shall have to prepare a detailed report along with necessary drawings, sketches, measurement records, readings, observations, survey analysis, log sheets about the following aspects.

**1. Critical appraisal:** Post Occupancy Analysis of any building that the office has designed and executed. The building should be in use and the students may record the reactions of the users to support his appraisal in addition to photographs, drawings etc.

**2. Site Supervision and practices** – A detail report on minimum number of two site supervisions for any part of a building that has been personally supervised by the student/ his supervisor. If the student does not get an opportunity to supervise their office work, he can give site report of any other work. It may include total site information, cross verification of as built drawings and statutory drawings, material palette and other necessary information.

**3. Log Sheet and Training Certificate** – A student shall fill the log sheets, as a record of his work on daily basis and shall submit the same, along with the performance certificate through confidential report from his employer. The student must maintain at least 90% of attendance.

4. A student shall submit all the working details prepared by him during his practical training along with estimates and specifications report of a small project or any special work done during his training such as any computer programme, lighting scheme, glazing details for energy efficiency and calculations, acoustical details, etc.

\*The student is advised to adhere to the syllabus and keep constantly prepare and update the training report on monthly basis while working in the office where he/she is undergoing the training, and prepare themselves ready for the viva-voce to be conducted at the school at the end of the Practical Training programme.

**Course Outcomes:**

- The student will be able understand on how theory & practical are works together in design and construction of buildings and its services.
- The course recognizes buildings as a dynamic structure that supports the people and technologies working within its four walls.
- The course builds competence to understand that an intelligent building is one which provides a productive and cost-effective environment through optimization of its four basic elements structure, systems, services and management and the interrelationship between them..

## X- SEMESTER

Sl. No.	Course Code	Course Name	No. of Hrs. per week			Credits	Marks			End Exam Duration Hours
			L	S	P		I	E	T	
1	AAR502	Professional Practice & Building Regulations	3	0	0	3	50	50	100	3
2	AAR 504	Entrepreneurship Skills for Architects	2	0	2	3	50	50	100	3
3	AAR522	Design Thesis	0	0	0	18	600	-	600	Viva
4	AARxxx	<b>Program Elective-IV</b>	3	0	0	3	50	50	100	3
	AAR542	Intelligent Buildings								
	AAR544	Research Methods in Architecture								
	AAR546	Professional Ethics and Human Values								
Total			08	00	02	27	750	150	900	

NOTE:

\*AAR522 Design Thesis, 40% of continuous evaluation marks shall be evaluated by conducting viva-voce with an external member.

## **X – SEMESTER**

**AAR 502      PROFESSIONAL PRACTICE & BUILDING REGULATIONS      CREDITS: 3**

### **Course Objectives:**

- To provide students with in-depth understanding of the origin and importance of Indian Institute of Architects, and the Council of Architecture, and to make students familiar with the liabilities, and obligations of a professional architect towards client, peers, and the society at large.
- To make the students familiar with common elements of various building bye-laws, and the National Building Code 2015.
- To make the students aware of the various options available after graduating from architecture and familiarize them with the pros and cons of the common ones - private practice, and salaried appointment.
- To introduce the students to CoA prescribed format of building contract and familiarize them with important aspects of the contract.
- To familiarize the students with CoA prescribed guidelines for architectural competitions.

### **UNIT 1**

Role of Professional body - Indian Institute of Architects, its working, constitution and bye laws, categories of membership, election procedures. Code of conduct. Role of its conventions, Its publications etc. Architects Act'1972: Detailed study of the act and its provisions and recent amendments. Role and responsibilities of Council of Architecture. Role of its electorate, procedure of membership.

### **UNIT 2**

Professional Responsibilities and Liabilities of the architects, Responsibilities of Client and Contractor(s), copy rights, scale of charges, variation of charges, mode of payment, termination of services. Arbitration. Specialized building services. Professional Service Tax.

Architectural Competitions: Its purpose, Types of Architectural competitions, Its guidelines for participation, prizes, assessment, etc.

### **UNIT 3**

#### **Architects in practice**

- a) Private practice - Partnership office management, methods of organization, filing, documentation and working.
- b) Salaried appointment - Public sector, Private sector jobs, procedure of operation in government organization.



## **UNIT 4**

### **Contracts and Construction process**

Types of building contracts, their merits and de-merits. Preparation of tender documents, method of writing tenders, opening of tenders. Preparation of contract documents, general conditions of contract, interim certificates, defect liability periods, retention amount, security deposits, mobilization money and virtual completion.

