



JAWAHARLAL NEHRU ARCHITECTURE AND FINE ARTS UNIVERSITY
Mahaveer Marg, Masab Tank, Hyderabad – 500 028.

Revised Academic Regulations for Bachelors Programs
(Effective from the Academic Year 2022-2023)

Preamble:

The Curriculum of JNAFAU Bachelor Programs is inline with the spirit of NEP and aims to provide comprehensive learning opportunities in the frame work of CBCS and Outcome Based Education (OBE), which responds to diverse interests and abilities of the students. Apart from the compulsory core courses, the students can choose from the elective courses on offer in the university or also from approved online platforms like the MHRD's SWAYAM or MOOCs.

These regulations are subject to amendments as may be decided by the Academic Council / Committee of the University from time to time. Any or all such amendments will be effective from such date and to such batches of students (including those already in the middle of the program) as may be decided by the Academic Council / Committee.

1. Glossary of Terms

- 1.1. **Program:** An educational program leading to award of a Degree in a discipline.
- 1.2. **Course:** Generally referred as a 'subject' offered under the degree program. Each course is identified by a unique course code and course title. A course may be designed to comprise lectures/ studio/tutorials/ laboratory work/fieldwork/ outreach activities/ project work/vocational training /seminars /term papers/ assignments/ presentations/ self-study etc. or a combination of some of these. All courses do not carry the same credits.
- 1.3. **Choice Based Credit System (CBCS):** In addition to the compulsory core courses in a program, CBCS provides **choice** for students to select from a number of elective courses offered. The term **credit** refers to the weightage given to the course and is usually the number of periods per week allotted to it.
- 1.4. **Re-admission:** When a student is detained in a semester due to shortage of attendance or the student takes a break of study, the student has to take re-admission to continue the program.
- 1.5. **Re-registration:** When a student has failed in a course due to low internal assessment marks, but has satisfactory attendance, the student can re-register to improve performance in internal assessment as well as external evaluation.
- 1.6. **Re-appearance/ supplementary examinations:** When a student has failed in a course and wishes to improve performance only in end semester external examination he/she can register to reappear for the supplementary examination.
- 1.7. **Director of Evaluation (DIRECTOR OF EVALUATION)** means the Authority of the University who is responsible for all activities of the End Semester Examinations of the University.
- 1.8. **Director, Academic and Planning (DAP)** means the authority of the University who is responsible for all academic activities for the implementation of relevant rules and regulations.

2. Program Structure

- 2.1. **Category of Courses:** The program shall have a curriculum with syllabi consisting of courses as prescribed by the Board of Studies, and broadly categorized under:
 - 2.1.1. **Compulsory Core (CC)** are courses deemed to be the core learning required for the discipline. These courses are part of the compulsory requirement to complete the program of study. A core course cannot be substituted by any other course. A core course offered in this program may be treated as a Professional or Open Elective by other programs.

- 2.1.2. **Professional Electives (PE)** are courses which are elective courses relevant to the discipline. An Elective course is generally a course that can be chosen from a pool of courses on offer. Every student shall be required to opt for the electives from the list of electives offered. Students can also opt for the electives on offer from any of the other Programs, besides his / her own discipline courses, or even do online courses subject to the respective Program specific regulations.
- 2.1.3. **Open Electives (OE)** are chosen generally from an unrelated discipline/ subject, with an intention to seek exposure/ add generic proficiency. These may include Liberal Arts courses, Humanities and Social Science courses, etc. and essentially facilitate the student to do courses (including Core Courses or Professional Electives) offered by other departments/ programs / institutions or online. Open Electives may not be specified in the course structure and the University may approve and offer any Open Elective courses in any semester as an option for the students.
- 2.1.4. **Ability Enhancement Courses (AEC).** These are mandatory courses based upon content that lead to general knowledge, ability and soft skills enhancement, such as, Environmental Studies, Communication Skills, Universal Human Values, etc. Some of these courses are non credit courses and some carry credits.
- 2.1.5. **Non- Credit Courses / Activities mandatory for award of Degree:**
There are some non-credit courses / activity such as: 1) Co-Curricular Activity / Extension Activity (EA), 2) any other as specified in the respective course structure / syllabus. A 'Satisfactory' grade in the above is compulsory for the award of degree.
- 2.1.6. **Online Courses:** Students may be permitted, with the prior approval of the Department, to take online courses through SWAYAM or MOOCs or any other approved online facility, in lieu of the Electives (both PE and OE) offered in the University.
- 2.2. **Credits:**
- 2.2.1. Credits are indicative of the importance of the course. In the case of core courses 1 period of direct teaching per week (Theory / Tutorial/ Studio/) = 1 credit. One period of practical/field work = 0.5 credits.
- 2.2.2. In the case of some courses like Thesis, Project, Internship the credits are based on their level of importance as decided by the Board of Studies and as described in their respective course structures.
- 2.3. **Pre-requisites:** Some of the courses may have pre-requisites (i.e. the student may be required to have registered and attended the course specified as a pre-requisite.)

2.4. **Types of Courses and Learning Sources**

Types of Courses	Learning Sources
Compulsory Core (CC)	Parent Department (PD)
Professional Elective (PE)	PD / OD / online
Ability Enhancement Course	PD / OD / online / Univ.
Open Elective (OE)	PD / OD / online / Univ.
Extension Activity (EA)	PD, OD, Univ.

Note: PD = Parent Department; OD = Other Departments / Institutions / Universities

3. Duration of Program

- 3.1. A student is normally expected to complete the Program in four academic years (8 Semesters), five academic years (10 Semesters) in case of B. Arch., but in any case not more than 8 years, 10 years in case of B. Arch. (including break of study for personal reasons or suspension/ detention due to disciplinary action, etc.).
- 3.2. Each semester shall normally consist of 90 working days (excluding end semester examination days).
- 3.3. **Gap Year:** A student may be permitted to take a break of study for a maximum of one academic year for professional development, with prior approval from the Vice Chancellor. In exceptional cases, this may be extended to another year after an appraisal process approved by the State Govt. / University. In such cases the student will also be eligible for award of First Class with Distinction/ other awards. Rules of re-admission will apply to such cases.

The Head of the concerned department shall notify any such cases to the Director of Evaluation through proper channel for information and appropriate action.

4. Registration for choice of Electives:

- 4.1. Each student shall be deemed to have registered for **all the compulsory core and other mandatory (AEC) courses** of every semester that he/she is admitted to / promoted to, on the payment of the requisite fees.
- 4.2. However, in the case of electives (as per the course structure), students shall submit their preferences from the list of electives on offer (including approved online courses), and after allotment of the elective course, register for elective courses of their choice – both professional and open electives.
- 4.3. The information on the list of all the courses offered as elective in every department specifying the course code, course title, credits, prerequisites, the time table slots and the registration process with the time schedules will be made available on the University website. Every student is expected to go through the above information, consult the faculty members, and select their choice of elective courses.
- 4.4. Every student shall submit their preferences from the list of electives on offer (including approved online courses), register / re-register as per the registration process and the schedule notified.
- 4.5. The departments shall put up the list of electives allotted to the students, using their (departments') discretion based on physical and other capacities, with first preference given to the students from the parent department and later, considering a first come first and/or SGPA basis for students from other departments. However, students who have registered for elective courses previously are allowed to re-register for courses in which they have failed.
- 4.6. In case none of the student's preferred choices is allotted, or even otherwise, the student may propose an alternative choice from among the available ones after due consultation with the respective faculty. In any case, the students shall register (which is effected only on their choice of elective being approved) for the courses within the given schedule/ deadline.
- 4.7. After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Internal Assessment marks and appear for the End Semester Examinations.
- 4.8. A student is permitted to cancel his/her registration for the elective courses, within two weeks of starting of the semester.
- 4.9. To enable the students to choose electives from across the departments, the DAP shall in consultation with all the departments, facilitate the announcement of a common time-slot for the elective periods in the individual time tables of the departments.
- 4.10. No elective course shall be commenced unless a minimum number of students are registered (this number may be different for different courses and Programs and may be decided by the Departments / College/ University every semester).

5. Attendance Requirements

- 5.1. A student has to put in a minimum of 75% of attendance, in aggregate of all the courses registered in the semester (excluding approved online elective courses) for becoming eligible to register for the end examinations and for acquiring credits in each semester.
- 5.2. Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the College Academic Committee on genuine and valid (including medical grounds), based on the student's representation with supporting evidence.
- 5.3. Condonation of shortage of attendance as stipulated above, shall not be automatic but on the merits of the case to the satisfaction of the College Academic Committee.
- 5.4. A stipulated fee shall be payable along with the application for condonation.
- 5.5. Shortage of attendance below 65% in aggregate (including medical grounds) shall in no case be condoned.
- 5.6. A student will not be promoted to the next semester unless the attendance requirement of the present semester is satisfied. In case of such detention the student is not eligible to take

the End Examination of that semester and the course registration shall stand cancelled. The student shall seek re admission for that semester when offered next.

- 5.7 In the case of re-registration (clauses 10.4 to 10.7) for a course/s, the attendance requirement is not applicable.

6. Assessment

- 6.1 **Distribution of Internal Assessment and End Exam Marks:** Performance in each course shall be evaluated as prescribed in the respective Program's course structure and syllabus. As a general pattern, 50% of the marks in a course are through internal assessment and 50% through end semester examinations. A few courses may have 100% of the assessment purely through internal assessment. The thesis, the internship courses and many of the studio courses are assessed through a jury and viva-voce for the end semester examination.

- 6.2 In case of capstone courses such as Project / Thesis / Dissertation / Towards Exhibition in the final year, the students work shall be assessed periodically through the semester.

On completion of approximately 2/3 of the duration of the semester expected work, if the Project Supervisor / Review panel members are of the opinion that the work does not achieve the minimum standard required, they shall report the same to the HoD / Thesis or Project Co-ordinator. The Thesis Committee (or an equivalent Committee Consisting of at least three teachers and the Review Panel Members / thesis guide shall review the progress of the students, and work once again.

At this stage, they will assess whether the student can be permitted to proceed further with the work for appearing at the end-semester external examination. If the student is permitted, his / her work shall be reviewed once again by the same panel just before the end-semester examination, for final clearance to attend the external examination.

- 6.3 **Schedule for Internal Assessment:** The students shall diligently follow the given internal assessment schedule for the semester including submissions and tests.

- 6.4 The compiled cumulative internal assessment marks and attendance of the students will be displayed once in every four weeks for information to the students. 50% of the marks allotted for the internal assessment courses shall be finalized before the 10th week. All internal assessment marks have to be finalized and submitted to the DE before the first day of End Semester Examinations of the semester.

- 6.5 **Assessment for Online Courses:** In case of credits earned through approved online modes, the credits and grades shall be assigned by a committee consisting of Head of the Department or a teacher nominated by the HoD and a senior faculty member nominated by the DAP/ Principal (in case the credits or grades are not included by the online course faculty).

- 6.6 **Non-Credit, Mandatory Courses / Activity:** Assessment in non credit courses will be in marks as indicated in the course structure. The marks secured in these courses will not be awarded grade points and hence will not be included in the computation of SGPA/CGPA.

Assessment for activities as listed in 6.5.1 below will be in terms of "Satisfactory" or "Not Satisfactory". A 'Satisfactory' grade in these listed courses/ activities is compulsory for the award of degree.

- 6.6.1 Co-Curricular Activity / Extension Activity (EA) (for all round development) :Every student has to participate in any one of the following activities like NCC/ NSS/ Sports/ FSAI University's Pro-bono project activity/ any national or international student camp /any other community development activity listed by the University and acquire a "Satisfactory" grade to be considered eligible for award of a degree.

6.6.1.1 The student's performance shall be examined by the faculty in-charge of the relevant extension activity along with the Head/ Coordinator of the Department/ activity.

6.6.1.2 Physically challenged students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above activities and be graded and certified accordingly.

- 6.6.2 Any other course or activity as specified (including the mode of assessment) in the respective course structure or syllabus.

7. Award of Letter Grades

- 6.7 The performance of a student will be reported using letter grades, each carrying certain points as detailed below:

S. No.	% of Marks		Letter Grade	Grade Points
	Minimum	Maximum		
1.	90.00	100.00	A +	10
2.	80.00	89.99	A	9
3.	70.00	79.99	B	8
4.	60.00	69.99	C	7
5.	50.00	59.99	D	6
6.	40.00	49.99	E	5
7.	00.00	39.99	F	0
8.	<i>Shortage of attendance and hence prevented from writing end semester examination</i>		SA	0
9.	Absent for End semester examination		Ab	0
10.	Satisfactory *		Satisfactory	0

Note: *Satisfactory grade will be given only for the non-credit courses/ activity such as mentioned in clause 6.5.A'Satisfactory' grade in these listed course/ activities is compulsory for the award of degree.

Example of assignment of letter grade and grade points for marks:

Course Title	Int. Marks	End Exam	Total	Grade	Grade point (GP)
Course X1	22	25	47	E	5
Course X2	39	41	80	A	9
Course X3	37	34	71	B	8
Course X4	29	30	59	D	6
Course X5	25	24	49	E	5

- 7.2. A student who earns at least an 'E' grade in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course. A course successfully completed cannot be repeated.
- 7.3. Students who fail to appear for end semester examinations will be marked as 'Ab' (Absent) and should register for supplementary examination by paying the prescribed fees.
- 8. Academic Requirements:** The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in clause 7.
- 8.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if the student secures not less than 40%marks in the semester end examination, and a minimum of 40% (45% in the case of B. Arch as per Clause 7(4) of the CoA Minimum Standards of Architectural Education Regulations 2020) marks in the sum total or aggregate of the Internal Assessment and Semester End Examination taken together; in terms of letter grades, this implies securing 'E' grade or above in that subject/ course.
- 8.2 A student failing in any course on the first attempt will not be eligible for any awards.
- 8.3 A student eligible to appear in the end semester examination for any course, but absent from it or failed (thereby failing to secure 'E' grade or above) may reappear for that course in the supplementary examination as and when conducted. In such cases, the internal marks obtained earlier for that course will be retained, and added to the marks obtained in the end semester supplementary examination for evaluating performance in that course.
- 9. Promotion between Semesters:**
- 9.1. A student shall be promoted from odd to even semester if the minimum requirement of attendance as in clause 7 is fulfilled.
- 9.2. A student shall be promoted from even to odd semester, if the minimum requirement of attendance as in clause 7 is fulfilled and as per the other requirements specified in the following table.
- 9.3. Table indicating promotion requirements from even to odd semesters:

Promotion	Amendment
From 4th sem. to 5th sem.	does not have more than six (6) backlog courses up to 3rd semester
From 6th sem. to 7th sem.	does not have more than nine (9) backlog courses up to 5th semester
For B. Arch	
From 8th Sem. to 9th Sem.	does not have more than twelve (12) backlog courses up to 7th semester

.(Revised as per Standing Committee Minutes dt. 15.05.2024)

10. Re-admission and Re-registration

- 10.1 A student may be detained in a semester either due to shortage of attendance, or due to having more than the permissible number of backlog courses. Students detained due to shortage of attendance may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements.
- 10.2 A student detained due to not having enough credits or having more than the permissible number of backlog courses, shall be promoted to the next academic semester only after fulfilling the requirements as per Table 9.3.
- 10.3 No grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which student has been detained.
- 10.4 The academic regulations under which a student has been first admitted shall be applicable in all cases of re-admission.
- 10.5 If a student fails in a Professional Elective or an Open Elective, the student may re-register for the same or register afresh for any other Professional Elective or Open Elective course respectively in the subsequent semesters. In case of re-registration in the same courses, attendance is not mandatory, whereas registration for any other elective course/s requires the student to attend the classes and fulfill the attendance requirements as per Clause 7.
- 10.6 A student who fails in any course may be permitted the option of re-registering in that subject only if the internal assessment marks are less than 40%, so as to enable him to improve/redo and resubmit the work for internal evaluation. In such cases of re-registration, the student's previous performance both in the internal evaluation and end evaluation in the particular subject/s shall stand cancelled and he/she shall be required to appear for the end semester evaluation again (end examination and /or external jury as the case may be).
- 10.7 The maximum number of courses a student may be permitted for 're-registration' in a semester, is limited to three. Re-registration of any course should be done within 15 days from the date of commencement of class work. The student also have to register for the end examination at the time of notification for the re-registered courses. A stipulated fee shall be payable towards re-registration in any subject.
- 10.8 Every college shall send a list of re-registered candidates with course details to the office of the Director of Evaluation within one month from the date of commencement of the semester.
- 10.9 The student may attend classes in the case of the re-registered courses, if the student wishes. However, the attendance requirement is not compulsory for such courses.

11. Grade Points, SGPA and CGPA Calculation

- 11.1. After the results are declared, Grade Sheets will be issued to each student which will contain the list of courses registered during the semester and the performance in each with details of whether passing or failing, credits earned in that semester, promoted or not, letter grades, grade points, etc.
- 11.2. **Grade Points:** The grade points obtained in a subject multiplied by the credits for that subject will be the weighted grade points.

$$\text{Weighted Grade Points (WGP)} = C \times GP$$

Where 'C' is the number of credits assigned for the subject and 'GP' is the Grade Point obtained as per the Table in clause 7.1 above.

- 11.3. **SGPA:** The sum of the weighted grade points divided by the total number of credits in a semester will give the Semester Grade Point Average (SGPA).

$$SGPA = \sum C_i GP_i / \sum C_i = 1 \text{ to } n$$

Where n is the number of courses the student registered for in the semester, 'C' is the number of credits allotted to each of the courses, and 'GP' is the grade-point obtained by the student in the respective courses.

An example follows:

Course Title	Credits (C)	Grade (GP)	Weighted Grade Points (WGP)
Course X1	3	7	21
Course X2	8	8	64
Course X3	8	7	56
Course X4	7	7	49
Course X5	2	6	12
Course X6	2	6	12
Total	30		214
Semester Grade Point Average (SGPA) = Total WGP/ Total credits =			7.13

- 11.4. **CGPA:** The Cumulative Grade Point Average (CGPA) will be computed for every student as:

$$CGPA = \sum C_i GP_i / \sum C_i = 1 \text{ to } m$$

Where 'm' is the number of subjects registered for in all the semesters from the 1st semester onwards. 'C' is the number of credits allotted to each of the courses, and 'GP' is the grade-point obtained by the student in the respective courses.

- 11.5. The CGPA and SGPA will be rounded off to the second decimal place and recorded as such.
- 11.6. *For the purpose of computation of the final CGPA, award of degree, award of the class as in clause 14, and other honours if any, including medals, the performance in 163 credits (265 credits in the case of B. Arch.) will be taken into account. For calculating the 163 credits (265 credits in the case of B. Arch.) the credits secured in all the Core and Ability Enhancement Courses (which are compulsory) shall be included. The choice of 'best' credits to be included in the calculation shall be from only those credits secured in the Electives – both Professional and Open Electives. (Revised as per Standing Committee Minutes dt. 27.07.2023)*

- 12. Eligibility for the Award of Degree:** A student shall be eligible for the award of the Bachelors Degree in the specific discipline into which he/she was admitted, if the following academic regulations are fulfilled:

- 12.1. Has pursued the program of study for not less than four academic years and not more than eight academic years. Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in the program and their seat shall stand cancelled.
- 12.2. Successfully secured "Satisfactory" grades in all the mandatory non-credit courses/ activity.
- 12.3. Has secured a minimum of 5.0 CGPA
- 12.4. No disciplinary action is pending against the student.

- 13. Withholding of the results:** The results of a student may be withheld if:

- 13.1. He/she has not cleared any dues to the University/Institution/Hostel.
- 13.2. A case of disciplinary action against the student is pending disposal.

14. Classification of the Degree Awarded

- 14.1. After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of the Bachelors Degree in the Program to which he/she was admitted, he/she shall be placed in one of the four classes as shown in the Table.

First Class with Distinction	1. 8.0 and above of CGPA and should have cleared each and every subject in a single attempt. 2. Should have passed the examination in all the courses of all the eight semesters in the student's First Appearance within five years, which includes any authorized break of study of one year (clause 3.3). 3. Withdrawal from examination (as per clause 15) will not be considered as an appearance. 4. Should NOT have been prevented from writing end semester examination due to lack of attendance in any of the courses.
First Class	1. Below 8.0 but not less than 7.0 of CGPA and 2. Those students who secured a CGPA of 8.0 and above but have cleared at least one or more subjects in more than one attempt.
Second Class	Below 7.0 CGPA but not less than 6.0
Pass Class	Below 6.0 CGPA but not less than 5.0

Note: In all the above cases CGPA shall be calculated from the 163 credits (265 credits in the case of B. Arch). Refer to Clause 11.6.

- 14.2. A student who is absent in End Semester Examination in a course after having registered for the same shall be considered to have appeared in that examination (except in the case of approved withdrawal from end semester examinations as per clause 15) for the purpose of classification.

15. Provision for Withdrawal from Examination:

- 15.1. A student may, for valid reasons, (medically unfit / unexpected family situations / sports/ etc.) be granted permission to withdraw from appearing for the end semester examination in any course or courses in ANY ONE of the semester examinations during the entire duration of the degree program. The application shall be submitted to the Principal/ Chief Superintendent of the Examination with the required documents.
- 15.2. Withdrawal application shall be valid only if the student is otherwise eligible to write the examination (Clause 5) and if it is made before the commencement of the end semester examination in that course or courses and also recommended by the Head of the Department (excepting in the case of any unforeseen incident occurring after registration for the examination, which prevents the student from attending/writing the examination)
- 15.3. Withdrawal shall not be considered as an appearance for deciding the eligibility of a student for First Class with Distinction.
- 15.4. Withdrawal is permitted for the end semester examinations in the final semester, only if the period of study of the student concerned does not exceed duration of the course.

Note: The sessional marks of the students availing the withdrawal from the examination shall be forwarded by concerned HoD to the University Examination section without fail.

(Revised as per Standing Committee Minutes dt. 20.09.2024)

- 16. Malpractice:** If a student indulges in malpractice in any of the examinations, he/she shall be liable for punitive action as prescribed by the University from time to time.

17. General

- 17.1 In case of any doubt or ambiguity in the interpretation of the academic regulations, the decision of the Vice-Chancellor is final.
- 17.2 The University may from time to time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of Assessment.

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TRANSITORY REGULATIONS (from the Academic Year 2022-23)**Preamble:**

The CBCS & OBE based regulations and courses (referred to collectively as R-22) introduced from the academic year 2022-23 have brought in significant changes in the course structure and academic regulation of the programs in the University as indicated below:

Sl. No.	Aspects	Remarks
1.	Course Codes	All changed
2.	Course Names/Titles	Some changes
3.	Course Structure	Some changes
4.	Pass Marks	Changed in B. Arch. Program
5.	Promotional Requirement	Changed in all programs
6.	Award of Degree	No changes
7.	Performance Evaluation and Award of Class	No changes
8.	Choice in terms of credits	Available in all programs

Considering the significant changes in all the aspects as indicated above, the following transitory regulations have been approved.

The following regulations shall be applicable for the students from the pre R-22 Regulations applying for re-admission:

1. Re-admission into 1st Semester of R-22:

Only students re-admitted into the full 1st Semester of R-22 will, for all purposes be subjected to the entire provisions of R-22.

2. Re-admission from 2nd Semester onwards:

- Students re-admitted from the 2nd Semester onwards will be subjected to the provisions of the pre R-22 regulations if still in force, in which they are first admitted. In case the pre R-22 regulations are not offered, the students shall be re-admitted into R-22 regulations.
- Students re-admitted from the 2nd Semester onwards will be subject to the provisions of the R-22 regulations only. Once re-admitted in R-22 regulations, the students will have to fulfill all the academic requirements of R-22 regulations and shall pass out in the same regulations.
- The student re-admitted into R-22 regulations, he/she has to complete all the courses from the semester of re-admission irrespective of the total number of credits secured.
- Courses with similar nomenclature & syllabus already completed in R-17 regulations need not be repeated again in R-22 regulations. In all other cases the guidelines given for the approved list of equivalent subjects may be followed.
- Pending courses if any of R-17 regulations for the re-admitted students, have to be completed in R-17 regulations only.
- Requirements of pre-requisites need not be followed for candidates re-admitted from R-17 to R-22 regulations.

3. Academic Regulations for Re-registration cases of Students admitted prior to 2022

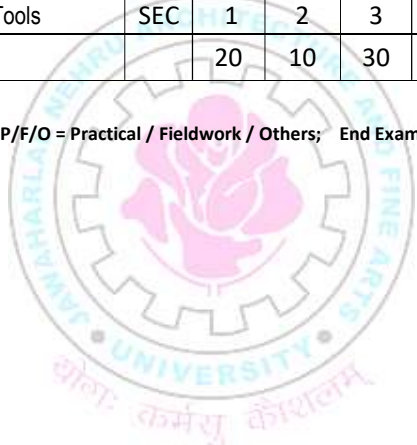
- Students originally admitted in the pre R-22 regulations, may be assigned teacher/s wherever possible, to enable them to complete their internal assessment as per their pre R-22 regulations. Student has to complete the courses whenever offered. Special arrangement for the course/s may be made in case it affects the time line of the students' academic engagement.
- Whenever there is a change of syllabi, end semester examinations based on the old syllabi will be conducted in order to enable the students to clear the backlogs.

FIRST SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	
1	AR22B1.1C	Basic Design	PC	9		9	9	100	100	200	S
2	AR22B1.2C	Materials and Building Construction-I	BS	5		5	5	50	50	100	J
3	AR22B1.3C	Architectural Drawing - I	PC		4	4	4	50	50	100	S
4	AR22B1.4C	Introduction to Art and Architecture	PC	2	1	3	3	50	50	100	W
5	AR22B1.5C	Thinking for Architects	PC	2	1	3	3	50		50	---
6	GN22B2.1A	Communication Skills	SEC	1	2	3		50	50	100	P
7	SP22B1.1A	Basic Digital Tools	SEC	1	2	3	2	50		50	---
				20	10	30	26	400	300	700	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical



Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

SECOND SEMESTER

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B2.1C	Architectural Design – I	PC	9		9	9	100	100	200	S
2	AR22B2.2C	Materials and Building Construction -II	BS	5		5	5	50	50	100	S
3	AR22B2.3C	Architectural Drawing – II	PC		4	4	4	50	50	100	S
4	AR22B2.4C	Structural Mechanics	BS	3		3	3	50	50	100	W
5	AR22B2.5C	Site Surveying	BS	1	2	3	3	50		50	---
6	AR22B2.6A	Model Making Workshop	PC	1	2	3	3	50		50	---
7	GN22B2.2A	Environmental Studies	BS		2	2		50	50	100	J
				19	10	29	27	400	300	700	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)
THIRD SEMESTER

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B3.1C	Architectural Design – II	PC	9		9	9	100	100	200	J
2	AR22B3.2C	Materials and Building Construction III	BS	5		5	5	50	50	100	S
3	AR22B3.3C	Perspective and Rendering	PC		4	4	4	50		50	---
4	AR22B3.4C	History of Architecture – I	PC	3		3	3	50	50	100	W
5	AR22B3.5C	Structural Analysis - I	BS	3		3	3	50	50	100	W
6	GN22B3.1A	Universal Human Values	SEC	3		3	3	50	50	100	J
7	AR22B3.6C	Climatology for Built Environment	BS	2	1	3	3	50	50	100	W
				25	5	30	30	400	350	750	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)
FOURTH SEMESTER

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T /S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B4.1C	Architectural Design – III	PC	9		9	9	100	100	200	J
2	AR22B4.2C	Materials and Building Construction -IV	BS	5		5	5	50	50	100	S
3	AR22B4.3C	Landscape Architecture	PC	4		4	4	50	50	100	W
4	AR22B4.4C	History of Architecture – II	PC	3		3	3	50	50	100	W
5	AR22B4.5C	Structural Design (RCC)	BS	3		3	3	50	50	100	W
6	AR22B4.6C	Water, Sanitation and Hygiene	BS	3		3	3	50	50	100	W
7	AR22B4.7C	Computer Aided Design - I	SEC		3	3	3	50		50	---
				27	3	30	30	400	350	750	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

FIFTH SEMESTER

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B5.1C	Architectural Design – IV	PC	9		9	9	100	100	200	J
2	AR22B5.2C	Materials and Building Construction V	BS	4		4	4	50	50	100	S
3	AR22B5.3C	History of Architecture – III	PC	3		3	3	50	50	100	W
4	AR22B5.4C	Structural Design (Steel)	BS	3		3	3	50	50	100	W
5	AR22B5.5C	Electrical Systems, Lighting and HVAC	BS	3		3	3	50	50	100	W
6	AR22B5.6C	Working Drawing and Details	PC	4		4	4	50	50	100	J
7	AR22B5.xE	Professional Elective – I	PE	2	2	4	4	50	-	50	-
				28	2	30	30	400	350	750	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

PROFESSIONAL ELECTIVE-I

1	AR22B5.1E	Workshop: Vernacular Architecture
2	AR22B5.2E	Workshop: Craft in Architecture
3	AR22B5.3E	Workshop: Appropriate Building Technologies
4	AR22B5.4E	Workshop: Advanced 3D Modelling
5	AR22B5.5E	Workshop: Stone Construction

Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)
SIXTH SEMESTER

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B6.1C	Architectural Design – V	PC	9		9	9	100	100	200	J
2	AR22B6.2C	History of Architecture – IV	PC	3		3	3	50	50	100	W
3	AR22B6.3C	Building Estimating, Costing and Specifications	PC	4		4	4	50	50	100	W
4	AR22B6.4C	Building Information Modelling	SEC	1	2	3	3	50	--	50	--
5	AR22B6.5C	Human Settlements and Urban Planning	PC	4		4	4	50	50	100	W
6	AR22B6.6C	Architectural Acoustics and Illumination	BS	3		3	3	50	50	100	W
7	AR22B6.xE	Professional Elective – II	PE	4		4	4	50	-	50	-
				28	2	30	30	400	300	700	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

PROFESSIONAL ELECTIVE-II

1	AR22B6.1E	Theory of Design and Architecture
2	AR22B6.2E	Vaastu Shastra
3	AR22B6.3E	Technology in Architecture

SEVENTH SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B7.1C	Advanced Design -I	PC	9		9	9	100	100	200	J
2	AR22B7.2C	Advanced Construction Technology & Structural Systems	BS	3		3	3	50	50	100	W
3	AR22B7.3C	Advanced Services	BS	3		3	3	50	-	50	-
4	AR22B7.4C	Building Economics and Valuation	BS	3		3	3	50	50	100	W
5	AR22B7.xE	Professional Elective - III	PE	4		4	4	50	50	100	W
6	AR22B7.xE	Professional Elective - IV	PE	4		4	4	50	50	100	J
7		Open Elective – I									
				26	0	26	26	350	300	650	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Professional Elective -III

1	AP22B7.1E	Urban Design
2	AP22B7.2E	Housing
3	AP22B7.3E	Building Construction Management
4	AP22B7.4E	Interior design
5	AP22B7.5E	Interior Landscape Design

Professional Elective -IV

1	AP22B7.6E	Architectural Journalism
2	AP22B7.7E	Parametric Design
3	AP22B7.8E	Green Buildings
4	AP22B7.9E	Furniture and Product Design

EIGHTH SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B8.1C	Advanced Design -II	PC	10		10	10	100	100	200	J
2	AR22B8.2C	Pre- Thesis	AEC	2	2	4	4	50	50	100	J
3	AR22B8.3C	Environment Responsive Design	BS	3		3	3	50	50	100	W
4	AR22B8.4C	Architectural Practice - I	AEC	3		3	3	50	50	100	W
5	AR22B8.xE	Professional Elective - V	PE	4		4	4	50	50	100	J
6	AR22B8.xE	Professional Elective - VI	PE	4		4	4	50	-	50	-
7		Open Elective - II									
				26	2	28	28	350	300	650	

Note: L/T/S = Lecture / Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Professional Elective -V

1	AP22B8.1E	Structural Project
2	AP22B8.2E	Workshop in Tall Buildings
3	AP22B8.3E	Disaster Resistant Architecture
4	AP22B8.4E	Intelligent Building System

Professional Elective -VI

1	AP22B8.5E	Architectural Conservation
2	AP22B8.6E	Architectural Pedagogy
3	AP22B8.7E	Regionalism in Architecture
4	AP22B8.8E	Architectural Criticism

NINTH SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B9.1C	Design Thesis	PC	16		16	16	300	300	600	J
2	AR22B92C	Architectural Practice - II	AEC	2	1	3	3	50	50	100	W
3	AR22B9.xE	Professional Elective – VII	PE	4		4	4	50	-	50	-
				22	1	23	23	400	350	750	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Professional Elective -VII

1	AP22B9.1E	Architectural Office Management
2	AP22B9.2E	Real Estate Planning
3	AP22B9.3E	Project Formulation

TENTH SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

Ninth Semester

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	
1	AR22B10.1C	Practical Training	AEC				15	100	100	200	J
2		Open Elective - III									

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Bachelor of Architecture
First Semester Syllabus, R22
(As Approved as by Board of Studies, Architecture on 07-11-2022)



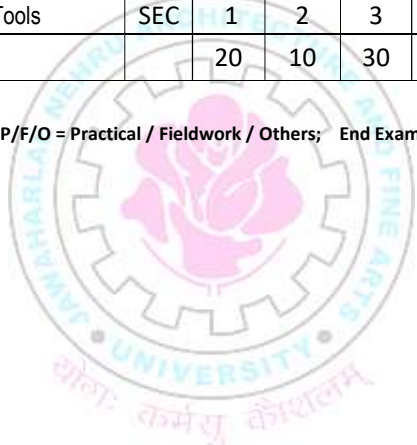
Jawaharlal Nehru Architecture and Fine Arts University
Hyderabad

FIRST SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	
1	AR22B1.1C	Basic Design	PC	9		9	9	100	100	200	S
2	AR22B1.2C	Materials and Building Construction-I	BS	5		5	5	50	50	100	J
3	AR22B1.3C	Architectural Drawing - I	PC		4	4	4	50	50	100	S
4	AR22B1.4C	Introduction to Art and Architecture	PC	2	1	3	3	50	50	100	W
5	AR22B1.5C	Thinking for Architects	PC	2	1	3	3	50		50	---
6	GN22B2.1A	Communication Skills	SEC	1	2	3		50	50	100	P
7	SP22B1.1A	Basic Digital Tools	SEC	1	2	3	2	50		50	---
				20	10	30	26	400	300	700	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical



AR22B1.1C: BASIC DESIGN

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
9	0	9	9	100	100	200	S

Objectives of the Course:

- A. Develop expression and creative thinking among the students through exploration of elements and principles of design in simple design problem.
- B. Inculcating systematic problems solving methods in carpentry elements and principles 2D and 3D designs in different mediums, colours and textures.
- C. Sensitize the students to appreciate the architectural context of various building typologies and solve the problem related to building elements.
- D. Train the students to work in groups and put-up effective teamwork with inter-disciplinary approach.
- E. Train the students to express and communicate abstract ideas both graphically and orally.

Course Contents:

Unit I: Design Elements and Principles

Theoretical introduction to Elements and Principles of design; Observation, exploration, appreciation and analysis of nature with respect to elements and principles of design through simple exercises; critical analysis of manmade objects and environment to understand the concepts underlying in design; Analysis and application of elements and principles of design using simple exercises;

Unit II: Shape and Form Transformation

Compositions in geometric and organic shapes using Elements and Principles of Design; Study of gestalt principles; Extrusion of shapes to form using 2D graphics and 3D forms; Exercises to explore shapes and patterns using grids, symmetry and asymmetry; rule of thirds in 2D graphics; Exploration of 3D forms through addition and subtraction, solids and voids; abstract forms; Making 3D compositions using model-making material;

Unit III: Application of Color in Design

Introduction to Color Theory, Color wheel, different schemes like monochromatic, analogous, complementary, split complementary, triadic, square, and rectangle (or tetradic); color coding systems and hue, value and intensity; psychological factors and their choices in architecture, color compositions in 2D&3D.

Unit IV: Introduction to Abstraction

Development of geometric patterns by division, subtraction, and addition, and express them with the use of colors; Two & Three dimensional Design Exercises involving abstraction of

real and imaginary objects, drawing compositions and models; understanding complex of forms using graphics and models.

Unit V: Building Elements

Conceptualizing and designing of various building elements like railings, sun-shades, flooring patterns, grills, entrance portals, gates, murals and outdoor furniture appropriate to different building typologies with the understanding of architectural context.

References:

1. Francis D.K. Ching, "Architecture-Form, Space and Order", Van Nostrand Reinhold Company, New York, 2007.
2. Simon Unwin, "Analysing Architecture", Routledge, London, 2003.
3. YatinPandya,"Elements of Space making", Mapin 2007.
4. Krier, Rob. Architectural Composition, Academy Editions, London, 1988.
5. Meiss, Pierre Von. Elements of Architecture: From form to place, E and FN Spon, London, 1992.
6. Shibikawa, Ikuyoshi and Takahashi, Yumi. Designers Guide to Colour.
7. Smithies, K.W. Principles of Design in Architecture. Chapman and Hall, 1983
8. Chauhan, P.(2005). Learning Basic Design. Mumbai : Rizvi College of Architecture

COURSE OUT COMES:

After the completion of this course, the student will be able to

1. Solve simple design problems creatively with clear expression within the frame work of elements and principles of design.
2. Solve 2D and 3D design problems with a systematic approach in different mediums, colour and textures.
3. Design building elements in different architectural contents for various building typologies.
4. Demonstrate the ability to work in group to put-up effective teamwork with interdisciplinary approach.
5. Demonstrate the ability to express and communicate abstract ideas both graphically and orally.

AR22B1.2C: MATERIALS AND BUILDING CONSTRUCTION – I

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
5	0	5	5	50	50	100	J

Objectives of the Course

- A. Imparting comprehensive knowledge to the students on the basic building materials while highlighting the current innovations and trends.
- B. Preparing the students for a systematic study of building materials in the scope of ingredients, properties, manufacturing process, uses, installation and market price and application in real life problems.
- C. Understanding the basic building components and the Structural Systems of buildings.
- D. Imparting Systematic methods of construction of buildings.
- E. Imparting how to represent building construction in the form of drawings, instructions and check the quality of work.

Unit I: Building Blocks

Introduction and evolution (dimensions and quality testing with brief description of the manufacturing process) of building blocks;

Composition, properties and uses of various building block materials: red bricks, concrete blocks, hollow concrete blocks, Autoclaved Aerated Concrete blocks (AAC), Cellular light weight blocks, Fly ash bricks, Terracotta blocks, Compressed Stabilized Earth Blocks (CSEB), Fascia Blocks, qualitative parameters of building blocks.

Stone: Introduction and extraction, Classification of rocks, Properties and uses of Stone: Granite, Laterite, Quartzite, Marble, Slate.

Stone Blocks: finely finished, rubble.

Unit II: Cementing Materials

Manufacturing process of cement and its importance in building construction

Different types of cement: Ordinary Portland Cement, Quick setting cement, Rapid hardening cement, Blast furnaces slag cement white cement, Portland pozzolana cement, Low heat cement, High alumina cement. Lime: Classification, Properties and uses, Sand: Sources of sand, characteristics, grading and bulking of sand. Cement mortar, lime mortar, composite mortar, surki mortar; Laticrete and other block binding adhesives

Unit III: Basic Structural Systems and Components of Buildings

Introduction to basic structural systems and its components;

Building Structure: Substructure (Foundation), Plinth, DPC, Super structure (Flooring, walls, sill, lintel, sun-shade, the wall above the lintel, arches) and Roof: roof-beam, slab, weathering course, parapet, and gutters. Types of structures: load bearing, framed and combined construction systems, Load bearing structure- components, advantages and disadvantages. Other components: Windows, Doors, Ventilators, Grills, Columns, Jali, Railings, Portico, Porch;

Unit IV: Brick Masonry

Tools and equipment used in masonry; Principles of construction in masonry walls;

Meaning and need of bonding; types of bonds: English bond, Flemish bond, Rat-trap bond. Technical drawings and instructions (to be followed on site) indicating the process of construction of single and half brick wall in the above bonds: straight wall and L- junction;

Process of construction of walls using various building blocks with special emphasis on best practices; Curing and Quality testing of masonry construction;

Unit V: Stone Masonry and Foundations

Stone masonry: masonry joints, stone walls, window sills, plinth, cornices, surface finishes.

Types of stone masonry: Ashlar, Coursed rubble and random rubble; Composite masonry: Brick backed ashlar, rubble backed ashlar, and concrete backed masonry; Best practices in stone masonry

Types of Foundations: stage-wise process of construction of foundations; basic principles of foundation design; CRS foundations for load bearing walls;

References:

1. Barry. (1999). The Construction of Buildings, Vol- 1, 5th Edition. New Delhi: East West Press.
2. Mahaboob Basha S. (2015). Building Materials, Construction and Planning. Anuradha Publications.
3. Bhavikatti, S. (2012). Building Construction. New Delhi: Vikas Publications.
4. Bindra SP, Arora. SP. (2000). Building Construction: Planning Techniques and Methods of Construction, 19th ed. . New Delhi: Dhanpat Rai Pub.
5. Dr. BC. Punmia, E. A. (2016). Building Construction, 11th Edition. Laxmi Publications
6. Duggal, S. (2019). Building Materials, 5th Edition. Delhi: New Age International Publications PVT.
7. Mckay, W. (n.d.). Building Construction-V, Vol 1, Metric 5th Edition. Pearson India Edition, Services Pvt.
8. Dr. Gurucharan Singh. (2017). Building Construction and Materials, 16th Edition. New Delhi: Standard Book House.
9. Varghese. (2019). Building Construction, 2nd Edition. New Delhi: PHI Learning PVT.
10. Varhese. (2019). Building Materials, 2nd Edition. . New Delhi: PHI Learning PVT.
11. Rangwala, S.C. Building Construction, 22nd ed. Charotar Pub. House, Anand, 2004.
12. Sushil Kumar. T.B. of Building Construction, 19th ed. Standard Pub, Delhi, 2003.
13. Roy Chudley and Roger Greeno,. Building Construction Handbook,(11th ed.).London &New York:Routledge, Taylor & Francis Group, 2016

COURSE OUT COMES:

After the completion of this course, students will be able to:

1. Comprehensively learn knowledge on basic building materials with the current innovations and trends.
2. Carry out a systematic study of building materials in the scope of ingredients, properties, manufacturing process, uses, installation and market price with real life applications.
3. Understanding and graphic representation of basic components of buildings in formal methods.
4. Learning systematic methods of construction of buildings.
5. Learning to represent building construction in the form of drawings, instructions and check the quality of the work.



AR22B1.3C: ARCHITECTURAL DRAWING- I

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
0	4	4	4	50	50	100	S

Objectives of the Course:

- A. Familiarize the students with different drafting tools and accessories and their usage.
- B. Introduce the students to theoretical, practical and pictorial aspects of architectural drawings.
- C. Impart systematic methods to construct basic geometrical shapes in an accurate way.
- D. Provide clear understanding about measuring and representing in scale the real world objects.
- E. Impart ability to make neat, accurate and impressive method of graphic representation of buildings.

Unit I: Free Hand Drawing and Lettering

Learning: sketching, drawing and visual thinking.

Drawing medium such as pencil, charcoal, graphite, pastels, brush, pen etc. and applications; Line strokes, shading, hatching, Indoor and Outdoor sketching of existing art, built and natural forms, figure drawing.

Lettering: Typography and Anatomy of type, Architectural Lettering-Letter strokes. Exercises in lettering used in architectural drawings including different letter types. Expression through drawings and models;

Unit II: Basic Architectural Drafting

Drafting instruments and their usage;

Principals of drafting: Line weights, Line tones, Line types, text hierarchy etc.

Introduction to Geometry drawing and construction- elements of Geometry, Construction of lines and shapes;

Construction of planes- circles, tangents, curves, sections and regular polygons and other complex figures.

Representation of architectural materials and elements, Symbols, Human figures, vegetation, entourage; Use of scale in representation;

Introduction to Pictorial Drawings-Isometric, Axonometric and Oblique views;

Unit III: Measured Drawing

Understanding of scales- representation factor, types of scales, dimensioning and their use in drafting practice;

Measured drawing of simple objects (like furniture, entrance gates etc.) and building components.(like cornices, columns, doors, windows etc.);

Techniques of measuring buildings and their details, drawing to Scale;

Reduction and Enlargement of drawings

Building drawings: Plan, section and elevation;

Unit IV: Geometrical Constructions

Construction of basic geometrical shapes- Triangle, Square, Rectangle, Quadrilateral, Polygons inscribed in a Circle;

Construction of plane curves like Ellipse, Parabola, Hyperbola, Ionic volute, spiral, and helix.

Representation of 2D and 3D elements in plan elevation and Sections of solids and true shape of section such as prism, pyramids, cylinder, cones and spheres etc.

Unit V: Fundamentals of Documentation

Introduction to Documentation-need, objectives;

Identification of basic building elements and their representation;

Visual documentation techniques through sketches, freehand drawing and photography;

On-site documentation and visual analysis of basic building elements of a site;

***Note:** Unit V. Fundamentals of Documentation is purely for internal evaluation.*

Reference:

1. Fraser Reekie, Reekies Architectural Drawing, 2006. ISBN 81-7649-086-5.
2. N.D. Bhatt and VM Panchal, Engineering Drawing: Plane and Solid Geometry, 42nd Edition, 2000.
3. John A. Nelson, Wannostrand Reinhold, Handbook of Architectural and Civil Drafting, New York, 1983. ISBN-0-442-26865-3.
4. Nickdunn, Architectural Model Making, 2nd Edition, 2013. ISBN 9781780671727.
5. Thomas Obermayer, Architectural Drafting (Residential and Commercial).

COURSE OUT COMES:

After the completion of this course, the student will be able to:

1. Measure the parts of the buildings, prepare and present different architectural drawings.
2. Demonstrate the ability to systematically construct basic geometrical shapes accurately.
3. Demonstrate the ability to measure buildings parts and graphically represent to scale.
4. Demonstrate the ability to make neat, accurate and impressive method of graphic representation of buildings.

AR22B1.4C: INTRODUCTION TO ART AND ARCHITECTURE

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	1	3	3	50	50	100	W

Objectives of the Course:

- A. Introduce the students to art, its theories and philosophies.
- B. Explain relevance of art in architecture and their inter relationship.
- C. Familiarize the students with the basics of architecture.

Unit I: Introduction to Art

Purpose and relevance of art, Art consciousness: Aesthetics, Perception, Symbolism, Expression, Style, Fashion, Appropriateness and Values. Understanding works of Art; Its role meaning and purpose in terms of basic characteristics and development as an expression of culture; An understanding of basic vocabulary that is needed to describe a work of Art; Appreciation, Analysis and Critiquing of artwork

Unit II: History of Art

Development of art; Timelines of Art History; changing nature of art through time in terms of content, form and material; Characteristics of art in Pre-historic, Classical, medieval, modern and contemporary periods; Art as an expression of Socio-cultural and political scenario of its time;

Unit III: Exploration of Art Forms

Understanding types of arts: fine arts and performing arts; abstract nature of art; art forms: folk, classical and pop; Nature and characteristics of art forms such as Painting, Sculpture Dance, Drama, Music, The Film and Literature; Relationship between art and architecture;

Unit IV: Introduction to Architecture as a Profession

Understanding of architecture as a response to human needs, role of architect in a building project, Architect's relation with other consultants, contractors and client, the changing role of architects, evolution of the profession of architecture with time;
Technical knowledge and skills required for an architect, various subjects to be learnt by architecture students, their relevance to practice;

Unit V: Understanding Shelter Forms

Shelter as a protection from the ravages of nature, various factors influencing the shelter forms in a region; shelter-form as a response to climate; relationship between house-form and culture; temporary, semi-permanent and permanent shelter forms;
Architecture as a response to social, cultural, technological and environmental factors;

Unit VI: Seminar on Shelter Forms

Shelter forms in various regions of the world, Examples of vernacular architecture in the world with special emphasis on the vernacular architecture of India.

***Note:** Unit VI: Seminar on Shelter Forms is purely for internal evaluation and not for external evaluation.*

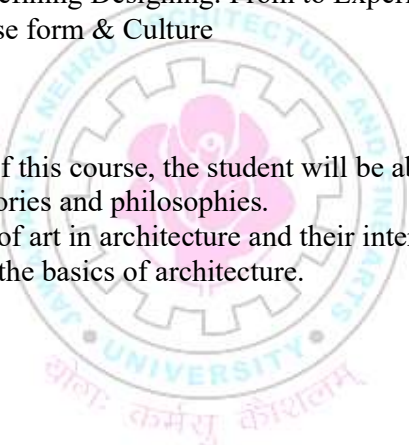
Reference:

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. Bharatiya Jnanpith, New Delhi
5. James C. Snyder, Introduction to Architecture, New York: McGraw Hill.
6. Christopher Alexander, Pattern Language, New York: Oxford University Press
7. Thomas Mitchell, Redefining Designing: From to Experience
8. Rapoport, Amos, House form & Culture

COURSE OUT COMES:

After the completion of this course, the student will be able to:

1. Understand art, its theories and philosophies.
2. Understand relevance of art in architecture and their inter-relationship.
3. Become familiar with the basics of architecture.



AR22B1.5C: THINKING FOR ARCHITECTS

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	1	3	3	50	0	50	---

Objectives of the Course:

- Develop thinking skills and familiarize learners with the importance of thinking in the field of Architecture.
- Develop techniques of critically analyzing the issues related to complex problems and real-world problems.
- Develop problem solving skills and abilities in a creative process using conceptual and graphic thinking.

Unit I: Critical Thinking

Introduction to importance of thinking in Architecture, Critical thinking: Benefits of critical thinking, critical thinking as a tool and skill, critical thinking to encourage curiosity, creativity and problem solving ability; Components of critical thinking;

Unit II: Creative Thinking

Creative thinking: disadvantages of depending on intuition, Convergent and Divergent thinking, creativity as a skill and process, Lateral thinking as a tool for creativity, difference between vertical thinking and lateral thinking, the process of lateral thinking, techniques for generation of alternatives, problem solving in design.

Unit III: Conceptual Thinking

Identifying patterns or connections between situations that are not obviously related, identifying the key or underlining idea or issues in complex situations; Challenging and improving the existing situation;

Looking for common factors in different situations and applying for problem situation, ability to recognize the value of problem solving in new ideas;

Unit IV: Graphic Thinking

Visual thinking, use of graphic thinking in the process of solving complex problems; Use of graphics in the process of design; Use of graphics in abstraction, analysis, exploration and validation; Communication using graphics;

Unit V: Problem Solving

Defining complex problems, understanding problems, prioritizing the problems, identification of potential causes for the problems, strategy and solutions, most feasible solutions, plan for implementing the solution, improving decision making skills;

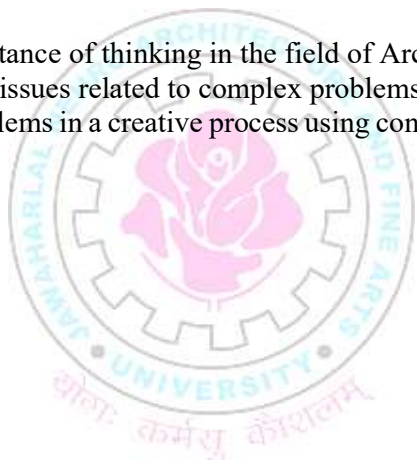
Reference:

1. Randy Deutsch, Think Like an Architect, RIBA publishing, London, 2020.
2. Jonathan Haber, Critical Thinking, The MIT Press, Cambridge, 2020.
3. Edward de Bono, Lateral Thinking: Creativity Step by Step, Harper & Row Publishers, New York, 1990.
4. John Adair, The Art of Creative Thinking, Kogan Page, London, 2007.
5. Daniel Kahneman, Thinking Fast and Slow, Farrar, Straus and Giroux, New York.
6. John S. Rhodes, Mind Maps, JJ Fast Publishing, LLC, 2013
7. Paul Laseau, Graphic Thinking of Architects & Designers, John Wiley & Sons, INC, New York, 2001.
8. Paul Klee, Notebook volume I, The Thinking Eye Lund Humphries, London, 1973.

COURSE OUT COMES:

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

1. Understand the importance of thinking in the field of Architecture.
2. Critically analyse the issues related to complex problems and real-world problems.
3. Solve real-world problems in a creative process using conceptual and graphics thinking.



GN22B2.1A: COMMUNICATION SKILLS

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
1	2	3	0	50	50	100	P

Objectives of the Course:

- Develop LSRW skills and familiarize with effective language usage.
- Learn techniques of formal communication- interpret, analyze and organize information.
- Introduce various genres of writing to the students.

Unit I: Basics of Communication

Vocabulary: Collocations; Grammar: Sentence structures; Non-verbal communication: understanding how important our body language - gestures, posture, facial expressions are for effective communication.

Understanding Non-verbal Data (flow charts, tree diagram, tables) Speaking Skills: Pictionary or Describing Places / People/ Events

Unit II: Basic Writing Skills

Vocabulary: Words often confused; Grammar: Tenses and their uses; Writing Skills: Essay writing – Types of Essay writing, How to write an essay. Letter writing (formal and informal) and Email writing (formal and informal), Minutes of the Meeting – What is MOM and format of MOM;

Unit III: Professional Speaking Skills

Vocabulary: Idioms and Phrases. Grammar: Direct and Indirect Speech. Public speaking – Improve ability to communicate, overcome fear and anxiety, projecting confidence, develop leadership skill; Presentations – Guidelines for effective presentations and structuring the presentations;

Unit IV: Professional Writing Skills

Grammar: Active and Passive Voice, Degrees of Comparison – Positive, comparative and superlative; Writing Skills: Self Expression – describing and conceptualizing students' work, Difference between Curriculum Vitae and Resume;

Review writing- descriptive and analytical review in nature, Resume writing: Writing a cover letter: what is a Covering letter and how to write one; How to write a Resume – positioning your resume to specific market and purpose;

Unit V: Reading Comprehension

Vocabulary: Learning how to use a Dictionary (Both book and Online), Thesaurus- what is thesaurus and how to use it. Reading Comprehension – Unseen passages (Factual, descriptive and literary); Skimming, Scanning and SQ3R – understanding reading techniques and how to use them; Reading Books, Magazines, Newspapers, etc. and their interpretation; Social Media etiquettes; Attending academic and job interviews-Tips for attending interviews, Do's and Don'ts for an interview. How to start a conversation in interviews - Introducing one-self, Asking questions and giving polite replies;

Reference:

1. Essential English–E.Suresh Kumar,P Sreehari,J Savithri
2. Practical Everyday English–Steven Collins
3. Introduction to English Phonetics and Phonology–Ulrike Gut
4. English Idioms in Use Advanced–Felicity O'Dell &Michael McCarthy
5. English Phrasal Verbs in Use–Michael McCarthy & Felicity O'Dell
6. Practice Makes Perfect–English Verbs- Loretta Gray
7. Speak Better Write Better English –Norman Lewis
8. Spoken English–Flourish Your Language– Robert Carmen
9. Make an Impact with your Written English- Fiona Talbot
10. How to Write Essays–A step-by-step guide for all evels with sample essays–Don Shiach
11. You Can Win- Shiv Khera
12. Who Moved My Cheese? An Amazing Way to Deal with Change in Your Work and in Your Life - Dr. Spencer Johnson

COURSE OUT COMES:

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

1. Demonstrate LSRW skills and familiarizing with effective language.
2. Interpret, analyze and organize information suitable for formal communication.
3. Articulate in different genres.

SP22B1.1A: BASIC DIGITAL TOOLS

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
1	2	3	2	50	0	50	----

Objectives of the Course:

- Creating Digital awareness among the students that are important in the present competitive job market.
- Enabling the students to usage of the powerful content – creation tools which help them communicate their knowledge in the best way.
- Boosting student engagement in presenting their complex ideas quickly in visually compelling ways.
- Imparting the students with the evolving technology that allows them to create designs in 2D as well as 3D environments as well as simple flash animations.
- Introducing to the programming literacy and understanding web & mobile application technology which will develop ones career and drive growth for the business and work for own.

Unit I: Basic Operations

Introduction to various software for documentation, presentation & drawing purposes; Operations such as creating, editing, formatting, saving in different file formats, compressions and security, exporting, importing, and printing documents; Familiarizing with the use of scanners, printers plotters etc;

Word Processing

Introduction to MS Word, toolbar, creating a new document, formatting text, inserting various objects, preparing the reports in MLA and APA formats, Proofing and Printing; Advanced word processing automatic indexing, merge documents, content page generation. PDFs

Spreadsheets

Introduction to Excel Spreadsheets, Formatting excel workbook, Perform Calculations with Functions, Create Effective Charts to Present Data Visually, Analyze Data Using Pivot, Protecting and Sharing the workbook, Proofing, and Printing, Databases / MS Access;

Unit II: Powerpoint

Setting up PowerPoint Environment, applying themes, working with Objects, Animation and Slide Transition, Proofing, and Printing; Database packages MS-Access Introduction, Planning a Database, Creating Tables, Working with Forms, Creating queries, Reports, Printing–Importing data from other databases viz. MS Excel etc.;

Multi-media Presentations: Introduction to the multimedia presentation (like MS PowerPoint), creating a presentation, opening an existing presentation, creating a blank presentation, different PowerPoint views, slide manipulation, slide animation, slide transitions, view slideshow, navigating while in the slideshow, hyper-linking to other applications, scanning in different formats, setting of options, resolution settings, management of file size, integrating partial scans of large documents. Pack up a presentation for use on another computer, taking printouts;

Unit III: All Picture Formats

Graphical Concepts – I: Raster Image based Software's (Adobe Photoshop/or Equivalent) Getting Acquainted with Photoshop, Basic Image Manipulation, Color Basics, Painting Tools, Brush Settings, Making Selections, Filling and Stroking, Layers, Advanced Layers, Text, Drawing, Using Channels and Masking, Manipulating Images, Getting to Know the Work Area, Basic Photo Corrections, Typographic Design.

Graphical Concepts – II: Vector Image based Software (CorelDraw/Adobe Illustrator / Equivalent) Photo editing and Desktop publishing (application) – Import and export of photo edited files, objects in photo editing, fills, outlines, total text control, basic toolbox of vector-based software (like CorelDraw or Equivalent), color management tools, starting your page right etc. Introduction to Adobe Animate / Equivalent;

Graphical Concepts-III: Document and Publication (Adobe InDesign / Equivalent) – Layouts, Alignments, Master Layout, Pages, Size, Document Layout, Graphics etc..

Unit IV: Sketchup (3D)

Introduction to Sketchup, Understanding the Layout, Grouping and Components, Toolbar, Creating Basic Shapes, Painting, Materials, and Textures, Rendering, Adding Text and Dimensions, Importing plans and elevations, scale the plans, Aligning and Positioning Plans, Elevations, sections, modeling;

Unit V: Web & Mobile Applications, Basics of App Development, Introduction to Web Page Creation

Programming languages

Introduction to C programming, Variables, standard library functions, I/O statements, branching statements (if, if-else, nested if, switch-case) and Looping controls (while, do-while, for), break and control statements.

Introduction to Python Script and Programming

Reference:

1. Angela Rose, Microsoft Word In 30 Minutes, I30 Media Corporation, 2022
2. Alexander, Michael, and Dick Kusleika., Microsoft Excel 365 Bible. 1st ed., John Wiley & Sons, New Jersey, 2022
3. Donny Wise, Microsoft PowerPoint for Teachers and Students, Lulu.com, 2015
4. Allan Hanson, Learning Sketchup: A 3d Modeling Guide for Beginners, 2017
5. Greg Perry, C Programming Absolute Beginner's Guide, 3rd Edition, Que Publishing, 2013
6. Eric Matthes, Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction to Programming, No Starch Press, US, 2019.

COURSE OUT COMES:

Upon successful completion of this course student will be able to:

1. Work with a word processing program and a desktop publishing software application which helps them to create on their own with quality, such as essays, resume, flyers, brochures, magazines, thesis reports.

2. Work with both raster and vector software which covers the gamut of image editing to creating banners, billboards, posters, digital artwork and designs, icons, logos, website graphics which can be widely used in advertising, branding or promotional content.
3. Compose effective presentations and slideshows and present complex concepts and ideas with clearly understandable graphs and pictograms.
4. Develop general 2D layout drawing and 3D modelling skills which can be used across various other platforms in any style they want.
5. Write simple computer programming and create simple shape animations.



Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

SECOND SEMESTER

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B2.1C	Architectural Design – I	PC	9		9	9	100	100	200	S
2	AR22B2.2C	Materials and Building Construction -II	BS	5		5	5	50	50	100	S
3	AR22B2.3C	Architectural Drawing – II	PC		4	4	4	50	50	100	S
4	AR22B2.4C	Structural Mechanics	BS	3		3	3	50	50	100	W
5	AR22B2.5C	Site Surveying	BS	1	2	3	3	50		50	---
6	AR22B2.6A	Model Making Workshop	PC	1	2	3	3	50		50	---
7	GN22B2.2A	Environmental Studies	BS		2	2		50	50	100	J
				19	10	29	27	400	300	700	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

AR22B2.1C ARCHITECTURAL DESIGN – I

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
9	0	9	9	100	100	200	S

Objectives of the Course

- A. Understand design as a thinking and problem-solving activity
- B. Learn experientially the theoretical aspects of design from fundamentals.
- C. Learn the aspects of space-making interpreting form and function in design of spaces.
- D. Recognizing the determinants of form in architecture with the help of examples etc.

Unit I: Design in Everyday Life

Basic definition (understanding) of Design, Basic definition (understanding) of Architecture: commodity, firmness and delight; appreciation of Design in nature and manmade things, Design at various levels: Urban Design, Architectural Design, Interior Design, Fashion Design, Product Design, Graphic Design; purposes of Design, Design as a problem solving exercise.

Unit II: Unmeasurable and Measurable Aspects in Architecture

Quantitative and qualitative nature of aspects in architectural spaces,

Qualitative aspects: cultural, social, economic, comfort and convenience, psychological, aesthetics; temporal, contextual.

Quantitative aspects: dimensions, area, volume, Anthropometrics, Ergonomics, clearances, air velocity, temperature, light, noise; environmental response, structural.

Meaning of architectural spaces as an outcome of interaction between qualitative and quantitative aspects.

Unit III: Differentiating and Delineating Spaces

Fluid nature of space, different types of spaces in built-environment, relationship between spaces, meaning and symbolism of spaces in different contexts: sacred and profane, men and women, front and back, private and public, habitable and inhabitable; concept of servant and serving spaces

Open, semi-covered and enclosed spaces; Elements of Space making: floor, walls, openings and roof

Architecture: the art of shaping space, concept of physical space, conceptual space and behavioural space.

Unit IV: Form and Function

Form as physically manifested thing. Form as the outer shape and aesthetic expression of things; form as an outcome of ordering and composition, components of form in design.

Function as the utility of space. Form as an outcome of the functional aspect. Form as a complex set of relationship of spaces to be organized consciously so that the building performs the task. Understanding form and function as inseparable aspects of architecture and how they come together at various scales.

Unit V: Determinants of Form in Architecture

Environment of the building; functional aspect; region, climate, landscape and natural lighting condition; materials; psychological demands of the space; spirit of time as explained by Paul Rudolph.

Guidelines for learning:

Students learning progresses from a universal language of design to specific contexts in architecture. Design is introduced as a Problem-solving activity which requires effective methods. Design process and methodologies are introduced to help students learn experientially problem solving in architecture. Knowledge of Anthropometry is applied on small spatial settings. New concepts such as cognitive maps, bubble diagrams, Circulation patterns, space clearances, User requirements, Case-studies and Desk- Studies are introduced so as to integrate them into the thinking process.

Assignments to be formulated:

Small problems in design are introduced to help students integrate theory and observations such as Form and Function into Architectural Design. Creative explorations are to be encouraged. Some exercises introduced to this level are: Critical appraisal of small residence; ATM, General store; florist; bakery; Coffee Shoppe, watchman's cabin, bus shelter, Petrol bunks, pavilions crèche etc.

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

Integration: The design portfolio shall consists of doors and window details of the spaces designed. The specifications of the materials to be written and a line estimate based on carpet area, built up area has to be indicated.

References:

1. James C. Snyder and Anthony J. Catanese, Introduction to Architecture, McGraw-Hill, New York, 1979.
2. Donald A. Norman, The Design of Everyday Things, MIT Press Cambridge, 2013.
3. Stephen Pheasant, Body Space: Anthropometry, Ergonomics and the Design of work, Taylor & Francis, London, 2003.
4. Yathin Pandya, Elements of Space making, Mapin Publishing Pvt. Ltd, 2007.
5. Francis D.K. Ching & James F.Eckler, Introduction to Architecture, John Wiley & Sons, Inc, New Jersey, 2013.
6. Leeland M.Roth and Amanda C. Roth Clark, Understanding Architecture Its Elements, History and Meaning, Rouledge, Newyork, 2018.
7. Francis D.K.Ching, Architecture Form, Space and order, John Wiley & Sons, Incs, New Jersey, 2007.
8. Brian Edwards, Understanding Architecture Through Drawing, Taylor & Francis, New York, 2008.
9. Alban Janson & Florian Tigges, Fundamental concepts of Architecture: The vocabulary of spatial situations, Birkhauser, 2014.
10. Charles Jencks and Karl Krypt, Theories and Manifestoes of Contemporary Architecture, Academy Editions, New York, 1997.

E-resources:

https://www.oxfordartonline.com/page/1394	Artist's Work/Artist's Voice: Louis I. Kahn: Further Consideration
https://www.oxfordartonline.com/page/artists-work-artists-voice:-louis-i.-kahn:-lesson-1/artists-workartists-voice-louis-i-kahn-lesson-1	Artist's Work/Artists Voice: Louis I. Kahn: Lesson 1 What is Architecture?
https://www.chiararubessi.com/works/proxemics-spacedesign/#:~:text=According%20to%20Hall's%20definition%20%E2%80%9CProxemics,The%20Hidden%20Dimension%2C%201966).	The space Between The Proxemic in Space Design
http://article.sapub.org/pdf/10.5923.j.ijpbs.20130304.04.pdf	Ergonomics and Design A Reference Guide
https://ftp.idu.ac.id/wp-content/uploads/ebook/ip/BUKU%20ANTROPOMETRI/Bodyspace%20Anthropometry,%20Ergonomics%20and%20the%20Design%20of%20the%20Work,%20Second%20Edition.pdf	Bodyspace Anthropometry, Ergonomics and the Design of Work
https://iopscience.iop.org/article/10.1088/1757-899X/1090/1/012095/pdf#:~:text=Introduction%20Servant%20and%20served%20spaces,storage%2C%20or%20similar%20secondary%20space.	The Relationship between the Servant Spaces and the Served Spaces in Single Families Residential Patterns: Baghdad as a Case Study
https://www.thoughtco.com/form-follows-function-177237	The Meaning of 'Form Follows Function' The famous architectural phrase said design should reflect activities
https://omrania.com/insights/the-multiple-meanings-of-function-in-architecture/	
https://www.youtube.com/watch?v=IZGOyBzy5c8	Louis Kahn's Architecture of the Room [Trenton Bath House, Esherick House, Exeter Library]

Course Outcomes:

Upon successful completion of this course student will be able to:

1. Develop experiential relationship between theory and design in architecture.
2. Interpret human needs and experiences both qualitatively and quantitatively into spatial aspects.
3. Experience architecture as differentiating and delineating Spaces
4. Understand the significance of form and function in architecture
5. Interpret the determinants of form in architecture from real-world examples.

AR22B2.2C MATERIALS AND BUILDING CONSTRUCTION – II

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
5	0	5	5	50	50	100	S

Objectives of the Course

- A. Impart comprehensive knowledge to the students on the building materials while highlighting the current innovations and trends.
- B. Prepare the students for a systematic study of building materials within the scope of ingredients, properties, manufacturing process, uses, installation and market price and application in real-life situations.
- C. Construction of building components and the Structural Systems of buildings.
- D. Impart systematic methods of building construction.
- E. Represent building construction in the form of drawings, instructions and check the quality of work.

Unit I: Wood

Timber, types of sources of timber and properties, drying and seasoning, moisture contents, purpose of seasoning, natural and artificial methods; sawing of timber, shrinkage and distortion in timber, wastage, methods of sawing, defects in timber; Use and application of timber in construction such as doors and window frames, shutters, stair cases, floors, partitions, panelling and false ceiling; alternative materials as substitute to timber; relevant IS standards.

Unit II: Plywood and Engineered Boards

Types of plywood and manufacturing process; types of laminates; laminated wood, veneers from different varieties of timber, their characteristics and uses;
Industrial timber, engineered wood, black boards, MDF, HDF; gypsum and Processed Boards: Synthetic boards, properties and their applications; Insulating boards

Unit III: 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, joinery schedule.

Unit IV: Doors

Definition of terms, types of wooden doors their making and fixing: ledged, ledged and braced, panelled; hinged: single and double shutters; sliding, folding, revolving, pivoted doors, louvered doors, rolling shutters; flush door and UPVC doors

Unit V: Windows in wood and metal

Fixed windows, Casement, top and bottom hung pivoted and sliding sash, cornered window, french window, louvered window, bay window, clerestory window, dormer window, gable window, skylights, fan lights, UPVC and PVC windows. Metal (steel and aluminium) windows, Preparation of shop-drawings for metal windows. Fixing mosquito screens, grills etc.

Hardware: fixtures, locks, hinges, fastenings for doors and windows

References:

1. Barry. (1999). The Construction of Buildings, Vol- 2, 5th Edition. New Delhi: East West Press.
2. Mahaboob Basha S. (2015). Building Materials, Construction and Planning. Anuradha Publications.
3. Bhavikatti, S. (2012). Building Construction. New Delhi: Vikas Publications.
4. Bindra SP, Arora. SP. (2000). Building Construction: Planning Techniques and Methods of Construction, 19th ed . . New Delhi: Dhanpat Rai Pub.
5. Dr. BC. Punmia, E. A. (2016). Building Construction, 11th Edition. Laxmi Publications.
6. Duggal, S. (2019). Building Materials, 5th Edition. Delhi: New Age International Publications PVT.
7. McKay, W. (n.d.). Building Construction-V, Vol 3, Metric 5th Edition. Pearson India Edition, Services Pvt.
8. Dr. Gurucharan Singh. (2017). Building Construction and Materials, 16th Edition. New Delhi: Standard Book House.
9. Varghese. (2019). Building Construction, 2nd Edition. New Delhi: PHI Learning PVT.
10. Varhese. (2019). Building Materials, 2nd Edition. . New Delhi: PHI Learning PVT.
11. Rangwala, S.C. Building Construction, 22nd ed. Charotar Pub. House, Anand, 2004.
12. Sushil Kumar. T.B. of Building Construction, 19th ed. Standard Pub, Delhi, 2003.
13. Roy Chudley and Roger Greeno,. Building Construction Handbook, (11th ed.).London&New york:Routledge, Taylor & Francis Group, 2016
14. Willibald Mannes, Techniques Of Staircase Construction,1st ed. London&New york: Van Nostrand Reinhold Company, 1979

COURSE OUTCOMES:

After the completion of this course, students will be able to:

1. Gain knowledge on building materials and the current innovations and trends.
2. Carryout a systematic study of building materials in the scope of ingredients, properties, manufacturing process, uses, installation and market price with real life applications.
3. Represent graphically the components of buildings in formal methods.
4. Appraise systematic methods of construction of buildings.
5. Represent building construction in the form of drawings, instructions and recognise the quality of the work.

AR22B2.3C ARCHITECTURAL DRAWING -II

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
0	4	4	4	50	50	100	S

Objectives of the Course:

- Appraise on the theoretical, practical, and visual aspects of architectural drawing
- construct orthographic projections applying precise techniques
- Comprehend the need for measuring real-world objects and spaces and their visual representation in drawings prepared to scale
- Acquire graphic skills and presentation techniques by using different artistic media and methods to depict built environments in a realistic manner.

Unit I: Orthographic Projections

Introduction to Orthographic Projections, conventions. Orthographic Projections of points, lines, planes and solids. Introduction to Architectural drawings- Simple Floor plans, Sections, Elevations.

Development of Building drawings to depict important detailing- Furniture layout, hidden elements, built-in furniture labelling, etc.

Unit II: Graphic Skills and Presentation Techniques

Composing of slides for presentation, sheet composition of drawings and designs for professional presentations, Presentation techniques for basic architectural drawings like bubble drawing, zoning map. Figure ground map, site plan, ground floor plans, sections, elevations etc.

Unit III: Graphic Techniques

Data presentation techniques such as use of charts, diagrams and other info graphics
Using graphics and text to represent design idea and clearly communicate the details and essential aspects Sheet background using title, story and content, composing for visual appeal.

Unit IV: Basic Rendering Techniques

Introduction to Black and White Medium- Pen and Ink; Pencil; Pastels etc.

Introduction to rules of composition, study of Light, colors and tones, shades, tints in rendering exercises, Entourage. Tone styles-stippling, hatching, dots, overlapping, blending etc. Exercises in rendering of 3D forms and documented works including scene setting.

Unit V: Basic Sciagraphy Techniques

Introduction to Sciagraphy - principles of shade and shadow. Shadow of lines, planes and simple solids. Shadows of architectural elements- shades and shadows. Simple drawing problem on orthographic projection and Sciagraphy for the same.

Unit VI: Architectural Documentation

On site analysis of major activity spaces, through scale and measured drawings. Preparation of maps, plans, elevations, sections, views using different media of presentation such as sketching, drafting, collage, photos etc. Documentation of progressive work on site, preparation of report of detailed documentation for a historical monument.

***Note:** Unit VI: Seminar on Shelter Forms is purely for internal evaluation and not for external evaluation.*

Reference Books:

1. Francis D.K. Ching, Architectural Graphics, 5th Edition, ISBN 978-0-470-39911-8 (pbk)
2. Dr. N. Kumara Swamy and A. Kameswara Rao, Building and Drawing, 2019, 9th Revised and Enlarged Edition.
3. N.D. Bhatt and VM Panchal, Engineering Drawing: Plane and Solid Geometry, 42nd Edition, 2000.
4. P. S. Gill, Engineering Drawing (Geometrical Drawing), 11th edition, charottar publications. ISBN 81-85749-62-0
5. Robert W. Gill, Rendering with Pen and Ink, Revised and Enlarged Edition, ISBN 978-81-767-097-8
6. Albert O.Halse, edited by Spencer L. George and Helen A. Halse, Architectural Rendering , International Edition 1989, ISBN-0-07-100498.

COURSE OUT COMES:

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

1. *Represent* three-dimensional objects and spaces as pictorial views and two dimensional drawings
2. *Communicate* technical understanding of simple built-spaces such as floor plans, sections and elevations.
3. Graphically *represent* visualized design ideas and proposals.
4. *Prepare* reports on architectural information of buildings and spaces.

AR22B2.4C: STRUCTURAL MECHANICS

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3	0	3	3	50	50	100	W

Objectives of the Course:

- To enrich the knowledge of students in understanding force systems, statics, and equilibrium
- To define and explain Mechanical and geometric properties of material used for structural elements.
- To understand the joints in structural elements and framing and the critical design parameters involved in design of joints.
- To introduce truss formation, its configuration in two and three dimensions and analysis of truss as a structural element.

Course Contents:

Unit – I

Forces - Static forces and Equilibrium in a plane. System of forces, resultant and equilibrium. Parallelogram law, Triangle law, polygon law, Lami's Theorem. Resultant of coplanar, concurrent force system. Couple, characteristics of couple. Varignon's Theorem. Lateral forces – behavior of members under lateral loads

Unit – II

Material Characterization – Mechanical properties of elastic materials like Strength, Stiffness, Ductility, Toughness, brittleness, Quasi elastic and plasticity etc., Definition of Stress and Strain. Types of stresses and strains. Stress-strain curve for ductile Material, Hooke's law, Modulus of Elasticity, Compatibility conditions- Bars of Varying Section and Bars of Composite Section.
Relation between the three Elastic Constants - Poisson's Ratio, Shear modulus, Bulk Modulus.

Torsion - definition –as part of structural behavior, shear stresses under torsion

Unit – III

Cross sectional Properties – Area and lines of symmetry, Definition, formulae and calculation of Centroid for some standard shapes like L,T,C,I , hollow Sections etc., Moment of inertia - formulae and Derivation for calculation of Moment of Inertia to Rectangle, circle, L,T ,C, I Sections etc., Introduction to shear center.

Stress Behavior in the cross sections of members subjected to Axial, eccentric and lateral loads– Direct and Bending Stresses.

Unit IV: Mechanics of Joints (Bolted, Riveted and Welded)

Bolted and Riveted Joints: Introduction, Advantages and disadvantages, Sizes and Types of Bolts and Rivets - Lap and Butt joints, Study of failure of bolted and Riveted joints,

Forces in joints, Strength of a joint, Efficiency of a joint. Unwin's formula, Chain riveting and Diamond Riveting. Reference to the IS Code clauses. Design of Bolted joints under axial load.

Welded joints: Introduction, Advantages and disadvantages, types of welds, strength of fillet weld and Butt weld. Design of the welded joint to plates and unsymmetrical sections for axial loading.

Unit V: Two Dimensional Trusses

- Types of trusses, Statically Determinate and Indeterminate Trusses, Loads on trusses, 2-D truss analysis (Cantilever & Simply supported) using the method of joints.

Three Dimensional Trusses, Grids - Definitions and behavior, code provisions.

Reference Books

1. Khurmi. R.S. Strength of Materials, S. Chand and Co. Ltd., New Delhi, 1999.
2. Ramamrutham. S. Strength of Materials, 7th ed. Dhanpat Rai Pub. Co. Ltd., Delhi, 2004.
3. Timoshenko. S. and Young, D.H. Strength of Materials, McGraw-Hill International Editions.

Course Outcomes

At the end of the semester, student should be able to

1. Describe the force systems and equilibrium.
2. Classify the Engineering materials and demonstrate the material properties that helps them to distinguish their applications.
3. Explain the sectional properties for a structural member.
4. Discuss the different types of joints in a structure and design few basic joints types.
5. Discuss the types of 2-D trusses being used and examine the force system in basic truss systems.

AR22B2.5C: SITE SURVEYING

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
1	2	3	3	50	0	50	---

Objectives of the Course:

- A. To learn measurement on a site.
- B. To identify the levels on a site. To read a contour map.
- C. To analyse and plan a building on a site.
- D. To mark a plan on to the site.
- E. To extract the measurements from images.

UNIT I: SURVEY METHODS AND EQUIPMENT

Importance of Surveying and Levelling in Architecture. Terminology, definitions and Classification of Surveying. Understanding the Instruments and accessories for each type of Surveying. Chain Surveying, Compass surveying, Plane Table surveying; Levelling instruments, Dumpy level, Theodolite, Electronic Distomat, Total Station Survey, and Satellite Imagery using GPS. Process of installation of Equipment on site, Temporary and permanent adjustments of equipment.

UNIT II: SURVEY AND SITE PLAN PREPARATION

Difference between plot, site, land etc. Reconnaissance survey of the site to know the location, shape, and various topographical factors, natural and manmade things; Preparation of notes inclusive of preliminary hand sketches make quick notes; Importance of site Analyse site to establish appropriate location for the equipment on site and to decide the survey method;

Process of taking site measurements using each of the equipment, precautions in the process of measurements, possible errors and probable corrections. Importance of taking notes along with readings in the Field Measurement Book. Preparation of site plan, deciding the scale of site plan, marking the readings and measurements on the drawing sheet, representing the data on the site plans, computing area of site using different methods.

UNIT III: LEVELING

Importance of Levelling in Site measurement. Identification of Bench Mark, Datum line and Reduced Levels (RLs). Instruments used for Levelling, deciding the location of installing the equipment for levelling, process of taking readings of levelling staff and marking them on Field Measurement Book. Applying the Calculations to readings in field book, deciding the scale of site plan, plotting the readings on drawing sheet, preparing contour maps with the requisite site data. Understanding and evaluating the existing topographic maps and contour maps for architectural design.

UNIT IV: METHOD OF MARKING ON THE SITE:

Clearing, cleaning levelling the site, understanding the site: orientation, outline and shape; establishing the boundaries and site dimensions, setting up the reference line and benchmark on the site, creating a right angle corner with respect reference line, marking the building block as per the drawing and given setbacks by marking parallel lines to the reference line, confirm right angle at all the corners of the block using 3,4,5. Check the diagonals to confirm to the right angles. Mark the wall centreline parallel to the first two reference lines as per the measurements given in the drawing, fix the centrelines properly,

For building with non-regular shapes, corners of the building to be established by intersection of arcs as per the drawing.

UNIT V: EXTRACTING MEASUREMENTS FROM IMAGES

Updating with the latest technological advances in surveying methods, using Graphical Interface methods, image lapping methods and virtual measurement methods in taking measurements from the Digital Images; Using GPS to read the satellite images and extract linear and angular measurements to the possible correctness; Image measurements and their refinement. Introduction to Coordinate Systems and Image Measurements, simple scales for Photographic measurements, Measuring Photo Coordinates with simple scales, Trilaterative method of photo coordinate measurement.

Reference Books:

1. Surveying and Levelling by Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni , Pune Vidyarthi Griha Prakashan.
2. Surveying and Levelling by Subramanian, Oxford University Press.
3. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain , Laxmi Publications.
4. Textbook of Surveying by C. Venkatramaiah , University Press.
5. Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill.

Course outcomes:

At the end of the semester, student should be able to

1. *Learn* to measure a site.
2. *Measure* the levels on a site and read a contour map.
3. *Analyse* and locate a building on a site.
4. *Mark* a plan on to the site.
5. *Extract* the measurements from images.

AR22B2.6A: MODEL MAKING WORKSHOP

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
1	2	3	3	50	0	50	---

Objectives of the Course:

- A. Review various tools and techniques and incorporate them in visual communication and model making.
- B. Prepare models to present the architectural design concepts.
- C. Learn photography of architectural models.

UNIT I: INTRODUCTION TO MODEL MAKING

Understanding of various tools and machines and their methods in model making; safely guidelines in using sharp instruments and machines; exploring different materials used in physical model making: paper, wood, metal and Fiber, abstract models, realistic models, block models, planar models, solid models.

UNIT II: 3D FORMS (SURFACE AND SOLIDS)

Site models, mockup models, design process models, study models, final models. Making of geometric models using paper, techniques of paper folding to create shapes into forms: Cube, Cuboid, Pyramid, Prism, Octahedron, Tetrahedron, Dodecahedron, 3d Compositions.

UNIT III: CONTOURS AND LANDSCAPE ELEMENTS

Introduction to levels and contours, reading and translating into form with the help of paper/cardboard. Road, Pathways, Trees, Scrubs, Pavilion, Pergolas, Outdoor furniture, landscape lighting, railing, gate, compound wall, Vehicles, Swimming pool, Deck.

UNIT IV: 3D ARCHITECTURAL MODELS

Understanding the presentation technique for built forms; Block Models; Exterior build form model: Villa, Hospital; Interiors model: Living, Bed Room, Kitchen, Toilet, Staircase; High Rise buildings, Stadiums, decorative lighting on models.

UNIT V: DIGITAL MODELS AND RAPID PROTOTYPING

Process of Digital model making from file to finished product in digital fabrication, CNC, Jet cutting, 3D Printing and Laser Cutting, preparation of digital models for printing, giving input to machine using appropriate software's; materials used in digital printing: thermoplastic material, liquids, and powder grains being fused. Introduction to presentation skills in photography

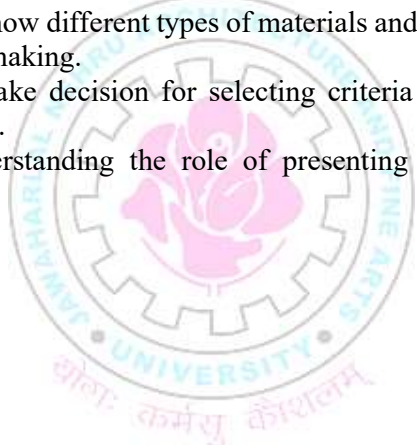
Reference Books:

1. Paul Jackson. Folding techniques for designers, Laurence king; Mac Win Pa Edition 2011.
2. Catherine Woram. Paper Scissor Glue, Ryland Peters & Small Ltd 2011
3. Eugene Felder & Emmett Elvin. The complete book of drawing techniques, Kandour 2005

Course Outcomes:

At the end of the semester, student should be able to

1. Students will get to know different types of materials and manufacturing techniques for Architectural model making.
2. Gain knowledge to take decision for selecting criteria of material according to the model has to be made.
3. Students get to understanding the role of presenting design concepts using three dimensional models.



GN22B2.2A: ENVIRONMENTAL STUDIES

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
0	2	2	0	50	50	100	J

Objectives of the Course:

- Creating awareness among students about Environment and ecosystem.
- Inculcating the importance of bio-diversity and its conservation in students.
- Imparting knowledge to students about natural resources and how they need to be consumed.
- Sensitizing students to the issues involved in creating sustainable environment and framing the policies and practices in achieving it. Prepare models to present the architectural design concepts.
- Establishing the need of co-existence between the human community and the environment.

UNIT I: THE ENVIRONMENT AND ECOSYSTEM

Environment and Environmental Studies: Definition, concepts, components and importance.

- 1.1 Ecosystem: Structure and function of ecosystem.
- 1.2 Food chain, food web and ecological pyramids.
- 1.3 Bio geo chemical cycles in ecosystems (Carbon, Nitrogen and Phosphorous cycles)
- 1.4 Ecosystem: Structure and function of ecosystem.
- 1.5 Food chain, food web and ecological pyramids.
- 1.6 Bio geo chemical cycles in ecosystems (Carbon, Nitrogen and Phosphorous cycles)
- 1.7 Ecosystem: Structure and function of ecosystem.
- 1.8 Food chain, food web and ecological pyramids.
- 1.9 Ecological succession: Definition, types, concept and process (Hydrosere, Xerosere)
- 1.10 Bio geo chemical cycles in ecosystems (Carbon, Nitrogen and Phosphorous cycles)

UNIT II: BIODIVERSITY AND ITS CONSERVATIONS

- 2.1 Definition, concept, levels and values of biodiversity.
- 2.2 Biodiversity of India, India as a mega diversity nation, hotspots of biodiversity.
- 2.3 Threats of biodiversity (habitat loss, poaching of wildlife and man wildlife conflicts).
- 2.4 Conservation of biodiversity: In-situ conservation: ex-situ conservation.
- 2.5 Eco-tourism - concept of protected area network with special reference to wild life reserves in the region.