## **UNIT 5**

### **Review Contents of National Building Code.**

Building bye laws, submission plans, Methods of municipal approval, Development Controls and Zoning regulations, and other regulatory aspects such as Master plan and Zonal plans.

### **Course Outcomes**

- Student shall understand the roles of Indian Institute of Architects, and the Council of Architecture and
- Students shall be prepared for professional practice by understanding the liabilities, obligations, and responsibilities of a professional architect, and also understanding building bye-laws and regulations, and learning to apply the same.
- Students shall have learned about various prospects after graduation including professional practice or salaried appointment and evaluating the pros and cons of each
- Students shall be able to understand, analyze and evaluate various types of contracts, and will be able to issue Notice Inviting Tenders.
- Students shall understand the importance and types of competitions

### **Reference:**

1. Roshan Namavati; Professional Practice.
2. Code of Professional Practice : I. I. A.
3. Architect Act 1972.
4. Krishnamurthy K.G. & Ravindra S.V., Professional Practice (2014)
5. Handbook of Professional Documents- 2015, by Council of Architecture (CoA).
6. Online. Bye-laws of IIA. The Architects' Act 1972, and related regulations; Local Building Bye-laws (such as AP GO 168) National Building Code 2005.

**Course Objectives:**

- To study about entrepreneurship skills required for architects
- To study about the marketing, finance management & office management
- To equip with the fundamentals to deal with live building projects from its commencement to completion

**UNIT 1****Introduction to entrepreneurship**

The nature of entrepreneurship, characteristics that contribute to the success of entrepreneurs; aspects of small business ownership, steps to start the business.

**UNIT 2****Architectural competitions & legislations**

Regulations governing the conduct of competitions, open & closed competitions

Role of development authorities & urban arts commissions, Environmental acts & laws, special rules governing hill area development & coastal area management, heritage act of India etc. Pre-requisite for Indians to work in other countries & vice versa, emerging trends in architectural collaborations.

**UNIT 3****Marketing & Finance Management**

Principles of Business, Marketing, and Finance. Business Law, Advertising and Sales Promotion, principles to start & operate business, Code of conduct for architectural practice.

**UNIT 4****Employee and Office Management**

Understanding office management and project awarding; organization structure, responsibility towards employees, consultants & associates; maintenance of accounts; filing of records; balance sheet, Income tax; Service tax; Professional tax.

Various architectural services, additional services and scale of professional fees.

Building regulations related to submission of approval drawings to concerned public bodies.

**UNIT 5****Social entrepreneurship and its relevance to the practice of architecture**

Architects duty and responsibility towards society, Future-oriented design principles to increase the design organization's innovative and competitive qualities, Sustainability.

**Course Outcomes:**

- Ability to learn about potential skill of entrepreneurship for architects
- Ability to understand the building bylaws, competition guideline.
- Ability to deal with clients and initiate building approval process.
- Ability to manage employee and finance management
- Ability to design habitable space for the society considering future oriented design principles

**Reference:**

1. Architect and Entrepreneur: A Field Guide to Building, Branding, and Marketing Your Start up Design Business, Eric Reinhold.
2. Architects Practice, J.J.Scott.
3. COA. (2005). Handbook of Professional Documents. Council of Architecture.

**AAR 522      DESIGN THESIS****Credits: 18****Course Objectives:**

- To encourage students to take-up a project of suitable scale, complexity and societal relevance.
- To guide them study the project with rigour of enquiry, to derive the real needs of the project.
- To sensitize applicable norms, standards, techniques of drawing development, report writing.
- To develop an ability to apply the knowledge gained to new situations.
- To develop abilities to present their work effectively at various forums.

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.

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 services-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.

Students have to submit and present their work for this project in following stages:

**Stage I:****Thesis Synopsis Presentation, Data Collection & Case studies:**

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.

Collection of literature data related to the chosen thesis topic. Case study of projects relevant to the thesis topic to be completed. Minimum of 2 case studies required to be done.

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**Stage II:****Site Analysis and Project Requirements**

Detailed site analysis should reflect complete physical and environmental characteristics of the project site.

Project requirements should have complete requirement of the project under the scope, in terms of facilities and area with reference to the case studies made earlier.

**Stage III:****Concept Design and Design Feasibility**

This stage will have the following:

- Basic concept/principal ideas leading to the design
- Site Plan, zoning of activity spaces, movement patterns and building blocks.
- Schematic floor plans of all the buildings under the scope of the project
- Conceptual built form, in terms of elevations, sections, views, study models etc.