UNIT III: NATURAL RESOURCES AND THEIR CONSERVATION

- 3.1 Forest Resources: Uses and over-exploitation of forests and consequences of deforestation.
- 3.2 Water Resources: Use and consequences of over-utilization - concept of rain water harvesting and watershed management - water conflicts.
- 3.3 Food Resources: Sources of food - impact of modern agriculture on environment (Fertilizer-pesticide problem, water logging and salinity) - organic farming.
- 3.4 Energy Resources: Renewable and non-renewable energy sources - growing energy needs and alternate energy sources.
- 3.5 Land Resources: Global land use patterns, soil erosion, and desertification and wasteland reclamation - The Save Soil movement.

UNIT IV: ENVIRONMENTAL POLICIES AND PRACTICES

- 4.1 Climate changes - global warming - ozone layer depletion - acid rain and their impacts on human communities and agriculture.
- 4.2 Environment Laws: Environmental Pollution.
Definition, Cause, effects and control measures of:
(a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards

Role of an individual in pollution control & pollution case studies.
Wildlife Protection Act; Forest Conservation Act; Water (Prevention and control of Pollution) Act; Air (Prevention & Control of Pollution) Act; Environment Protection Act; Biodiversity Act.
- 4.3 International agreements: Montreal Protocol; Kyoto Protocol and Climate Negotiations; Convention on Biological Diversity (CBD).
- 4.4 Protected area network - tribal populations and rights - human wildlife conflicts in Indian context.

UNIT V: HUMAN COMMUNITIES AND THE ENVIRONMENT

- 5.1 Human population growth: Impacts on Environment, Human Health and Welfare.
- 5.2 From unsustainable to sustainable development - Urban problems related to Energy - Water conservation, rainwater harvesting, and watershed management - resettlement and rehabilitation of people & case studies.
- 5.3 Environmental Disaster: Natural disasters - floods, earthquake, cyclones, tsunami and landslides; Man-made disasters: Bhopal and Chernobyl disasters - Disaster Management.
- 5.4 Environmental movements: Bishnois Chipko, Silent Valley, Big Dam Movements.
- 5.5 Environmental ethics: Role of gender and cultures in environmental conservation issues and possible solutions.
- 5.6 Environmental education and public awareness - Consumerism and waste products - Solid Waste Management: Causes, effects and control measures of urban and industrial wastes.

Reference Books:

1. Environmental Studies: From Crisis to Cure by R. Rajagopalan (Oxford University Press).
2. Essentials of Ecology and Environmental Science by S.V.S. Rana (Prentice Hall India Learning Private Limited, New Delhi).
3. Introduction to Environment Management, M.M. Sulphery & M.M. Safeer (Prentice Hall India Learning Private Limited, New Delhi) (2015).
4. Environmental Law by Surender Kumar Sharma (Wisdom Press, New Delhi) (2015).
5. Ecology and Environment by P.D. Sharma (Rastogi Publications) (2018).
6. Environmental Science by S.C. Santra (New Central Book Agency, Kolkata) (2016).
7. Text Book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission (Orient Blackswan Pvt. Ltd., New Delhi).
8. Sustainable Development Goals and Indian Cities – Inclusion, Diversity and Citizen Rights (Part I), edited by Ashok Kumar & D.S Meshram (Routledge India, New Delhi).

Course Outcomes:

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

1. Define the basic concepts of the environment & eco-systems and their concerns and issues.
2. Apply their knowledge for efficiently conserving natural resources and achieving sustainable development.
3. Analyze the importance of biodiversity and its conservation.
4. Synthesize the policies and practices formulated by the Government and other agencies and propose alternative solutions and strategies.
5. Evaluate the relationship existing between human communities and their surrounding environment.

Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)
THIRD SEMESTER

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B3.1C	Architectural Design – II	PC	9		9	9	100	100	200	J
2	AR22B3.2C	Materials and Building Construction III	BS	5		5	5	50	50	100	S
3	AR22B3.3C	Perspective and Rendering	PC		4	4	4	50		50	---
4	AR22B3.4C	History of Architecture – I	PC	3		3	3	50	50	100	W
5	AR22B3.5C	Structural Analysis - I	BS	3		3	3	50	50	100	W
6	GN22B3.1A	Universal Human Values	SEC	3		3	3	50	50	100	J
7	AR22B3.6C	Climatology for Built Environment	BS	2	1	3	3	50	50	100	W
				25	5	30	30	400	350	750	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

AR22B3.1C ARCHITECTURAL DESIGN – II

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
9	0	9	9	100	100	200	J

Objectives of the Course:

- To introduce the students to the pre-design phase and provide effective tools and methods in dealing with them.
- Emphasize the role of conceptual and creative thinking in the ideation phase using elements of visual language
- Develop a critical understanding of context specific approach in design.

Unit I: Design Process

Understanding design as a cyclic process, iterative process for refinement, different stages involved in design: Pre-design studies, conceptual design, design development, evaluation and validation; design as analysis, synthesis and evaluation; design as Problem solving and decision making;

Unit II: Case Study

Case-study method of research, enumeration of standards, selecting appropriate case, observations, documentation, analysis, inferences leading to design,

Study of form: built-form, structure, style, elements and meaning

Function: building type, served and servant spaces, circulation system, zoning, diagrammatic representation of figure-ground, circulation, orientation and sun path, lighting, air flow

Structure: structural system, materiality, construction and services

Unit III: Understanding the context

Site and the environs: geographical, cultural and historical concerns; temporal, socio-economic aspects, climate and ecological aspects

Site analysis: understand the physical and environmental context of the site, including topography, climate, vegetation, and views, building orientation, site layout, landscaping and sustainability;

Cultural and historical research: understand the cultural and historical context of the site and its surrounding area. Understanding local traditions, culture, and architectural styles, historical events and landmarks

Unit IV: Problem Seeking

Critical appraisal of real-world situations, enumerating standards, listing of activities, spaces for activities, relevant spaces pertinent to building typology, quantity and quality of spaces; relationship between spaces: adjacencies, bubble diagrams;

Identifying the problem, understanding the problem, and define the design problem clearly; to prepare the design the program.

Unit V: Concept Formulation

Constraints or opportunities presented by the context of the site and typology of the building, abstract and graphical representation of ideas leading to the solution, Concept as a theme or central idea driving the design, metaphors in concept formation.

Guidelines for learning:

Dealing with the complexity of multiple spaces and their inter-relationships is the focus in this semester. Students need to sensitize themselves to the user requirements, design process, understanding the context and problem solving. Students are advised to more pursue more alternatives and do many iterations and refinements to their design in order to gain experience in solving real life problems.

Assignments to be formulated:

At least one major design exercise and one minor design in this semester.

In the major design exercise, emphasis to be given to the process and methods of design. Efforts have to be made to build-on what students have learnt in the previous semesters and integrate the learning in the present semester to ensure a systematic learning experience to the students. Students are to be encouraged in pursuing more alternatives. Students are to be encouraged to use physical model as a tool to visualize and validate their design.

The minor problems can be a Design Charrette or a time problem.

Type of Design Problems: Kindergarten, Balwadi, Primary Health Center, Architect's office, departmental store, Police Station, Post office, Café, Food Courts, Food Plaza, Plug and Play facility, Day Care, Small Bank, Doctor's clinic, Beauty Saloon etc.

Integration: The design portfolio shall consist of construction details of the spaces designed and the details of the building structural components in RCC. The students are expected make the staircase details as part of the portfolio. The built-up area has to be indicated; the specifications of the materials to be written, construction techniques, structural systems used and the elements of built forms to become part of portfolio. Approximate estimate based on built-up area to be worked out.

Reference:

1. Karl Aspelund, The Design Process, 3rd Edition, Fairchild books, 2015.
2. William M.Pena, Steven A.Parshall, Problem Seeking: An Architectural Programming Primer, 5th Edition, John Wiley & Sons; 2012.
3. James Tait, The Architecture Concept Book, 1st Edition, Thames and Hudson, 2013.
4. Geoffrey Makstutis, Design Process In Architecture, Laurence King Publishing, 2018.

5. Joy W. Siegel, Thinking by Making: Architecture Design process Documented and Demystified, Blurb, 2023.
6. Gaston Bachelard, The Poetic of Space, Penguin Classics, 2014.

E-resources:

https://www.re-thinkingthefuture.com/2021/01/12/a2830-8-concepts-trending-among-architecture-students/	Architecture Concepts :8 Concepts trending among Architecture Students
https://www.firstinarchitecture.co.uk/architecture-design-process/	Architecture Design Process
https://www.gov.wales/sites/default/files/publications/2018-09/site-context-analysis-guide.pdf	Site and Context Analysis
https://www.re-thinkingthefuture.com/rtf-fresh-perspectives/a1730-a-checklist-for-architectural-case-studies/	A checklist for architectural case studies
https://archexamacademy.com/download/Programming-Planning-Practice/PPP_ProblemSeekingPena.pdf	Problem Seeking
https://www.firstinarchitecture.co.uk/how-to-develop-architectural-concepts/	how to develop architectural concepts

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

COURSE OUTCOME	DESCRIPTION
CO1	Develop an effective design process model that familiarizes the students to the iterative nature of design.
CO2	Formulate methods of Case-study as an important phase in the design cycle and equip the students with necessary tools, procedural knowledge and skills
CO3	Investigate the Problem-Seeking methodology as a primer to gain in depth understanding of the design problem before an effective solution could be conceived.
CO4	Create articulated design by adopting meaningful design rationale and engage in conceptual thinking to generate creative design concepts.
CO5	Generate design solutions for diverse contextual settings such as user, site, built space, etc.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO 1	2	3	-	2	2	2	2	2	1	2	-	3	1	1
CO 2	2	2	2	2	3	2	2	2	3	3	1	2	2	3

CO 3	2	2	2	-	2	2	2	1	1	2	1	2	3	2
CO 4	3	2	3	2	3	2	3	-	1	3	2	2	2	3

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation



AR22B3.2C MATERIALS AND BUILDING CONSTRUCTION – III

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
5	0	5	5	50	50	100	S

Objectives of the Course:

- Imparting comprehensive knowledge to the students on the building materials while highlighting the current innovations and trends.
- Preparing the students for a systematic study of building materials in the scope of ingredients, manufacturing process, properties, uses, installation and market price and application in real life problems.
- To explore materials like Glass and Floorings materials and the methods and techniques for constructing RCC components in building projects with comprehensive understanding of the underlying theory.
- To combine theoretical and practical instruction and equip the students to apply the knowledge to real-world situations, enabling them to make informed decisions when designing and constructing with RCC.
- Imparting how to represent building construction methods in the form of drawings, instructions and check the quality of work on site

UNIT I: Glass and Glass Products:

Composition and manufacturing of float glass, types of glass: clear glass, tinted glass, wired glass, laminated glass; Properties of glass and use of glass in buildings; Special glasses: tempered glass, structural glass, glass blocks, glass-crete, and fiber glass.

UNIT II: Floorings:

Essential requirements of a flooring material, criteria for selection of flooring material, natural and artificial materials for flooring; Properties of natural flooring materials: Kadapa stone, Kotah stone, Tandur stone, marble, flag stone, sandstone, rubber, wooden; Properties of artificial flooring materials: cement concrete, brick, terrazzo, vitrified tiles, ceramic tiles, Linoleum, PVC and PVA floorings, granolithic;

UNIT III: Introduction to R.C.C.:

Understanding the properties and characteristics of RCC, Advantages and disadvantages of RCC: Cast-in-situ and pre-cast constructional methods in RCC. Constructional methods in RCC: ingredients, mixing, pouring, machinery and tools used in RCC; Structural components of typical R.C.C. framed structure. Observing junctions of RCC beams and columns use of Ready Mix Concrete.

UNIT IV: R.C.C. Building components:

Foundations: Isolated footing viz. rectangular and trapezoidal footings, combined footings, shoe foundations, raft foundation and pile foundation. Step by step procedure for laying foundation and detailed construction process, Soil bearing capacity, criteria for deciding the type of foundation,

RCC columns – different shapes, different combinations and loading conditions, placing column footers, maintaining the plumb and orthogonality over the height of column and number of stories

RCC beams: Single and doubly reinforced beams, T and L beams, continuous beams, lintels and brackets, cover blocks, spacer bars, layers of Reinforcement : RCC slabs: One way and two way slabs, Reinforcement placing in cantilever slabs , chairs for Reinforcement. R.C.C Balconies, Chajjas.

UNIT V: Staircases:

Principles of staircase construction and its elements; Terms defined: Tread, riser, stringer, nosing, flight, landing, head room, handrail, balusters, newel post etc., types of stairs i.e., straight, doglegged, open-well, geometrical, circular, spiral, bifurcated, wooden stairs, stone stairs, metal stairs and elementary knowledge of R.C.C. stairs. Details of various staircases in wood, stone, steel and RCC; Thumb rules and safety provisions for staircases;

(For Internal assessment only)

UNIT VI: Traditional Construction Methods

Exploration and documentation of the following traditional elements from field with an emphasis to understand the methods:

Brick: Columns, brackets, corbelling, arches, domes, jalties and compound walls;

Stone: Columns, brackets, corbelling, arches, chajjas, and roofs;

Reference:

1. Bindra and Arora. Building Construction: Planning Techniques and Methods of Construction, 19th ed. DhanpatRai Pub., New Delhi. (2000)
2. Barry, The Construction of Buildings, Vol- 2, 5th Edition. New Delhi: East West Press. (1999)
3. McKay, W.B. Building, Construction Metric Vol. 1 – IV, 4th ed. Orient Longman, Mumbai. (2005)
4. Foster, J. Stroud. Mitchell, Building Construction: Elementary and Advanced, 17th ed. B.T. Batsford Ltd, London. (1963)
5. Ramamrutham, S. Reinforced Concrete Design, DhanpatRai Publishing company. (2013)
6. Willibald Mannes, Techniques Of Staircase Construction, 1st ed. London & New York: Van Nostrand Reinhold Company. (1979)
7. Sushil Kumar, T.B. of Building Construction, 19th ed. Standard Pub. Distributors, Delhi. , (2003)
8. Dr. Gurucharan Singh, Building Construction and Materials, 16th Edition. New Delhi: Standard Book House. (2017)
9. Duggal, S. Building Materials, 5th Edition. Delhi: New Age International Publications PVT. (2019)

10. Dr. BC. Punmia, E.A. Building Construction, 11th Edition. Laxmi Publications..(2016)
Rangwala, S.C Building Construction, 22nd ed. Charotar Pub. House, Anand. .(2004)

E-resources:

https://in.saint-gobain-glass.com/glass-manufacturing-process	Manufacturing process of Glass, Types of Glass by Saint gobain.
https://johnkollyns.com/application-of-glass-in-building-and-construction/	Applications of Glass in buildings.
https://theconstructor.org/building/types-of-flooring-materials-uses-building/16992/	Types of Floorings , applications of flooring materials,
https://www.civilprojectsonline.com/building-construction/introduction-to-design-of-rcc-structures/	Introduction to R.C.C. , Components of R.C.C., examples of R.C.C. structures
https://www.linkedin.com/pulse/components-rcc-frame-structure-fourmarketing?trk=organization-update-content_share-article	Structural components of typical R.C.C. framed structure
https://www.ultratechcement.com/home-building-explained-single/the-right-way-to-install-rcc-footings-for-a-strong-home	Right way to install R.C.C footings. Step by step process of laying foundations.
https://tribby3d.com/blog/one-way-slab-and-two-way-slab/#:~:text=In%20a%20one%2Dway%20slab,it%20occurs%20in%20both%20directions.	R.C.C One way Slab and Two way Slab
https://www.keuka-studios.com/types-of-stairs-2/	Types of Staircases, advantages and disadvantages
https://bmtpc.org/DataFiles/CMS/file/PDF_Files/61_PAC_Urbaanic_Final.pdf	Precast concrete technology
https://theconstructor.org/concrete/self-compacting-concrete-properties-tests/7683/	Self-compacting concrete, properties, applications
https://www.concrete.org/topicsinconcrete/topicdetail/High%20Performance%20Concrete?search=High%20Performance%20Concrete	High performance concrete, applications and uses.
https://www.nbmcw.com/product-technology/construction-chemicals-waterproofing/concrete-admixtures/sustainable-concrete-an-inevitable-need-for-present-future.html	Sustainable construction techniques in R.C.C. construction
https://moremargie.com/article/bricks-of-kerala	Laurie Baker — Brick Genius
https://nayeemasif.files.wordpress.com/2014/04/poetry-in-brick.pdf	Poetry in brick: the infamous architecture of Laurie Baker

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

COURSE OUTCOME	DESCRIPTION
CO1	Demonstrate knowledge on glass, types of glass, natural and artificial flooring materials and R.C.C components.
CO2	Implement the knowledge of R.C.C construction in architectural design and appraise building materials in the scope of ingredients, properties, manufacturing process, uses, installation and market price with real life applications.
CO3	Learn systematic methods of construction of buildings using R.C.C.
CO4	Prepare construction drawings as studio exercises along with the theoretical inputs on R.C.C.
CO5	Conduct site visits, case studies market surveys for flooring materials, Glass types, and documentation of R.C.C building components.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/ PO	PO- 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO- 10	PO- 11	PO- 12	PSO 1	PSO 2
1	3	2	1	-	1	2	-	-	2	3	-	2	2	1
2	3	3	-	1	-	2	1	-	2	3	2	1	2	1
3	3	2	1	3	-	3	-	-	-	1	-	2	3	-
4	3	2	2	2	-	1	-	-	-	3	-	-	-	3
5	3	3	-	-	-	-	2	2	-	3	3	-	1	2

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR23B3.3C PERSPECTIVE AND RENDERING

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
0	4	4	4	50	0	50	-

Objectives of the Course:

- To impart the skills of composition, rendering and documentation for the presentation of the design ideas in real-life situation.
- To impart the skills in understanding of Perspective as a tool to visualize design in real-life environment
- To encourage the students to explore different rendering techniques that help them to visualize the different aspects of design.
- To train students in organizing and presenting the drawings in appropriate format for portfolios and Digital Presentations of their work.

UNIT I: 3D Perception in Architecture

Three dimensional perception of simple forms, understanding views of the objects, components and characteristics of complex objects with respect to human eye in a visual environment.

UNIT II: Perspective Views

Representation of 3D Objects on flat surface; preparation of perspective views of buildings from plans and elevations. One point and Two Point Perspectives of Buildings and Interiors. Understanding perspective components like Horizon Level, Stationary Point Vanishing Point and Picture Plane; constructing One point and Two Point Perspectives views in detail. Introduction to 3 Point Perspective

UNIT III: Rendering

Study of the surfaces, textures and colours of buildings in different light conditions and materials; Developing Shades and Shadows of building on vertical and horizontal planes and in perspective; Application of manual and digital techniques of rendering in perspective with various media;

UNIT IV: Sciagraphy

Constructing Shadows on vertical and horizontal surfaces of a building near to reality. Representation of Shadows of different elements like Trees, Shrubs, Human Figures and other elements in the drawing.

UNIT V: Graphics and Composition

Illustration Techniques, Page making, Portfolio Design and formats, Brochure preparation.
Digital Techniques in rendering and graphics.

Reference:

1. Robert Gill, “Rendering with Pen and Ink”, The Thames & Hudson Manuals, 1984.
2. Bellings, Lance Brown, “ Perspective, Space and Design”.
3. Holmes, John M, “ Sciagraphy “, Sir Isaac Pitman & Sons, 1952
4. Dick Powell, “Design Rendering Techniques- A Guide to Drawing and Presenting Design Ideas “, 1986.
5. Sara Eisenman, Building Design Portfolios: Innovative Concepts for Presenting Your Work (Design Field Guide) , 2008.

E-resources:

https://doi.org/10.3390/su13116223	The Drawing and Perception of Architectural Spaces through Immersive Virtual Reality, <i>Sustainability</i> 2021
https://ieeexplore.ieee.org/abstract/document/9615339	The Digital Perception of Architectural Space, <i>Hugo C. Gomez</i>
https://ieeexplore.ieee.org/author/37717691400	Using Architectural Perspectives , <i>Eoin Woods</i>
https://www.journals.uchicago.edu/doi/abs/10.2307/750956?journalCode=jwci	The Perspective of Shadows: The History of the Theory of Shadow Projection, <i>Thomas Da Costa Kaufmann</i>
https://books.google.co.in/books?id=hoTOJJdyG3EC&sitesec=buy&source=gbs_vpt_read	Design Drawing Techniques: For Architects, Graphic Designers & Artists, <i>Tom Porter, Sue Goodman</i>

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

COURSE OUTCOME	DESCRIPTION
CO1	Perceive the Objects in Three Dimensional Environment and able to create 2 D drawings of the same.
CO2	Develop a perspective drawing understanding the scale and visual geometry of the buildings representing ideas of Design.
CO3	Render a perspective understanding different light conditions and environment that enhances the value of drawings close to reality.
CO4	Construct shadows on Building Facades as well as objects associated in the Landscape like Trees, Human Figures considering the day light at different times.
CO5	Compose architectural design work in the form of Portfolio using Illustration and Digital techniques for a professional presentation.

Program Articulation Matrix

Course Code	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	POS 1	POS 2	POS 3	POS 4
AR17B 3.2C.1	3					3			2			3				
AR17B 3.2C.2	3								2			1				
AR17B 3.2C.3	2								3	2		3				
AR17B 3.2C.4	2											2				
AR17B 3.2C.5	3	2			1	3			3	3		3				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

AR 22B3.4C HISTORY OF ARCHITECTURE - I

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3	0	3	3	50	50	100	W

Objectives of the Course:

- To expose the students to a wide spectrum of architectural styles ranging from pre-historic to pre-modern times.
- To elucidate the evolution of architecture in relation to time with special emphasis on social, religious and environmental factors.
- To make the students understand the developments in the construction technology in different periods.

Unit I: Ancient Civilizations

Architectural developments of the ancient civilizations, Mesopotamia: Ziggurats and other built-forms; in Indus valley: people and culture, development of town-form, built-form, community living, building typologies, brick masonry and sanitation system;

Unit II: Architecture of Egypt

Elements of nature in architecture of Egypt, Study of Pyramids and construction process, Temples, Mastabas, residences; study of architectural elements, hypostyle halls, obelisk, hieroglyphs

Unit III: Architecture of Greek period

Architecture in the Classic Greek periods: different orders, optical correction and appreciation of perfection in architecture; Study of Greek buildings like: temples, agora, house-forms; construction of elements like arches and columns;

Unit IV: Architecture of Roman Period

Architecture in Roman period: grand scale, application of Greek orders, addition of new orders, construction of pointed arches and vaults, use of puzzolana concrete, study of different typologies of public buildings and residential buildings; development of roads and aqueducts.

Unit V: Architecture of Medieval Period

Architectural developments: churches and Basilicas; development of plan-form of churches in the Early Christian; developments of domes in Byzantine; Churches of Romanesque; churches of Gothic period in Europe and rest of the world excluding Asia; introduction of newer architectural elements in churches of Gothic period

Reference:

1. Fletcher, Sir Banister. A History of Architecture, 19th ed. CBS Pub., Delhi, 1992.
2. Yarwood, Doreen. A Chronology of Western Architecture. B.T. Batsford Ltd., London, 1987.
3. Schulz, Christian Norberg. Meaning in Western Architecture, 2nd ed. Rizzoli Intl. Pub., New York, 1981.
4. Copplstone, Trewin and Others. World Architecture: An Illustrated History, 11th ed. Hamlyn, London, 1979.
5. Bindoo. D.D, History of Architecture, Milind P Lakshana, Hyderabad – 2006.
6. Wittkaner R Architectural Principles in the Age of Humanism, Chichester :Academy Editions 1998.

E-resources:

https://www.worldhistory.org/Indus_Valley_Civilization/	Indus Valley Civilization
https://www.khanacademy.org/humanities/world-history/world-history-beginnings/ancient-india/a/the-indus-river-valley-civilizations	Indus River Valley civilizations
https://en.unesco.org/silkroad/sites/default/files/knowledge-bank-article/vol_I%20silk%20road_the%20indus%20civilization%20BIS.pdf	THE INDUS CIVILIZATION1
https://www.history.com/topics/ancient-egypt/ancient-egypt	Ancient Egypt
https://www.historymuseum.ca/cmc/exhibitions/civil/egypt/egcivile.html	egyptian civilization
https://www.history.com/topics/ancient-middle-east/mesopotamia	Mesopotamia
https://education.nationalgeographic.org/resource/resource-library-mesopotamia/	MESOPOTAMIA
https://www.worldhistory.org/Greek_Architecture/	Greek Architecture
https://artincontext.org/greek-architecture/	Greek Architecture – An Exploration of Ancient Greek Structures
https://www.worldhistory.org/Roman_Architecture/	Roman Architecture
http://www.classichistory.net/archives/early-christian-architecture	Early Christian Architecture
https://www.worldhistory.org/Byzantine_Architecture/	Byzantine Architecture

https://engineering.tiu.edu.iq/architecture/wp-content/uploads/2019/11/4-Romanesque-Architecture.pdf	Romanesque Architecture History of Architecture
https://www.worldhistory.org/article/1649/gothic-cathedrals-architecture--divine-light/	Gothic Cathedrals: Architecture & Divine Light
https://www.worldhistory.org/Renaissance_Architecture/	Renaissance Architecture
https://www.youtube.com/watch?v=uUumTRgCCx8&t=37s	Baroque & Rococo Architecture
https://cavitt.eurekausd.org/documents/Parents/PTC/Art%20Docent%20Presentations/8th%20Grade/Revised_Oct2015_Neoclassical_Architecture_Presentation.pdf	Neoclassical Architecture
https://victorianweb.org/art/architecture/stevenson/renaissance.html	The Renaissance in England
https://victorianweb.org/art/architecture/indian/index.html	Moorish, Saracenic, Northern Indian, and Islamic, Architectural Styles in Great Britain, the Empire, and Other Countries

COURSE OUTCOMES

After the completion of this course, students will be able to

CO1	Identify the common characteristics of a particular architectural style
CO2	Describe the development of built form in response to socio religious, aesthetic, and environmental factors of architecture from prehistoric to modern times.
CO3	Illustrate various building types, construction methods, architectural characteristics of prehistoric, classical, medieval and pre modern periods.
CO4	Recognize the architectural elements used in different time periods.

CO/PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	1	-	-	2	3	3	2	-	1	2	-	2
CO2	3	2	1	1	2	-	2	3	3	2	-	2
CO3	3	2	1	3	3	3	2	1	1	3	1	2
CO4	1	2	-	2	2	1	1	2	1	3	-	2

AR22B3.5C: STRUCTURAL ANALYSIS -I

Periods per week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3		3	3	50	50	100	W

Objectives of the Course:

- A. To understand the shear force and bending moments in determinate beams.
- B. Classify the shear and bending stress behaviour for beams.
- C. Enrich shear force and bending moment to fixed beams and propped cantilevers.
- D. To develop the magnitude of deflections for simply supported and cantilever beams for point load and uniformly distributed load.
- E. To develop the skills to analyse the reactions, horizontal thrust and bending moment for 3 hinged arches.
- F. Understand the structural behaviour of domes and vaults, chimneys and retaining walls.

UNIT I: Flexure, Analysis of Flexural Members

Flexure, analysis of flexural members - Types of Beams, types of supports, types of loads. Calculation of reactions. Definition of shear force & Bending Moment, Relation between loadings, SF & BM. Plotting SFD, BMD for Cantilever, simply supported (S.S), and over hanging. Definition of Point of contra flexure, its location.

UNIT II: Flexure Members - Bending and Shear

Cross sectional Behaviour of flexural members. Bending Stresses: Introduction to Theory of simple bending, pure bending, Assumptions, derivation of flexure formula, section modulus, calculation of bending stress distribution in the Cross section of member. Numerical solutions. Shear stresses Introduction to shear stress in beams, shear stress formula, shear stress distribution for standard shapes like Rectangle, Circle, I,T Section, etc., Numerical solutions. Torsion in beams – Behaviour of members subjected to Torsion

UNIT III: Fixed Beams and Propped Cantilevers

Fixed beams - Introduction to behavior of fixed beams, Advantages and disadvantages of fixed beams over simply supported beams, SFD & BMD for fixed beams with combination of point loads & UDL (No derivations)

Propped Cantilevers - Introduction to behavior of Propped Cantilevers, Reaction of propped Cantilevers with UDLs and point loads. Drawing SFD and BMD. Slope and Deflection at end and the intermediate positions.

UNIT IV: Deflection

Deflection – Understanding the behavior of deflection in beams under various loads and various support conditions.

Slope and deflection of cantilever beams and simply supported beams for various loads using Double integration method, moment area method and Macaulay's method

UNIT V: Arches, Chimneys and Retaining Walls

Arches: Types of Arches (2, 3 hinged) and behavior of arches under various loads. Funicular shapes for loads. Different geometry of arches. Determination of support reactions, horizontal shear, bending moment, horizontal thrust and radial shear. Mainly for three-hinged parabolic and segmental arches with supports at same and different levels.

Structural behavior of Vaults and Domes along with the Force flow showing the way the statics operate.

Structural behavior of Chimneys and Retaining Walls to lateral loads.

Reference:

1. **Khurmi. R.S.** Strength of Materials, S. Chand and Co.Ltd., New Delhi, 1999.
2. **S S Bhavikatti** Mechanics of Structures, Vikas Publishing House, New Delhi, January 2021
3. **H. J. Shah, S. B. Junnarkar**, Mechanics of Structures Vol. II 32nd ed., Charotar Publishing house, 2016
4. **Gambhir M.L** Fundamentals of Structural Mechanics and Analysis, Prentice Hall India Learning Private Limited, January 2014
5. **Ramamrutham. S.** Theory of Structure 11th ed., Dhanpat Rai Publishing Company Ltd. January 2020.
6. **Timoshenko. S. and Young, D.H.** Theory of Structures, McGraw-Hill, International Editions

E-resources:

https://www.studocu.com/en-us/document/university-of-memphis/reinforced-concrete-design/chapter-5-flexural-analysis-and-design-of-beams/1060825	Flexural Analysis and Design of Beams.
https://www.bu.edu/moss/mechanics-of-materials-bending-shear-stress/	Bending shear stress mechanics of members
https://www.engineeringtoolbox.com/beams-fixed-both-ends-support-loads-deflection-d_809.html	Analysis of fixed beams for various loads and end conditions
https://www.sciencedirect.com/topics/engineering/proppe-d-cantilever	Propped cantilever practical applications
https://skyciv.com/docs/tutorials/beam-tutorials/what-is-deflection/	Deflection in beams in various types.
https://www.structuralbasics.com/arch-structure-bending-moment	Arch structure: Bending moment, normal and Shear force calculation

COURSE OUTCOMES:

Upon the successful completion of the course, the student will be able to

COURSE OUTCOME	DESCRIPTION
CO1	Assess the shear force and bending moments in determinate beams.
CO2	Analyze shear and bending stress behavior for beams
CO3	Evaluate shear force and bending moment to fixed beams and propped cantilevers.
CO4	Compute the magnitude of deflections for simply supported and cantilever beams for point load and UDL.
CO5	Analyze 3 hinged arches to perform bending moment calculations. Understand structural behavior of domes, vaults, chimneys and retaining walls.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

AR17B 3.5C	PO- 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO- 10	PO- 11	PO- 12	PSO 1	PSO 2
CO-1	3	2	2	-	2	2	-	1	-	-	-	-	2	-
CO-2	3	2	2	-	2	3	1	-	2	-	-	2	2	2
CO-3	3	2	2	2	2	3	-	1	2	2	2	2	2	3
CO-4	3	2	2	2	2	2	-	1	2	2	-	2	2	2
CO-5	3	2	2	-	-	2	2	-	-	-	-	2	2	2



GN22B3.1A: UNIVERSAL HUMAN VALUES

Periods per week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
1	2	3	3	50	50	100	J

Unit I

Introduction to Value Education (6 lectures and 3 tutorials for practice sessions)

Lecture1: Understanding Value Education

Lecture2: Self-exploration as the Process for Value Education

Tutorial 1: Practice Session PS 1 Sharing about One-self

Lecture3: Continuous Happiness and Prosperity– the Basic Human Aspirations

Lecture 4: Right Understanding, Relationship, and Physicality

Tutorial 2: Practice Session PS 2 Exploring Human Consciousness

Lecture5: Happiness and Prosperity– Current Scenario

Lecture6: Method to Fulfill the Basic Human Aspirations

Tutorial 3: Practice Session PS 3Exploring Natural Acceptance

UNIT II

Harmony in the Human Being (6 lectures and 3 tutorials for practice sessions)

Lecture 7: Understanding Human being as the Co-existence of the Self and the Body

Lecture 8: Distinguishing between the Needs of the Self and the Body

Tutorial 4: PracticeSessionPS4Exploring the difference of Needs of Self and Body

Lecture9: The Body as an Instrument of the Self

Lecture10: Understanding Harmony in the Self

Tutorial 5: Practice Session PS 5 Exploring Sources of Imagination in the Self

Lecture11: Harmony of the Self with the Body

Lecture12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS 6 Exploring Harmony of Self with the Body

UNIT III

Harmony in the Family and Society (6 lectures and 3 tutorials practice sessions)

Lecture13: Harmony in the Family –the Basic Unit of Human Interaction

Lecture14: Values in Human-to-Human Relationship

Lecture 15: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS 7 Exploring the Feeling of Trust

Lecture16:'Respect'–as the Right Evaluation

Tutorial 8: Practice Session PS 8 Exploring the Feeling of Respect

Lecture17: Understanding Harmony in the Society

Lecture18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfill Human Goal

UNIT IV

Harmony in the Nature/Existence (4 lectures and 2 tutorials practice sessions)

Lecture19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation, and Mutual Fulfillment among the Four Orders of Nature

Tutorial 10: Practice Session PS 10 Exploring the Four Orders of Nature

Lecture21: Realizing Existence as Co-existence at All Levels

Lecture22: The Holistic Perception of Harmony in Existence

Tutorial11: Practice Session PS 11 Exploring Co-existence in Existence

UNIT V

Implications of the Holistic Understanding – a Look at Professional Ethics

(6lectures and 3 tutorials for practice session)

Lecture23: Natural Acceptance of Human Values

Lecture24: Definitiveness of (Ethical)Human Conduct

Tutorial 12: Practice Session PS 12Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture26: Competence in Professional Ethics

Tutorial 13: Practice Session PS 13 Exploring Humanistic Models in Education

Lecture 27: Holistic Technologies, Production Systems and Management Models -Typical Case Studies

Lecture28: Strategies for Transition towards Value-based Life and Profession

AR22B3.6C CLIMATOLOGY FOR BUILT ENVIRONMENT

Periods Per Week			CREDITS	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	1	3	3	50	50	100	W

Objectives of the course:

- A. Understand systems that affect global climate and how the country has been divided into climatic zones.
- B. Understand factors that affect thermal gain in a built envelope and what indoor conditions are ideal for indoor human comfort also in the context of external climate.
- C. Sensitize the students to micro climate at site level and what elements may be used to modify micro climate for human comfort
- D. Train the students to modify building volumes and use proven passive design strategies to ensure thermal comfort
- E. Sensitize students to best practices in the area of climate sensitive design

Unit I: Macro Climate:

Climate change, Global climatic factors: global wind currents and ocean currents , movement of earth around the sun, shape of the earth, angle of tilt, earth rotation and revolution ; Elements of climate: Solar radiation, temperature, humidity, wind velocity, precipitation; climatic zones in India: hot and dry, warm-humid, composite and temperate,cold; measurement of climatic data, instruments and measurement of climatological data, climatic data required for design of buildings and interpretation of graphical data.

Unit II: Thermal Comfort

Importance of thermal comfort in buildings: thermal comfort factors: body's heat production and regulatory mechanisms, heat loss in various environments body heat balance deep body temperature; thermal comfort indices CET (corrected effective temperature), interpretation of psychometric charts, bioclimatic chart, human comfort ranges and levels. Basic principles of heat flow through buildings: conduction, convection, radiation, thermal properties of building materials steady state calculations and introduction to periodic heat flow.

Unit III: Analysis of Climate

Analysis of microclimate from macro climate, site and the environs, factors effecting the micro climate at the site, instruments and methods used to carry out measurements of climate data: temperature, humidity, wind, precipitation, driving rain, sky conditions, solar radiation, vegetation, graphical representations of data,

Use of tools like mahoney's tables; climate consultant for analysing the requirements of buildings in relation to climate.

Unit IV: Passive Solar Design Technologies

Understanding Solar charts, orientation-siting of building with respect to sun and design of shading devices; passive cooling devices: humidity control, use of evaporative cooling, physiological cooling, convective cooling, ground cooling-earth air tunnel.

courtyard houses , night time cooling, reflective surfaces and radiant barriers, thermal mass, cavity walls, cool roof and green roof, stack effect ,wind catchers, Trombe walls and sun room,.

Unit V: Ventilation and micro climate control through Landscape

Ventilation: interpretation of wind-rose diagrams, Beaufort wind force scale, predicting air movement around site, airflow through buildings, natural ventilation: windward and leeward sides, position and size of openings, cross ventilation, borrowed ventilation, forced ventilation, window floor ratio, sick building syndrome. orientation and positioning of windows.

Plantation for: shading, wind buffer, dust control, minimizing the reflected ground factor in radiation, cooling through evapo-transpiration, use of water: evaporative cooling, misters.

Unit VI: Design and Best Practices (for internal evaluation)

Design process: Forward analysis, plan development, elements design stages, Design strategies for each climate (ref. Koenigsberger); effect of orientation , design of shading devices , heat flow calculations, Case study and climatic analysis of a local model building. Class discussions on national and International best practices as per climate and typology of building.

Reference:

1. Markus, T.A. and Morris. E.N., Buildings, Climate and Energy. Pitman Pub. Ltd., London, 1980.
2. Narashimhan ,An Introduction To Building Physics ,CBRI, 1974
3. Otto H Koenigsberger, O. H., Ingersoll, T. G., Mayhew, Manual Of Tropical Housing And Building – Part I – Climatic Design, Orient Longman Private Limited, 1975
4. Fred Pearce, Climate and Man, 1989
5. RamachandraGuha, Environmentalism: A Global History, 1999
6. Sustainable Buildings - Design Manual: Vol 2, TERI
7. Energy-efficient buildings in India, The Energy and Resources Institute (TERI), 2001
8. MiliMajumdar and MinniSastry, Green Homes and Workplaces, TERI
9. Building wise, CSE, 2021
10. Energy conscious Architecture, Ministry of non-conventional energy resources, GOI, Jan 2005.

E-resources:

https://www.teriin.org/	TERI (The Energy and Resources Institute): This website provides information on sustainable development in India, including research on building energy efficiency and renewable energy.
https://www.cseindia.org/	Centre for Science and Environment (CSE): This website provides information on sustainable development in India, including research on building energy efficiency and renewable energy.
https://thearchspace.com/5-different-climate-zones-in-india-and-their-important-characteristics/	5 different climatic zones in India.
https://youtu.be/6D4ow2WulVA	Heat Flow through buildings NPTEL (IIT Roorkee).
https://archive.org/download/nationalbuilding02/in.gov.nbc.2016.vol2.digital.pdf	NBC national building codes Part.8.

COURSE OUTCOMES

After successfully completing the course the student will able to:

AR22B3.7C.1	Apply knowledge of macro level climatic data to the site level
AR22B3.7C.2	Understand and analyse thermal comfort factors effecting the human body.
AR22B3.7C.3	Evaluate potential of site for comfortable micro climatic conditions
AR22B3.7C.4	Develop climate sensitive design strategies
AR22B3.7C.5	Create small scale structures which can achieve comfortable indoor thermal conditions through passive design

CO-PO mapping

CO\PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PS-01	PS-02
AR22B3.7C.1	1	2	-	1	2	-	-	-	2	-	-	1		
AR22B3.7C.2	2	3	-	1	2	1	-	-	-	-	-	-		
AR22B3.7C.3	3	1	3	3	-	-	1	1	-	-	2	-		
AR22B3.7C.4	3	2	3	3	-		1	1	-	-	-	1		
AR22B3.7C.5	2	1	1	2	2	1	-	-	-	-	-	-		

Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)
FOURTH SEMESTER

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T /S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B4.1C	Architectural Design – III	PC	9		9	9	100	100	200	J
2	AR22B4.2C	Materials and Building Construction -IV	BS	5		5	5	50	50	100	S
3	AR22B4.3C	Landscape Architecture	PC	4		4	4	50	50	100	W
4	AR22B4.4C	History of Architecture – II	PC	3		3	3	50	50	100	W
5	AR22B4.5C	Structural Design (RCC)	BS	3		3	3	50	50	100	W
6	AR22B4.6C	Water, Sanitation and Hygiene	BS	3		3	3	50	50	100	W
7	AR22B4.7C	Computer Aided Design - I	SEC		3	3	3	50		50	---
				27	3	30	30	400	350	750	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

AR22B4.1C ARCHITECTURAL DESIGN- III

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
9		9	9	100	100	200	J

Objectives of the Course:

- Develop a critical understanding of various conditions that effect design outcomes such as Socio-economic conditions, statutory laws and norms.
- Sensitize the students on the role climate plays in building design and material selection criteria that provides thermal comfort.
- Perceive the building as a cohesive model of several systems and components that perform specific functions in an integrated manner.

Unit I: Socio-economic Factors

Understanding of Socio-economic factors that exist in society and their impact on the design of built environment. Understanding of communities, their requirements and cultural aspects that needs to be considered in design of public, semi-public and private areas of residences. Introduction to the economic levels effect the construction of built-forms. Importance of universal design such as, the accessibility and inclusivity of buildings, including the design of entrances, accessibility features, and the provision of public spaces.

Unit II: How Buildings Work

The outdoor environment, the human environment, the concept of shelter;

building function, providing water, recycling wastes, providing for thermal comfort, thermal properties of building components, controlling the radiation of heat, controlling air temperature and humidity, controlling air movement;

Keeping water out, seeing and illumination, hearing and being heard, providing concentrated energy;

Fitting buildings to people, providing structural support, providing for building movement,

Controlling fire, getting a building built, keeping a building alive and growing, building components and building function;

Unit III: Standards – NBC - Bye laws and codes

Collection of different standards pertinent to building typology; Understanding the application of spatial standards pertaining to the built-form given out different by authorities; Minimum standards provided by NBC for particular building typology and spatial requirement; Local building byelaws and its consideration to the particular context of design.

Unit IV: Structural Systems

Introduction to the role of structural systems in design; range of spans and limitations of each structural system; exploration of different types of forms that can be achieved adapting different structural systems;

Unit V: Climate and Environment

Understanding of local macro-climatic factors, interpreting the local macro-climatic data for given site to understand the micro-climate; understanding application of climate responsive design; understanding and application of sustainable design goals: conservation of natural resources, usage of renewable energy resources, active and passive design solutions, using orientation of buildings, concepts of building façade to minimize heat-gain, balancing of indoor and outdoor spaces.

Guidelines for learning: Guidelines for learning:

Building is a complex set of systems performing in coordination with each other. Architecture is socially and environmentally responsible engagement. Therefore students need to sensitize themselves to the requirements of climate responsive design, environmentally responsive design and socially responsive design and integrate them into the design process and problem solving. Students are advised pursue alternative ways and to do many iterations and refinements to their design in order to gain experience in solving real-life problems.

Assignments to be formulated:

At least one major design exercise and one minor design in this semester.

In the major design exercise, emphasis to be given to the process and methods of design. Efforts have to be made to build-on what students have learnt in the previous semesters and integrate the learning in the present semester to ensure a systematic learning experience to the students. Students to be encouraged to use physical model as a tool to visualize and validate their design.

The minor problems can be a Design Charrette or a time problem.

Type of Design Problems: Small Residence, Guest-house, students hostel, Multi-family Housing: block of flats, cluster housing, row housing; holiday resorts, Clubs, Small Mixed-Use buildings, Etc.

Integration: The design portfolio shall consist of construction details of the spaces designed. And the details of the building structural components. The students are expected make the structural details of steel elements as part of the portfolio. The portfolio shall consist diagrammatic representation of climatic data and design. The built-up area has to be indicated; the specifications of the materials to be written, construction techniques, structural systems used in the elements of built forms and approximate estimate based on carpet area.

Reference:

1. Alexander, C., Ishikawa, S., & Silverstein, M. (1977). A pattern language: towns, buildings, construction. New York, Oxford University Press.
2. Edward Allen, How Buildings Work: The Natural Order of Architecture, 3rd Edition, Oxford University Press, 2005
3. William H. Whyte, The Social Life of Small Urban Spaces, 8th edition, Project for public Spaces, Inc. 2021
4. Joseph De Chiara And John Hancock Callendar, Time-Saver Standards for Building Types, 4th Edition, McGraw Hill Education, 2017
5. Telangana Government orders for land development.

6. Ernst Neufert, Peter Neufert, Neufert Architects' Data, 5th Edition, Wiley Blackwell, 2019
7. National Building Code Of India 2016 Volume 1, Bureau Of Indian Standards, 2016
8. National Building Code Of India 2016 Volume 2, Bureau Of Indian Standards, 2016
9. MarjaSarvimaki, Case Study Strategies for Architects and Designers Integrative Data Research Methods, 1st Edition, Routledge, 2017

E-resources:

https://lsrsa.edu.in/blog/the-building-design-responsive-to-climate/	THE BUILDING DESIGN RESPONSIVE TO CLIMATE
https://www.re-thinkingthefuture.com/2020/08/19/a1539-examples-of-climate-responsive-architecture-in-indian-cities/	Examples of Climate responsive architecture in Indian cities
Http://www.pif.zut.edu.pl/images/pdf/pif%2039/DOI%2010_21005_pif_2019_39_B-02_Kravchenko.pdf	Impact of socioeconomic factor on architectural formation of buildings for non-formal education in Ukraine
Https://www.explainthatstuff.com/howbuildingswork.html	How buildings work
Https://www.architecturaldigest.com/story/buildings-redefined-architecture-past-5-years	These 13 buildings redefined architecture in the past 5 years

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

COURSE OUTCOME	DESCRIPTION
CO1	Formulate various conditioning factors that play important role in architecture design such Scio-economic aspects, cultural and historic aspects, climate responsive solutions, etc.

CO2	Develop an understanding of the function of a typical building in terms of an integrated system of components such as structure, plumbing, electrical, sanitary provisions.
CO3	Investigate various statutory norms, NBC local bye laws and other codes relevant to buildings and adopt salient guidelines for specific building topologies.
CO4	Generate a methodology for structural basis in architectural design for while discussing the different structural components and their roles in the building.
CO5	Categorize various building materials employed in modern-day buildings and develop appropriate selection criteria for using them.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/ PO	PO -1	PO -2	PO -3	PO -4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO- 10	PO- 11	PO- 12	PS- 01	PS- 02
CO 1	2	1	1	2	1	2	3	2	1	3	2	3	2	2
CO 2	3	2	1	1	2	1	1	-	-	2	-	1	3	2
CO 3	2	2	3	1	2	3	1	1	3	1	2	3	2	2
CO 4	2	3	1	2	2	2	2	1	2	3	2	3	1	3
CO 5	3	2	1	2	1	2	3	3	1	2	1	2	3	1

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B4.2C MATERIALS AND BUILDING CONSTRUCTION – IV

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
5		5	5	50	50	100	S

Objectives of the Course:

- Imparting comprehensive knowledge to the students on the basic building materials while highlighting the current innovations and trends.
- Preparing the students for a systematic study of building materials in the scope of ingredients, properties, manufacturing process, uses, installation and market price and application in real life problems.
- Throughout the course, students will explore materials like Metals, Paints and varnishes and methods and techniques for utilizing Steel in building projects, gaining a comprehensive understanding of the underlying theory behind these approaches.
- By combining theoretical and practical instruction, students will be well-equipped to apply their knowledge to real-world situations, enabling them to make informed decisions when designing and constructing buildings that incorporate Steel.
- Imparting how to represent building construction in the form of drawings, instructions and check the quality of work.

UNIT I: Metals

Ferrous Metals: Manufacturing, processes and casting. Characteristics and uses of different types of metals like iron and steel. Corrosion of iron and their prevention, metallic protective coatings.

Non Ferrous Metals: Basic idea of important ores, properties and uses of aluminum, zinc, copper, tin and lead.

UNIT II: Paints and Varnishes

Paints: Constituents of paints, functions, selection of paints and storage of paints. Types of paints oil based, water based, cement based paint and emulsion. Non VOC's, Acrylic paints. Surface finishing of different types of paints and their applications.

Varnishes: Characteristics and uses of varnishes, types of varnishes oil and spirit

UNIT III: Introduction to Steel

Introduction: General principles and terms defined, standard sections like I-section, C-section, T-section, H-section, equal and unequal angles, rivets and welding
Steel Work Connections: Bolts, rivets, types of riveting and types of welding methods.

UNIT IV: Steel Members and Roof Trusses

Steel Members: Columns and stanchions, column bases, beam and girders, column and beam connection, plate girder, lattice or warren girder.

Roof Trusses: Steel Trusses, types of truss for various spans, tubular steel roof truss, monitor roof, north light roof truss and steel lattices.

UNIT V: Miscellaneous

Lantern light, dome light, structural steel practice and drawings as per IS Code. Portal frame, Geodesic principles, cable net and tensile structures.

Reference:

1. Bindra and Arora. Building Construction: Planning Techniques and Methods of Construction, 19th ed. Dhanpat Rai Pub., New Delhi, 2000.
2. Foster, J. Stroud. Mitchell Building Construction: Elementary and Advanced, 17th ed. B.T. Batsford Ltd, London, 1963.
3. McKay, W.B. Building Construction Metric Vol. 1 – IV, 4th ed. Orient Longman, Mumbai, 2005.
4. Sushil Kumar. T.B. of Building Construction, 19th ed. Standard Pub. Distributors, Delhi, 2003.
5. Sushil Kumar. T.B. of Building Construction, 19th ed. Standard Pub, Delhi, 2003
6. Dr. BC. Punmia, E. A. (2016). Building Construction, 11th Edition. Laxmi Publications
7. Rangwala, S.C. Building Construction, 22nd ed. Charotar Pub. House, Anand, 2004
8. Barry. The Construction of Buildings, Vol- 4, 5th Edition. New Delhi: East West Press, 1999.

E-resources:

https://www.melfab.com.au/the-six-steps-of-modern-steel-manufacturing/	The Six Steps of Modern Steel Manufacturing MELFAB Engineering
https://tigertmt.com/blog/effects-of-corrosion-on-buildings.php	Effects of Corrosion on Buildings
https://eoncoat.com/corrosion-prevention-methods/	5 Different Types of Corrosion Prevention Methods
https://www.bbc.co.uk/bitesize/guides/z74bcj6/revision/3	Material Categories And Properties
https://theconstructor.org/building/paints-and-varnishes-for-buildings/4621/	Paints And Varnishes For Buildings - The Constructor
https://essential.construction/academy/tutorials/the-ultimate-guide-to-the-design-and-construction-of-structural-steel/	The Ultimate Guide To The Design and Construction of Structural Steel
https://theconstructor.org/structural-engg/steel-frame-structure-building-construction/24906/	What is Steel Frame Structure Building Construction?
https://havitsteelstructure.com/type-steel-building-structures/	The Type of Steel Building Structures
https://www.pretoriusstructures.co.za/lattice-steel-structures/	Lattice Type Steel Structures
https://www.civilprojectsonline.com/building-construction/lantern-light-architectural-element-of-roof-lighting/	Lantern Light steel frame roof lighting.
https://www.lfspaceframe.com/application/the-light-steel-dome-space-frame-multifunctional-activity-hall-project/	Dome light
https://ia800407.us.archive.org/6/items/gov.in.is.800.2007/is.800.2007.pdf	IS code 800 (2007)
https://www.designingbuildings.co.uk/wiki/Tensile_structures	Tensile structures
https://www.designingbuildings.co.uk/wiki/Geodesic_dome	Geodesic dome

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

COURSE OUTCOME	DESCRIPTION
CO1	Demonstrate knowledge on Building Materials like Metals, Paints and Varnishes and its applications in building construction
CO2	Implement the knowledge of the principles, theories, and applications of Steel in building construction.
CO3	Develop the ability to select appropriate steel sections for different elements, steel work construction methods and techniques based on the specific needs and requirements of a building project.
CO4	Prepare construction drawings as studio exercises along with the theoretical inputs on steel.
CO5	Conduct market surveys for Metals, Paints and Varnishes and documentation of steel structures.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/ PO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PS- 01	PS- 02
1	3	3	-	-	-	3	1	-	-	2	-	2	2	1
2	3	3	-	1	-	3	1	-	2	2	-	2	2	1
3	3	1	2	1	-	2	3	-	1	2	-	2	3	2
4	3	2	2	2	-	1	-	-	-	3	-	1	-	3
5	3	3	-	-	-	-	2	2	-	3	3	1	1	2

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B4.3C LANDSCAPE ARCHITECTURE

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4		4	4	50	50	100	W

Objectives of the course:

- A. To introduce the students to the discipline, Landscape Architecture and its relevance in built environment.
- B. Articulate an understanding on the interactions between human and environmental process for creation of aesthetic, functional and environmentally tuned designs.
- C. To develop an understanding on site features, site planning Principles and the process of site development.
- D. To develop skills to integrate buildings with open spaces and design sustainable built environments.
- E. To train students to design comprehensive Landscape proposals and detail landscape elements for small scale projects.

Course Contents:

UNIT I: Evolution and Development of Landscape Architecture

Introduction to landscape Architecture and Role of Landscape design in built environment.

A brief review of garden design in history in various regions Persian, Spanish, Italian, French, Moghul, English, Japanese Garden styles. Changing perception of man's relationship with nature in various phases of history and its influence on environment.

Evolution of concepts in landscape design after the industrial revolution leading to new theories in integrating built spaces to open spaces. Increasing awareness of ecological variables in landscape design. Artistic sensibility in Landscape Architecture.

Multi-disciplinary approach in design of built environment- integrating ecology, Bio-diversity and sustainability. Introduction to concepts of green architecture and micro climate planning.

Contemporary concepts and concerns in design of open spaces in Architecture and City Planning. Basic knowledge of professional work in contemporary Landscape Architecture.

UNIT II: Site Analysis and Site Planning:

Site survey and appraisal – understanding different site characteristics –topography, vegetation, hydrology, Access, Surroundings etc. documentation of site characteristics and establishing relationship with design / Architecture Programme requirements.

Study of landform its technical expression through grading plan, section, profiles layout plans and earthwork computations. Development of site integrating the built and open spaces by mutual exploitation of forms and use of grading principles.

Principles of soil mechanics. Understanding surface drainage, sewage disposal, and water systems their application in site development for small scale projects.

Philosophical and design issues related to site development. Identifying functional requirements of site, spatial and contextual relationships of built and outdoor space and circulation, site and its relationship to surroundings. Importance of climate and social factors in development of site.

Principles of site Planning and land use. Understanding different Landscape situations - siting of buildings, inter connection of areas, nodes, circulation and zoning, in Residential, Institutional planning and other land use typologies. Examples of contemporary Landscape Architecture Projects in India and abroad.

UNIT III: Plants and Design:

Introduction to study of plants in relation to landscape design and architecture.

Study of Plant material – Botanical Nomenclature anatomy and physiology of plant growth study of trees, shrubs, ground cover, indoor plants in Indian context.

Design with plants – Basic principles of designs. Plant selection criteria –The physical attribute of plants and relation to design. Appearance, functional and visual effects of plants in landscape design and built environment. Selection and management of plant material in relation to built environment.

Planting principles – Bed preparation, mounding, and application of fertilizers, roll preparation, pruning and maintenance.

UNIT IV: Elements in Landscape Design:

Introduction to Elements in Landscape design Natural and Manmade elements.

Hard landscapes: Design concepts related to use of sculpture, outdoor lighting, built /architectural elements, and street furniture and grouping them into meaningful compositions for various purposes. Design of vehicular and pedestrian ways.

Soft landscapes: Use of landform, water and vegetation as landscape elements. Design of soft landscapes features lawns, shrubs, hedges, trees in relation to buildings and other landscape elements. Introduction to design of vertical gardens, terrace gardens and green facades.

UNIT V: Landscape Construction Details and Services

Materials and techniques of landscape construction with emphasis on appropriateness for intended use – Circulation (roads, parking, and paths), level changes (walls, steps), outdoor lighting, boundary walls, trellis, fences, decks, pools. etc.

Landscape construction details- paving, curbs, retaining wall, fountain, decks, terrace and vertical gardens etc.

Bed preparation, mounding, and application of fertilizers, roll preparation, pruning and maintenance.

Introduction to irrigation systems – sprinkler trickle irrigation, drip irrigation and laying irrigation networks.

Assignments /Tests

1. History and development of Landscape Architecture.
2. Studio exercises on preparing Site inventory, Site analysis, grading.
3. Studio exercise emphasizing relationship between built form and outdoor areas.
4. Studio exercises in site zoning and site planning
5. Simple exercises in using plants and landscape elements
6. Documentation of designed landscapes such as residential, institutional, and recreational spaces.
7. Comprehensive Landscape Design proposal for small scale buildings
8. Write a report on the design process or narratives on site studies.

Reference:

1. **Blake, Alan.** Landscape Construction and Detailing. B.T. Batsford Ltd., London, 1996.
2. **Colvin, Brenda.** Land and Landscape.
3. **Hacheat, Brian.** Planting Design.
4. **Harris, C.W. and Dines, T. Nicholas.** T.S.S for Landscape Architecture. McGraw Hill, New York, 2014.
5. **Laurie, Michael.** An Introduction to Landscape, 2nd ed. Prentice Hall, New Jersey, 1986.
6. **Lynch, Kevin.** Site Planning. MIT Press, Massachusetts, 1962.
7. **John I. Mutloch.** Introduction to Landscape Design, 2nd ed. John Wiley & Sons, Inc, New York, 2001.
8. **J.O. Symonds,** Architecture-A manual of site planning and design
9. **Santapau. H.** Common Trees. National Book Trust, New Delhi, 1981.

E-resources:

https://www.academia.edu/34842204/introduction_to_landscape_architecture	Introduction to Landscape Architecture
https://doarch411sp16.files.wordpress.com/2016/01/site_planning_and_design_handbook_second_edition.pdf	Site Planning and Design Handbook, Second Edition
https://www.academia.edu/31755549/Site_Planning_and_Design_Handbook	Site Planning and Design Handbook, Thomas H. Russ
https://www.calloways.com/landscape-design-texas/landscape-design-elements/	10 Elements for Landscape Design, Calloway's Nursery
https://worldlandscapearchitect.com/what-is-landscape-architecture/?v=3a1ed7090bfa	What is landscape architecture?
https://archi-monarch.com/ancient-to-modern-landscape/	Ancient to Modern Landscape

COURSE OUTCOMES:

With the successful completion of the course students will have capability to:

COURSE OUTCOME	DESCRIPTION
CO1	Understand the history and development of landscape architecture and its role in built environment.
CO 2	Conduct survey, prepare site inventory, analyze site, and draw inferences/ identify challenges for design and development
CO 3	Assimilate and apply site planning principles to develop site for various land uses.
CO 4	Identify plants and design with plants for functional, environmental, and visual effects.
CO 5	Skill to design and detail various landscape elements and specify appropriate materials and construction techniques to be used.
CO 6	Research, document, discuss and narrate designed landscapes /works of landscape architects
CO 7	Ability to design and plan landscape for small scale projects.

These course outcomes ensure that students will acquire functional environmental and aesthetic sensitivity towards design of sustainable landscapes in built environment and develop practical and ethical skills that are relevant to their professional practice as architects.

AR22B4.4C HISTORY OF ARCHITECTURE – II

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3		3	3	50	50	100	W

Objectives of the Course:

- To expose the students to a wide spectrum of architectural styles ranging from ancient to pre independence period in India.
- To explain the students the evolution of architecture in relation to time with special emphasis to social, religious and environmental factors.
- To make the students understand the developments in the construction technology adopted during different time periods.

Course Contents:

Unit I: Vedic and Buddhist Architecture.

Development of Vedic Architecture; Development of built forms, ornamentation and architectural characteristics of Buddhist Architecture in India and rest of Asia.

Unit II: Early Temple Architecture.

Evolution of Hindu temple form, construction techniques in examples of early rock cut examples; architectural style developed by Early Chalukyans in temples.

Unit III: Nagara, Dravidian and Pandayan styles.

Development of Hindu Architecture: Temples constructed in Nagara style in Orissa, Kahjuraho, Gujarat, Bengal and Deccan; Developments of Dravidian style in temples constructed during Pallava, Chola, Pandya periods.

Unit IV: Continuation of Temple Architecture in South India and Jain Architecture.

Development of Hindu Architecture under the reign of later Chalukyans, Architecture of Vijayanagara- Rayas, Nayakars, Development of built forms and ornamentation used in Jain Architecture.

Unit V: Indo-Islamic Architecture.

Islamic Architecture in India: Early Saracenic School in India: Imperial school at Delhi. Development of Islamic Architecture in India; Understanding Provincial styles of Gujarat, Deccan and Bengal regions; Different built forms constructed in Moghul Architecture in India.

Reference:

- Brown, Percy. Indian Architecture: Buddhist and Hindu Periods. D.B. Taraporevala Sons and Co., Mumbai, 2003.
- Brown, Percy. Indian Architecture: Islamic Periods. D.B. Taraporevala Sons and Co., Mumbai, 2003.
- Grover, Satish. The Architecture of India. Vikas Pub. House Pvt. Ltd., Ghaziabad, 1980.
- Rowl, Benjamin. Art and Architecture of India.
- Tadgell, Christopher. The History of Architecture in India: from the Dawn of Civilization to the End of the Raj. Om Book Service, New Delhi, 1990.

E-resources:

Buddhism in India, Ceylon, China and Japan, a reading guide by Clarence H. Hamilton	https://ignca.gov.in/Asi_data/7273.pdf
Encyclopedia of Indian Temple Architecture: Volume II, Part 1 – Text By American Institute of Indian Studies	https://archive.org/details/encyclopedia-of-indian-temple-architecture-ii-pt.1-text/page/n7/mode/2up
Indian Architecture (Buddhist and Hindu Periods) by Percy Brown	https://ignca.gov.in/Asi_data/18060.pdf
Indo-Islamic Architecture By Desai, Ziyaud-Din A., 1925-2002	https://archive.org/details/indoislamicarchi00desa
Temple Architecture and Sculpture	https://ncert.nic.in/textbook/pdf/kefa106.pdf

COURSE OUTCOMES:

After the completion of this course, students will be able to

COURSE OUTCOME	DESCRIPTION
CO1	Illustrate the development of Buddhist architecture in India and Asia.
CO 2	Understand the development of Hindu temple Architecture in different parts of India.
CO 3	Review the development of Jain Architecture in Indian Sub-Continent.
CO 4	Identify the characteristic features of Islamic architecture in different provinces of India.
CO 5	Describe the construction techniques used in building Temples and Mosques etc in India.

CO-PO Mapping for History of Architecture - II

CO	PO -1	PO -2	PO -3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
AR-4.4 -01	2	2	-	2	1	-	1	2	1	-	-	3
AR-4.4-02	2	2	-	2	1	-	1	2	1	-	-	3
AR-4.4-03	2	2	-	2	1	-	1	2	1	-	-	3
AR-4.4-04	2	2	-	1	3	3	1	2	1	1	1	3
AR-4.4-05	2	2	-	2	1	-	1	2	1	-	-	3

AR22B4.5C: STRUCTURAL DESIGN (RCC)

Periods per week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3		3	3	50	50	100	W

Objectives of the Course:

- A. To understand the clauses and provisions in IS Codes for RCC design.
- B. Classify the design methodologies in RCC design.
- C. Enrich the knowledge of students in understanding the RCC elements.
- D. To develop the structural design skills in RCC elements.
- E. Imparting information on latest technologies in Concrete Designs.

UNIT I: Introduction to RCC Design and its Code

Introduction to Design Philosophies: Working stress and limit state method; (Limit State of Collapse and Serviceability). Introduction to different structural elements in RCC. General conditions, loads and load combinations, design concepts of different structural elements for flexure, shear, torsion and deflection as per IS- 456 2000.

UNIT II: Design of Flexure Members - Beams

Beams –Analysis and Design of single and doubly reinforced beams using limit state methods for flexure, shear, torsion and deflection. Introduction to T beam and L beams. Design of a Lintel and Cantilever beam.

UNIT III: Design of Flexure Members - Slabs and Staircases

Slabs: Introduction, Design of One way, two way and cantilever slabs for flexure and deflection.

Staircases: Types of staircases in RCC and their behaviour. Design of a dog-legged stair case.

UNIT IV: Compression Members - Columns and Footings

Columns: Analysis and Design of axially loaded RCC columns. Design of columns subjected to uniaxial and biaxial bending. Design of Column for buckling and torsion.

Footings: Design of Isolated footings (Square and Rectangle) for columns by LSM.

UNIT V: Pre- Stressed Concrete

Introduction to pre-stressed concrete, Codal provisions of IS code, Materials and equipment used in pre-stressed concrete, Methods of Pre-stressing, Pre tensioning and Post tensioning techniques. Practical applications in current projects.

Introduction to flat slab design concepts and waffle slabs.

Reference:

1. A.K.Jain. Reinforced Concrete: Limit State Design, 5th ed. New Chand and Bros., Roorkee, 1999.

2. Ramamrutham. S. and Narayan, R. Design of RCC Structures, 12th ed. Dhanpat Rai Pub. Co. Pvt. Ltd., Delhi, 1998.
3. Krishna Raju. N and PraneshNR., Reinforced Concrete Design: Principles And Practice., 1st ed., New Age International Pvt Ltd Publishers, 2018.
4. Punmia BC, Ashok Kumar Jain, Arun Kumar Jain, Limit State Design of Reinforced Concrete, Revised ed., Laxmi Publications, 2016.

E-resources:

https://www.ultratechcement.com/home-building-explained-single/the-right-way-to-install-rcc-footings-for-a-strong-home	Right way to install R.C.C footings. Step by step process of laying foundations.
cademya.edu/12715036/IS_456_2000	Indian Standard PLAIN AND REINFORCED CONCRETE CODE OF PRACTICE Fourth Revision
https://www.civilprojectsonline.com/building-construction/introduction-to-design-of-rcc-structures/	Introduction to R.C.C. , Components of R.C.C., examples of R.C.C. structures
https://www.linkedin.com/pulse/components-rcc-frame-structure-fourmarketing?trk=organization-update-content_share-article	Structural components of typical R.C.C. framed structure
https://tribby3d.com/blog/one-way-slab-and-two-way-slab/#:~:text=In%20a%20one%2Dway%20slab,it%20occurs%20in%20both%20directions.	R.C.C One way Slab and Two way Slab
https://www.keuka-studios.com/types-of-stairs-2/	Types of Staircases, advantages and disadvantages
https://bmtpc.org/DataFiles/CMS/file/PDF_Files/61_PAC_Urbaanic_Final.pdf	Precast concrete technology

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

COURSE OUTCOME	DESCRIPTION
CO1	<i>Understand</i> IS code provisions to evaluate design concepts of RCC.
CO2	<i>Perform</i> the design calculations for flexure members, beams and slabs.
CO3	<i>Evaluate</i> the behavior and design capacity of compression members.
CO4	<i>Assess</i> the strength and design of Cantilever beams and slabs, lintels, sunshades and staircases.
CO5	<i>Discuss</i> the conceptual understanding of pre stressing methods.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

AR17B4 .3C	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO-1	3	2	2	-	2	2	2	-	1	-	-	-	2	-
CO-2	3	2	2	-	1	2	-	1	2	1	-	2	2	2
CO-3	3	2	2	2	1	3	-	1	2	2	2	2	2	3
CO-4	3	2	2	1	1	2	-	-	2	2	-	2	2	2
CO-5	2	2	1	-	-	2	2	-	-	-	-	3	1	2



AR22B4.6C WATER, SANITATION AND HYGIENE

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3		3	3	50	50	100	W

Objectives of the course

The objective of the subject is to enable students to understand and apply:

- To enrich the knowledge of students in understanding the need and importance of building services at building and urban level with standard bye laws as per BIS.
- Water distribution systems and its requirements at different scales such as building, site, neighborhood, etc.
- To equip the fundamentals to design plumbing systems for different sizes of buildings.
- Calculations and disposal of rainwater and solid waste disposal.
- Formulating sustainable solutions for real world problems.

UNIT I: Water Supply

Sources of water supply – Surface and Underground, standards of purity-pH levels and treatment of water- Conventional water **treatment** – sedimentation, coagulation, filtration and disinfection, Impurities, and treatment; Hardness of water – softening, qualities of potable water. Domestic water **distribution** system- Continuous, intermittent, service **connections**, water meters, capacity of **storage tanks** - overhead tank, sump and pumping plants required, **calculation** of water consumption. **Demand** of water for domestic, commercial, industrial, and public utility purposes as per **BIS standards**. Domestic water piping systems. Hot and cold-water distribution within the building: **Layout** of water supply lines in a domestic house. Types of fittings to Kitchen and bathrooms, etc. Water supply to high rise buildings: **problems** encountered, and **systems** adopted. Energy Efficient Pumping Systems as per Eco-Niwas Samhita 2021 **recommendations**. New **trends** in water supply and plumbing to domestic and commercial level (**Green building Concepts** on water supply and plumbing)

UNIT II: Plumbing and Sanitary Appliances

Building service **connections**- Domestic and Commercial - Hot and Cold-water **distribution systems** and **design** in small and multi storied buildings, **Types** of Valves (gate, flap, ball, flush valves etc.) & station, Pipe supports, hangers, fixing, plumbing for small houses direct and indirect water supply systems for individual and multistorey buildings, Fire hydrants, solar heating systems. Preparation of plumbing **drawings**, **symbols** commonly used in these drawings. **Drainage** – floor traps, drains, P, Q, S-trap, bottle traps, Single stack, two stack, cross venting, fixture venting, **Materials** for construction.

Sanitary appliances – Kitchen and toilets, etc., Basic requirements of Drainage and Sanitation, **Selection**, and **Installation** of Sanitary Appliances from Hot and Cold-Water system- Pipe **Sizes**, **Materials** and **type** of fixtures, Sanitary pipe work – PVC, GI, CI, HDPE, etc. within the premises and multi storied building. **Quantity Estimate** for Sanitary Fixtures.

UNIT III: Sanitation and Storm Water System

Basic **principles** of sanitation and disposal of various kinds of waste matter from building. Brief **description** of **various types** systems of sewage disposal systems - surface drainage combined and separate system of drainage, Individual disposal systems- cess pool, Septic tank etc., Public Drainage system, **Materials**, details of **Construction** etc., Refuse disposal: - Refuse bins, refuse chutes etc, **plumbing systems** (one pipe, two pipe etc), Anti siphonage and vent pipes, single stack and double stack system House drainage system, Drainage of sub-soil water. Manholes, Sub drains, culverts, ditches, and gutters, drop inlets and catch basins, roads and pavements, storm water overflow/regulators. **On-site processing** and disposal **methods**. Aerobic and Anaerobic decomposition, purifying capacity of water bodies. Sewage **treatment**- Biochemical Oxygen Demand.

Sources and **uses** of storm water, Roof drainage – Pitched roofs, flat roofs, Surface Water drainage, storm water drains. Rainwater harvesting **techniques**, Swales, ditches etc, **methods** of recharging ground water, **construction** details and techniques for **storage** of rain water for building and site use.

UNIT IV: Solid Waste Disposal

Types of solid waste, **quantity** of waste generated, **collection** and **segregation** of municipal solid waste. Recycling **techniques** for solid waste. **Properties** of Solid Wastes: Physical and chemical composition of municipal solid wastes, waste generation rates. **Management** of Solid Wastes in India: Prevalent SWM **practices and deficiencies**: **Storage** of waste at source, segregation of wastes, primary collection of waste, transportation of waste, disposal of wastes. **Disposal** of Wastes: Sanitary landfilling, Composting, Incineration, Pyrolysis – **advantages** and **limitations**.

UNIT V: Hygiene

Importance of Health- Individual and Building, set of **practices** performed for the preservation of health and well-being. World Health Organization (WHO) **guidelines**. Hygiene Cleanliness, Waterborne, Water-related, Water based, Epidemic **diseases**, Conservancy to water carriage system. Understanding the **Sustainable techniques** related to sanitation without compromising the hygiene at Individual and building level. Incorporating the aspects of hygiene for bathrooms, kitchens, and other areas where people engage in activities that require hygiene and clean conditions.

There are also emerging areas of focus in architecture related to hygiene, such as designing buildings and spaces that can better resist the spread of diseases, such as those that have become more relevant in the context of the COVID-19 pandemic, etc.

ASSIGNMENTS TO BE FORMULATED:

1. Assigning work to learn about the BIS related to the topics.
2. Case Study- Understanding the Water Supply from Residential Level to Neighborhood level.
3. Market survey for pipes, fittings and fixtures, traps etc
4. Online Study on Water Supply, Sanitation and Hygiene – report submission.

5. Inculcate working drawings and report on Water supply and Sanitation with all fixtures in Kitchen, Bath, and Utility for a small Residence and multi storied i.e., Plan and Section, Terrace plan with Rainwater down take pipes, Sump and OHT. Report Writing - Understanding the present technologies and facilities.
6. Individual and group presentation on micro and macro (Environment) Problems and solutions associated with the health and well-being of the society.

Reference:

1. National Building Code (NBC) – 2005, 2016.
2. Wise, A.F.E. and Swaffield, J.A., “Water Sanitary Services for Buildings”, Longman Scientific and Technical, Harlow, 1995.
3. Greeno, Roger, “Building Services Technology and Design”, Longman Scientific and Technical, Harlow, 1997.
4. Chatterjee, A.K., “Water Supply and Sanitary Engineering”, Khanna Publishers, New Delhi, 1986.
5. Punmia, B. C., Jain, A. K. and Jain, A. K. (1995). Water Supply Engineering. New Delhi: Laxmi Publications.
6. Punmia, B. C., Jain, A. K. and Jain, A.K. (1998). Waste Water Engineering. New Delhi: Laxmi Publications
7. Rangwala, S. C. (2005). Water Supply and Sanitary Engineering. Charoter Publishing.
8. Birdie, G. S., and Birdie, J. S., Water Supply and Sanitary Engineering, Dhanpat Rai and Sons, New Delhi, 2007.
9. Garg, S. K., Environmental Engineering, Vol. II, Khanna Publications, New Delhi, 2009.
10. Duggal, K. N., Elements of Environmental Engineering, S Chand and Co. Ltd., New Delhi, 2008
11. Hussain, S.K. T.B. of Water supply and Sanitary Engineering, 3rd ed. Oxford and IBH Pub. Ltd., New Delhi, 1994

E-resources:

https://www.pas.org.in/Portal/document/ResourcesFiles/pdfs/Module_1%20Basics%20of%20water%20supply%20system.pdf	Basics Of Water Supply System Training Module for Local Water and Sanitation Management
https://ncert.nic.in/textbook/pdf/iepg105.pdf	Pipe Fittings, Joints, and Valves
https://law.resource.org/pub/in/bis/S03/is.sp.35.1987.pdf	Handbook On Water Supply and Drainage (With Special Emphasis on Plumbing)
https://iricen.gov.in/iricen/books_jquery/Plumbing%20And%20Pipe%20Line%20Work.pdf	Rets-Practical Guide Book Series- Plumbing and Pipeline Work
https://www.philadelphia.edu.jo/academics/nbadarneh/uploads/CH%202%20part2.pdf	Sanitary Systems Design Part 2 Prepared By: Eng. Nadia Badarneh
https://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WEDC/es/ES07CD.pdf	Chapter 7-Solid Waste Management

http://www.mmmut.ac.in/News_content/21020tpnews_10312020.pdf	Madan Mohan Malaviya Univ. Of Technology, Gorakhpur Solid Waste Management
https://www.eawag.ch/fileadmin/Domain1/Abteilung_en/sandec/E-Learning/Moocs/Solid_Waste/W2/Solid_waste_management_UNEP_2005.pdf	Solid Waste Management
https://ec.europa.eu/programmes/erasmus-plus/project-result-content/908fceb3-6d8d-43a0-bc76-d780aeb1a13b/Hygiene-Sanitation-Handbook_ENG.pdf	Hygiene And Sanitation Handbook 2018
https://apps.who.int/iris/bitstream/handle/10665/330100/WHO-CED-PHE-WSH-19.149-eng.pdf	Water, Sanitation, Hygiene and Health A Primer for Health Professionals
https://www.jica.go.jp/project/solomon/002/materials/ku57pq00003um0e9-att/Water_Sanitation_and_Hygiene.pdf	Healthy Village Facilitator's Guide- Water Supply, Sanitation and Hygiene (Wash)

COURSE OUTCOMES:

On successful completion of the course, student should have capability to

COURSE OUTCOME	DESCRIPTION
CO1	Identify the importance of water supply, sanitation and hygiene in architecture and design.
CO 2	Evaluate different water supply and plumbing technologies, systems and interventions for buildings and communities
CO 3	Apply site planning and design principles for building water supply, sanitation and plumbing facilities and infrastructure in relation to water resources, sanitation, and hygiene requirements
CO 4	Design integrated solutions that promote health, safety, wellbeing at building and site level.
CO 5	Apply critical thinking, problem-solving, and project management skills to develop water supply, sanitation, and hygiene projects that align with local and global standards, regulations, and best practices

These course outcomes ensure that students will not only acquire technical knowledge in water supply, sanitation and hygiene but also develop practical, creative, and ethical skills that are relevant to their professional practice as architects.

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	
CO1	2	-	1	-	1	-	2	1	1	-	-	1	1,3,5,7,8,9,12
CO2	3	-	-	2	1	3	1	-	2	3	-	2	1,4,5,6,7,9,10,12
CO3	2	-	-	-	3	3	2	2	2	1	2	-	1,5,6,7,8,9,10,11
CO4	-	2	3	2	-	2	-	3	2	-	-	-	2,3,4,6,8,9
CO5	1	3	2	-	1	2	-	-	3	-	3	1	1,2,3,5,6,9,11,12
1- Low Correlation 2-Medium Correlation 3-High Correlation													



AR22B4.7C COMPUTER AIDED DESIGN-I

Periods Per Week			CREDITS	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
	3	3	3	50		50	-

Objectives of the Course:

- A. To orient the student to create two and three-dimensional objects in virtual space
- B. Train students to use CAD to produce more work/ quicker time
- C. Train students to convert their virtual drawings to high quality prints
- D. Sensitize students to create 2D documents which can be used for further development in 3D softwares

Course Contents:

Unit I : Manual and CAD Techniques

History; Advantages of CAD over manual drafting, integrating CAD with manual methods like sketching and model making.

Introduction to the Interface of Auto CAD, other alternative CAD softwares

Unit II : CAD Interface

Starting Auto CAD: Introduction to the menu, starting drawings from scratch,

Creating and using templates starting drawings with setup wizards. Saving and closing a file.

Using co-ordinate system: The UCS, Working with Cartesian and polar co-ordinate systems, using displays with key shortcuts.

Unit III: Drafting

Drawing tools, modification tools, layers (CTB/STB), line weights, keyboard shortcuts

Creating and modifying blocks

Model space vs paper space

Unit IV: Documenting and Printing

Using database information for objects, calculating distance and angle, areas etc.

Annotate: Dimensioning the objects in linear, angular fashions along with quick time dimensioning etc.

Presentation- Colour, texture, Hatch, templates and layout

Plotting Setup: sheet size, ctb, object line weights, export file type, Scale, print setup.

Unit V: Geo-mapping And Rastering

Practicing the geometric shapes, geo-mapping by using google earth images to scale, extracting contour information from google maps, reading and understanding them.

Digitisation by documentation of existing site plans by tracing in autocad , importing images/pdf/different file types in to cad.

Reference:

1. **Teyapoovan, T.** Engineering Drawing with Auto CAD 2000. Vikas Pub. House Pvt. Ltd., New Delhi, 2000.
2. **Parker, Daniel and Rice, Habert.** Inside Auto CAD Daniel. 1987.
3. **Georgemura,** Auto CAD Release 2000.
4. **AutoCAD 2010** Textbook-AutoCAD 2010: A Problem-Solving Approach-Customizing AutoCAD 2010
5. **Beginning AutoCAD 2007-** By Bob McFarlane, Robert McFarlane

E-reference:

- <https://help.autodesk.com/view/ACD/2022/ENU/?guid=GUID-2AA12FC5-FBB2-4ABE-9024-90D41FEB1AC3>.
- https://images.autodesk.com/adsk/files/autocad_aca_user_guide_english.pdf

COURSE OUTCOMES:

After successfully completing the course the student will able to:

CO1	Apply CAD as a tool to create better presentations
CO2	analyse Satellite imagery to extract site related information into the CAD interface
CO3	Understand interoperability of various digital formats
CO4	Create required project drawings on CAD
CO5	Create technical drawings and plans for architectural and engineering projects.

CO-PO mapping

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	1	-	-	2	-	-	-	3	-	-
CO2	1	2	-	-	3	-	-	-	-	-	1	1
CO3	-	-	1	-	-	-	-	-	-	-	3	-
CO4	3	-	-	-	-	1	-	-	-	3	-	1

Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

FIFTH SEMESTER

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B5.1C	Architectural Design – IV	PC	9		9	9	100	100	200	J
2	AR22B5.2C	Materials and Building Construction V	BS	4		4	4	50	50	100	S
3	AR22B5.3C	History of Architecture – III	PC	3		3	3	50	50	100	W
4	AR22B5.4C	Structural Design (Steel)	BS	3		3	3	50	50	100	W
5	AR22B5.5C	Electrical Systems, Lighting and HVAC	BS	3		3	3	50	50	100	W
6	AR22B5.6C	Working Drawing and Details	PC	4		4	4	50	50	100	J
7	AR22B5.xE	Professional Elective – I	PE	2	2	4	4	50	-	50	-
				28	2	30	30	400	350	750	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

PROFESSIONAL ELECTIVE-I

1	AR22B5.1E	Workshop: Vernacular Architecture
2	AR22B5.2E	Workshop: Craft in Architecture
3	AR22B5.3E	Workshop: Appropriate Building Technologies
4	AR22B5.4E	Workshop: Advanced 3D Modelling
5	AR22B5.5E	Workshop: Stone Construction

AR22B5.1C ARCHITECTURAL DESIGN – IV

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
9		9	9	100	100	200	J

Objectives of the Course:

- A) Elaborate the key elements of site-planning from analysis to actual preparation of site plans.
- B) Provide a framework for programming phase in design by defining and addressing the design brief with embedded goals, concepts, problem statements, and feasibility.
- C) Gain an understanding on the various influential design philosophies and encourage students to infuse a personal philosophy for their design interventions and experiences
- D) Develop insights on the complex nuances of urban issues that impact design and provide appropriate solutions

Unit I: Site Planning

Site planning with organizing and arranging buildings, structures, and open spaces on a given site, taking into account its natural and built environment, context, built-form goals; Key considerations include topography, infrastructure, regulations, and circulation; Incorporating the harmonious relationship between the built and natural environments (landscaping), while improving usability, sustainability, and universal design solutions.

Unit II: Architectural Program

Preparation of Architectural Program, defining a building's requirements through data collection, case-study, analysis, and synthesis.

Data collection stage- collect information about the project's context, such as the site location, local building codes and regulations, the client's budget and timeline: questionnaires and interviews with the client and stakeholders to determine their needs and preferences.

An orientation towards working with clients and stakeholders to identify the purpose, activities, and goals of the building typology, the design concept, development of a detailed program that outlines the building's requirements and specifications. Programming to ensure users' requirements, responding to the site, through collaboration, analysis, and creativity.

Unit III: Design Philosophy

The design philosophy: how every aspect of a project is approached – from motivations, investment goals, regulations, to opportunities, and aesthetics.

Notable design philosophies such as: Functionalism, Modernism, Postmodernism, Sustainable design, Parametricism, Biophilic design, Contextualism.

Students should encourage to discover their own design philosophy, which could be based on the insights / motivation and studio experience gained.

Unit IV: Micro-Climate Analysis

Micro-climate analysis in architecture: studying and evaluating local environmental conditions to inform design decisions; Site analysis, climatic data collection, solar and wind analysis, thermal comfort evaluation, and integration of microclimate-responsive design strategies: optimize energy efficiency, occupant comfort, and sustainability by tailoring the design to the site's unique microclimate; Post-occupancy evaluations, validate the effectiveness of design strategies.

Unit V: Barrier-Free Environment

Barrier-free design: creating inclusive and accessible spaces for people of all abilities; Understanding various accessibility standards and regulations, incorporating universal design principles, providing accessible entrances, circulation, and facilities, considering sensory and cognitive needs, designing inclusive outdoor spaces, and engaging users for feedback: equal access, independence, and dignity for individuals with disabilities, going beyond mere compliance to create functional environments.

Guidelines for learning:

Assignments to be formulated:

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

Type of Design Problems: Institution Buildings, Research Institution, Schools, Colleges, Research Center

Integration: The design portfolio shall consist of construction details of the spaces designed. Design portfolio to contain MEP calculations and Drawings

Reference:

1. Thomas Russ, The Site Planning and Design Handbook, 2nd Edition, McGraw Hill, 2009
2. Gary Hack, Site Planning: International Practice, The MIT Press, 2018
3. James A. LaGro Jr, Site Analysis: A contextual approach to Sustainable Land Planning and Site Design, 2nd Edition, John Wiley & Sons, 2007.
4. Thomas J. Elpel, The Site Planning Guide: Learn the Principles of Successful Site Planning and Design
5. Peter Zumthor, Thinking Architecture, Birkhauser, 2010
6. Manfredo Tafuri, Architecture and Utopia: Design and Capitalist Development, Revised Ed, MIT Press, 1976
7. Kevin Lynch, The Image of the City, The MIT Press, 1964
8. Christopher Alexander, Sara Ishikawa, Murray Silverstein, A Pattern Language: Towns, Buildings, Construction, Oxford, 2015
9. Jane Jacobs, The Death and Life of Great American Cities, 1st Edition, Vintage, 1992.
10. Pena, William, Problem Seeking: an architectural programming primer, Cahners Books International, Boston 1977
11. Bally Meeda, Neil Parkyn, David Stuart Walton, Graphics for Urban Design, Thomas Telford Ltd, London, 2007

E-resources:

https://indianinstituteofarchitects.com/pdf/study-material/Site-Planning.pdf	SITE PLANNING FOR ARCHITECTURAL PROJECTS
https://web.iit.edu/sites/web/files/departments/academic-affairs/academic-resource-center/pdfs/arch_programming.pdf	ARCHITECTURAL PROGRAMMING
https://simplicable.com/design/design-philosophy	The Design Philosophy
https://blog.proto.io/10-of-the-best-design-philosophies-of-all-time/	10 of the Best Design Philosophies of All Time.