**Stage IV:****Design Development**

This stage should comprise of detail design of the project with the following drawings to suitable scale:

- Site plan
- Building plans of all the building units and all floors.
- Furniture layout for typical areas.
- Elevations and sections of all building units.
- Working Drawings (min 2 nos) and services drawing (min 2 nos).
- Study model
- Perspective/view of interior
- Walk through (optional)

**Stage V:****Finalization of Project drawings**

Students have to produce all the drawings of the previous review along with the corrected drawings based on the comments of that review for final approval on the design.

**Stage VI:****Project Synopsis**

Students must submit Thesis report (3 copies) summarizing the salient points of their project.

**Stage VII:****Thesis report**

Students must submit Thesis report (3 copies) comprising write ups, case studies and drawings in the format as specified by the school.

### **Stage VIII:**

#### **Final presentation to external jury**

Final design, comprising project introductions, case study/literature study, site analysis and the final proposal and model, is to be submitted for assessment by a panel of jury members comprising of external experts.

#### **Course Outcomes:**

- students are developed with required abilities to derive apt architectural solution with high quality drawings and technical write-up.
- students are confident to put-up to the challenges of the profession of architecture.
- Students are knowledgeable towards deriving the real needs of the projects, applicable norms, standards, techniques of drawing development, techniques of report writing.
- students have an ability to apply the knowledge gained to new situations.
- students can present their work effectively at various forums.

### **AAR 542 INTELLIGENT BUILDINGS**

**Credits: 3**

#### **Course Objectives:**

- To develop orientation towards the need and advancement in technology contributing to the intelligent buildings concept.
- To inculcate the ideas of interface and components of building automation controls and techniques in an intelligent buildings.
- To introduce about various aspects of building intelligence and building automation.
- To introduce to various aspects of intelligent systems in buildings design.
- To enhance the insight about existing intelligent buildings in India and abroad through proper Case- Studies.

### **UNIT 1**

#### **Building Intelligence**

- Introduction to intelligent Buildings - history and development
- Intelligent Buildings- Features and definitions
- Use of artificial intelligence in building systems
- Developments in technology contributing to the intelligent buildings concept

### **UNIT 2**

#### **Building Automation and Controls**

- Interfaces and components of Building Automation Systems
- Hardware and software requirements of Building Automation System

### **UNIT 3**

#### **Building Automation Techniques**

- Expert systems, genetic algorithms, Artificial Neural Networks Fuzzy Systems, and their

application in Intelligent Buildings especially for HVAC, Electrical, Fire, Vertical Transportation, safety and security systems and energy management and design

#### **UNIT 4**

##### **Various aspects of Intelligent Building Design**

- Environmental controls- traditional building controls, Lighting control- integration of automatic lighting control for buildings
- Sensors, actuators, and end devices-including adjustable speed drives, chillers complete packaged air-conditioning, Fire and Life Safety integration with the automated buildings
- Security integration for the tenants of automated buildings
- Elevators integration for the tenants of automated buildings

#### **UNIT 5**

Case-studies of Intelligent Buildings from India and Abroad.

##### **Course Outcomes:**

- Students understand the need and advancement in technology contributing to the intelligent buildings concept.
- Students are familiar about the ideas of interface and components of building automation controls and techniques in an intelligent building.
- Students are knowledgeable about various aspects of building intelligence and building automation.
- Students are familiar about various aspects of intelligent systems in buildings design.
- Students acquired an insight about the existing intelligent buildings in India and abroad through proper Case- Studies.

##### **References:**

1. Dubin, Freds; Energy Conservation Standards: For building design, construction, and operation.
2. ASHRAE Journals.

#### **AAR 544 RESEARCH METHODS IN ARCHITECTURE**

**Credit: 3**

##### **Course Objectives:**

- To appreciate the process of research and make the students aware of its potential in the field of architecture
- To equip knowledge to construct necessary tools of enquiry necessary for research, and ethics.
- To clarify relevance of a particular / predominant tool (s) for research in the Profession of Architecture.
- To equip tools and methods needed to handle the scale of a project suitable for Research at various levels at i.e. limiting to UG & PG level.

- To add effective skills for report writing, study of current practices and conventions.