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Cultivate the necessary skills for Site Selection, Documentation, Analysis, Planning and Design
2	CO2	Devise and develop a robust design brief for the architectural design based on well-defined scope and thorough interpretation of the goals, needs and overall vision for the building program.
3	CO3	Infuse an individualistic design philosophy that would guide them towards refined design outcomes based on their exposure to popular dictums and design philosophies of leading proponents.
4	CO4	Relate to the elements and influencing aspects of Urban Contexts and adopt a holistic perspective to come up with an architectural design.
5	CO5	Formulate and document their research efforts and resultant outcomes of the entire design process in a well-structured format as per accepted standards in Project Report writing.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO 1	3	3	1	2	2	2	2	2	1	2	-	3	1	1
CO 2	3	3	2	3	3	2	2	2	3	3	1	2	3	3
CO 3	2	2	2	1	2	2	2	1	1	2	1	2	3	3
CO 4	3	3	3	2	3	2	3	1	2	3	3	3	3	3+

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B5.2C MATERIALS AND BUILDING CONSTRUCTION V

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4		4	4	50	50	100	S

Objectives of the Course:

- To create awareness among the students regarding problems related to old buildings and renovations: methods to deal with them
- To apply the construction techniques in real life problems.
- By combining theoretical and practical instruction, students to be equipped to make well informed decisions when designing and construction of buildings.
- Imparting how to represent building construction in the form of drawings, instructions and check the quality of work.

UNIT 1: Introduction to Building Failures

Causes and damage in old building, issues of maintenance and repair, preliminary Inspection and general observation, decayed elements, difference between decay and damage.

UNIT 2: Substructure- Foundations (Classification by Material)

Stone -Signs to be repaired-Mortar is falling out, bulging or leaning wall, Loose stones, Cracked stone walls. Causes - Water and moisture, Frost, Modification, Vehicular traffic, Roof spillage, Trees.

Repair methods – Repointing, Proper drainage and runoff, Shotcrete, Replacement.

Brick – Common Problems with a Brick Foundation - the bricks themselves break down over time, The mortar holding the bricks together breaks down over time, The foundation walls bow inward because of hydrostatic pressure, Wet basements, The bricks are wet and deteriorating from excess moisture.

Repair methods - Mortar deterioration, Wet basement and damp bricks, Interior walls have a layer of flaking cement or paint, Differential foundation settlement. The interior or exterior foundation walls are coated with cement or paint, and it's flaking off, Stair step cracks in the foundation wall are a sure sign of trouble, Efflorescence on foundation walls. The bricks are mouldy or have moss growing on them.

R.C.C - Causes of foundation failures are: Load transfer, Lateral Movement, Unequal Support, Drag Down and Heave, Change in Water Level, Construction Sequencing, Poor Workmanship, Undermining Safe Support, and Vibration Effects.

Prevention/Remediation of Foundation Failures - Load Transfer Remediation, Unequal Support Remediation, Drag Down Remediation and Heave, Change in Water Level, Poor Workmanship, Undermining Safe Support Remediation, Vibration Effects,

UNIT 3: Superstructure

Timber:

Moisture content, treatment prior to installation, factors reducing strength of timber, approach to repair and to the timber roofing system.

Bricks:

Strength reducing factors in brick work, effect of ageing, weathering, temperature variation of brick-work, joints and cracks, construction defects, repair and maintenance.

R.C. Concrete:

Mixing methods at site, structural design for repairs, causes of failure in concrete structures, pressure-grouting.

UNIT 4: Methodical approach to Repairs

Cracks over openings, sinking and sagging balconies, repairs to decayed floors and floor joints, example: Jack arch., madras roof terrace, foundation sinking,

Repairs to walls. Propping, shoring, strutting and under pinning.

UNIT 5: Unusual problems

Repairs to large span rooms, water proofing the roof terraces, leakages from toilets, case studies and site visits.

Note: This is a studio subject and students should be made to document the problems in old buildings through inspections and propose remedial measures by preparing construction drawings and report on materials as studio exercise with the theoretical inputs given through lectures.

Efforts have to be put in inspecting a heritage building and suggest suitable materials (authentic) and remedial measures under the considerations of Handbook of Conservation of Heritage Buildings, published by Directorate General, Central Public Works Department, New Delhi, 2013.

Reference:

1. Feilden, M. Bernard. Conservation of Historic Buildings. Butterworth Scientific, London, 1992.
2. McKay, W.B. Failures and Repair of Concrete Structures Vol. IV.
3. Raikar, R.N. Learning From Failures: Deficiencies in Design. Construction and Service, R and D Centre, New Bombay, 1987.
4. Handbook of Conservation of Heritage Buildings, published by Directorate General, Central Public Works Department, New Delhi, 2013.
5. REPAIR AND RETROFITTING OF MASONRY STRUCTURES Published by Arabella Taylor
6. TYPICAL FOUNDATION FAILURES AND REMEDIATIONS Prepared by Samer Zaidan Civil Engineering, Construction Management, New Jersey Institute of Technology CE 615-850 Infrastructure and Facilities Remediation Summer 2021 Professor Giri Venkiteela

E-RESOURCES

https://www.foundationprosfl.com/stone-foundation-repair-101-methods-that-work/	Stone Foundation Repair 101: Methods That Work!
https://amc911.com/repairing-a-brick-foundation/	Repairing a Brick Foundation
https://www.researchgate.net/publication/354400090_TYPICAL_FOUNDATION_FAILURES_AND_REMEDIATIONS	Typical foundation failure and remediation
https://ecajmer.ac.in/facultylogin/announcements/upload/Cracks%20in%20masonry%20building%20(causes%20&%20prevention).pdf	Cracks in masonry building (causes & prevention)
https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_RRS_Lecture_Notes_0.pdf	Rehabilitation & Retrofitting of Structure
http://www.cv.titech.ac.jp/~courses/atce2/Lesson3.pdf	Shoring, scaffolding, and underpinning
https://core.ac.uk/download/pdf/41805063.pdf	Defects in Timber and its repair.
https://www.civilprojectsonline.com/building-construction/guide-to-repair-and-waterproofing-of-jack-arch-concrete-roof/	Repair of Jack arch roof

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Demonstrate knowledge on Building Failures in old buildings, issues of maintenance and repairs in old buildings.
2	CO2	Document problems in old buildings through inspections and propose remedial measures.
3	CO3	Learn various techniques and their implementation in repairing the existing structure.
4	CO4	Prepare construction drawings as studio exercises along with the theoretical inputs on building failures, repairs and maintenance.
5	CO5	Conduct case studies, site visits and documentation of building components.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PS O 1	PS O 2
1	3	2	1	1	3	2	1	-	-	-	3	-	2	-
2	2	3	1	-	-	2	1	-	1	3	3	1	1	1
3	3	2	2	-	1	3	-	-	2	3	1	-	2	2
4	2	2	2	2	-	1	-	-	-	2	-	-	-	3
5	2	3	-	-	-	-	1	2	-	3	3	-	1	2

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B5.3C HISTORY OF ARCHITECTURE- III

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3		3	3	50	50	100	W

Objectives of the Course:

- To expose the students to a wide spectrum of architectural styles and theory.
- To explain the students how architecture evolved in relation to time with special emphasis to social, religious and environmental factors.
- To make the students understand the developments in the construction technology and theories developed in different countries in same timeline.

Course Contents:

Unit – I – Architecture of Renaissance and neo-classicism.

Architecture of Early Renaissance, High Renaissance and Late Renaissance, Baroque and Rococo styles; Neo classical Architecture and study of building typologies. The other architecture styles preceding the advent of Industrial revolution in Europe.

Unit – II- Impact of Industrial revolution

Influence of Industrial Revolution on building materials, Construction Technology, evolution of new building types and increasing user requirements.

Use of Steel and Glass in 19th Century buildings and structures. Iron bridges, Development of Reinforced Cement Concrete Structures

Unit – III - Avant Garde, movements in Architecture

Characteristic styles of modern architecture up to First World War. Arts and crafts movement, Theories of John Ruskin and William Morris

Art Nouveau Movement. Vienna School of Modernism in Architecture, Chicago School and Development of Skyscrapers. Deutscher Werkbund, Monumentalism and Expressionism.

Unit – IV - Pioneers of Modernism

Contributions to Architecture by pioneers of Modernism and Development of International Style.

Frank Lloyd Wright-Organic Architecture and Prairie Style, Walter Gropius- Bauhaus School and its impact, Mies Van der Rohe- Minimalism and Le Corbusier's contribution in the periods between the World Wars.

Characteristics of modern architecture after the Second World War. Study of works by Alvar Aalto, Eero Saarinen, Richard Neutra, Louis I Kahn, Phillip Johnson, etc.

Unit – V - Engineer Architects and Pre Independence Architecture in India

Design theories and contributions of Engineer- architects Pier Luigi Nervi, Felix Candela, Buckminster Fuller, Frei Otto

Pre-Independence architecture in India: Development of secular architecture from the end of the 18th Century to the middle of the 20th Century.

Reference:

1. Benevolo, Leonardo. History of Modern Architecture: the tradition of modern architecture Vol.1. Routledge and Kegan Paul, London, 1971.
2. Frampton Kenneth Modern Architecture: A Critical History London: Thomes& Hudson, 1980
3. Benevolo, Leonardo. History of Modern Architecture: the modern movement Vol.2. Routledge and Kegan Paul, London, 1971.
4. Curtis, J.R. William. Modern Architecture since 1900. Prentice-Hall, Inc., New Jersey, 2002.
5. Giedion, Sigfried, Space, Time and Architecture: the growth of a new tradition, 4th ed. Harvard Universtiy Press, Cambridge, 1962.
6. Hilberseimer, L. Contemporary Architecture: Its roots and trends. Paul theobald, Chicago, 1964.
7. Pevsner, NicolausOersonem: Pioneers of Modern Design from William Morris to Walter Gropius-.
8. Sharp, Dennis. Twentieth Century Architecture: A Visual History, Facts on File. New York, 1991
9. Norbergschul C., Principles of Modern Architecture, London Andreas papadakes, 2000.

Course Outcomes:

Upon successful completion of the course the students will be able to:

S. No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Describe the evolution of new building types and techniques due to the influence of industrial revolution
2	CO2	Classify characteristic styles of modern architecture
3	CO3	Discuss the contributions of Pioneers to modern Architecture
4	CO4	Explain the development of pre independence architecture in India
5	CO5	Understand modern design philosophies in the evolution of innovative architectural forms and designs

CO-PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
AR-5.3-01	1	1	-	2	2	2	1	2	2	1	1	2
AR-5.3-02	1	1	-	2	3	3	1	1	1	1	1	3
AR-5.3-03	3	2	-	2	3	3	2	3	2	2	2	3
AR-5.3-04	1	1	-	2	2	2	1	1	1	-	-	2
AR-5.3-05	3	3	-	2	2	3	2	1	1	1	2	3

AR22B5.4C: STRUCTURAL DESIGN (Steel)

Periods per week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3		3	3	50	50	100	W

Objectives of the Course:

- A. To enrich the knowledge of students in relevant IS codes.
- B. To develop the skills in design of elements of a steel structure.
- C. To develop capability of designing an entire structure in Steel.
- D. Imparting information on various joints in steel construction.
- E. Enable them to understand industrial and infrastructure steel buildings.

UNIT I: Introduction to IS Code Is 800-2007 and Tension Members

Design as per IS Code: Introduction to the IS Code and relevant Clauses. Usage of Standard rolled steel sections. Types of various design mechanisms. Study of Plastic analysis of steel elements

Tension members: Introduction to Axially loaded tension members, net effective areas, analysis and design of single angle, double angle and hollow circular sections for tension with bolted and welded connections.

UNIT II: Compression Members

Columns: Sections used for Compression members. Various End Conditions of columns, Slenderness ratio, Analysis for Strength and Design of axially loaded steel columns. i.e., by using I-sections, channel sections, and Angle sections. Design of lacing and battening system to compound columns.

Base Plate: Design of the base plate for axial loads. Introduction to gusseted base plate design.

UNIT III: Flexure Members

Introduction to simple beams and plated beams with various end conditions. Analysis of a beam from strength and stiffness considerations.

Design of laterally supported simple beams and built up beams with flange plates including check for shear, buckling and deflection.

UNIT IV: Types of Connections

Bolted and Welded connections. Beam end and bracket connections, bolted seated connections, welded seated connections.

UNIT V: Portal Frames and Industrial Structures

Industrial Structures and Portal Frames: Introduction to components of a Steel Industrial structure. Introduction to types of Gantry girders. Loads such as DL, LL, WL and Seismic loads. Effect of Wind loads on Sloped roofs and roof members such as Purlins and roof Cladding.

Design of a purlin by using an angle section, a channel section and I section.

Reference:

1. Shiyekar, M R., Limit State Design in STRUCTURAL STEEL, PHI Learning Pvt Ltd., New Delhi, 2011.
2. Subramanian N, Design of Steel structures limit states method, 2 Ed by Oxford University press, 2016.
3. Duggal SK, Limit State Design of Steel Structures, 2nd ed., McGraw Hill Education, 2017.
4. Bhavikatti SS, Design of Steel Structures By Limit State Method as per IS: 800-2007, 4th ed. I K International Publishing House Pvt. Ltd, 2019.
5. Kanthimathinathan S, Limit State Design of Steel Structures: As per IS: 800 / 2007, 1ST ed., Dreamtech Press, 2019.

E-reference:

https://www.sciencedirect.com/topics/engineering/elastic-design	Elastic design of steel beams
https://www.eolss.net/sample-chapters/c05/E6-139-04	PLASTIC VERSUS ELASTIC DESIGN OF STEEL STRUCTURES
https://www.researchgate.net/publication/317370904_Studyin_g_the_Behaviour_of_Base_Plates_with_High_Degree_of_Rigi_dity	Behavior of steel Base Plates
https://www.allaboutsheds.com.au/blog/what-is-a-portal-frame/	Portal Frame components
https://www.steelconstruction.info/Trusses	Truss members in steel structures
https://www.apsed.in/post/steel-connection	Steel Connections Bolted and Welded Joints
https://structville.com/2017/10/how-to-design-roof-purlins.html	Arrangement and design of roof purlins

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

S. No.	COURSE OUTCOME	DESCRIPTION
1	CO1	<i>Understand</i> IS code provisions to evaluate design concepts of Structural Steel members
2	CO2	<i>Perform</i> the design calculations for tension and compression members.
3	CO3	<i>Evaluate</i> the design capacity of beams, girders and purlins.
4	CO4	<i>Assess</i> the strength of connections of Steel elements.
5	CO5	<i>Discuss</i> the conceptual understanding of elements in industrial structures

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

AR17B 5.3C	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO -1	3	2	2	-	2	2	-	-	2	1	-	2	2	1
CO -2	3	2	2	-	2	1	-	1	2	2	-	3	2	2
CO -3	3	2	3	2	-	2	-	-	2	2	-	3	1	2
CO -4	2	2	2	-	2	2	-	-	2	2	-	2	2	2
CO-5	2	-	-	2	2	2	-	-	2	2	-	3	2	2

AR22B5.5C ELECTRICAL SYSTEMS, LIGHTING AND HVAC

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3		3	3	50	50	100	W

Objectives of the Course:

- The course module can help students to understand the basic concepts of electrical layout plan, different annotations, reading drawings as per building design and increase knowledge of the allied building services.
- To develop skills of understanding and design - Electrical, Lighting and HVAC for various typologies like residential and commercial, etc.
- To identify the factors responsible for Electrical, Lighting, comfort conditions and HVAC load calculations.
- Imparting the skills to design service systems that meet the needs of different types of buildings and occupants.
- Formulating the sustainable techniques towards building services using alternative resources and less resources.
- Building ability to investigate and research on innovative trends and techniques towards energy efficient.
- Demonstrating the importance of services in built environment.

UNIT I: Electrical Systems

Introduction to the **scope** and **purpose** of electricity in the building. Sources of electricity. General **definitions**, Fundamental **Principles** of electricity as per standard norms, Power generation, transmission, distribution and consumption, National Electricity Grid network, Lightning, and sub-station operations at the buildings scale. Introduce to the electrical circuit- single and three phase, **types** of wiring system, **distribution system** and **supply** – HT & LT, AC/DC Current-generators, Transformers, Methods of wiring- joint box and open and concealed circuit, etc. Wiring **materials**, lighting accessories wires and cables- materials **types**, **sizes**, switch boards, M.C.B, ELCB, Types of Earthing, Types of electric motors and pumps, distribution board and meter, Control switches. Electrical Symbols and layout preparation. Electric Vehicle Charging systems at residential and commercial level. Share the knowledge of power systems, and power load factor; introduce to the energy conservation concepts.

UNIT II: Building Safety and Electrical Services

As per NBC 2016, introduce to the relevant chapters of Electrical Services, definition, scope and purpose of Building Safety and Electrical Services. Electricity regulations and basics of electricity safety norms towards Indoor and outdoor. Building Safety and security systems wiring and types – Surveillance System, Access control systems, Public Addressing and Fire Alarm System, Electric fencing, etc. safety strategy, devices and technology, fire, and smoke safeguards. Market survey to be done by the students and analyse with the regulations.

UNIT III: Electrical and Lighting Load Estimation

Indian Electricity Rules- relevant codes of practice, Basics of energy auditing. Building Energy requirement – Power and light, for independent residence, and Multi Storied. Basic Energy consumption load calculations. Elementary idea of special features required and minimum level of illumination required for physically challenged and elderly in building types. Lighting Calculation: NBC standards, nominal illumination levels in building interiors, lux, lumen, intensity. Light requirement at Residences and Commercial by considering day light factor with load calculations.

UNIT IV: Lighting Systems

Building lighting systems - Artificial light sources –: artificial illumination, various types of lamps, fixtures and light controls, advantages and disadvantages, method of lighting - direct, semi direct, indirect, concealed lighting, spot lighting, task lighting, decorative lighting, rope lights, neon lights, flood lighting, yard lighting, under water lighting, etc. Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals, and house lighting. Preparation of a lighting - electrical scheme and layout.

UNIT V: HVAC Systems

Introduction to HVAC, terminologies, scope and purpose of HVAC and notations as per standards. Principles of air-conditioning - IAQ, comfort conditions, gas laws, refrigeration cycle, a/c equipment, compressor heat exchangers, condenser, evaporators.

Types of Air Conditioning- single zone, multi zone, window air conditioners, split air conditioners, ductable air conditioners, package system and central air conditioning, all air systems and chilled water systems. a/c plant room, AHU's Building ducting, types of insulation, diffusers and grills, FC units and controls. Spatial and design requirement of HVAC plants and duct layout. General knowledge on Energy efficient systems in air conditioning. . HVAC requirements and Load Calculations for domestic and commercial. To give the learning in this subject a more practical orientation seminars by industry or trade related organisations or field/site visits should be organized.

GUIDELINES FOR LEARNING:

This course involves library-based study and report writing. They are expected to write critical essays, book reviews and research report based on their readings

Interact technically with Electrical Vendors and MEP experts

Maintain an Inventory and check list of fixtures required to design an electrical Supply, lighting, and HVAC.

Identify the Present materials and fixtures available at market

Appraise the best practices involved to achieve the knowledge of the subject.

For better understanding of each topic students should undergo any ongoing case study and make an appraisal report.

ASSIGNMENTS TO BE FORMULATED:

- Design of an electrical layout
- Creating lighting plans for different types of spaces such as residential, commercial, and hospitality.

- One of the assignments can include designing systems that are integrated with other aspects of a building such as space planning and sustainability measures.
- Lighting: Market surveys and Case Study related to Domestic, commercial and hospitality.
- Prepare a lighting layout for domestic and commercial typology.
- Designing HVAC Systems for different types of space and climatic conditions.
- Case Study and Report Writing on any Commercial Spaces for HVAC.

INTEGRATION:

This module should focus on the integration of electrical, lighting and HVAC systems with other design considerations such as spatial design, Aesthetics, structural, plumbing, MEP, fire protection and energy efficient systems. Students should learn how to coordinate with other design disciplines and ensure the efficient use of resources in the building systems.

Reference:

1. Arora & Duinkand,; “Text book of Refrigeration & Air conditioning”
2. Bovay, H. E. (1981). Handbook of Mechanical & Electrical systems for Buildings. McGraw-Hill Higher Education.
3. Architectural Graphic Standard (HVAC System)
4. National Building code.
5. William.K.Y.Tao; “Mechanical and electrical Systems in Buildings”
6. V.P.Lang,” Principles of air conditioning”
7. Ambrose, E.R. (1968). Heat pumps and Electric Heating, John and Wiley and Sons Inc, New York.
8. Handbook for Building Engineers in Metric systems (1968), NBC, New Delhi.
9. William H. Severns and Julian R. Fellows. Air conditioning and refrigeration. John Wiley and sons, London
10. Khurmi, Gupta & Arora. Refrigeration and Air Conditioning, S Chand & Co.
11. Modern Air-Conditioning, Heating and Ventilation: Carrer and G. Pitman.
12. Air Conditioning and Ventilation, Servems and Fellows, John Wiley
13. An Introduction to Building Physics: Narsmhan

E-resources:

https://docs.google.com/file/d/0B1gQVe9QVieHR19ZaHJsOGNLbUk/edit?resourcekey=0-rU6C-FFfcWUuojwq9BypjA	Lighting Design Basics - Mark Karlen, James Benya
https://www.academia.edu/31815995/Design_of_Electrical_Services_for_Buildings	Design Of Electrical Services For Buildings
https://hosting.iar.unicamp.br/lab/luz/ld/Arquitetural/Handbooks/Lighting%20Design%20Basics.pdf	Lighting Design Basics - Based On The Book By Mark Karlen And James Benya, Wiley And Sons, 2004 Presented By NKBA And Benya Lighting James Robert Benya, PE, FIES, IALD, LC BENYA LIGHTING DESIGN Portland
https://www.cedengineering.com/userfiles/Intro%20to%20Air%20Cond%20Systems.pdf	An Introduction To Air Conditioning System Design J. Paul Guyer, P.E., R.A.
https://archive.org/details/ashraehandbook2016hvacsyste msandequipments/page/n3/mode/2up?view=theater	Chapter 1 - Hvac System Analysis And Selection
https://www.ashrae.org/File%20Library/Technical%20Resources/Bookstore/previews_1986629_pre.pdf	Principles Of Heating Ventilating And Air Conditioning 8th Edition Based On The 2017 ASHRAE Handbook—Fundamentals Ronald H. Howell
https://www.academia.edu/31815995/Design_of_Electrical_Services_for_Buildings	Design Of Electrical Services For buildings, 4th Edition
https://www.scribd.com/document/182801135/Design-of-Electrical-Services-for-Buildings-4th-Edition-1	Design Of Electrical Services For Buildings
https://www.researchgate.net/publication/341097573_Design_of_an_Electrical_Installation_of_a_Storey_Building	Design Of An Electrical Installation Of A Storey Building
https://www.pearsonhighered.com/assets/preface/0/1/3/4/0134701186.pdf	Mechanical And Electrical Systems In Buildings Sixth Edition
https://www.academia.edu/5268049/_Architecture_Ebook_Building_Services_Handbook	Building Services Handbook - Fred Hall & Roger Greeno Fourth Edition
https://www.cedengineering.com/userfiles/Intro%20to%20Air%20Cond%20Systems.pdf	An Introduction To Air Conditioning System Design J. Paul Guyer, P.E., R.A.
https://ceae.colorado.edu/~brandem/aren3050/docs/HVACDesignOverview.pdf	HVAC Systems: Overview Michael J. Brandemuehl, Ph.D, P.E. University Of Colorado Boulder, CO, USA

COURSE OUTCOMES:

Upon completion of this course, students should be able to:

1. **Understand** the principles of electrical systems, heating, ventilation, and air conditioning (HVAC), and lighting design in building design and construction.
2. **Analyse** the functional, aesthetic, and environmental requirements for electrical, HVAC, and lighting systems in buildings of different types and scales.
3. **Evaluate** various electrical, HVAC, and lighting technologies, products, and materials available in the market, considering their performance, efficiency, and sustainability.
4. **Apply** knowledge and skills to design electrical, HVAC, and lighting plans and layouts that meet building code requirements, client needs, and standards for energy efficiency, indoor air quality, and comfort.

5. **Collaborate** with other professionals such as mechanical and electrical engineers, lighting designers, and contractors to integrate electrical, HVAC, and lighting systems with the architecture of the building.
6. **Communicate** effectively with clients, stakeholders, and contractors on the benefits, costs, and limitations of different electrical, HVAC, and lighting options, using appropriate forms of representation.
7. **Apply** critical thinking and problem-solving skills to diagnose and troubleshoot common issues related to electrical, HVAC, and lighting systems in buildings.
8. **Reflect** on the ethical, social, and environmental impact of electrical, HVAC, and lighting design decisions, and **propose** solutions that **contribute** to the well-being of users and the planet.

These course outcomes ensure that students will acquire knowledge and skills to design integrated and sustainable electrical, HVAC, and lighting solutions for buildings that meet the needs and expectations of users, clients, and society.

PROGRAMME ARTICULATION MATRIX

CO	CORRELATION WITH PROGRAM OUTCOMES												Linked PO's
	Core Competence	Problem analysis	Development of design solution	Innovative solution	Appropriate Research	Latest Development in	Sustainable Development	Ethics	Challenges of Built	Communication	Project management	Life long learning	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	
CO1	3	-	-	-	1	-	-	-	1	3	-	1	1,5,9,10,12
CO 2	1	3	2	-	3	1	-	1	3	2	3	2	1,2,3,5,6,8,9,11,12
CO 3	-	3	-	-	-	2	3	-	-	1	-	3	2,6,7,10,12
CO 4	3	2	1	2	-	3	2	-	3	1	-	2	1,2,3,4,6,7,9,10,12
CO 5	2	-	-	-	2	-	-	3	2	-	3	-	1,5,8,10,11,12
CO 6	1	-	-	-	3	-	-	2	-	3	3	2	1,5,8,10,11,12
CO 7	2	3	3	2	2	3	1	-	3	-	-	1	1,2,3,4,5,6,7,9,12
CO 8	-	2	3	2	1	-	3	3	3	1	-	1	2,3,4,5,7,8,9,10,12
2- Low Correlation				2-Medium Correlation				3-High Correlation					

AR22B5.6C WORKING DRAWING AND DETAILS

Periods Per Week			CREDITS	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4		4	4	50	50	100	J

Objectives of the Course:

- E. To impart training for preparation of Technical Drawings and working Drawings conforming Indian Code of Practice and BIS.
- F. To train students to generate Professional Architectural Drawings to work on site and communicates between different professionals.
- G. To train the students to prepare a complete set of working drawings and specifications required at site to construct a building.
- H. To sensitize the students in preparing finer details required for different components of a building

COURSE CONTENTS

UNIT-1

Introduction to Types of Drawings in Architecture and significance of working drawings in profession with reference to IS code and BIS.

Understanding the physical, structural, material, technological trends in building design relating to Load bearing and framed structures.

Preparation of detailed typical floor plan with column positions.

UNIT -2

Suitable scales in drawings- dimensioning of plans, elevations, details and sections with proper presentation

Title panel – use of graphic standard – line weights- line types- text- abbreviations- hatch etc.

UNIT-3

Preparation of building marking plan showing site dimensions, setbacks as per local urban development authority, road width, north direction, diagonal measurements, contour levels etc.

Preparation of centre line of wall/column marking plan showing excavation pits.

Layer wise preparation of drawings of foundation, plinth, floor plans, brick work drawings, sections and elevations.

UNIT-4

Developing drawings of services like electrical layout, plumbing and sanitary layout, introduction to MEP features like HVAC, lifts and elevators, fire fighting systems etc.

UNIT-5

Façade detailing, detailed drawings of Toilets, Kitchens, Doors and Windows (Openings), railings, staircases etc., with required specifications and representation.

REFERENCE BOOKS:

Keith styles and Andrew Bichard, Working Drawings Handbook, Fourth Edition, Taylor & Francis Ltd.

Walter K Palmer, Mechanical Drawing - Projection Drawing, Isometric and Oblique Drawing, Working Drawings, White Press (29 July 2016), ISBN-10 : 1473331846, ISBN-13 : 978-1473331846.

Within 20 Hours Teach you to Understand Building Construction Drawings (English, Paperback, Li Liang)

Specifications In detail, macay w frank. Fifth edition, technical press limited, London, 1955.

Professional practice of architectural detailing, second edition, New York wiley, 1987, wakita osamu A and Lindey Richard M.

Building construction illustrated by Francis D.K. Ching | Architectural Detailing

Building Planning and Drawing (English, Paperback, Bhavikatti S. S.

E-resources:

https://www.designingbuildings.co.uk/wiki/Working_drawing	DESIGNING BUILDINGS
https://www.youtube.com/watch?v=Pyaw8ivOz6Q	WORKING DRAWINGS FOR BEGINNERS
https://en.wikipedia.org/wiki/Shop_drawing	SHOP DRAWINGS
https://www.flooringtech.com.au/unit15_work_documents/section1_working_drawings/lesson1_buildig_plans.htm	WORK DOCUMENTS
https://www.uceb.eu/DATA/CivBook/13.%20The%20Professional%20Practice%20of%20Architectural%20Working%20Drawings.pdf	The Professional Practice of Architectural Working Drawings
https://www.amazon.com/Construction-Drawings-Details-Interiors-Rosemary/dp/1119714346	Rosemary Kilmer (Author), W. Otie Kilmer (Author) Construction Drawings and Details for Interiors 4th Edition
https://www.youtube.com/watch?v=k9RTbu-k5Y4	Staircase Complete Details for Commercial Plans

https://monograph.com/reference/guide-to-construction-documents	A GUIDE TO CONSTRUCTION DOCUMENTS
https://www.re-thinkingthefuture.com/2020/12/02/a2278-10-books-for-architectural-detailing-and-construction-that-architects-must-know/	10 Books for Architectural Detailing and Construction

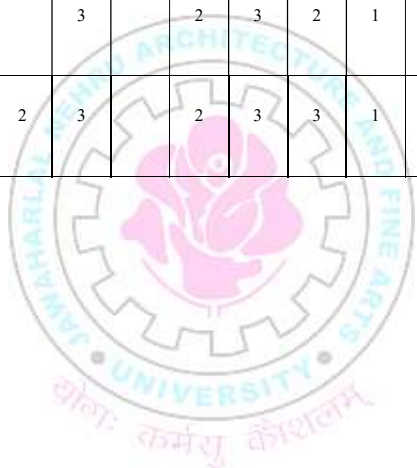
COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

S. No.	COURSE OUTCOME	DESCRIPTION
1	CO1	understand the building components and able to relate the construction of building on ground with prepared working drawings.
2	CO2	learn to prepare drawings as per scales, line weights, light types, text, etc fulfilling the standard working drawing requirement.
3	CO3	learnt to prepare all types of working drawings that will help to execute the buildings and also communicate with all concerned construction workers.
4	CO4	Understand the concept of MEP and develop Electrical, Plumbing and Sanitary Layout.
5	CO5	Detail out the given space with required arrangement of furniture, storage, fixtures etc. with proper material and technical specifications for better space planning.

Program Articulation Matrix

Course Code	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	POS 1	POS 2	POS 3	POS 4
AR22B5.6C.1	3	1	2			3		2	2	3	2	3				
AR22B5.6C.2	3				2	3				3	2	3				
AR22B5.6C.3	3		2			3			3	3	1	3				
AR22B5.6C.4	3		3			3		2	3	2	1	3				
AR22B5.6C.5	3		2		2	3		2	3	3	1	3				



AR22B5.xE PROFESSIONAL ELECTIVE-I

AR22B5.1E WORKSHOP: VERNACULAR ARCHITECTURE

Periods Per Week			CREDITS	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	2	4	4	50	-	50	--

Objectives of the Course:

- To introduce traditions of building structures for habitation.
- To reinforce the knowledge of Traditional Architecture as an expression of local identity and indigenous traditions of the culture.
- To inculcate sensitivity towards Architectural building practices, that are ecologically sensible, culturally relevant and cost effective.

COURSE CONTENTS

UNIT I: Introduction to Vernacular Architecture:

Definitions, Theories, Categories, Contextual Responsiveness: Climatic, Geographical, Anthropological and Cultural influences, Concepts and approaches to the study of Vernacular Architecture.

Materials and Construction techniques: Typical Building Materials, Built form and elements, Construction Techniques and Environmental Performance

UNIT II: Vernacular Style of Dravidian/ South Region:

Planning aspects, Construction materials, techniques and details, Settlement Patterns, Dwelling Typology, Symbolism Typical features of

- **Kerala** – Nair houses (Tarawads), Kerala Muslim houses (Mappilah houses), Temples, Palaces and theaters – Thattchushastra.
- **Tamil Nadu** – Toda Huts, Chettinad Houses (Chettiars) and Palaces
- **Karnataka** – Gutthu houses (land owning community), Kodava ancestral home (Aynmane)
- **Andhra Pradesh** – Chuttillu, Kaccha buildings, Manduva Logili
- **Telangana** – Bhavanti houses, Gadde houses, Kavelu Penkula illu, Gond houses, Khoyya houses and wooden houses of Dharmapuri

UNIT III: Vernacular Style of Western Region:

Planning aspects, Construction materials, techniques and details, Settlement Patterns, Dwelling Typology, Symbolism Typical features of

- **Rajasthan** - Jat houses for farming caste, Bhungas(Circular Huts) and Havelis (Pukka houses)
- **Ahmedabad** - Pol houses, Primitive forms, Symbolism, Colour, Folk art etc
- **Gujarat** - Desert settlements and houses of Kutch.
- Vernacular architecture of **Goa**.

UNIT IV: Vernacular Style of Northern and Eastern India

Planning aspects, Construction materials, techniques and details, Settlement Patterns, Dwelling Typology, Symbolism Typical features of

- **Kashmir** – Typical Kutchha houses, mosque, Dhoongas (Boathouses), Ladakhi houses, bridges
- **Himachal Pradesh** – Kinnaur houses
- **Uttar Pradesh** – Domestic housing of Uttar Pradesh
- **Bengal** – Bangla (Rural house form), Aat Chala houses – change from Bangla to Bungalow, Kutchha & Pucca
- Architecture of Bengal. Nagaland – Naga houses & Naga village, Khasi houses

UNIT V: Vernacular Architecture's Influence and Adaptation in Contemporary Architecture:

A critical review of the relevance and application of vernacular ideas in contemporary times. An appraisal of the architects who have creatively innovated and negotiated the boundaries of tradition while dynamically responding to the changing aspirations and lifestyles. Examples: Works of Laurie Baker, Hasan Fathy, Anil Lau, etc.

Note: This subject is expected to be conducted in a workshop mode. While the syllabus acts as a guiding framework, it must be interpreted to maximise hands on training, practical exposure and learning from live examples.

ASSIGNMENTS TO BE FORMULATED:

Assignments to include Study and documentation of vernacular architecture of selected house forms
Study of an existing settlement in the vicinity for onsite comprehension of mentioned characteristics.

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. Ilay Cooper and Barry Dawson. Traditional Buildings of India, Thames and Hudson Ltd., London. 1998.
5. Frampton, Kenneth. Towards a Critical Regionalism: Six points for an Architecture of resistance, In the Anti-Aesthetic: Essays on Postmodern Culture. Edited by Hal Foster. Seattle, WA: Bay press. 1983.
6. V.S. Pramar. Haveli – Wooden Houses and Mansions of Gujrat, Mapin Publishing Pvt. Ltd., Ahmedabad. 1989.
7. Kulbushanshan Jain and Minakshi Jain. Mud Architecture of the Indian Desert, Aadi Centre, Ahmedabad. 1992.
8. G.H.R. Tillotsum – The tradition of Indian Architecture Continuity, Controversy – change since 1850, Oxford University Press, Delhi. 1989.
9. Carmen Kagal, VISTARA -The Architecture of India, Pub: The Festival of India, 1986.
10. S. Muthiah and others: The Chettiar Heritage, 2000
11. House forms of Andhra Pradesh, Census of India, 1960

E-RESOURCES

1. <https://www.novatr.com/blog/vernacular-architecture>
2. <https://www.wisdomlib.org/hinduism/essay/vernacular-architecture-of-assam>
3. https://www.bricknbolt.com/blogs-and-articles/construction-guide/vernacular-architecture-history-sustainability?gad_source=1&gclid=CjwKCAjwxNW2BhAkEiwA24Cm9FEU4fro05vDsWrAhO_ikQrduATWMDLI3e9Y6q5Fx7m3DJ5rRPtEcRoC0UUQAvD_BwE
4. <https://issuu.com/harshmshah94/docs/dissertation/s/11635516>
5. <https://iupress.org/9780253023629/vernacular-architecture/>



AR22B5.2E WORKSHOP: CRAFT IN ARCHITECTURE

Periods Per Week			CREDITS	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	2	4	4	50	-	50	--

Objectives of the course:

- F. To understand the relationship between Architecture and Crafts
- G. To create awareness and exposure for skill based knowledge systems
- H. To develop skills for documenting craft traditions
- I. To develop new paradigms of practice in the application of Crafts in Architecture

Course Contents:

Unit I: ARCHITECTURE AND CRAFTS THROUGH HISTORY

CRAFT- Definition and understanding, differentiation from art and importance of skill and knowledge transfer in craft systems.

Application of various crafts in different building traditions. Ex- sculpture in Greek, stained glass and stone tracery in Gothic, calligraphy in Islamic architecture; In Indian tradition, introduction to - wood, bamboo, brick, stone and plaster based crafts.

Unit -II: CRAFTS INTEGRATED INTO THE STRUCTURE

Building Crafts: Definitions; Perspectives and Frameworks; Craft and its Role in Creating/Enhancing Architecture

Documentation of traditional knowledge systems- communities, materials, tools and techniques (understanding documentation techniques used in other studies of craft based communities)

Case study of a craft-based community to be done using primary or secondary data as per availability. For example-wood crafts in Kerala and Himalayan regions, Bamboo in the Northeast, Stonework, Brickwork, handmade tiles, terracotta pottery for roof tiles, Attangudi floor tiles etc. Examples are only suggestive; study must be taken up as per availability of literature and resources.

Unit III: DECORATIVE CRAFTS

Decorative crafts- traditional medium and interpretation in internal and external surfaces of the built structure

Documentation of traditional knowledge systems- communities, materials, tools and techniques. Case study examples- plaster arts of the Deccan and Rajasthan, Murals, Jaalis, Stone inlay, wood and stone carvings etc, reinterpretation of textile patterns in interior walls. Examples are only suggestive; study must be taken up as per availability of literature and resources.

Unit IV: CRAFTS FOR PRODUCTS AND ACCESSORIES

Products and accessories used within the building- discussion and understanding

Crafts used for making furniture, fabrics in furnishings, accessories like lamps, Statement pieces etc.

Case study examples- Dokra, Cane and rattan furniture, Bidri, silver filigree, Nirmal, Cherial masks and paintings, Pembarthi brass, Etikoppaka toys, Kondapally toys, and leather puppetry.

Unit - V: INTERNATIONAL AND CURRENT TRENDS

Understanding trends in international scenario of how different cultures have adapted traditional crafts in modern design like Japan, Scandinavian countries, Bangladesh, Srilanka and Nepal. All the aforesaid countries have used existing expertise in material like wood, stone and terracotta based materials and reinterpreted them for contemporary aesthetic.

Modern Industrialised crafts like CNC cutting, Metal fabrication, Glass work, furniture workshops etc.

Note: This subject is expected to be conducted in a workshop mode. While the syllabus acts as a guiding framework, it must be interpreted to maximise hands on training, practical exposure and learning from live examples.

Case study by students of a crafts community in one chapter Unit II, III or IV is desirable while the other 2 units, the study could be a review of information already available in online and offline resources about the craft itself.

Reference:

1. Crafts Atlas of India, Jaya Jaitley
2. Handmade In India Crafts of India by Ranjan Aditi, Mapin publishing.
3. Published works by DICRC, CEPT.

E-References:

The Hindu: Building with Indian Craftsmen, Nidhi Gupta, May 10, 2024
<https://www.thehindu.com/life-and-style/building-with-indian-craftsmen-architecture-museum-of-meenakari-heritage-krushi-bhawan-iit-bhilai/article68152753.ece>

NPTEL: Role of Craft and technology in Interior-Architecture, Prof Smriti Saraswat, IIT Roorkee

<https://archive.nptel.ac.in/courses/124/107/124107006/#>

[suggested site visit: Rural technology park, NIRD, Hyderabad](#)

AR22B5.3E Workshop: Appropriate Building Technologies

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	2	4	4	50	--	50	-

Objectives of the Course:

- To explore broad range of “good” solutions in construction
- To learn the connect between design and construction process
- To identify the opportunities for invention in construction

Unit -I : TRADITIONAL BUILDING TECHNIQUES

Stone Carving and Masonry, Timber Frameworks, Terracotta construction styles, Rammed Earth and Cob Construction, Traditional Cooling Techniques.

Unit -II : BRICK CONSTRUCTION STYLE

Laurie baker and Anil Laul techniques : types of bonds , filler slabs, arches and domes, roofing and flooring, frameless doors and windows, brick jali walls or perforated brick architecture, curved walls, latticed brick walls, letting trees live and building with mud

Unit -III: NATURAL BUILDING

Bamboo Structures: Bamboo reinforced concrete, Structures like ferro cement channels, plank and joist, Bamboo bridge fabrications , Kangra style dry stone construction,

Unit -IV: EMERGING TECHNOLOGIES

Formwork for Monolithic Concrete Construction, Modular Tunnel form, Sismo Building Technology, Precast Sandwich Panel Systems: Rapid Panels, Reinforced EPS Core Panel System, QuickBuild 3D Panels, Concrewall Panel System, Glass Fibre Reinforced Gypsum (GFRG) Panel System

Unit -V: STEEL STRUCTURAL TECHNOLOGIES

Light Gauge Steel Framed Structure (LGSFS), Light Gauge Steel Framed Structure with Infill Concrete Panels (LGSFS-ICP), Factory Made Fast Track Building System, Speed Floor System, Waffle-Crete Building System, Precast Large Concrete Panel System, Industrialized 3-S system using cellular light weight concrete slabs & precast columns

Note: This subject is expected to be conducted in a workshop mode. While the syllabus acts as a guiding framework, it must be interpreted to maximise hands on training, practical exposure and learning from live examples.

Reference:

- Building: 3,000 Years of Design, Engineering and Construction" by Bill Addis
- The Science and Technology of Building Materials" by Henry J Cowan and Peter Smith

3. Automation Systems in Smart and Green Buildings (Modern Building Technology)" by V K Jain
4. Prototype Commercial Buildings for Energy and Sustainability Assessment: Design Specification, Life-cycle Costing and Carbon Assessment" by Joshua D Kneifel
5. Building Construction" by Rangwala
6. Building Construction" by B C Punmia and Ashok Kumar Jain
7. Alternative building materials: timeless mud." In: *Architecture & design*, vol. 3, no. 3 (1987 Mar./Apr.), p. 32-35
8. Architecture and the people." In: *A + U: architecture and urbanism*, n.12 (363) (2000 Dec.), p.69-73
9. Laurie Baker's cost-reduction manual." In: *A + U: architecture and urbanism*, n.12 (363) (2000 Dec.), p.116-129
10. Laurie Baker, 'The Question of Taking Appropriate Building Technology to Pithoragarh', Science and Rural Development in Mountains, J.S. Singh, S.P. Singh and C. Shastri(eds.), Gyanodaya Prakashan, Naini Tal, 1980.
11. GREEN IS RED (2013) by Anil Laul
12. Architecture.live/prof-anil-laul-a-pioneer-of-indigenous-architecture-in-india-pappal-suneja/

E-RESOURCES

- <https://www.whereisthenorth.com/article/%2011-laurie-baker-strategies-and-his-low-cost-brick-construction-style>
- <https://www.whereisthenorth.com/article/%209-sustainable-roofing-methods-for-your-building-design>
- <https://www.whereisthenorth.com/article/%204-uses-of-jali-and-what-materials-to-use>
- <https://www.whereisthenorth.com/article/%209-types-of-brick-bonds-in-architecture>
- <https://pmay-urban.gov.in/uploads/presentations/1BMTPC-Demo-Housing.pdf>
- <http://nirdpr.org.in/rtp.aspx>
- <https://zynorique.com/>
- <https://archgyan.com/earth-building-workshops-in-india-archgyan/>

COURSE OUT COMES:

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

1. Understand the applications and properties of various building materials
2. Understand the potential applications of architectural techniques with materials
3. Obtain the knowledge about materials and smart materials

AR22B5.4E WORKSHOP: ADVANCED 3D MODELLING

Periods Per Week			CREDITS	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	2	4	4	50	-	50	--

Objectives of the course:

- To further architectural design skills through advanced computer applications.
- Explore the impact of existing and emerging digital media and software, for advanced digital visualization, simulation and communication
- Help students generate 3D models from their 2D auto cad drawings
- Understand how the models generated can be made ready for import to BIM.

Course Contents:

Unit I: BASICS OF 3D MODELLING

Types of 3D modelling: polygonal modelling, NURBS modeling, subdivision surface modelling; like and building information modeling etc to design and test Architectural built environments virtually.

End uses of 3DModelling:

Suggested tools: Sketchup, Revit, 3dsMax.

UNIT II: CREATING AN ARCHITETURAL MODEL

3d modeling in Architecture through different softwares: interface,workspace setup, templates, basic modelling commands and component based 3D modelling.

Unit III: SCENE SETUP

Scene setup involves arranging virtual objects, lights, cameras and other entities on a scene which will later be used to produce a still image or an animation. Image processing and video editing to create Architectural walkthroughs.

Digital solar studies

Suggested tools: 3d softwares

Unit IV: DIGITAL PORTFOLIO PREPARATION

Understanding paper sizes and equivalent digital resolution, composition with design principles, types of image files, exporting different file types for different end uses, making a ready template for various uses

Suggested tools: PhotoShop, InDesign.

Unit V: HIGHER INTEGRATION

Preparation of the 3D model for integration with BIM, 3D printing, laser cutting, AR/VR, walkthroughs/ 360 degree virtual tour.

E-References:

<https://learn.sketchup.com/courses/sketchup-fundamentals-part-1>
<https://www.adobe.com/support/training/products/illustrator.htm>
<https://www.graphisoft.com/resources-and-support/learning>
<https://learn.graphisoft.com/helpx.adobe.com/in/indesign/tutorials.html>
<https://help.autodesk.com/view/RVT/2021/ENU/?guid=GUID-9E9688A2-0645-4F8E-9D96-F1B76291A6C6>
<https://www.udemy.com/course/game-art-with-inkscape/?matchtype=p>
<https://www.photopea.com/tuts/>
https://www.rhino3d.com/learn/?query=kind:%20jump_start&modal=null
<https://howtorhino.com/masterclass-application/>

Course outcomes

CO1	Create digital presentations of architectural portfolio
CO2	Use virtual techniques to collect site data and evaluate the site
CO3	Create virtual study models during design development stage
CO4	Understand application of 3D models in higher level integrations

CO-PO mapping

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	3	-	-	-	3	-	2
CO2	1	3	1	-	2	1	1	-	-	-	-	-
CO3	2	3	1	1	1	-	1	1	-	1	1	1
CO4	1	-	-	-	-	2	-	-	-	-	2	1

AR22B5.5E WORKSHOP: STONE CONSTRUCTION

Periods Per Week			CREDITS	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	2	4	4	50	-	50	--

Objectives of the Course:

- To introduce Stone Construction and its importance in Development of Architecture through History.
- To expose the students to different types of Stone Masonry and Construction Techniques that were prevalent in Monumental Stone buildings across the World.
- To allow the students to experience and Document Stone Buildings that enable them to understand the building design, aesthetics and functionality.
- To inculcate the practice of stone construction in designing buildings that require identity and recognition.

COURSE CONTENTS

UNIT-1

HISTORY OF STONE MASONRY

Application of Stone in Architecture, Iconic Buildings of Stone in History, Evolution of Construction Techniques, and Tools used for construction, Binding materials used in Stone Masonry, Ornamentation with Stone, Stone Masonry Techniques.

UNIT-2

INTRODUCTION TO STONE MASONRY

Stone as a Building Material, Types of Stones, Definition of Terms used in Stone Masonry, Physical Properties of Stone- Durability, Adaptability, Climatic responsiveness, Seismic Resistance and Sculptural Treatment of Stone masonry; Advantages and Disadvantages of Stone masonry, Dressing of Stones, Types of Stone Masonry.

UNIT -3

BUILDING COMPONENTS IN STONE

Foundations, Plinth, Columns, Beams, Walls, Roofs, Flooring, Staircases, Piers, Arches, Vaults, Domes, Canopy, Sill, Jambs, Cornices, Copings, Buttresses, Thresholds, Railings, Corbels, Ornamental Stone work, Stone Cladding, Lintels, Chajja, compound walls;

UNIT-4

JOINERY IN STONE MASONRY

Bonds in Stone Construction, Methods of Stone Laying, Defects in Stone Masonry, Composite Masonry, Appliances for Lifting Stones, Supervision of Stone Masonry Construction. Pre-cut Stone Construction.

UNIT-5

STONE STRUCTURES

Study of Traditional Stone Structures - Documentation and Analysis of construction techniques and materials used for Buildings like Traditional Residences, Forts, Palaces, Temples, Stepped Wells, OAT etc. Relevance of Stone Construction in Contemporary Architecture.

Reference:

1. RANGWALA, "Building Construction", charotar publishing house, 2016.
2. IAN CRAMB, "the art of stone mason", ISBN: 9780811769877, 0811769879, Stackpole books, 2021.
3. P.R. HILL, J.C. DAVID," Practical Stone Masonry" , ISBN 9781873394144 Routledge, 1995.
4. JOHN VIVIAN, " Building stone walls " , ISBN:9781612123721, 1612123724, Storey Publishing, LLC, 2014,
5. Daniels, Chris, The Stone Restoration Handbook: A Practical Guide to the Conservation Repair of Stone and Masonry, ISBN: 9781847979070, The Crowood Press Ltd, 2015

Course outcome:

At the end of the course, the student shall be able to:

1. Understand the importance of Stone as a building material in history that sustained identity through ages.
2. Understand different terminology used for stone masonry and in depth properties of stone for construction of different elements in buildings.
3. Analyze different elements used in stone buildings and their harmony with the other materials of the building.
4. Recognize and understand the techniques and methods used in stone construction, that made some of the buildings memorable with their style and architecture.
5. Document monumental buildings constructed in stone that helps students to understand scale and to implements techniques in Historical Documentation

Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)
SIXTH SEMESTER

S.No.	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B6.1C	Architectural Design – V	PC	9		9	9	100	100	200	J
2	AR22B6.2C	History of Architecture – IV	PC	3		3	3	50	50	100	W
3	AR22B6.3C	Building Estimating, Costing and Specifications	PC	4		4	4	50	50	100	W
4	AR22B6.4C	Building Information Modelling	SEC	1	2	3	3	50	--	50	--
5	AR22B6.5C	Human Settlements and Urban Planning	PC	4		4	4	50	50	100	W
6	AR22B6.6C	Architectural Acoustics and Illumination	BS	3		3	3	50	50	100	W
7	AR22B6.xE	Professional Elective – II	PE	4		4	4	50	-	50	-
				28	2	30	30	400	300	700	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

PROFESSIONAL ELECTIVE-II

1	AR22B6.1E	Theory of Design and Architecture
2	AR22B6.2E	Vaastu Shastra
3	AR22B6.3E	Technology in Architecture

AR22B6.1C ARCHITECTURAL DESIGN – V

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
9		9	9	100	100	200	J

Objectives of the Course:

- Familiarize the students with the knowledge and application of various Structural systems and their integration into the architectural design solutions harmoniously.
- Emphasize on pragmatic thinking during design phase with an acuity towards detailing by express use of materials, systems, mechanisms, technologies, specifications etc.
- Provide an effective methodology to systematically seek out fit design solutions based on a proper evaluation of the problem and objective criteria
- Examine the building performance critically under the effects of micro climatic conditions in order to achieve optimum comfort conditions
- Sensitize the students towards the specific user needs, particularly those physically and visually challenged and equip them with the knowledge of statutory provisions, norms, design guidelines and recommendations for Barrier –free spaces.

Unit I: Structural Systems

Understanding Structural systems in different buildings and distribution of loads; Introduction to different types of structural systems such as framed, load-bearing, cable and tension, shell, truss, and space frame structures; Selection of appropriate structural system for each project, taking into account the unique requirements of the building and the site

Unit II: Architectural Details

Introduction to various Architectural details such as ornamentation, fenestration, roofing, stairs, materials, and lighting; Details contribute to a building's character, history, and cultural significance, reflecting unique craftsmanship and architectural styles.

Unit III: Problem Solving

Problem-solving in architecture: systematic approach, including problem definition, research, stakeholder collaboration, design generation and evaluation, refinement, communication, implementation, and evaluation. Innovative and functional solutions that meet client and user needs while considering contextual and practical factors. Understanding the nature of complex problems, use of graphics in complex problems, adjacency diagrams, inter-relationships of different components of complex problem, prioritizing different aspects within a complex problem

Unit IV: Urban Context

Urban context: location- densely built city centers, medium density areas, sparsely built fringe areas, Historical aspects, heritage, socio-economic aspects, topography, physical and social infrastructure, surrounding buildings, culture and built environment; urban morphology, mapping and diagramming of these aspects; SWOT analysis;

Responding to the urban context: designing buildings to respond to site characteristics, surrounding built environment, and social and sustainability factors; access, transportation and parking requirements.

Unit V: Project report

Preparation of architecture project report includes the design and development process of a building or structure, including objectives, constraints, design concept, materials, cost estimation, and environmental impact assessment. It may include visual aids like drawings and 3D models. The report must provide a clear overview of key features and design decisions while addressing issues and highlighting sustainability features and compliance. Report to ensure project success by providing a comprehensive and transparent record of the process.

Guidelines for learning:

Assignments to be formulated:

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

Type of Design Problems: Large Span Buildings Convention centers, Auditorium, Function halls, Malls, Industrial buildings

Integration:

Students will keep in mind the spatial requirements, emerging activities, put forward acoustic feasibility, workout detailed estimates and come-out with Building Information Model for the design and respond to Barrier-free challenges.

Reference:

1. Tamura, Yukio, Kareem, Ahsan, Advanced Structural Wind Engineering, Springer, Mario Salvadori, Robert Heller, Deorah Oakley, Salvadori's Structural in Architecture: the building of buildings, Person, 2017
2. Paul Michael Davis, Critical Skills for Solving Design Problems: Useful Tips from Architects in Practice, Images Shenyang, 2022
3. Randy Deutsch, Think like An Architect: How to develop critical, creative and collaborative problem-solving skills, RIBA Publishing, London, 2020
4. Feng Yang, Lang Chea, High-Rise Urban Form and Microclimate: Climate-Responsive Design for Asian Mega-Cities, Spriger, 2020
5. James Holmes-Siedle, Barrier-free Design: A Manual for Building Designers and Managers, illustrated, Routledge, 1996
6. Oliver Heiss , Christine Degenhart and Johann Ebe, Barrier-Free Design:Principles, Planning, Examples, Edition detail, Birkhäuser 2010

E-resources:

https://www.mdpi.com/2225-1154/8/6/72	Microclimate Analysis as a Design Driver of Architecture
https://climate-consultant.informer.com/6.0/	climate consultant
https://www.ribabooks.com/think-like-an-architect-how-to-develop-critical-creative-and-collaborative-problem-solving-skills_9781859469316	Think Like an Architect: How to develop critical, creative and collaborative problem-solving skills
https://arc345ergofactors.files.wordpress.com/2016/03/william-lidwell-kritina-holden-jill-butler-universal-principles-of-design-rockport-publishers-2003.pdf	universal principles of design pdf

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Conceive the architectural form and functions in a wholesome manner while incorporating structural elements and systems that projects a distinct visual identity.
2	CO2	Create enriching design solutions, that reflect the concerned deliberations and practical approach, to the architectural problem
3	CO3	understand and examine the nature of architectural problems and formulate with much needed clarity the priorities before generating appropriate solutions
4	CO4	Prescribe various appropriate climate-responsive solutions and devise strategies for combating harsh climatic conditions.
5	CO5	Incorporate the design guidelines specific to Barrier-free spaces with a greater responsibility to serve the broad spectrum of society.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO 1	3	1	1	3	1	2	3	3	1	3	2	3	2	2
CO 2	3	3	3	1	2	1	1	-	-	2	-	1	3	3
CO 3	3	2	3	1	2	3	1	1	3	1	3	3	2	2
CO 4	3	3	1	2	2	2	2	1	3	1	3	1	1	1
CO 5	3	3	1	2	2	2	3	3	1	2	1	1	1	1

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B6.2C HISTORY OF ARCHITECTURE - IV

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3		3	3	50	50	100	W

Objectives of the Course:

- To orient the students to various developments in the field of architecture and for a better understanding of contemporary architecture.
- To make students aware of trends in architecture of India after Independence and the influence of Masters.
- To familiarize with the theory and works Indian Architects in the post independent period.
- To make students aware of the development of architecture in rest of the world in the second half of twentieth century.

Course Contents:

Unit – I - Post independence Architecture in India

Contemporary trends in architecture of India after Independence, Options after Independence – The Revivalist Style and the International Style; Influence of Le Corbusier's work in Chandigarh and Ahmedabad and Louis.I.Khan in Ahmedabad and Dhaka

Unit – II - Pioneers in India

The evolution of Contemporary Indian Architecture - Theory and works of Achyut Kanvinde, J.A. Stein, Anant Raje, Habib Rehman, Jeet Malhotra, and J.K.Chowdary etc.

Contributions made by Pioneers - Charles Correa's work and response to Climate – Themes and Ideas of B.V. Doshi's Theory of Design, Tradition and Modernity in the work of Raj Rewal and

Unit – III - Contemporary Indian Architects

Design Theories and works of contemporary architects - Uttam Jain, Hasmukh Patel, Chandravarkar and Thacker, Jaisim, Anil Laul, ShirishBerl, Romi Khosla, Ranjit Sabiki, Shashi Bhooshan and Sanjay Mohe;

Familiarisation of architecture at Auroville and Laurie Baker's work in Kerala; appropriate technologies of Anil Laul

Unit – IV - Post Modernism

Contemporary trends in the world architecture; Theory of Post Modernism in Architecture

Design Theories and works of Charles Moore, Michael Graves, Richard Meyer, James Sterling, Aldo Rossi, Robert Venturi, Peter Eisenmann, etc.

Unit – V - Contemporary International Architects

Design Theories and works of Hassan Fathy, Geoffery Bawa, Norman Foster, Renzo Piano, Richard Rogers, Bernard Tschumi, Frank Gehry, Zaha Hadid, Maya Lin, Peter Zumthor, Tadao Ando, Cesar Pelli, I.M. Pei, Yamasaki, Santiago Calatrava, etc.

Reference:

1. Bahga, S.S: Post Independent Architecture.
2. Bhatt, Vikram and Scriver, Peter. Contemporary Indian Architecture After the Masters. Mapin Pub. Pvt. Ltd., Ahmedabad, 1990.
3. Curtis, J.R. William. Modern Architecture since 1900. Prentice-Hall, Inc., New Jersey, 2002.
4. Jencks, Charles. The Language of Post-Modern Architecture, 4th ed. Academy Editions, London, 1984.
5. Frampton, K Tad Ando- buildings, Projects Writings, New York Rizzoli, 1984.

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Explain the development of contemporary architecture in India after Independence.
2	CO2	Discuss contemporary trends in rest of the world architecture after the modern period.
3	CO3	Understand the design theories and works of contemporary architects in India and abroad.
4	CO4	Classify the strategies adopted by different architects worked in India and World.

CO-PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
AR-6.6 -01	1	2	-	2	2	2	2	2	1	1	-	3
AR-6.6-02	1	2	-	1	2	2	1	3	2	2	-	3
AR-6.6-03	3	2	-	2	3	3	2	2	1	2	1	3
AR-6.6-04	2	2	-	1	1	1	1	2	1	1	-	2

AR22B6.3C BUILDING ESTIMATING, COSTING AND SPECIFICATIONS

Periods per week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	-	4	4	50	50	100	W

Objectives of the Course:

1. To understand the methods to calculate the quantity of materials used in construction.
2. Man power assessment for various construction works.
3. Study of current material rates and SSRs from various competent authorities.
4. Arriving at the cost of work by combining factors of materials and man power.
5. Evaluate the quantity of work along with total cost of an individual construction project.

UNIT I: Extracting the Quantities form Working Drawings

Study of a project: Study the project plan with the corresponding sections and elevations, with respect to the given dimensions. Identify the elements of structure from the plan and elevations or sections. Make the list of items of works involved in the project. List the units for work quantity of each of the item. Evaluate each of the items in terms of its units' viz., length, area or volume of work. Obtain the total for work quantity into a work sheet. Sum up of items into an abstract of the project. Definitions and terms used in the Project Estimate assessment. Use of Spreadsheets in computing the quantities for each item;

UNIT II: Types of Estimates

Knowledge of various types of estimates: Preliminary estimate, detailed estimate, Quantity estimate, Bid estimate, Cost estimates. Approximate methods: Plinth area method, Cubic content method and others. Estimate for services: Water Supply, Plumbing, Electrical, HVAC and Sanitation for a residential project. Knowledge of various types of SSRs available, along with their application and updates of SSRs;

UNIT III: Detailed Estimate by Examples, Cost Estimate

Introduction to Long wall short wall method and the Centre line method.

Estimate of a building quantities for a load bearing structure and a framed structure.

PWD Method of computing the quantities; Explanation of previous projects estimates in Audio visual mode; Preparation of BOQ, Bill of Quantities. Knowing the commands to obtain lengths, areas and volumes for items of a building plan from the prevailing softwares like AutoCAD, Revit, Archicad and other BIM softwares;

UNIT IV: Specifications and Rate Analysis

Specifications: Purpose and the importance of specifications in Building estimation, General, brief specifications and Detailed specifications. Specification for all items of a residential construction from earthwork excavations to floor finishes. Writing the specifications to include materials, tests, pre and post installation and modes of Measurements.

Rate Analysis: Assessment of Cost of each building construction work by compiling cost of materials and cost of labour; Preparation of data sheet for items such as masonry, PCC, RCC, Plastering and flooring., Methods of execution of works viz., piece work, daily basis, Lumsum, labour rate and percentage etc.

UNIT V: Valuation

Introduction to the purposes of valuation of building, terminology, market value, book value, capital cost, capitalized cost, years' of purchase; Methods of estimating the depreciation of building properties; Methods to calculate the value of a property.

Reference:

1. Datta, B.N. Estimating and Costing in Civil Engineering: Theory and Practice, 23rd ed. UBS Pub. Distributors Ltd., New Delhi, 1993.
2. Bride, G.S. Estimating and Costing, 2nd ed. Dhanpat Rai and Sons, Delhi, 1982.
3. Rangwala, S.C. Valuation of real Properties, 6th ed. Charotar Pub. 6 House, Anand, 2003.
4. Standard Specification and rates, Government of Andhra Pradesh, Government Press, Hyderabad
5. Indian Standards Institution. National Building Code of India 1983. Indian Standards Institution, New Delhi, 1984.
6. Lerrs, Jack. Engineering Construction Specification.
7. Macey, W. Frank. Specification in Detail, 5th ed. Technical Press Ltd, London, 1955.
8. Lewis, R. Jack. Building Construction Specifications. Prentice-Hall, Inc., New Jersey, 1975.
9. Govt. of Maharashtra. Standard Specifications, Government Press, Nagpur, 1972.

E-reference:

https://www.ecmweb.com/construction/estimating/article/21119807/the-purpose-of-the-estimate	Role of an estimate in building construction
https://www.costengineering.eu/blog-article/3-types-of-construction-cost-estimating	Estimation of cost of construction
https://esub.com/blog/what-are-building-specifications-in-construction	Building Specifications importance and measures
https://www.designingbuildings.co.uk/wiki/Specification_for_construction	Specifications in construction
https://dailycivil.com/valuation-of-building-methods-and-calculation-of-valuation-of-property/	Valuation of buildings and parameters
https://www.johnsoncontrols.com/openblue	Buildings with innovative current trends
https://constructioncoverage.com/estimating-software	Construction software for building estimation
https://www.freshbooks.com/hub/estimates/construction-estimating-software	Best Construction Estimating Softwares

Course Outcomes:

Upon the successful completion of course, student will be able to

S. No.	COURSE OUTCOME	DESCRIPTION
1	CO1	<i>Assess</i> the items of work in construction by studying the building plan, sections and elevations to calculate the quantities of work in each item.
2	CO2	<i>Acquire</i> the cost estimate computing skills using spread sheets and other softwares and prepare BOQs.
3	CO3	<i>Classify</i> the specifications for various types of works in the construction industry.
4	CO4	<i>Evaluate</i> the rate analysis as per SSRs of concerned authorities.
5	CO5	<i>Perform</i> valuation of all types of buildings.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

AR17 B5.5C	P O - 1	P O - 2	P O - 3	P O - 4	P O - 5	P O - 6	P O - 7	P O - 8	P O - 9	P O - 10	P O - 11	P O - 12	P S O 1	P S O 2
CO-1	3	2	-	-	2	3	2	-	2	2	2	2	2	2
CO-2	3	2	2	-	2	2	-	-	-	-	-	2	2	2
CO-3	2	2	-	2	-	-	-	2	-	-	2	2	2	2
CO-4	2	2	3	-	-	2	-	-	2	2	-	2	2	3
CO-5	3	2	-	-	-	2	-	-	2	2	-	2	2	2

AR22B6.4C BUILDING INFORMATION MODELLING

AR22B6.5E	Periods Per Week		CREDITS	Marks			End Exam
	L/T/S	P/F/O		Internal	External	Total	W/J/S/P
1		2	3	50	--	50	--

Objectives of the course:

- A. The course shall impart theoretical and practical knowledge on BIM for building and infrastructure design
- B. Train students to extract information from the BIM model for preconstruction
- C. Sensitize students to use of BIM in execution stage
- D. Familiarize students with use of BIM as a facility management tool

Course Contents:

Unit - I: Introduction

History; building design process with purely drafting and modelling software and its limitations and disadvantages

Difference between a purely drafting and modelling software and BIM software;

Unit - II: Building Design Basics

Introduction to Parametric 3D modelling and exploration of its advantages (Shall include Architectural, Structural, Electrical, Mechanical and all specialist consultant's elements) using any of the popular BIM software, preferably Revit 2018, Autodesk – the most popular software.

Project Elements Planning – Creation of Project Tree; Hierarchical Identity creation of the project elements and intelligent internationally recognisable naming system;

Building design – Creation of Digital Model of a building and its geo-physical location; creation of elemental details;

Creation of Elements' families;

Import of elements of all related trades; Format of digital model (IFC; acceptable formats and its advantages)

Preparation of Project Documentation and Rendering

Preparation of Schedules and BOQ (quantity take-off);

Solar Studies – Daylighting simulation

Unit – III: BIM Information Sharing

Concept of Central Model ownership of the digital model and interoperability.

Location of the Central Model

Access to model for the projects various stakeholders – The Client, Architect, Project Managers, Contractor, Structural Engineer, Electrical Engineer, Mechanical Engineer, all specialist consultants and Vendors in some cases.

Other ways of exchange of information, in case of non-availability of common platform like the internet.

Unit - IV: BIM as Project Design and Management Tool

Introduction to 4D and 5D.

Project Estimate and Scheduling; Linking of software like MS Project, Primavera, MS Excel to BIM. Exchange and Analysis of information

Preconstruction study; project optimization

BIM as tool to integrate Sustainability issues to building design and construction process; linking of various sustainability related applications, output and Analysis.

Construction process and Constructability

Unit - V: BIM Execution Plan

Formats being used in different parts of the world to prepare a BIM execution plan.

Need to prepare a project specific BIM Execution plan.

LOD (Level of Development) for project specific requirement – production of Design Drawings, production of Working Drawings, coordination of various trades plus Clash Detection, production Shop Drawings, as-built drawings and compilation of information for Facility Managements (COBIE etc.).

Reference:

1. **Revit 2018 Suite** _ Complete Reference Series, Mc Graw Hill Publication **Mastering Revit Architecture** - Demchak, Dzambazova&Krygiel
2. **BIM Handbook / Eastman**, Teicholz, Sacks, Liston / Wiley
3. **Optional: BIM and Construction Management: Proven Tools, Methods, and Workflows** Hardin / Sybex — A BIM reference with a focus on construction management
4. BIM – WillernKymmell

E-References:

Courses on Coursera and Udemy

Autodesk help: <https://help.autodesk.com/view/RVT/2023/ENU>

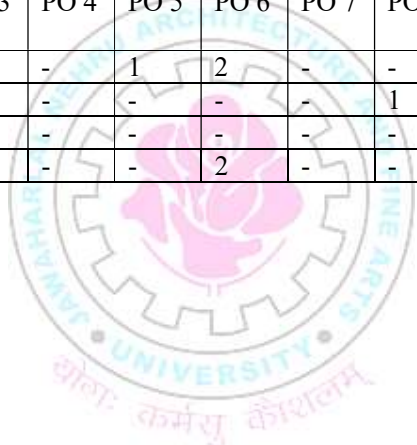
Archicad help: <https://helpcenter.graphisoft.com/user-guide/136632>- online and downloadable formats

Course outcomes

CO1	To Develop Proficiency in creating a BIM model at design stage
CO2	To Recognize the requirement of inter-workability of a BIM model
CO3	To Develop all required architecture drawings and quantities from the BIM model
CO4	To Understand how the BIM model is used during project delivery
CO5	To Collaborate effectively with project stakeholders and teams using BIM workflows.

CO-PO mapping

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	2	-	-	1	2	-	-	-	2	-	-
CO2	1	-	-	-	-	-	-	1	-	-	1	2
CO3	2	1	1	-	-	-	-	-	-	3	1	1
CO4	1	-	-	-	-	2	-	-	2	3	2	1



AR22B6.5C: Human Settlements and Urban Planning

Periods Per Week			CREDITS	Mark			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	-	4	4	50	50	100	W

Objectives of the Course:

- A. To introduce Elements and characteristics of human settlements; Various planning concepts in urban, and regional level development plans in the context of India; Changing scenario in the context of Globalization
- B. To introduces the vocabulary, elements and classification of human settlements.
- C. To give exposure to planning concepts at different scales of settlements.

Unit -I: Evolution of Human Settlements

Historic Evolution: Brief review of the origin of early human settlements, lessons learnt from Medieval and Industrial Revolution times, evolution of Bylaws and Development Control Regulations; Anatomy of human settlements, Elements of human settlements: Nature, shells and networks- their functions and linkages. Classification of human settlements: rural and urban; classification of towns and cities; problems of small towns, medium towns and metropolitan cities in India; Metropolis, megalopolis and conurbation; town planning as Policing and Regulatory authorities; Structure and form of settlements - linear, non- linear and circular, combinations. Reasons for development. Advantages and disadvantages. Case studies. Factors influencing the growth and decay of human settlements.

Unit -II: Planning Theories

Ekistics, Introduction Garden city, Neighborhood unit, Broad-acre city, nuclei theory, sector theory, green belt and satellite town, ribbon development, urban sprawl, inner city problems,

Unit -III: Housing and Transportation

Population growth; Migration; slums, social and environmental problems of slums, habilitation of slums, housing and community facilities,

Classification of land use; Types of housing: detached, semi-detached, row, cluster, group housing leading to neighborhoods, gated communities: implementation of URDPFI guidelines in planning at various levels.

Transportation: Types of transportation; potentials and limitations of roadways, railways, waterways and airways, metro rail, MMTS;

O-D surveys, desire line diagrams, trip generation, distribution and model split

Unit -IV: Urban Planning and Urban Renewal

Urban development plans, programmes and policies from case studies: land use plan and Development control Regulations, Master Plan, Scope, content and limitations of master plan, preparation of Master Plan, Action Plan, Structure Plan, Advocacy Planning, DDP/ZDP, Regional Plan.

Urban renewal, redevelopment, rehabilitation and conservation. Urban development projects – case studies.

Unit -V: Aspects in Contemporary Urban Planning

Globalisation and its impact on cities, new forms of developments: Neighborhoods, Gated-communities, self-sustained communities, SEZ, transit oriented development (TOD), integrated townships, smart cities, Sustainable planning concepts; Case studies.

Reference:

1. C.L.Doxiadis, Ekistics, 'An Introduction to the Science of Human Settlements', Hutchinson, London, 1968.
2. Thooyavan K R, 'Human Settlements- A Planning guide to Beginners', M.A.Publications, 2005.
3. Ministry of Urban affairs and Employment, Government of India, New Delhi, 'Urban Development Plans: Formulation and Implementation-Guidelines', 1996.
4. Andrew D Thomas, 'Housing and Urban Renewal', Harper Collins, 1986
5. V. Nath, 'Regional Development And Planning In India', Neha Publishers & Distributors, 2009.
6. Government of India, 'Report of the National Commission on Urbanisation', 1988.
7. Hansen N., 'Regional Policy and Regional Integration', Edward Elgar, UK, 1996.
8. Taylor, N. (1998) Urban Planning Theory Since 1945, SAGE Publications Ltd.
9. Ramachandran R. (1992) Urbanization and Urban Systems in India, OUP India.

E-Resources:

Online Resources: Nptel, Swayam, edx, Coursera

- <http://tcpo.gov.in/urban-and-regional-development-plans-formulation-and-implementation-urdpfi-guidelines>
- <https://archive.org/details/dli.ernet.234011/page/3/mode/2up>
- <https://onlinebooks.library.upenn.edu/webbin/book/lookupid?key=olbp76674>
- <https://www.studocu.com/in/document/galgotias-university/urban-design-and-construction/human-settlements-and-planning/17478326>
- https://www.academia.edu/37150419/HUMAN_SETTLEMENTS_PLANNING_Com_piled

COURSE OUTCOMES:

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

1. Understand human settlements and the forces that influence the development.
2. Understand the role of planning processes in making positive changes to settlements.
3. Develop appreciate /assess the planning interventions in real time urban development.
4. Understand the relation between built environment and the social, political, religious, sustainability technological and environmental factors that shape urban environment.

CO-PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
AR-6.5-01	3	3	1	1	1	1	-	1	3	2	-	2
AR-6.5-02	3	3	1	1	1	1	-	2	2	3	-	2
AR-6.5-03	3	3	2	-	1	1	1	3	3	2	3	2
AR-6.5-04	3	3	1	-	3	1	2	1	3	3	-	3

1-Low Correlation; 2-Moderate Correlation; 3 –Substantial correlation



AR22B6.6C: ARCHITECTURAL ACOUSTICS AND ILLUMINATION

AR22B6.4C	Periods Per Week		CREDITS	Marks			End Exam
	P/F/O	Total		Internal	External	Total	W/J/S/P
3		3	3	50	50	100	W

Objectives of the course:

- Understand the principles and practices of architectural acoustics and illumination.
- Learn about physical properties of sound and light, design techniques for controlling sound and light in terms of architectural design.
- Recognize and assess the use of materials and technologies to improve acoustical and lighting performance.
- Use design strategies and technologies to improve the acoustics and lighting design in architectural spaces.
- Effectively communicate with experts in acoustics and illuminations and related fields and conduct market research and learn about latest developments.

Course Contents:

Unit I: Acoustics fundamental laws and terminology.

Sound fundamentals and qualities: loudness, frequency and pitch; human ear and sound perception of sound, sound measurement and analysis, subjective aspects of human ear, Decibel scale, Acoustic design guidelines and standards for typology of site/ buildings, Reflection, absorption, and diffusion, Principles of room acoustics design,; coefficient of absorption, The properties of acoustic materials; behavior of sound in enclosed space, reverberation, Sabines formula, echoes, Acoustic modelling and simulations;

Unit II: Room Acoustics

Acoustic design process and considerations for Auditoriums, concert halls, cinema halls, seminar rooms, lecture halls, class rooms, and open offices all have different acoustic design processes and requirements; An auditorium case study with a report containing drawings and reverberation time calculations, and critical analysis; Detailed acoustic design for any building type;

Unit III: Environmental Acoustics: Sources of Noise and types of noise in and around buildings, noise characteristics and effects on humans/behavior; noise curves, noise transmission, Outdoor sound propagation, noise control and noise isolation; noise limitations and standards in communities, Speech privacy and sound masking; sound reinforcement systems;

Unit IV: Fundamentals of Illumination

Light and vision, basic units, photometry and measurement, quality and quantity of light of different sources of light: Daylight and of different types artificial lighting; market survey of lamps with cost and technical specifications;

Advantages of daylighting; design tools in daylighting. Behaviour of daylighting in an interior spaces; Potentials of daylighting as an energy resource

Unit V: Principles and Techniques of Lighting Design

Lighting as determinant of form for architecture with graphic examples; Design of lighting: lumen method, point by point method, design tools, design documentation, Specific lighting design requirement of different buildings such as homes, offices, industrial, hospital, art galleries, museums and exhibitions, case study of at least one type. Conservation of energy in lighting use of daylight, optical fibre lighting, LED in lighting and the emerging trends in lighting.

Reference:

1. National Building Code 2005.
2. Barron. M. (2009). *Auditorium acoustics and architectural design*. 2nd Ed. Taylor & Francis.
3. Cox, T. J. and D'Antonio, P. (2009). *Acoustic Absorbers and Diffusers*. 2nd Ed. Taylor & Francis.
4. Smith, B. J., Peters, R. J. and Owen, S. (1982). *Acoustics and Noise Control*. New York : Longman.
5. Vigran, T. E. (2008). *Building Acoustics*. 1st Ed. Taylor & Francis.
6. Basic Refrigeration and Air Conditioning by A. Ananthanarayana.
7. Building Construction by Rangwala.
8. Architectural Acoustics by M. David Egan.
9. K. A. Siraskar, *Acoustics in Building Design*, Orient Longman Ltd., 1972.
10. S. Kandaswamy, *Architectural Acoustics and Noise Control*, Allied publishers Pvt. Ltd., 2005.
11. Moore, Fuller. *Concepts and practice of Architectural DayLighting*. Van Nostrand Reinhold co.,
12. New York, 1985.
13. Valia, Anil. *Designing with light: A Lighting H.B.* International Lightning Academy, Mumbai, 2002, *Architectural Physics: Lighting*.
14. Hopkinson R.G, Her Majestrip stationery office, London.
15. David Egan. M, *concepts in Architectural lighting* Mc Grew Hill Book company, New York, 1983
16. Catalogues of leading Audio equipments agencies e.g. Philips, Ahuja etc.

Course outcomes

After successfully completing the course the student will able to:

CO1	Describe the fundamentals of sound and light and its behaviour in varied site/building contexts.
CO2	Analyse and assess acoustical and illumination issues in architectural spaces.
CO3	Classify design strategies and technologies to improve the acoustics and lighting of architectural spaces.
CO4	Effectively interact with experts in acoustics and lighting and related areas.

CO-PO mapping:

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	2	-	1	2	-	1	1	2	1	1	1
CO2	2	3	-	1	2	1	-	1	-	-	1	-
CO3	3	1	3	3	-	-	1	1	1	1	2	-
CO4	3	2	3	3	-		1	1	-	1	1	1



AR22B6.xE: PROFESSIONAL ELECTIVE-II

The course, Professional Elective II, to be taught in seminar mode, while keeping the syllabus as a guideline for exploration of the topics. The desired outcome of the course-work is to lead towards publications and readers on the topics.

AR22B6.1 E Theory of Design and Architecture

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	-	4	4	50	-	50	--

Objectives of the Course:

- A. To enable the student of architecture to understand the basics of theory of design
- B. To empower the student with the knowledge of the design process
- C. Understanding and using elements and principles of architectural design
- D. To enable the student to understand and analyze buildings objectively and subjectively

Unit I- Theory of Design

Understanding Design as an integration of Aesthetics and Function; Multi- faceted nature of design as a mixture of creativity and analysis; Position of design and its relation to science, art, technology; Categories of design: Product Design, Interior Design, Architectural Design, Urban Design; Principles and Elements of Design; Gestalt's laws; Golden Ratio, Rule of thirds;

Unit II- The Design Process

Introduction to the Design process - Understanding of formative ideas, organization concepts;

Design thinking as an iterative, non-linear process: An insight into design activity and how designers think; Design thinking as problem solving and decision making; Uncertainties in the design process;

Design thinking terms: Empathy, integrative thinking, experimentalism, collaboration between designers and users, intuitive thinking; Metaphors, Analogy and Symbolism in Design;

The five stages in an typical design process: Understand, Define, Ideate, Prototype, Test

Unit III- Elements of Architecture

Primary Elements in Architecture: Point, Line, Plane, Volume; Form: Properties of Form, Shape, Regular and irregular Forms, Subtractive and Additive Forms; Form and Space: Form defining Space, Qualities of Architectural Space, Degree of Enclosure; Light, View; Organization of Form and Space: Spatial Relationships, Spatial Organization; Circulation; Proportion and Scale in Architecture; Anthropometry; Modular System; Ordering Principles: Axis, Symmetry, Hierarchy, Datum, Rhythm, Repetition, Transformation

Unit IV- Theories in Architecture

Vitruvius' De Architectura-The Vitruvian Triad; Alberti's On the Art of Building; John Ruskin's Seven Lamps of Architecture; The Five Points of Architecture and The Modulor by Le Corbusier; Frank Lloyd

Wright's Organic Architecture; Form follows Function; Less is more; God is in the details; Ornamentation is Crime; Less is a bore; Blobitecture; Defensible space; Isms in architecture – Definitions and basis for classification

Unit V- Analyzing Architecture

Architecture as Identification of Place; Basic Elements of Architecture; Modifying Elements of Architecture; Primitive Place Types; Architecture as making Frames; Ideal Geometry; Themes in Spatial Organization; Space and Structure; Transition; Hierarchy

Unit VI- Architectural Criticism

Architectural Criticism – need and importance; Specific criteria to consider in critiquing architecture: Function-Purpose, Comfort, Practicality, Stability; Form- Composition, Consistency of Style, Aesthetics; Context-Physical and Cultural, Appropriateness, Relevance to Society; User Experience- Perception, Association, Emotion; Sustainability-Feasibility, Efficiency in terms of Material Usage, Energy and Inter-relationship with Nature.

Reference:

1. Form Space and Order, Francis D K Ching
2. Analyzing Architecture, Simon Unwin
3. Precedents in Architecture, Roger H. Clark, Michael Pause
4. Introduction to Architecture, Francis D K Ching



AR 22B6.2E VAASTU SHASTRA

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	-	4	4	50	-	50	--

Objectives of the Course:

- To introduce Vaastu Shastra in terms of the texts, instructors and vocabulary to enable its appreciation.
- To give outline knowledge of the Vaastu Shastra principles dealing with site.
- To introduce the dimensional system and the mandala.
- To give an insight into the methods of design process related to buildings.

Unit –I- Introduction to Vaastu Shastra

Traditional architecture - achievements in India - Source and Meaning of Vastu and Vaastu Classification of Vaastu and Silpins- ancient texts on Vaastu Shastra, Instructors, Importance of Vaastu Shastra,

Unit –II -Site selection, Analysis and Planning

Features of good building site, slope of land, nature of soil, orientation of site, squaring of site, roads adjoining to a plot and veedhi-sulas, location of building on plot, open spaces on site, location of water source, drainage outlet, entrance gate and auxiliary structures, landscaping.

Unit –III - Dimensional System in Vaastu Shastra

Units of measurement - Tala system and Hasta system of measures, dimensional unit based on grain size and human figure, scales for land measurement, prime dimension, modular measurements. Musical measurements compared to space measurements, resultant ambience in built space.

Unit –IV - Concept of Vaastu Purusha Mandala

The celestial grid or vaastu purusha mandala and its types. Difference between Manduka and Paramasayika mandalas, positive and negative energies - importance of cardinal and ordinal directions, flow of energy within built space and outside – spatial arrangement and zoning of functional areas, The Vaastu Pursha Mandala and its significance in position of doors, creation of patterns, and lay-outs.

Unit –V - Making of Buildings

Elemental building shapes, combination of shapes, orientation of building, house types, shala bhavanas, spatial division within house, doors and windows, floor levels, heights of buildings, materials and techniques of construction, aesthetics in architecture based on Vaastu Shastra, analysis of building design of single and multi-storied residential building,

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Develop familiarity with the texts and scope of Vaastu Shastra
2	CO2	Understand the theories, principles and methods of Vaastu Shastra.
3	CO3	Look at Vaastu Shastra from rational perspective and analyse the basic theory
4	CO4	List out the components of a building as per Vaastu Shastra.
5	CO5	Design for a building as per Vaastu Shastra principles.

CO-PO Mapping:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO 1	3	2	-	2	2	-	2	2	-	1	-	2	-	2
CO 2	2	1	-	2	3	1	2	2	-	2	-	2	2	1
CO 3	1	2	-	1	2	3	3	3	-	3	-	3	1	2
CO 4	3	2	-	2	2	1	1	3	1	2	-	1	1	2
CO 5	3	2	-	2	3	2	2	2	2	3	1	3	1	2

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

Reference:

1. **Balagopal.T.S.Prabhu, A.Achyuthan**, 1996, A Text Book of Vaastuvidya, Vaastu vidya prastanam, Calicut.
2. **Bruno Dagens (Tr.)**, 1985, Mayamata, An Indian Treatise on Housing, Architecture and Iconography, Sitaram Bhartia Institute of Science & Research, New Delhi.
3. **D.N. Shukla**, 1998, Vastu-Sastra: Hindu Science of Architecture, Munshiram Manoharlal Publishers Pvt.Ltd.
4. **Ganapati Sthapati**, 2001, Building Architecture of Sthapatya Veda, Dakshina Publishing House, Chennai.
5. **Madhura Krishnamurthy Shastry**, 1996, Vaastu Shastra Vivekamu, Jotishya Vijnana Kendramu, Rajamundry.
6. **Sashikala Ananth**, 1998, The Penguin Guide to VAASTU, The Classical Indian Science of Architecture and design, Penguin Books India
7. **K. Vasudeva Sastri**, 1958, Viswakarma Vastusastram, Sri Vani Vilas Press, Sri Rangam

AR 22B6.3E TECHNOLOGY IN ARCHITECTURE

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	-	4	4	50	-	50	--

Course Overview

The use of technology in architecture today is increasingly relevant and wide ranging. Innovations include Building Information Modelling (BIM), computational design, robotic fabrication, building performance analysis, artificial intelligence allied with digital technologies such as virtual and augmented reality, generative design, drones, walkthrough architecture; these can improve construction as well aid the monitoring of the progress of the construction.

Course Objectives

To understand the development of conventional tools and methods for creating architecture.

To enable the students to understand various technologies for future adaptation and development.