## **UNIT 1**

### **INTRODUCTION**

Definition, Basic research issues and concepts, Orientation to research process, Types of research: quantitative, qualitative, co-relational, experimental, simulation and modeling, logical argumentation, case study and mixed methods

## **UNIT 2**

**ELEMENTS OF RESEARCH PROCESS:** Finding topic- Writing and introduction- Stating a purpose of study identifying key research questions and hypotheses- Reviewing literature using theory, defining and stating the significance of the study, methods and procedures for data collection and analysis

## **UNIT 3**

### **RESEARCHING AND DATA COLLECTION**

Library and archives- The role of Internet, finding and evaluating sources of misuse, Test for reliability ethics- Methods of data collection- From primary sources: observation and recording, interviews: structured and unstructured, questionnaire, open ended and close ended questions, Problems encountered in collections data from secondary sources.

## **UNIT 4**

### **REPORT WRITING**

Writing and publishing the research works in journals- Research writing in general- Components: Referencing- Writing the Bibliography- Developing the outline, presentation, etc.

## **UNIT 5**

### **REVIEW OF RESEARCH PAPERS & CASE STUDIES**

Case studies illustrating how good research can be used from project inception to completion- review of research publications.

### **Course Outcomes:**

- Ability to select and design the process of conducting the research through various stages.
- To sensitize about emerging concepts in architecture to suit changing needs of society
- Ability to understand Research Objectives in a comprehensive manner to understand individual ability to contribute to the same as a team member in the sub topic / component assigned or selected.
- Ability carry out the Research process as effective tool of study, formulation of idea, data collection, analysis, synthesis and conclusion culminating into report writing as

documented Academic resource.

- Ability to translate the Research findings to derive solutions to the Design problems in general or to a particular context.

## References:

1. Kothari C.R., Research Methodology: Methods and Techniques, 2nd Edition, New Age International Publication, 2004.
2. Raman Meenakshi and Sharma Sangeeta, "Technical Communications – Principles and Practices", OxfordUniversityPress, New Delhi.
3. Marans, Daniel StokolsStokols. Specifications of Environmental Simulation: Research and Policy Issues. Springer Us, 2013.
4. Fraser, Murray. Design Research in Architecture an Overview. London: Ashgate, 2013.
5. Groat, Linda N, and David Wang. Architectural Research Methods, 2nd Edition. Wiley, 2013.
6. Hughes, Richard, and ShivaniTanna. Specifications of GPST Stage 3: Written and Simulation Exercises. Jp Medical Ltd, 2013.
7. Lin, Lin Huang. Specifications of Advanced Research on Computer Education, Simulation and Modeling. Springer, 2011.
8. Sharma, S C. Specifications of Operation Research: Simulation and Replacement Theory. Discovery Publishing House, 2006.

## AAR546 PROFESSIONAL ETHICS AND HUMAN VALUES

**Credits: 3**

### Course Objectives:

- To sensitize students about human values and their positive and negative impacts on human interactions and Society.
- To introduce the concept of engineering ethics and associated aspects.
- To present engineering as social experimentation and analyze the underlying aspects.
- To sensitize students about the safety, responsibility and basic human rights.
- To help co-relate professional ethics and global issues.

### UNIT 1

**Introduction:** Morals, values and ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty.

### UNIT 2

**Engineering Ethics:** Senses of 'Engineering Ethics', variety of moral issues, types of inquiry, moral dilemmas, moral autonomy

### UNIT 3

**Engineering as Social Experimentation:** Decomposing the system, overview of system design, system design concepts, system design activities, addressing design goals, managing system design.



## **UNIT 4**

**Safety, Responsibilities and Rights:** Safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk, the Three Mile Island and Chernobyl case studies. Collegiality and loyalty, respect for authority, conflicts of interest, occupational crime, professional rights.

## **UNIT 5**

**Global Issues:** Multinational corporations, environmental ethics, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership.

### **Course Outcomes:**

- Students are responsive about human values and their positive and negative impacts on human interactions and Society.
- Students understand the concept of engineering ethics and associated aspects.
- Students can analyze underlying human and social aspects of various engineering endeavours.
- Students are familiar about the safety, responsibility, and basic human rights.
- Students can co-relate professional ethics and global issues.

### **References:**

1. Charles D. Fleddermann, Engineering Ethics, Pearson Education / Prentice Hall, 2004
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, Engineering Ethics - Concepts and Cases, Wadsworth Thompson Learning, 2000
3. John R Boatright, Ethics and the Conduct of Business, Pearson Education, 2003
4. Edmund G Seebauer and Robert L Barry, Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, 2001.