Course Outcomes

- A. Ability to apply historical and modern technological tools in architectural design.
- B. Awareness in digital design and visualization techniques for architecture.
- C. Capability to integrate AI and computational tools in architectural planning.
- D. Understanding and application of intelligent building systems.
- E. Knowledge of smart materials and their feasibility in architectural construction.
- F. Ability to conduct pre-design analysis and generate essential deliverables.

UNIT I: Introduction and Evolution of Technology

History of technologies in the past: In this Unit the role of technology in architecture is explored with reference to its impact on the field, and its implications. Specific examples have been used to illustrate how technological innovations have evolved from need.

Specific examples evolved from need:

Evolution of earth construction, vernacular roof systems; Rajasthan: coping with extremities in weather and igloo, Himachal: building on mountain terrain, Warangal: sandbox foundations, Venice building over water,

Analogue Mechanical and Digital Technologies

Analogue refers to the tangible and personal connections that are nurtured through real-life experiences, genuine conversations, and engaging activities for example, Sketching, drawing, painting and sculpting and crafts

Mechanical technology in architecture has come to mean digital technology and computer aided design. Sophisticated designs can be created using various software techniques. For example, Hand tool, aqueducts, Lifting of large building blocks (in construction of pyramids), making of large columns.

UNIT II: Digital Design Tools and Techniques

Digital design has limits and the use of physical drawings, handmade models, and traditional construction techniques not only adds depth and authenticity to design, but also fosters innovation and sustainability.

Tools for pre design analysis

The Typical deliverables that are obtained or produced at the conclusion of pre-design include:

- Site Survey (Showing topographic information, existing structures, utilities, etc.)
- Geotechnical Report
- Zoning & Preliminary Building Code Analysis
- Program & Project Scope Verification Document
- Owner-Architect Agreement

Revit and AutoCAD and other tools will be discussed

Role of artificial intelligence in architecture

The use of AI is still at an experimental stage. However, it is necessary to comprehend and develop this and it can have a variety of applications

AI for streamlining

Ways in which Artificial intelligence (AI) can help architects. Limits of AI.

UNIT III: Visualization Tools

An Architecture Visualization is the graphical representation of an architecture model or an architecture view of a model. This can be done on paper / printed (physical) or on a computer screen (digital). Using a video, animation, or maquette are ways of architectural visualization.

Construction technologies

The utility of using visualization tools in construction technology are Enhanced Conceptualization, Improved Decision-Making, Accurate Planning and Design, Stakeholder Engagement, Marketing and Presentation, Cost-Efficiency, Compliance and Approvals.

Programming and Visualisation

Visualization tools are essential to successful application development and software architecture management. Some of the popular tools in India are Blender, Archicad, Autodesk Revit, V-Ray, AutoCAD, Google SketchUp, 3DS MAX and Photoshop

UNIT IV: Intelligent buildings and integrated systems

Intelligent (Smart) buildings are a new way of harnessing technology to create a building that better serves its tenants. Smart buildings can use a wide variety of different technologies that either already exist within the building or are fitted specifically for the purposes of collecting information to improve the way the building operates.

Examples of Smart buildings in India and globally.

UNIT V: Smart materials and innovations

Smart-intelligent- buildings are in the process of being preferred by clients. Some materials have been developed to meet specific objectives during their use without the need to be operated by any person or equipment. Self-maintenance, cleaning the air, working with the comfort of space, energy efficiency, are some of the benefits that can be achieved by adopting them.

Material Technologies

Some examples of smart material technologies include Regenerative Bioconcretes, Carbon Concrete, Hydroceramics, Self-Cleaning Materials, self-healing paint, low u value glass, and others

Their feasibility in building construction has to be examined within the context of usage.

Reference:

1. Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2011). BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors (2nd ed.). John Wiley & Sons, Inc.
2. Rastogi, P. (2014). Building with Intelligence: Smart Building Solutions in India. Rupa Publications.
3. Picon, A. (2010). Digital Culture in Architecture: An Introduction for the Design Professions. Birkhäuser.
4. Oxman, R. (2008). "Digital Architecture as a Challenge for Design Pedagogy: Theory, Knowledge, Models, and Mediums." Design Studies, 29(2), 99–120.
5. Menon, A. G. K. (2012). Architecture and Independence: The Search for Identity - India 1880 to 1980. Oxford University Press India.
6. Khosla, A. (2007). Ecohouse: A Design Guide. Orient BlackSwan.
7. Mehta, M., Scarborough, W., & Armpriest, D. (2018). Building Construction: Principles, Materials, and Systems (International Adaptation). Pearson India.
8. Mitchell, W. J. (2003). Me++: The Cyborg Self and the Networked City. MIT Press.
9. Addington, M. D., & Schodek, D. L. (2005). Smart Materials and New Technologies: For the Architecture and Design Professions. Architectural Press.
10. Kolarevic, B., & Klinger, K. (Eds.). (2013). Manufacturing Material Effects: Rethinking Design and Making in Architecture. Routledge.
11. Dixon, D., Levine, M., & Robinson, J. (2016). Urban Design for an Urban Century: Shaping More Livable, Equitable, and Resilient Cities. John Wiley & Sons.
12. Oxman, R. & Oxman, R. (Eds.). (2014). Theories of the Digital in Architecture. Routledge.
13. Sharma, R. (2019). Vernacular Traditions and Contemporary Architecture.
14. Schumacher, P. (2010). The Autopoiesis of Architecture, Volume I: A New Framework for Architecture. John Wiley & Sons.

SEVENTH SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B7.1C	Advanced Design -I	PC	9		9	9	100	100	200	J
2	AR22B7.2C	Advanced Construction Technology & Structural Systems	BS	3		3	3	50	50	100	W
3	AR22B7.3C	Advanced Services	BS	3		3	3	50	-	50	-
4	AR22B7.4C	Building Economics and Valuation	BS	3		3	3	50	50	100	W
5	AR22B7.xE	Professional Elective - III	PE	4		4	4	50	50	100	W
6	AR22B7.xE	Professional Elective - IV	PE	4		4	4	50	50	100	J
7		Open Elective – I									
				26	0	26	26	350	300	650	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Professional Elective -III

1	AP22B7.1E	Urban Design
2	AP22B7.2E	Housing
3	AP22B7.3E	Building Construction Management
4	AP22B7.4E	Interior design
5	AP22B7.5E	Interior Landscape Design

Professional Elective -IV

1	AP22B7.6E	Architectural Journalism
2	AP22B7.7E	Parametric Design
3	AP22B7.8E	Green Buildings
4	AP22B7.9E	Furniture and Product Design

AR22B7.1C ADVANCED DESIGN - I

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
9	0	9	9	100	100	200	J

Objectives of the Course:

- Develop the ability to design spaces that accommodate diverse needs of multiple user-groups, ensuring inclusivity and accessibility.
- Design efficient circulation systems that facilitate smooth movement and connectivity within architectural environments.
- Create strategies and design elements that enhance user navigation and orientation throughout a building or site.
- Integrate local cultural values, traditions, and contextual analysis into architectural designs for meaningful and responsive solutions.
- Apply passive and active design strategies to optimize energy efficiency and sustainability in architectural projects.

Course Contents:

Unit I: Requirements of Multiple User-Groups: Importance of Human-Centered Design, Understanding the complexity involved in working with diversity in user-groups; different hierarchies in the user groups; public, staff, service, VIPs, and differently-abled; relationship between user needs, functions and spatial organization; user behavior and space;

Methods of understanding user needs: surveys, interviews, post-occupancy evaluation, observation, behavior mapping, simulation techniques; study of user flow and circulation patterns;

Preparation of circulation diagram for complex buildings: Adjacency Matrix, Bubble Diagram, Flow Diagrams, Circulation Diagram, Zoning Diagrams and Stack Diagrams;

Developing zoning strategies that address specific needs of the users, while ensuring security, privacy, and access control;

Emphasis on flexible, adaptable spaces and effective circulation planning using various movement patterns (linear, radial, grid, loop, etc.), integrated vertical and horizontal circulation, emergency routes, and crowd flow management for safe and efficient movement in building;

Unit II: Wayfinding: Cognitive mapping and perception of space; user psychology of space usage;

Principles of Wayfinding: Clarity, simplicity and legibility of spaces; Hierarchy of circulation paths: primary, secondary, tertiary routes; Visual cues: landmarks, nodes, edges, paths and districts;

Elements and Tools for Wayfinding: Architectural cues: entrances, atriums, corridors, staircases, escalators, lifts; Signage systems: graphic design, typography, colours, symbols, and language; Environmental cues: natural light, texture, sound, and smell;

Role of spatial layout, visual connections, and landmarks; use of signage: color coding, lighting, and materials;

Unit III: Cultural and Social Context: Cultural and social influences on space requirements; Designing for local identity and heritage; Cultural context in design: Regionalism, Vernacular traditions and local materials, Symbolism, iconography, and cultural narratives in large buildings;

Social context in design: community needs and participation in design process, public Vs. private realms in large buildings; Incorporation of art, symbolism, and community values. Context-sensitive massing, form, and material palette;

Unit IV: Building Envelope: Role of the building envelope: walls, roofs, fenestration, and insulation; Climate Responsiveness: thermal comfort, solar orientation, daylighting, ventilation;

passive vs. active envelope strategies; Performance parameters: thermal performance, air and water tightness, acoustics, fire safety, durability, sustainability, embodied energy; integration of MEP Systems, HVAC integration, lighting control, PV panels, solar shading to the building envelope;

Smart facades, adaptive skins, dynamic glazing, nano-materials; Construction and detailing: joints, fixing systems, waterproofing, maintenance aspects;

Unit V: Energy Efficiency by Design: Need for energy-conscious architecture in large-scale projects;

Climate-Responsive Design: site planning, orientation, massing, landscape integration, wind flow, natural ventilation strategies;

Passive design strategies: Thermal mass, Cross ventilation, atria, courtyards, evaporative cooling, earth air tunnels;

Active Systems Integration: HVAC efficiency, demand control ventilation, high-performance chillers, radiant cooling, energy recovery systems;

Statutory codes and guidelines, norms of ISHRAE; ECBC; GRIHA; IGBC etc.,

Building typology: Special Buildings: Hospitals, Court buildings, Museums, cultural centers, Bus Terminus, Stadia and mixed-use developments

Students shall be encouraged to conduct extensive case studies covering above typologies of buildings analyze the above aspects.

Reference:

1. **William M.Pena, Steven A. Parshall**, Problem Seeking: *An Architectural Programming Primer*, 5th Edition, John Wiley & Sons: 2012.
2. **Romedi Passini**. Wayfinding in Architecture, Environment Design Series, V-4) Van Nostrand Reinhold Company. New York. **1984**
3. **Paul Arthur & Romedi Passini**. Wayfinding: People, Signs, and Architecture. 1st Edition. McGraw-Hill, 1992.
4. **Kevin Lynch**. The Image of the City. 1st Edition. MIT Press, 1960.
5. **Amos Rapoport**. House Form and Culture. 1st Edition. Prentice-Hall, 1969.
6. **Christopher Alexander**. A Pattern Language: Towns, Buildings, Construction. 1st Edition. Oxford University Press, 1977.
7. **Richard. D. Dober**. Campus Architecture: Building in the Groves of Academy. McGraw Hill, New York, 1996.
8. **Koenigsberger, O.H., Ingersoll, T.G., Mayhew, A., Szokolay, S.V.** Manual of Tropical Housing and Building: Climatic Design. Reprint Edition. Universities Press, 2017.
9. **Olgyay, Victor**. Design with Climate: Bioclimatic Approach to Architectural Regionalism. New and Expanded Edition. Princeton University Press, 2015.
10. **Bureau of Energy Efficiency (BEE)**. Energy Conservation Building Code (ECBC). Ministry of Power, Government of India, 2017.
11. **GRIHA Council**. GRIHA Manual: Volume 1–5. The Energy and Resources Institute (TERI), 2011.

E-resources:

https://www.gov.nl.ca/ecc/files/publications-building-envelopes-large-buildings.pdf	Guide to Better Building Envelopes for Large Building 2016
https://beeindia.gov.in	Bureau of Energy Efficiency (BEE), India – ECBC Code
https://www.grihaIndia.org	GRIHA Council – Green Building Rating System
https://igbc.in	Indian Green Building Council (IGBC)

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Analyze and respond to diverse user requirements in complex architectural programs by applying appropriate zoning, accessibility, privacy, and flexibility strategies for different user groups.
2	CO2	Apply circulation planning principles to design efficient and safe movement systems in large buildings, integrating vertical/horizontal circulation and crowd management techniques.
3	CO3	Design effective wayfinding systems using spatial layout, visual hierarchy, materials, and digital technologies, informed by behavioral insights.
4	CO4	Integrate cultural context into public architecture by incorporating local heritage, identity, and symbolic elements into design form and materials.
5	CO5	Implement passive and active energy-efficient strategies in architectural design, including climatic responsiveness, HVAC systems, and renewable energy integration.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PS O 1	PS O 2
CO 1	3	2	3	3	3	2	3	3	2	3	2	3	2	2
CO 2	3	3	3	3	2	3	2	2	2	2	1	2	3	3
CO 3	3	2	3	2	2	2	2	2	3	2	3	3	2	2
CO 4	3	3	2	2	3	2	2	1	3	3	1	3	3	3
CO 5	3	3	2	2	2	2	3	3	2	2	1	3	3	1

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B7.2C: ADVANCED CONSTRUCTION TECHNOLOGY& STRUCTURAL SYSTEMS

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3	0	3	3	50	50	100	W

Objectives of the Course:

- A. Understand the relationship between structural form, geometry, stability, and load transfer in building systems. Analyze economic factors affecting building inputs, land use, and planning in India.
- B. Recognize and apply various structural elements and systems in construction.
- C. Acquire knowledge of advanced construction methods and materials in concrete and steel structures.
- D. Analyze and design advanced and high-rise structural systems according to current standards and protection practices.

Course Contents:**Unit I**

Relation between structure and architecture; Geometry of form and structural function; Aesthetic theories of the expression of structural function in architectural form.

Equilibrium under simple tension or compression; Structural elements: Beams and slabs
Arches and catenaries; vaults, domes and curved membranes; Trusses, Portal frames and space frames.

Unit II

Folded plates like prismatic, V-type, trough type, pyramidal, prismatic and RCC folded plate and geometrical staircases, Shell structures, cyclonical shells, hyperbolic paraboloids, Space frames: Folded plates, shells, cyclonical shells, Hyperbolic paraboloids, free forms.

Unit III

Cable structures: Simply curved suspended roofs, membrane structures, cable structures, combination of cables and struts.

Structural Systems: single and double layer grids; braced domes, ribbed domes, plate type domes, Network domes, Lamella domes, Geodesic domes, Grid domes. Braced and folded structures.

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

Unit IV: Pre-stressed, Post-tensioned, and Modular Construction Technologies:

Introduction to Advanced Construction Systems; Concept and need for pre-stressing, post-tensioning, and modular methods in modern construction; Advantages over conventional reinforced concrete and cast-in-situ construction

Pre-stressed Concrete: Principles of pre-stressing (load balancing, reduced cracking, longer spans); Pre-tensioning methods: sequence, equipment, stressing beds, anchorage systems; Manufacturing process of pre-stressed members (beams, girders, railway sleepers, hollow-core slabs); Quality control and testing in pre-stressing yards

Post-tensioning Technology: Principle and applications in bridges, high-rise floors, and large-span structures; Post-tensioning systems: bonded vs. unbonded tendons; Equipment: hydraulic jacks, anchorage devices, ducts, grouting systems; Construction sequence: duct placement, tendon threading, stressing, and grouting; Case examples in high-rise slabs and segmental bridge construction

Modular and Prefabricated Construction: Principles of modular construction and industrialized building systems; Types: volumetric modules, panelized systems, hybrid approaches; Structural connection methods and assembly techniques; Equipment: mobile cranes, heavy-lift tower cranes, transport logistics, automated fabrication lines; Quality, safety, and speed advantages of modular systems

Unit V: Construction Technology, Methods, and Equipment for Skyscrapers:

Foundation Construction Technologies: Deep foundations: pile driving, drilled shafts, caissons; Diaphragm walls, slurry walls, ground freezing, dewatering equipment; Heavy machinery: rotary drilling rigs, diaphragm wall grabs, piling rigs

Structural Core and Frame Construction: Core-first vs. frame-first construction methods; Slipform and jumpform technologies for cores; High-capacity tower cranes and climbing cranes; Heavy-lift equipment for steel erection (derricks, strand jacks)

Formwork and Concrete Technologies: Self-climbing formwork, jumpform systems, automatic climbing platforms; High-strength concrete pumping technologies (high-pressure pumps, placing booms); Innovations in curing and quality control at height

Steel Construction Methods: Modular steel fabrication and erection sequence; Bolted vs. welded connections at height; Equipment: mobile cranes, high-capacity tower cranes, heavy-duty bolting machines

Facade and Envelope Installation: Unitized curtain wall systems and prefabricated facade panels

Equipment: mast climbers, construction hoists, facade installation rigs; Robotic and automated facade installation methods (emerging technologies)

Vertical Transportation of Materials and Equipment: Construction elevators, hoists, and temporary lift systems; Crane climbing techniques and logistics for supertall projects; Material delivery scheduling and just-in-time methods

Safety and Specialized Equipment: Safety screens, protection decks, netting systems; Fireproofing and cladding application equipment; Monitoring tools: drones, BIM-integrated site logistics

ASSIGNMENTS TO BE FORMULATED:

- Presentations on the different topics with reference to syllabus.
- Discussion sessions on impacts in structuring modern society.
- Case Study Analysis. Model making
- Internal exam
- Index-Based Cost Estimation (Group)

Reference:

1. Chudley, R. – Advanced Construction Technology. A comprehensive textbook covering modern construction techniques, including structural forms, advanced concrete, and steel system.
2. Allen, E. & Iano, J. – Fundamentals of Building Construction
3. Geometry of Structural Form" by L. Lachauer, ETH Zurich
4. B.S. Taranath – Structural Analysis and Design of Tall Buildings
5. Mahesh Varma- Construction Equipment and its Planning & Application
6. Mark Sarkisian- Designing Tall Buildings: Structure as Architecture
7. James Ambrose- Building Construction Enclosure System 1990
8. Andrea deplazes (ED)- Constructing Architecture: Materials processes structures-A hand Book Second Extended edition
9. Robert E Fischer- Engineering for Architecture 1989
10. R Barry- The construction of Buildings Volume 4 4th Edition
11. Schall, Rolf- Curtain Walls: Design Manual. Reinhold Pub., New York, 1962.
12. Sandela, Felix- Architecture and Structuralism. 1963.
13. Lane, Allen- Developments in Structural Form. Penguin Books ltd, London, 1975.
14. Macdonald, J. Angus- Structure and Architecture, 2nd ed. Architectural Press, Oxford, 2003.
15. Michaels, Leonard- Contemporary Structures in Architecture. 1950.
16. Schall, Rolf- Curtain Walls: Design Manual. Reinhold Pub., New York, 1962.
17. Siegel, Curt- Structure and Form in Modern Architecture. Crosby Lockwood and Son Ltd., London, 1962.
18. Subramanian, N- Principles of Space structures. Wheeler and Co., Allahabad, 1983.
19. Zannos, Alexander- Form and Structure in Architecture: The role of statical function. Van Nostrand Reinhold Co., New York, 1987.

COURSE OUT COMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand the relationship between structural form, geometry, stability, stiffness, and load transfer in various construction systems.
2	CO2	Identify and analyze different structural elements and their functions in both concrete and steel construction.
3	CO3	Explore advanced construction techniques in RCC, including pre-stressing, post-tensioning, prefabrication, and modular methods.
4	CO4	Examine advanced structural systems and high-rise structural solutions using concrete and steel, including innovative frameworks and bracing techniques

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PS O 1	PS O 2
CO 1	2	2	3	2	2	2	1	2	1	1	2	3	2	1
CO 2	3	2	1	1	1	2	2	1	3	2	3	3	2	3
CO 3	2	3	2	1	2	2	2	1	3	2	2	3	3	2
CO 4	3	3	2	2	1	2	1	2	3	2	1	2	1	2

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B7.3C ADVANCED SERVICES

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3	0	3	3	50	0	50	----

Objectives of the Course:

- A. Analyze and integrate** advanced building services such as vertical transportation, HVAC, fire safety, mechanical transportation, and automation into architectural designs
- B. Evaluate** the thermal, lighting, and acoustic performance of buildings and propose solutions for complex structures
- C. Apply** knowledge of water supply, sanitation, and waste management systems for large-scale projects, including sustainable and innovative approaches
- D. Understand** the principles of building automation systems (BAS) and smart building technology
- E. Comprehend** the statutory requirements and codes (e.g., National Building Code) related to fire safety and other building services

Course Contents:

Unit I: Vertical Transportation and Specialized Mechanical Systems

Types of Elevators like traction, Hydraulic, Pneumatic Systems, Machine room and Machine room less lifts, Double-decker, sky lobby, lift lobby, lift interiors, Passenger, Capsule, Hospital bed lift, goods lift; Working and operation of lifts, parts of lifts; industry standards planning for Elevators in a building: location in building, serving floors, grouping, size, capacity calculations. shape of passenger car, door arrangement etc.; Provisions to be made in buildings for installation, Service requirements: Quality of service, quantity of service, time, passenger handling capacity, space and physical requirements, machine room spaces and their typical layout;

Escalators and Moving Walkways – Definition, Application; Location and arrangement in buildings; Space requirement Introduction to working and design of escalator; Escalators V/S Elevators, Travelators, Conveyor belts - movement of passengers and goods

Unit II: Electronic Systems in Buildings

Telecommunication and Networking Systems - Introduction to Building Telecommunications: Overview of communication needs in modern buildings; Public Switched Telephone Network (PSTN) and IP Telephony (VoIP): Principles, components, and design considerations; Electronic Private Automatic Branch Exchange (EPABX): Functionality: Call handling, voicemail, conferencing. Architectural Integration: Space requirements for the EPABX room, cabling paths, and power needs. Building Networks: Types of Networks: LAN (Local Area Network), WAN (Wide Area Network). Network Topologies: Star, Ring, Mesh. Cabling Systems: Structured cabling standards (e.g., Cat6,

fiber optic), cable management, and pathways. Wireless Networks: Wi-Fi design and placement of access points;

Security Systems- Threat assessment, layers of security, and the role of the architect, Burglar Alarms and Intrusion Detection Systems, Video Surveillance (CCTV), Access Control Systems; Specialized Electronic Spaces and Infrastructure - Design of Computer Labs, Raised Access Flooring, Server Rooms / Data Centers;

Unit III: Fire Safety and Security Systems:

Fire Fighting Services: Behaviour of fire – ignition, igniter, Combustible contents, causes of fire, Mechanism of fire spread in building and prevention – fire safety standards – concepts in fire protection High temperature effect and combustibility: High temperature effects and combustibility of building materials and structure – Fire resistance of buildings – Classification of buildings based on occupancy – fire fighting installation and requirements; Passive and active fire precautions – site planning and fire brigade access– Roof covering – control of fire spread; Portable fire-fighting equipment, Heat sensitive detectors – smoke detectors –Automatic water system; Built-in wet riser system, dry standpipe, sprinkler system, fire hydrant Fire safety, fire and human behaviour – Means of escape, design and planning of escape halts and corridors to final exit; Psychological aspects – concept of panic – domestic, multiple occupancy and Hospital fires;

Unit IV : Advanced Water Supply, Sanitation and Waste Management

Water Treatment and Recycling: On-site water treatment plants, grey water recycling, and rainwater harvesting. Advanced Sanitation Systems: Vacuum drainage systems, sewage treatment plants (STP), and eco-friendly sanitation solutions, phyto-remedification

Solid Waste Management: On-site waste segregation, composting and pneumatic waste disposal systems.

Unit V: Miscellaneous

NBC standards - cooking gas distribution in buildings, piped gas supplies, bottled gas supply; Hotel services: Specialty services required for hospitality industry, Laundry services, Kitchen services, Channelled Music, Internet; Alternative energy sources for buildings: hot water solar energy system, applications of photo voltaic cells, biomass digesters, wind energy; Heating Ventilation, Air conditioning and Exhaust systems types and placement. Building Automation: Building Management Systems (BMS/BAS): Architecture of a BMS, including a study of controllers, sensors, and actuators. Protocols like BACnet and LonWorks; System Integration: Integration of HVAC, Exhaust systems, lighting, fire safety, and security systems through the BMS.

GUIDELINES FOR LEARNING:

- a. **Integrate with Design:** Don't treat services as a separate subject. For every topic, visualize how the system would be integrated into a building design. Think about how elevator shafts affect floor plates or how pipe risers impact wall thickness. This approach connects theoretical knowledge to practical architectural applications.

- b. **Master the Codes:** The design of building services is heavily regulated by safety and performance codes. You should thoroughly understand the provisions of the National Building Code (NBC), especially those related to fire safety and accessibility. These codes aren't just rules; they are the fundamental design parameters for all service systems.
- c. **Think Sustainably:** Analyze every system from a sustainability perspective. How can an elevator be more energy-efficient? How can you reuse water from an on-site treatment plant? A sustainable mindset ensures that your designs are not only functional but also environmentally responsible and cost-effective in the long run.
- d. **Embrace Software and Technology:** Learn to use software relevant to the field. Tools like BIM (Building Information Modeling) help visualize complex service layouts and avoid clashes. Energy modeling software can help you predict and optimize a building's performance. These skills are essential for modern architectural practice.
- e. **Analyze Case Studies:** Research and study how advanced service systems are implemented in real-world buildings, especially complex ones like airports, hospitals, or high-rise towers. Look at their service drawings, and understand the design decisions made by architects and engineers. This will provide you with concrete examples and solutions to common challenges.

ASSIGNMENTS TO BE FORMULATED: for reference

Task 1: Choose a high-rise building with a minimum of 20 stories (e.g., an office tower, a residential block, or a mixed-use building). Perform a detailed elevator traffic analysis for the building. Based on your analysis, design a complete vertical transportation system.

Task 2: Design the complete electronic systems infrastructure for a multi-floor corporate office building. This includes telecommunications, networking, and security.

Task 3: Select a public building with a high occupancy load (e.g., a hospital, a shopping mall, or a large auditorium). Develop a comprehensive fire safety and egress plan in strict compliance with the National Building Code (NBC)

Task 4: Design a complete water supply, sanitation, and waste management system for a new residential campus with a minimum of 5 residential blocks. The design should prioritize sustainability and a zero-discharge goal

Task 5: Choose a pre-existing building design and propose a plan to convert it into a smart, energy-efficient building. This involves integrating a Building Management System (BMS) and alternative energy sources

INTEGRATION:

The course on Advanced Services is not a standalone subject; it's a capstone course that integrates knowledge from several other core architectural subjects. Students should learn how to coordinate with other design disciplines and ensure the efficient use of resources in the building systems.

Reference:

1. **Building Services Handbook** by Fred Hall and Roger Greeno, 2024.
2. **Time-Saver Standards for Architectural Design Data** by Michael J. Crosbie, Donald Watson, and John Hancock Callender

CO	PO- 1	PO- 2	PO- 3	PO- 4	PO- 5	PO- 6	PO- 7	PO- 8	PO- 9	PO- 10	PO- 11	PO- 12	Linked PO's
CO1	3	-	3	2	1	3	-	-	1	3	-	1	1,3,4,5,6,9,10,12
CO 2	3	3	3	3	3	2	-	-	3	2	-	1	1,2,3,4,5,6,9,10,12
CO 3	-	3	3	-	2	2	3	3	3	1	-	3	2,3,5,6,7,8,9,10,12
CO 4	-	2	1	2	3	3	3	-	3	-	1	2	2,3,4,5,6,7,9,11,12
CO 5	2	3	-	3	2	-	-	3	2	2	3	-	1,2,,4,5,8,9,10,11
1- Low Correlation				2-Medium Correlation				3-High Correlation					

AR22B7.4C: BUILDING ECONOMICS AND VALUATION

Periods per week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3	0	3	3	50	50	100	W

Objectives of the Course:

- A. Understand micro and macroeconomic concepts related to construction and infrastructure.
- B. Analyze economic factors affecting building inputs, land use, and planning in India.
- C. Apply tools like cost-benefit analysis, life cycle costing, and feasibility evaluation.
- D. Use valuation methods, cost indices, and policy guidelines for project decision-making.

Course Contents:

Unit I: Micro and Macro Economic Principles

Basic concepts of micro and macroeconomics: demand, supply, equilibrium, cost minimization, monopoly, inflation, interest rate, and employment. Introduces GNP, GNP, fiscal and monetary systems relevant to construction economics- role of these in construction growth; Demand supply of building materials, labour, housing markets;

Price determination in construction markets; consumer choice, utility, and affordability in housing demand; market structure: perfect composition, monopoly, oligopoly in construction industry

Unit II: Economic Perspectives in Building Industry

Public vs. private sector roles, labour- vs. capital-intensive techniques, and equity in development. Addresses economic issues and decision-making in construction planning and policy; Employment and market trends in building sector; investment, savings and capital formation in real estate and infrastructure; Fiscal and monetary policies influencing construction sector;

Unit III: Applications in Building Economics:

Analysis of land, labour, capital, and materials in building. Market demand, choice of production techniques, and laws of returns. Urban land values, land use, and cost indices relevant to Indian cities.

Cost-benefit analysis in construction projects; Life-cycle costing and value engineering; impact of economic cycles on construction industry; sustainable developments and building economics

Unit IV: Principles & Methods of Evaluation

Definition, importance, and objectives of valuation in architecture; Difference between cost, Price and value; Types of values: book value, market value, salvage value, scrap value, sinking fund value;

Principles governing valuation; Methods: Direct comparison method, rental/income capitalization method, cost approach/ depreciation method, development method;

Factors affecting valuation: location, demand-supply, accessibility, amenities, land use, legal restrictions; Valuation land and buildings: open land valuation, valuation of commercial, and industrial properties; rent fixation basics; Depreciation and obsolescence- types: physical, functional, economic obsolescence; methods of calculating depreciation;

Unit V: Operational economics for Architecture

Cost analysis in building operations: Fixed and variable costs operation, depreciation of building equipment, Life cycle costing and cost-in-use; Economics of building services: Energy economics (electricity, HVAC, renewable integration), Water supply, sanitation, and waste management economics, maintenance and cost optimization

Operational Decision Tools: break-even analysis in facility operation, cost-benefit analysis for retrofitting and Green buildings

ASSIGNMENTS TO BE FORMULATED:

- Presentations on the different topics with reference to syllabus.
- Discussion sessions on impacts in structuring modern society.
- Case Study Analysis.
- Internal exam
- Index-Based Cost Estimation (Group)

Reference:

1. Varian, H.R. (2014). Intermediate Microeconomics: A Modern Approach. W.W. Norton.
2. Dornbusch, R., Fischer, S., & Startz, R. (2010). Macroeconomics. McGraw-Hill.
3. Microeconomics- Pindyck, Robert S & Rubinfeld, Daniel L,
4. Macroeconomics- N. Gregory Mankiw
5. Economics: Principles and Applications- N. Gregory Mankiw
6. Building Economics: Appraisal and Control of Building Design Cost and Efficiency- Ivor H. Seeley
7. Construction Economics: A New Approach
8. Modern Construction Economics: Theory and Application- Gerard de Valence
9. Samuelson, P.A. & Nordhaus, W.D. (2010). Economics. McGraw-Hill.
10. Mishan, E.J. (1981). Introduction to Normative Economics. Oxford University Press.
11. Sen, A. (1999). Development as Freedom. Oxford University Press.
12. Hillebrandt, P.M. (2000). Economic Theory and the Construction Industry. Macmillan.
13. Wells, J. (1986). The Construction Industry in Developing Countries. Croom Helm.
14. RICS (2016). Life Cycle Costing Guidance Notes.
15. CPWD Works Manual (Latest Edition).
16. IS 13152 – Valuation of Real Property.
17. Dutta, B.N. Estimating and Costing in Civil Engineering.

18. Glover & Henderson. Cost Analysis and Estimating for Engineering and Management.
19. Valuation Manuals – Income Tax Department and Institution of Valuers (India).
20. Rangwala, S.C. - Valuation of Real Properties
21. Roshan Namavathi – Theory and Practice of Valuation
22. M.L. Jhingan – Valuation of Real Estate in India
23. Seely I.H. – Building Economics: Appraisal and Control of Building Design Costs and Building Operations

E-resources:

NCERT Economics Textbooks (Class 11 & 12): <https://ncert.nic.in/ebooks.html>

- a. CPWD Publications – Works Manual, Valuation, SOR: <https://cpwd.gov.in/Publication.aspx>
- b. RICS Life Cycle Costing Guidelines (PDF): <https://www.rics.org/.../life-cycle-costing-1st-edition-rics.pdf>
- c. IGR Maharashtra – Ready Reckoner & Valuation: <https://igrmaharashtra.gov.in/>
- d. NITI Aayog – Infrastructure & Construction Reports: <https://www.niti.gov.in/>
- e. RERA Guidelines (Maharashtra/UP): <https://maharera.mahaonline.gov.in/> / <https://www.up-rera.in/>
- f. Internet Archive – Free Books (e.g., Samuelson): <https://archive.org/>
- g. MoSPI – Indian Cost Indices & Statistics: <http://mospi.nic.in/>

COURSE OUTCOMES:

After the completion of this course, students will be able to:

COURSE OUTCOME	DESCRIPTION
CO1	Understand and apply micro and macroeconomic principles in construction and urban development contexts
CO2	Analyze economic issues related to building inputs, land use, and infrastructure projects in India
CO3	Evaluate construction projects using cost-benefit analysis, life cycle costing, and valuation techniques
CO4	Interpret and utilize regulatory frameworks, cost indices, and market data for informed decision-making in construction

Building Economics and Valuation CO-PO Mapping

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
AR-7.4-01	3	2	1	2	1	1	3	1	2	2	2	2
AR-7.4-02	2	3	1	2	-	3	-	3	2	2	3	2
AR-7.4-03	3	1	2	2	1	1	1	2	2	3	1	1
AR-7.4-04	2	2	1	3	3	1	2	1	3	2	2	2

1-Low Correlation; 2-Moderate Correlation; 3 –Substantial correlation

AR22B7.xE PROFESSIONAL ELECTIVE – III**AR22B7.1E URBAN DESIGN**

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	W

Objectives of the Course:

- To create awareness in students in the subject ‘Urban Design’ as a specialization in the area of architecture and urban planning.
- To introduce the idea of the city and its components that shapes the urban form, space and structure.
- To impart the knowledge about various developments in the field of urban design theory and their applications

Course Contents:**Unit I: Definition**

Discussion on Architecture, Urban design, Town Planning Interface. Urban Morphology and Elements of Urban Design. Nature of urban design projects in public and private developments.

Unit II: History

Classical cities, medieval towns, neoclassic cities, and industrial towns. Characteristics of towns built by Hindu and Muslim rulers in India. Colonial inheritance, growth of post towns, civil lines, cantonments, railway and resort towns and Design in New Delhi.

Unit III: Theories

Modern movements in city design such as ‘city- beautiful’ and ‘Garden city’ movements, utopian model Towns in the west. Changing structure of cities: sectors, blocks, streets, squares, buildings and open spaces.

Unit IV: Urban Development

Role of planning agencies such as development authorities, Urban Arts Commission in the design of cities. Influence of city development policies namely Master plans, zoning regulations, on Urban Design. Built-form and space requirement in residential, commercial industrial and recreational land uses, activities. Patterns of subdivision and land-development.

Unit V Design Elements

Elements of urban spaces: squares and streets. Use of landscape in urban design, such as tree avenues, street fencing, sidewalks etc. Lighting and illumination of cities, methods of lighting, signage and elements of utility services in the city. Urban conservation and its role in urban design

Reference:

1. **Bacon, N. Edmund.** Design of Cities. Penguin Books, New York, 1976.
2. **Benevolo, Leonard.** History of the City.
3. **Krier, Rob.** Urban Space, 3rd ed. Academy Editions, London, 1984.
4. **Moughtin, Cliff and Others.** Urban Design: Ornament and Decoration. Butterworth-Heinemann, London, 1995.
5. **Moughtin, Cliff.** Urban Design Street and Square.
6. **Mumford, Lewis.** City in History: Its origin transformation and its prospects.
7. **Sprelregen, Paul.** Urban Design: The Architecture of Towns and Cities.
8. **Lynch, Kevin,** the Image of the city Cambridge mass: MIT press, 1965

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Define the role of Urban Design as specialization in the area of Architecture and Urban Planning
2	CO2	Discuss the development of urban design from historic to the present times.
3	CO3	Understand the various theories of Urban design and their applications
4	CO4	Design the elements of urban space, form and structure.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO 1	3	2	1	-	-	-	-	1	3	-	-	1	-	2
CO 2	3	2	1	-	2	1	-	-	-	1	2	1	-	2
CO 3	3	-	1	2	3	2	-	2	-	2	-	1	-	2
CO 4	2	2	3	3	-	1	2	-	1	1	-	2	3	-

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B7. 2E HOUSING

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	W

Objectives of the Course:

- To understand the historical evolution, typologies, and current challenges of housing in India.
- To analyze socio-economic and policy factors influencing housing design, including government schemes, community needs, and the role of public and private housing agencies.
- To interpret and apply housing standards, development control regulations, and neighborhood planning principles for various housing contexts such as urban, rural, and employee housing.
- To develop context-sensitive housing design solutions that integrate appropriate materials, participatory design processes, sustainable technologies, and spatial planning strategies.
- To enhance critical thinking and design skills through the analysis of real-life case studies, participatory methods, and emerging trends in housing design.

Course Contents:

Unit I: Housing in India

Brief review of historical development of Housing; Housing typologies in various climatic regions and contexts; Housing situation in India- issues of urban density, low-rise, mid-rise and high-rise

Unit II: Socio-Economic aspects

Social factors influencing housing design, social diversity, identity, economic factors and financial aspects of housing, housing schemes for various sectors- sites and services, slum upgradation and redevelopment, social housing schemes, incremental housing, affordable housing.

Unit III: Housing Standards

Standards and development control regulations for urban housing, rural housing, employee housing, etc. Neighborhood concept, Social and Physical infrastructure;

Unit IV: Housing Layout and Design

Row housing, Cluster housing, Co-housing, eco-housing; Issues in preparation of housing layout- Hierarchy of open spaces and street patterns, connectivity and integration, emerging trends in housing design; Relevant Case studies of different categories of Housing;

Unit V: Housing Process

Participatory Design Process, self-help and people's involvement in housing projects and perceived user satisfaction; Housing agencies and their role in housing development, issues of appropriate materials and technology and quality of built environment;

Reference:

1. Vohra, B. B. (1983). *Housing in India: A study of human settlements*. New Delhi: Chetna Publications.
2. Hiraskar, G. K. (1985). *Low cost housing in developing countries*. Mumbai: Dhanpat Rai Publications.
3. Cadman, D., & Topping, R. (1995). *The urban housing manual: Making regulatory frameworks work for the poor*. London: Earthscan.
4. Bureau of Indian Standards. (2016). *National Building Code of India 2016*. New Delhi: BIS.
5. Lynch, K. (1984). *Site planning* (3rd ed.). Cambridge, MA: MIT Press.
6. Roaf, S., Fuentes, M., & Thomas, S. (2007). *Ecohouse: A design guide* (3rd ed.). Oxford: Architectural Press.
7. Papanek, V. (1985). *Design for the real world: Human ecology and social change* (2nd ed.). London: Thames and Hudson.

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Demonstrate knowledge of the historical evolution and typologies of housing in India.
2	CO2	Assess the impact of socio-economic, cultural, and policy factors on housing design.
3	CO3	Apply relevant development control regulations, housing standards, and neighborhood planning principles.
4	CO4	Design sustainable housing solutions.
5	CO5	Interpret case studies to develop participatory and context-responsive housing designs for the future needs.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
01	3	2	2	2	1	2	1	2	–	3	–	2
02	2	3	2	2	–	2	2	2	2	3	2	2
03	3	3	3	2	2	3	3	2	3	2	2	2
04	3	3	3	3	3	3	2	2	2	3	2	3
05	2	3	2	3	2	3	2	2	1	3	3	3
Average	2.6	2.8	2.4	2.4	1.6	2.6	2	2	1.6	2.8	1.8	2.4

AR22B7.3E: BUILDING CONSTRUCTION MANAGEMENT

Periods per week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	W

Objectives of the Course:

- A. To know the importance of construction management in architecture
- B. To understand intricacies of a project management in construction
- C. To learn to control the quality of a project's scope, time and cost.
- D. To apply the management techniques
- E. To understand the networking methods in construction management.
- F. To learn to control the various costs of a project.

Course Contents:

Unit I: Introduction to Construction Management

The role of construction projects in the development of our nation; the importance of Management in Construction; the roles and responsibilities of Construction team, the Construction Manager and authorities of Project Management Organization.

Management Techniques: Stages of Planning for Construction Projects: Principles and objectives of planning; Scheduling in project: Definition, advantages and methods of Scheduling viz., Bar chart, Milestone chart, Controlling, Life cycle curves. Job layout and work break down structure.

Project Management through Networks

Terminology of network methods in project management; Types of network methods, outcome of each type; rules for drawing a network, Fulker son's Rate of numbering the events. Introduction to PERT and CPM methods, differences between PERT and CPM and finding the critical path

Unit II: Construction Management Parts

Equipment Management: Introduction to construction equipment, performance, characteristics and usage of equipment used in large scale projects.

Materials Management: Materials of construction, classification codification, ABC Analysis, estimation of materials procurement, inventory / stock control, purchase Procedures and stores management

Human Resource management: manpower estimation at various stages, recruitment, training, under manning and over manning.

Quality control in Construction: Importance of quality, elements of quality, organization for quality control, quality assurance techniques.

Unit III: Legislative Acts Knowledge and Safety Management

Labour Legislations pertaining to construction industry, payment of wages act, migration Act, Factories Act, Contract Labour Act, Labour Welfare Fund Act, Workmen's Compensation Act., etc.

Construction Safety Management: Importance of safety causes of accidents, safety

measures, safety benefits to employees, employees and customers

Unit IV: Money and Economics of Project Management

Economic analysis of projects: economic studies, sensitivity analysis. Cost estimating principles, parameter estimation, detailed estimates, cost concepts, classification of costs, elements of costs, and cost analysis for control.

Budgetary Control Systems: Types of budgets, new approaches for budgeting, responsibility of accounting, profit centre approach.

Financial Management: Meaning and scope, financial statement analysis, ratio analysis, funds flow analysis.

Working Capital Management: Meaning, policy for working capital, estimating working capital needs. Capital investment decision, long term financing working of financial institutions in India and abroad, self-financing, financing mechanisms.

Unit V: Value Engineering and Programming

Value engineering: Definition, value engineering in construction project management, job plan- Phases: information, function analysis, creative, evaluation, development, presentation, implementation; Application of FAST (Function Analysis System Technique) diagrams at a basic level

Value engineering applications: Role of Value Engineering in design decision-making, examples of cost vs, performance trade-offs, life cycle costing

Distinction between cost reduction and value improvement; concept of value index
Introduction to the Linear programming, Transportation problem and Sensitive analysis.

Reference:

1. **Gupta, B.L. and Gupta, Amit.** Construction Management, Machinery and Accounts, 3rd ed. Standard Pub, 2005.
2. **Loraine, R.K.** Construction Management in Developing Countries. Thomas Telford, London, 1993.
3. **Srinath, L.S.** PERT and CPM Principles and Applications, 3rd ed. Affiliated East-West Press, New Delhi, 2003.
4. **Singh, Harpal.** Construction Management and Accounts 14th ed. Tata McGraw-Hill P Pub., New Delhi, 1981.
5. **Gould, E. Frederick and Joyce, E. Nancy.** Construction Project Management. Prentice Hall, New Jersey, 2000.
6. **Shrivastava, U.K.** Construction Planning and Management, 3rd ed. Galgotia Pub., New Delhi, 2004.
7. **Kelly, J., Male, s., & Graham, D.,** Value Management of Construction Projects
8. **Mukhija, V.K.** Value Engineering: Concepts and Applications in Engineering and Management.

E-resources:

https://www.cmaanet.org/about-us/what-construction-management	Introduction to Construction Management
https://www.prospects.ac.uk/careers-advice/what-can-i-do-with-my-degree/building-and-construction-management	Building and construction management
https://www.wrike.com/project-management-guide/faq/what-are-project-management-skills/	Project management basics, skills and methodologies.
https://iclg.com/practice-areas/construction-and-engineering-law-laws-and-regulations/india	Legal view in construction management
https://www.sciencedirect.com/science/article/pii/S1110016818302126	Linear programming applications in construction sites
https://www.gordian.com/resources/value-engineering-for-construction/	Value Engineering for Construction: A 6 Step Methodology

COURSE OUTCOMES

After the completion of this course, students will be able to:

S No.	COURSE OUTCOME	DESCRIPTION
1	CO1	<i>Access the importance of construction management in architecture.</i>
2	CO2	<i>Apply intricacies of a project management in construction</i>
3	CO3	<i>Control the quality of a project's scope, time and cost.</i>
4	CO4	<i>Exercise the management techniques in profession.</i>
5	CO5	<i>Implement the networking methods in construction management.</i>

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

AR.17B 7.3E:	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO-1	3	2	-	-	2	2	-	-	2	2	2	2	2	1
CO-2	2	2	-	2	-	2	-	2	2	2	2	2	3	2
CO-3	-	2	-	2	-	2	2	2	2	2	2	-	1	2
CO-4	3	2	-	2	2	2	2	2	2	2	-	-	3	2
CO-5	2	2	2	-	2	2	-	-	2	2	-	2	2	2

AR22 B7.4E INTERIOR DESIGN

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	50	W

Course overview:

This course introduces students to the study and practice of Interior Design within architectural contexts. Emphasis is placed on understanding spatial design from human, cultural, and material perspectives, while developing foundational skills in planning, evaluation, and aesthetic decision-making related to interior environments.

Objectives of the Course:

- A. To introduce students to the principles, scope, and professional practices of interior design.
- B. To develop skills in human-centered space planning using ergonomics, anthropometry, and cultural considerations.
- C. To provide an understanding of interior elements—materials, furniture, lighting—and their role in functional and aesthetic design.
- D. To build knowledge of color theory, visual perception, and their application in creating mood, harmony, and thematic coherence.
- E. To explore historical and global influences in interior design, fostering appreciation for diverse traditions and contemporary trends.

Course Contents:

Unit I – Foundations of Interior Design

An introduction to the discipline, profession, and evolution of interior design; roles and responsibilities of an interior designer; scope of services; Concepts of design elements and principles—form, space, texture, color, rhythm, harmony, and balance—and their application in shaping interior environments

Unit II – Human-Centered Space Planning

Exploration of spatial organization informed by ergonomics, proxemics, anthropometry, and behavioral psychology; Emphasis on user experience, privacy, comfort, and cultural context in planning interior layouts for residential and commercial spaces;

Unit III – Interior Elements: Materiality, Furniture, and Lighting

Study of key components that define interior spaces—furniture systems, lighting strategies (ambient, task, accent), surface materials, furnishings, and artwork; Overview of lighting types and techniques, quality of light, material selection based on function, aesthetics, and sustainability.

Unit IV – Color Theory and Visual Perception

Understanding the role of color in spatial perception, mood, and functionality; Study of color theory, lighting effects, color psychology, symbolism, and cultural associations; Development of color schemes in relation to design themes and user needs;

Unit V – Historical and Global Influences in Interiors

Survey of furniture and interior styles from ancient to modern periods, including Egyptian, Classical, Renaissance, and contemporary movements; Analysis of international design traditions—French, Japanese, Italian, English—and their influence on current practices; Brief introduction to notable interior designers and their contributions.

A detailed study involving the design aspects of any one of the following: Furniture Design, Product design, Lifestyle accessories, Luminaire design, Signage.

Reference:

1. Ching, F. D. K., Interior Design Illustrated, Wiley, Latest Edition.
2. Pile, J. F., Interior Design, 4th Edition, Pearson, 2013.
3. Kilmer, R., & Kilmer, W. O., Designing Interiors, Wiley, Latest Edition.
4. Binggeli, C., Materials for Interior Environments, Wiley, 2011.
5. Abercrombie, S., A Philosophy of Interior Design, Harper & Row, 1990.
6. Feisner, E. A., Color Studies, Fairchild Books, Latest Edition.
7. Lawson, B., The Language of Space, Routledge, 2001.
8. Gura, J., & Wood, H., Interior Design in the 20th Century, Allworth Press, 2005.

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand the fundamentals, scope, and professional responsibilities in interior design practice.
2	CO2	Apply ergonomic, anthropometric, and cultural factors to create effective space planning solutions.
3	CO3	Integrate and select appropriate materials, furniture, and lighting to enhance functionality and aesthetics.
4	CO4	Develop color schemes based on color theory, psychology, and user requirements.
5	CO5	Analyze and draw inspiration from historical and global interior styles for contemporary design projects.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PS O 1	PS O 2
CO 1	3	2	3	3	3	2	3	3	2	3	2	3	2	2
CO 2	3	3	3	3	2	3	2	2	2	2	1	2	3	3
CO 3	3	2	3	2	2	2	2	2	3	2	3	3	2	2
CO 4	3	3	2	2	3	2	2	2	3	3	1	3	3	3
CO 5	3	3	2	2	2	2	3	3	2	2	1	3	3	1

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B7.5E INTERIOR LANDSCAPE DESIGN

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	W

Objectives of the Course:

The objective of the subject is to enable students to understand and apply:

- A. To understand the principles and techniques of interior landscape design
- B. To develop the ability to think critically to design interior landscape for various contexts.
- C. To learn the selection and maintenance of indoor plants
- D. To understand the importance of sustainable design practices in interior landscape design
- E. To develop skills to design and execute indoor landscape for small and medium scale projects.

Course Contents:

Unit I: FUNDAMENTALS OF INTERIOR LANDSCAPE

Definition of interior landscape, the **purpose** of interior Landscapes. **Understanding** the inter-relationship between the interior design, architecture, and landscape.

Brief review of indoor Landscape in history in various periods and contemporary use invarious **typology** of buildings such as residential, commercial, hospitality, recreational and institutional buildings.

Principles and concepts on design of aesthetic, functional, sustainable and wellbeing indoor environments. **Green concepts** related to Climate control, indoor air quality, noise control, energy saving in indoors, address sick building syndrome issues. Bio-climatic and Biophilic approach to design of indoor Landscapes.

Scope of interior Landscapes, its wide range of **applications** and Interior Landscape as profession.

Unit II: SPATIAL ANALYSIS AND DESIGN

Space Inventory and Appraisal: Documentation of architectural components such room configuration, windows, orientation, semi-outdoor spaces and linkages to outdoor spaces, the interior spaces, furniture, and decoration. Documentation of existing infrastructure such as lighting, sources of water, drainage outlets etc.

Space evaluation for functional requirements - Spatial relation with various activities, up cycling of indoor spaces, subdivision of large spaces, circulation, privacy, safety factors, aesthetic sensitivity. Assessment of quality and penetration of day light, indoor temperature, indoor air quality, noise levels etc.

Principles of spatial planning: Understand the basic principles of design layout, interior landscaping features and types. Indoor landscape design for different contexts and typologies- Case Studies.

Unit III: DESIGN WITH INDOOR PLANTS

Introduction to indoor planting design: Growing importance and role of indoor plants in interior Landscape.

Study of indoor plants – classification and characteristics of indoor plantation in Indian context; Botanical nomenclature, anatomy, and physiology of plants; Physical attributes of plants- such as form, colour, flower, foliage, texture, size, and shape. Study of Evergreen, Deciduous, Cacti and succulents, creepers with reference to use in Indoor Landscapes; Factors affecting the Plant growth – light, temperature, Relative Humidity, water quantity and quality, planting medium/soil, mulchand water, Nutrition/fertilizer, size of planter/pot, acclimatization and site adaptability;

Design with indoor Plants –Basic principles of planting design. Plant selection criteria – appearance, functional and visual effects of plants in relation to Plantscape and interior design;

Plant selection/grouping and Planting plan –Pots, hanging baskets, terrariums, Bonsai, green walls/screens, container gardens, hydroponic containers, small scale indoor/balcony spaces, enclosed courtyard gardens.

Unit IV: INDOOR LANDSCAPE ELEMENTS

Indoor Landscape elements- Pathways, stepping stones, feature walls, rocks and boulders, sculptures, decks, other features like planters with materials- stone, wood, fibre, etc.

Types of seating, Indoor lighting and light fixtures, Water features-fountains, pools, ponds, spouts, artificial waterfalls; Plant containers-Terracotta pots, fibre pots, PVC pots, plastic pots, ceramic pots, stone containers, cement containers, metal containers;

Vegetation as Indoor Landscape element - Focal Plant, accent plants,grouping and composition of plants for foliage and colour effects. Use of lawns, shrubs and climbers;

Indoor gardens-Green Garden (Softscaping), Living Green Walls (Vertical gardens), Terrace/ Balcony gardens, and Floating Indoor Landscaping, Stone Landscaping, Horticulture, Micro-farming, Hydroponics and Green houses.

Unit V: INDOOR LANDSCAPE CONSTRUCTION, SERVICES AND MAINTENANCE

Construction: Working details for construction of indoor landscape elements - Planter boxes, Water features, water proofing, vertical gardens, terrace garden- trellis, sub surface drainage, seats, Lighting, etc.

Services and Maintenance: Pruning, grooming, day light requirement, repotting- change of soil, light weight planting medium, soil fertility-Composting, foliage cleaning and pest management;

Electrical wiring and insulation, Lighting, Irrigation systems- manual, drip, automatic and other watering mechanisms, climatic and moisture control equipment, provision and cleaning run off drains, pumps, motors, and aerators. Water features- cleaning and maintenance, clogging of services lines, sub surface drainage, tools, and equipment for garden maintenance; Intelligent management systems, periodical inspections for services;

INTEGRATION: This course integrates with a wide range of architecture courses, such as interior design, sustainable design, and landscape architecture. It builds upon fundamental knowledge of architectural design as well as specialized knowledge of interior landscape design. The principles studied in this course can be integrated into architectural projects and design development.

GUIDELINES FOR LEARNING:

1. Readings on development and design of interior landscape.
2. Document and Analyse indoor built spaces for integration of indoor landscape.
3. Site Visits to nurseries to understand physical and physiological characteristics and selection of indoor plants for various contexts.
4. Study of landscape elements through various examples, market surveys and case studies
5. Visit projects in execution stage, gaining knowledge on codes and standards for implementation and maintenance.

ASSIGNMENTS TO BE FORMULATED:

1. Presentation on trends in indoor landscape design.
2. Review and Report writing on Indoor landscape projects comparing with standards.
3. Case Studies- Primary/ Secondary and Site Visits
4. Quiz's, Market Surveys, and inventory check list
5. Planting Design and Planting Plan (Marking Layout)
6. Prepare working drawing with BOQ for the Plant Material, Lights, type of light fixtures, and elements, etc.

Reference:

1. **Krouse, R.**(2019). Interior Landscaping: Publication for the Interior Landscaping Company.

2. **Lohr, V.I.** (2017). Interior Plants May Improve Worker Productivity and Reduce Stress in a Windowless Environment. Journal of Environmental Horticulture, 35(1), 44-47.
3. **Nelson Hammer**, Interior Landscape Design, ASLA, published in 1991
4. Planting Green Roofs and Living Walls Hardcover – April 15, 2008_by **Nigel Dunnett** (Author), **Noel Kingsbury** (Author)
5. Interior Landscape Design: A Guide to Designing Sustainable Spaces by **Randall B. Moody**
6. Planting Design for Dry Gardens: Beautiful, Resilient Groundcovers for Terraces, Paved Areas, Gravel, and Other Alternatives to the Lawn by **Olivier Filippi**
7. The Green House: New Directions in Sustainable Architecture by **Alanna Stang** and **Christopher Hawthorne**
8. Organic Gardening for Dummies by **Ann Whitman**
9. Landscaping with Native Plants of Texas and the Southwest by **George**

E-resources:

https://www.plantsnap.com/#:~:text=PlantSnap%20is%20the%20most%20high,plants%20in%20our%20searchable%20database.&text=Identify%2090%25%20of%20all%20known%20species%20of%20plants%20and%20trees.,-585%2C000%20species%20in	Plant Snap mobile app - plant identification tool
https://www.asla.org/	American Society of Landscape Architects (ASLA) - online resources and professional journals
https://www.greenroofs.com/	Greenroofs.com - online resource for green walls and roofs
https://www.wiley.com/en-us/Biophilic+Design%3A+The+Theory%2C+Science+and+Practice+of+Bringing+Buildings+to+Life-p-9780470163344	Biophilic Design: The Theory, Science and Practice of Bringing Buildings to Life by Stephen Kellert
https://www.plantscape.com/interior_1.htm	Plantscape Interior landscaping
https://planterra.com/wp-content/uploads/2019/04/PlanterraLightingGuide4.19.pdf	Planterra Lighting Guide For Interior Landscape Design By Shane Pliska
https://www.academia.edu/31741381/soft_landscape_elements_importance_and_implications_on_thermal_control_in_tropical_buildings?email_work_card=title	Soft Landscape Elements: Importance And Implications On Thermal Control In Tropical Buildings by Dorcas Ayeni

https://planterra.com/what-are-the-best-irrigation-methods-for-interior-plants/	Mastering Irrigation For Building Interiors
https://ntrs.nasa.gov/api/citations/19930072988/downloads/19930072988.pdf	A Study of Interior Landscape Plants for Indoor Air Pollution Abatement by B. C. Wolverton.
https://www.plantmaid.com/best-indoor-plant-watering-systems-for-holidays/	Watering plants while on holiday by plat whisperer.

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.NO.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand the principles of design and relevance of interior landscape design
2	CO 2	Understand and analyse built spaces in the context of integrating architecture, interior design, and landscape to develop skills to design indoor landscape projects.
3	CO 3	Study and select appropriate indoor plants based on their aesthetic and functional characteristics for sustainable indoor environments.
4	CO 4	Design/select Landscape elements that enhance and integrate with interiors.
5	CO 5	Prepare detailed technical drawings for execution, maintenance, and management of indoor landscape.
This course focuses on designing interior landscapes that not only enhance the aesthetic value of a building but also contribute to the well-being of the occupants. The students will learn the principles and techniques of interior landscape design, plant selection, and maintenance. The course will cover the analysis of site conditions, program requirements, design concepts and qualities, and design presentation and documentation.		

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:													
CO	Core Competence	Problem analysis	Development of design solution	Innovative solution	Appropriate Research	Development in real world situations	Sustainable Development	Ethics	Challenges of Built Environment	Communication	Project management and finance	Lifelong learning	Linked PO's
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	
CO1	3	-	-	-	3	2	1	-	-	1	1	2	1,5,6,7,10,11,12
CO 2	2	3	3	3	2	2	1	1	2	-	2	-	1,2,3,4,5,6,7,8,9,11
CO 3	3	-	2	-	3	-	3	-	3	2	3	3	1,3,5,7,9,10,11,12
CO 4	-	2	3	3	2	2	2	2	2	1	1	2	2,3,4,5,6,7,8,9,10,11,12
CO 5	3	-	1	2	-	3	1	-	3	3	3	1	1,3,4,6,7,9,10,11,12
2- Low Correlation 2-Medium Correlation 3-High Correlation													

PROFESSIONAL ELECTIVE – IV

AR-22B7.6E ARCHITECTURAL JOURNALISM

COA Group	Periods/Hours per week			CREDITS	Marks			End Exam Type
	L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
PE	4	0	4	4	50	50	100	J

Objectives of the Course:

- To make students aware about Architectural Journalism
- To encourage them for Architectural writing, Documentation and Page Composition
- To familiarize students in preparation of Book Reviews and Articles.

COURSE CONTENTS

Unit I: Architectural Journalism – Basic Principles

What is Journalism and its importance, scope and constraints of print, audio and visual architectural journalism in the context of newspapers, radio, film, and television; Relation between Architecture and Journalism; Roles of architectural journalist as a reporter, reviewer, cartoonist, interviewer, feature writer and specialist writer; Analysis of historical and contemporary examples of writings on architecture and critics; Different approaches, attitudes, and biases in covering design; Works of Indian and international writers and critics.

Unit II: Architectural Writing

Usage of language, Vocabulary and grammar; Methodology of writing; Writing on different kinds of articles - from news stories to critical essays on particular buildings and social issues; Development of writing skills: essays, news writing, precise writing, writing in architectural blogs; analyze talks, information gathered and to edit the gathered information to build an article; Gather information and to do research for stories and then write various kinds of articles about built environment in Architecture;

Unit III: Architectural Criticism

Introduction to Criticism and Importance of Criticism; Relationship between Architecture and Criticism; Reading the various articles from the magazines, newspapers and websites about the built environment to understand the criticism and social commentary; Analysis of various critical themes, comparison and to criticize a built environment in various aspects.

Unit IV: Photo Journalism

General introduction to the art of photography: concept of color; concepts of lighting, distance, visual angle, frames; media; Photographic Techniques: Types of cameras, properties and priorities; Exposure, Aperture, Speed; EDFAT methods in using the camera; Learning the techniques of clicking photographs through specific angles of built environment, their

editing and modification; Technique on how the photographs support the write-ups about the built environment, to help them understand the expression of pictorial, verbal and visual relationship of architecture journalism

Unit V: Contemporary Journalism:

Building pictures - Instant, Report - Editing - Editorial thinking – the picture Editor - Editing practices, creating drama - Photo editing -Documentary-evolution of the word document-methods and techniques;

Issues and Potential: Role of an architect as a writer and journalist in scripting the narrative of architecture; Topics relevant and needed in architectural journals, current issues; Mass Media and Public Opinion – critique of architecture through new age journalism and technology; Issues of code of ethics, copyright, royalty, publishing rights and policies; Citation and plagiarism.

ASSIGNMENTS TO BE FORMULATED:

1. Presentations on the techniques of writing different genres
2. Discussions of various readings to familiarize and analyze the methods and styles of writing.
3. Writing assignments related to the genres culminating in a term paper
4. Interactions with architectural writers and journalists to share their experience / perspective
5. Visit to Publication / Media house to understand the process of publishing

Reference:

1. Wiseman, Carter (2014), “Writing Architecture: A Practical Guide to Clear Communication about the Built Environment”, Trinity University Press
2. Lange, Alexandra (2012), “Writing About Architecture: Mastering the Language of Buildings and Cities”, Princeton Architectural Press
3. Schmalz, Bill (2014), “The Architect's Guide to Writing: For Design and Construction Professionals”, Images Publishing Dist Ac
4. Sykes, A. Krista (2007), “The Architecture Reader: Essential Writings from Vitruvius to the Present”, George Braziller Inc.
5. Musa, Majd, Al-Asad, Mohammad (2007), “Architectural Criticism and Journalism”, Umberto Allemandi & Co
6. Edward Jay Friedlander and John Lee (2000), “Feature Writing for Newspapers and Magazines”, 4th edition, Longman.
7. Dave Saunders, Professional Advertising Photography, Merchurst, London 1988
8. Julian Calder and John Garrett, The 35mm Photographer’s Handbook, Pan Books, London 1999
9. Julie Adair King, Digital Photography for Dummies, COMDEX, New Delhi 1998
10. Architecture and the Journalism of Ideas by Bender, Thomas
11. Architectural Criticism and Journalism by Mohammad al-Asad w/ Majd Musa
12. Nieman Reports: Architectural Criticism: Dead or Alive by Blair Kamin.
13. The Failures of Architecture Criticism, by Lance Hosey in the Huffington Post.
14. Writing Architecture: A Practical Guide to Clear Communication about the Built Environment, by Carter Wiseman

E-resources:

1. https://www.jstor.org/?utm_medium=website&utm_source=archdaily.com
2. https://www.archnet.org/collections/category/all/1?utm_medium=website&utm_source=archdaily.com
3. https://www.ribapix.com/?utm_medium=website&utm_source=archdaily.com#
4. <https://pdfcoffee.com/unit-1-notesdocx-pdf-free.html>
5. <https://www.archdaily.com/993671/can-architectural-journalism-shape-the-future-of-the-profession>
6. <https://www.architectural-review.com/author/apurva-bose-dutta>
7. <https://architecture.live/author/apurva-bose-dutta/>

COURSE OUTCOMES

After the completion of this course, students will be able to:

1. The Course prepares the students to gain an understanding into the fundamental issues in Architectural journalism
2. The students will develop their writing skills that enable them to record, analyze and evaluate architecture both in its theoretical and practical forms.
3. Develop the skill to create Articles/presentation capturing the essence of the project.
4. Students will develop skill to write articles in journals and create presentation capturing the essential design principles and underlying theme of the architectural projects.
5. Students will be able to critique & interview an architect.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
AR-22B7.6E - 01	3	1	-	-	1	-	1	-	-	1	-	2
AR-22B7.6E - 02	3	3	-	3	2	1	-	-	-	3	-	2
AR-22B7.6E - 03	2	3	-	3	3	2	1	-	2	3	-	-
AR-22B7.6E - 04	3	2	2	-	1	3	-	1	2	3	-	-
AR-22B7.6E - 05	-	1	-	2	1	-	3	3	1	3	1	-

1 – Low Correlation; 2 – Moderate Correlation; 3 – Substantial Correlation

AR-22B7.7E PARAMETRIC DESIGN

COA Group	Periods/Hours per week			CREDITS	Marks			End Exam Type
	L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
PE	4	0	4	4	50	50	100	J

Objectives of the Course:

- A. To introduce students to parametric thinking and its application in architectural design.
- B. To develop proficiency in parametric modeling tools and software.
- C. To understand the integration of environmental and structural parameters in design.
- D. To foster creative and analytical skills in form-finding through algorithms and scripting.

Course Contents:

Unit I: Introduction to Parametric Design

Definition and scope of parametric design in architecture, Historical context and evolution Key concepts: parameters, constraints, algorithms, generative systems; Case studies of iconic parametric architecture projects; Introduction to parametric modeling platforms (e.g., Rhino, Grasshopper)

Unit II: Software Fundamentals and Geometry Creation

Introduction to Rhino 3D and Grasshopper interface, Basic geometry creation and manipulation; Data types and data structures in Grasshopper (lists, trees); Parametric transformations: rotation, scaling, lofting, extrusion; Exercises in creating adaptive geometries

Unit III: Advanced Parametric Workflows

Conditional operations, mathematical functions, and logical expressions; Attractors, field-based design, and responsive systems; Integration with plug-ins (e.g., Kangaroo for physics-based simulation, Galapagos for optimization); Modular and recursive design strategies; Custom scripts using Python/C# (basic level)

Unit IV: Environmental and Structural Integration

Climate-responsive design using parametric tools; Daylighting and solar analysis (e.g., using Ladybug Tools); Wind flow analysis and façade optimization; Structural patterning and form-finding using physics engines; Case studies demonstrating performance-based design

Unit V: Studio-Based Design Application

Parametric design project: conceptualization, development, and presentation; Integration of environmental, structural, and aesthetic parameters; Iterative modeling and digital fabrication readiness; Final critique and documentation of design logic and outcomes

Reference:

1. Woodbury, R. (2010). *Elements of parametric design*. Routledge.

E-reference:

1. <https://labdigifab.wordpress.com/wp-content/uploads/2014/03/generative-algorithms.pdf>
2. https://www.rhino3d.com/learn/?query=kind:%20jump_start&modal=null
3. <https://parametrichouse.com/>
4. <https://www.ladybug.tools/>
5. <https://karamba3d.com/>
6. <https://discourse.mcneel.com/t/curve-curve-intersection-points-not-what-expected/204129/2>
7. <https://www.archdaily.com/tag/computational-design>
8. https://www.youtube.com/watch?v=w_Wy6fInRqU

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.NO.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand the principles and theoretical foundations of parametric design.
2	CO2	Demonstrate proficiency in parametric modeling tools and techniques.
3	CO3	Develop algorithmic thinking to generate and control complex geometry.
4	CO4	Apply parametric tools to solve environmental and structural design challenges.
5	CO5	Synthesize parametric methods into a coherent architectural design project.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PS O 1	PS O 2
CO 1	3	2	3	3	3	2	3	1	2	3	1	2	2	2
CO 2	3	3	3	1	2	3	2	3	2	2	1	2	3	3
CO 3	3	2	3	-	1	2	-	2	3	2	-	3	2	2
CO 4	3	3	2	2	2	2	3	2	3	3	1	3	3	3
CO 5	3	3	2	2	2	2	3	3	2	2	1	3	3	1

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B7.8 E GREEN BUILDINGS

Periods Per Week			CREDITS	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	J

Objectives of the course:

- A. Give a practical understanding of the need and trends in the green building sector
- B. Sensitize students towards the components of a green building and their inter relation
- C. Orient the students towards the documenting processes required for a green building
- D. Familiarize students with the differences between the various rating systems

Course Contents:

Unit I: GREEN BUILDINGS – NEED AND TRENDS

Difference between green buildings and sustainable construction, Market mechanisms to drive sustainable development, policy and regulatory mechanisms, Components of green building rating

Unit II: SUSTAINABLE SITE DESIGN

Processes adopted during construction to minimize air pollution and soil erosion, facilities for construction workers, site selection with respect to amenities, respecting natural topography, minimizing heat island effect

Unit III: EFFICIENT WATER AND WASTE MANAGEMENT

Supply side augmentation through rainwater harvesting, STP treated water reuse, Reducing demand through low flow fixtures, metering of water lines, using drought tolerant and native species for landscaping, water efficient irrigation techniques.

Unit IV: ENERGY EFFICIENCY

Energy efficiency with respect to base case, use of passive technology, thermally efficient materials especially glazing, meeting mandatory specifications for refrigerants, Energy efficiency norms as per ECBC, documentation through prescriptive means and simulations.

Unit V: INDOOR ENVIRONMENT AND HUMAN COMFORT

Calculation of daylighting, ventilation and other health facilities and necessary calculations for their documentation

Note: The course should be conducted in a studio mode where the **focus is on preparing the documentation required** for green building certification not on the design of green buildings.

Reference:

1. IGBC green homes manual
2. IGBC Green New Buildings Rating System (Version 3.0 with Addendum 5)
September 2016
3. SVAGRIHA
4. GRIHA EB
5. LEED Arc platform

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.NO.	COURSE OUTCOME	DESCRIPTION
1	CO1	Demonstrate knowledge of documentation required for green building certification.
2	CO2	Understand the inter dependence of the various categories
3	CO3	Evaluate feasible rating system for different typologies
4	CO4	Develop design strategy to achieve maximum rating

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	2	-	1	2	1	-	2	-	-	1
CO2	-	2	2	2	1	-	1	1	-	-	-	-
CO3	-	3	3	3	1	-	-	-	-	-	2	-
CO4	3		3	-	-		-	1	-	-	-	1

1 – Low Correlation; 2 – Moderate Correlation; 3 – Substantial Correlation

AR22B7. 9E FURNITURE AND PRODUCT DESIGN

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	J

Course Overview :

This course explores the theories and practices central to furniture and product design within architectural contexts, focusing on the interplay of form, function, user experience, materiality, manufacturing, and cultural meaning. Emphasis is placed on practical application, material experimentation, and prototyping with contemporary and traditional methods.

Objectives of the Course:

- A. To introduce the integration of form, function, and meaning in furniture and product design.
- B. To understand historical, cultural, and typological influences on design.
- C. To apply ergonomics and universal design for user-centered solutions.
- D. To build knowledge of sustainable materials and manufacturing processes.
- E. To develop skills in graphics, detailing, and prototyping for design applications.

Course Contents:

Unit I – Form, Function, and Semiotics in Design

A study of the interconnectedness between functional requirements, formal expression, and the meanings objects convey in built environments. Theories such as “Form follows function,” Gestalt laws, and principles of visual perception are applied in evaluating and conceptualizing architectural products; Introduction to semiotics, symbols, and the cultural context of objects;

Unit II – Historical Evolution and Typologies

Survey of furniture and product design evolution from antiquity to the present, highlighting shifts in social habits, technological advancements, and the architectural integration of objects within space; Understanding furniture as a reflection of cultural identity and changing human needs.

Unit III – Human Factors, Ergonomics, and Universal Design

Exploration of anthropometry, human factors engineering, and inclusive design principles as applied to furniture and architectural products; Emphasis on usability, comfort, accessibility, and adaptability across diverse user groups;

Unit IV – Materials, Industrial Manufacturing, and Prototyping

A comparative study of plastic, metal, wood, and composite materials—properties, selection criteria, and sustainability in architectural applications; Overview of industrial manufacturing and fabrication processes relevant to furniture and product design, including injection

moulding, casting, sheet metal work, blow moulding, vacuum forming, and emerging technologies for prototyping;

Unit-V Graphics, Fabrication, and Product Development

Introduction to environmental graphics, signage, and their integration into architectural spaces; Exploration of materiality, fabrication, and detailing in the development of furniture, lighting, lifestyle accessories, and signage, emphasizing studio-based prototyping and testing in real or simulated contexts;

A detailed study involving the design aspects of any one of the following: Furniture Design, Product design, Lifestyle accessories, Luminaire design, Signage.

Reference:

1. Norman, D. A. (2013). The Design of Everyday Things. Basic Books.
2. Ashby, M., & Johnson, K. (2014). Materials and Design: The Art and Science of Material Selection in Product Design. Butterworth-Heinemann.
3. Cranz, G. (2000). The Chair: Rethinking Culture, Body, and Design. W. W. Norton & Company.
4. Papanek, V. (1995). The Green Imperative: Ecology and Ethics in Design and Architecture. Thames & Hudson.
5. Heskett, J. (2005). Design: A Very Short Introduction. Oxford University Press.
6. Callender, J., & Quirk, J. (2012). Furniture Design. Laurence King Publishing.
7. Lawson, B. (2006). How Designers Think: The Design Process Demystified. Routledge

E-resources:

https://iea.cc/what-is-ergonomics/	International Ergonomics Association. (n.d.)
https://wdo.org/about/definition/	World Design Organization.

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Demonstrate the ability to integrate form, function, and meaning in furniture and product design.
2	CO2	Analyze historical and cultural influences to inform contemporary design solutions.
3	CO3	Apply ergonomic data and universal design principles to create inclusive products.
4	CO4	Select appropriate materials and manufacturing techniques considering performance and sustainability.
5	CO5	Produce detailed drawings, prototypes, and graphic presentations to communicate design intent effectively.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PS O 1	PS O 2
CO 1	3	2	3	3	3	2	3	3	2	3	2	3	2	2
CO 2	3	3	3	3	2	3	2	2	2	2	1	2	3	3
CO 3	3	2	3	2	2	2	2	2	3	2	3	3	2	2
CO 4	3	3	2	2	3	2	2	1	3	3	1	3	3	3
CO 5	3	3	2	2	2	2	3	3	2	2	1	2	3	1

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

EIGHTH SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B8.1C	Advanced Design -II	PC	10		10	10	100	100	200	J
2	AR22B8.2C	Pre- Thesis	AEC	2	2	4	4	50	50	100	J
3	AR22B8.3C	Environment Responsive Design	BS	3		3	3	50	50	100	W
4	AR22B8.4C	Architectural Practice - I	AEC	3		3	3	50	50	100	W
5	AR22B8.xE	Professional Elective - V	PE	4		4	4	50	50	100	J
6	AR22B8.xE	Professional Elective - VI	PE	4		4	4	50	-	50	-
7		Open Elective - II									
				26	2	28	28	350	300	650	

Note: L/T/S = Lecture / Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Professional Elective -V

1	AP22B8.1E	Structural Project
2	AP22B8.2E	Workshop in Tall Buildings
3	AP22B8.3E	Disaster Resistant Architecture
4	AP22B8.4E	Intelligent Building System

Professional Elective -VI

1	AP22B8.5E	Architectural Conservation
2	AP22B8.6E	Architectural Pedagogy
3	AP22B8.7E	Regionalism in Architecture
4	AP22B8.8E	Architectural Criticism

AR22B8.1C ADVANCED DESIGN - II

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
10	0	10	10	100	100	200	J

Objectives of the Course:

- To develop the ability to analyze and plan urban sites considering environmental, physical, and regulatory contexts.
- To equip students with skills in project formulation, including defining scope, functions, and phased implementation strategies.
- To enable understanding and application of urban design guidelines in shaping cohesive and livable urban environments.
- To foster awareness of urban morphology and its role in informing context-sensitive design interventions.
- To integrate urban infrastructure systems into design thinking for sustainable and functional urban development.

Course Contents:

Unit I: Site and Context

The principles and methods of site planning within an urban context; Site analysis techniques: physical, environmental, socio-economic, legal, and regulatory aspects. Understanding zoning regulations, building byelaws, and land use; Site grading, contour planning, and landscape integration; Development of master plan layout and site organization for large-scale public or mixed-use projects;

Unit II: Urban Morphology

Introduction to Urban Morphology; Elements of Urban Form: Streets, plots, buildings, blocks. Historical Urban Growth: Organic vs. planned cities; Street Patterns and Urban Grains: Gridiron, radial, irregular networks.

Unit III: Urban Design

Introduction to urban design principles: Imageability, legibility, and human-scale design; Built-form regulations: FSI, setbacks, height restrictions; Streetscape design, public-realm development, and interface zones; Urban design guidelines, and controls; Integration of mixed-use, density, and walkability;

Unit IV: Project formulation and phasing

Identifying user groups and stakeholder needs; Developing architectural programs and area statements; Defining project scope, vision, goals, and design parameters; Planning project

implementation in phases: time-based, function-based, and development-based; Case studies on staged development and phased construction;

Unit V: Urban Infrastructure

Urban infrastructure systems: water, sewage, storm-water, power, and waste management. Transportation infrastructure: roads, public transport, parking; Smart city concepts and integration of sustainable infrastructure; Role of infrastructure in shaping urban form and livability; Infrastructure mapping and overlays in design proposals;

Building typology: Neighborhood housing, Mixed use developments, Transit Oriented developments, Commercial districts, Redevelopment of heritage precincts etc.,

Reference:

1. Kevin Lynch, Site Planning, 3rd Edition, MIT Press, 1984.
2. Kevin Lynch, The Image of the City, MIT Press, 1960.
3. Edmund Bacon, Design of Cities, Revised Edition, Thames & Hudson, 1974.
4. Jon Lang, Urban Design: A Typology of Procedures and Products, *2nd Edition*, Routledge, 2005.
5. Paul L. Knox and Linda McCarthy, Urbanization: An Introduction to Urban Geography, 3rd Edition, Pearson, 2012.
6. Cliff Moughtin, Urban Design: Street and Square, 3rd Edition, Routledge, 2007.
7. Aymone Lambot, Urban Morphology: An Introduction to the Study of the Physical Form of Cities, Springer, 2018.
8. Stephen Marshall, Streets and Patterns, Routledge, 2005.
9. Vukan R. Vuchic, Urban Transit Systems and Technology, Wiley, 2007.

E-resources

http://tcpo.gov.in	Town and Country Planning Organisation (TCPO), Ministry of Housing & Urban Affairs. Guidelines and Manuals on Site Planning and Land Use.
https://www.itpi.org.in	Institute of Town Planners, India (ITPI). Journals and Policy Papers on Urban Planning.
https://www.services.bis.gov.in	Bureau of Indian Standards (BIS). National Building Code of India (NBC).
https://niua.in	National Institute of Urban Affairs (NIUA). Urban Studies and Research on Indian Cities.
https://smartcities.gov.in	Smart Cities Mission – Government of India. Guidelines and Best Practices for Urban Infrastructure.

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Analyze and interpret complex urban sites considering physical, environmental, regulatory, and social parameters.
2	CO2	Demonstrate the ability to formulate comprehensive project programs and develop phased architectural proposals for large-scale developments.
3	CO3	Apply urban design principles to create cohesive, context-sensitive, and human-scaled built environments.
4	CO4	Evaluate urban morphology to inform responsive and integrated design strategies.
5	CO5	Incorporate urban infrastructure systems effectively into their design proposals, promoting sustainable and functional urban environments.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO 1	3	2	2	3	2	2	3	3	2	3	2	3	2	2
CO 2	3	3	2	2	2	1	2	2	3	2	-	3	3	3
CO 3	3	2	3	3	2	3	2	3	3	2	1	3	2	2
CO 4	3	3	2	2	2	2	2	2	3	3	3	3	3	3
CO 5	3	3	2	2	2	2	3	3	1	2	1	3	3	1

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B8.2C Pre-Thesis

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	2	4	4	50	50	100	J

Objectives of the Course:

- A. To integrate research inquest with architectural design thinking.
- B. Equip students with research skills specific to architecture and the built environment.
- C. To formulate research questions and hypotheses related to architectural concerns.
- D. To enhance students' data collection, literature review, analysis, academic writing and presentation abilities in architectural discourse.
- E. To establish a structured and critical foundation to articulate the research proposals for the Final Design Thesis.

Course Contents:

The pre-Thesis should ideally be the preliminary work on which the students' design thesis would be based. Therefore students are advised to carefully select the topic for Pre-Thesis and continue the work into the Design thesis. The topic chosen by the student may be in any of the specialization or interest related to any level of the program and has to culminate into design. The department after approval of the topic, shall allot guide/supervisor to each student.

The student should submit a formal report on the topic approved by the department. This project-work should focus on the theoretical approaches to the chosen topic and should be based on extensive literature study, data collection, case studies and analysis. The student is expected to demonstrate the ability to conduct research through library and other sources and identify pertinent architectural issues related to the chosen topic.

The Pre-thesis project work shall be in two parts. The part one is project formulation for a duration of about 4 weeks of explorative research culminating in selection of the topic for Pre-Thesis as a synopsis.

The second part of Pre-thesis for the rest of the duration, the student is expected to work under the guidance of the supervisor and produce a detailed report based on data collection, literature study, case studies and analysis. The report basically must demonstrate the student's ability to conceptualize, investigate and synthesize objectives, design methods and contextual issues related to Architectural Design. The evaluation of the second part shall be by means of internal reviews.

Reference:

1. Borden, I., & Ray, K.R. (2014). The Dissertation: A Guide for Architecture Students.
2. Vernooy, D.A., Shanahan, J.O. and Young G. (2021). Undergraduate Research in Architecture: A Guide for Students.
3. Groat, L.N., & Wang, D. (2013). Architectural research methods. John Wiley & Sons.
4. Zeisel, J. (2006). Inquiry by design, Environment/ behavior/ neuro science in architecture, interiors, landscape and planning. W.W.Norton.

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.NO.	COURSE OUTCOME	DESCRIPTION
1	CO1	Identify and articulate a research problem.
2	CO2	Conduct literature review and identify research gaps
3	CO3	Develop appropriate research methodology suited for architectural investigation.
4	CO4	Communicate ideas through drawings, diagrams, and verbal presentation
5	CO5	Establish a strong theoretical foundation for the final design thesis project.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
01	3	3	2	-	-	-	2	1	-	-	-	-
02	3	-	2	-	-	1	2	2	2	-	-	-
03	3	3	3	2	2	-	-	-	-	2	1	2
04	2	2	2	-	-	-	-	2	1	3	-	2
05	3	3	3	2	2	2	2	2	2	2	2	2
Average	2.8	2.2	2.4	1.6	0.8	0.6	1.2	1.4	1	1.4	0.6	1.2

1 – Low Correlation; 2 – Moderate Correlation; 3 – Substantial Correlation

AR22B8.3C ENVIRONMENT RESPONSIVE DESIGN

L/T/S	Periods Per Week		CREDITS	Marks			End Exam
	P/F/O	Total		Internal	External	Total	W/J/S/P
3	0	3	3	50	50	100	W

Objectives of the course:

- To equip students with the ability to analyze environmental principles and climatic data with passive design strategies in climate-responsive built forms.
- Enable understanding and application of natural ventilation and airflow dynamics for the thermal comfort.
- To understand the human thermal comfort and sensory experiences of architecture, integrating social, psychological and environmental perspectives by studying the local built projects made by architects.
- Introduce advanced responsive technologies for sustainable practices by experts in the field.
- Develop the ability to design, prototype, and assess innovative and environmentally sustainable architecture through Design Thinking.

Course Contents:

Unit-I: ENVIRONMENTAL PRINCIPLES AND CLIMATE ANALYSIS

Fundamentals of macro and micro climates and their effects on building performance; focusing on interpreting climatic data using sun path diagrams, solar charts etc. by understanding the environmental challenges such as global climate and pollution and their impacts on architecture; Vernacular response to climate across regions are studied and analysed to provide fundamental knowledge on climatic analysis in to architectural design;

Unit-II: PASSIVE DESIGN STRATEGIES AND SOLOAR CONTROL

Exploring passive design principles, such as site planning, building orientation, building massing and shading systems; By learning how to optimize energy efficiency through daylighting strategies and integration of natural lighting in buildings; Solar envelopes, sky view factor, thermal insulation; Emphasis on climate zone specific design approaches and minimize energy consumption.

Unit-III: NATURAL VENTILATION AND AIR FLOW DYNAMICS

Learning on airflow patterns and the principles of natural ventilation, cross ventilation in the rooms that are designed to eliminate stack-effect in the buildings, wind movement, venturi effect; The role of courtyard, green buffers and landscaping in influencing ventilation; Emphasis on Indoor Air Quality (IAQ), introduction to mechanical and natural ventilation systems that are present in the market.

Unit-IV: HUMAN EXPERIENCE, THERMAL COMFORT and PSYCHOLOGICAL/ SOCIAL IMPLICATIONS.

By understanding users sensory and psychological experiences in environmental design through concepts like thermal comfort, proxemics and multisensory spatial experience, by studying psychrometric charts and bioclimatic comfort zones and human adaptability; Physical site/built project documentation by a local architect to help in understanding the user behavior, comfort, and spatial adaptation;

Unit-V: ADVANCED RESPONSIVE TECHNOLOGIES AND SUSTAINABLE INTEGRATION.

By exploring responsive design tools such as sensors, smart systems, building automation and green infrastructure.

Technologies like biometric sensors, projections and real-time environmental feedback tools are to be introduced by industry experts.

study on building rating systems like GRIHA, LEED, IGBC to evaluate and enhance their ongoing semester design projects. The goal is to embed sustainability and technological intelligence in to their architectural thinking.

Reference:

1. **Koenigsberger, O.H., Ingersoll, T.G., Mayhew, A. & Szokolay, S.V. – Manual of Tropical Housing and Building – Climatic Design**
2. **Givoni, Baruch – Climate Considerations in Building and Urban Design**
3. **Brown, G.Z. & DeKay, M. – Sun, Wind & Light: Architectural Design Strategies**
4. **Yeang, Ken – EcoDesign: A Manual for Ecological Design**
5. **Szokolay, S.V. – Introduction to Architectural Science: The Basis of Sustainable Design.**
6. **Rasmussen, Steen Eiler – Experiencing Architecture**
7. **Pallasmaa, Juhani – The Eyes of the Skin: Architecture and the Senses**
8. **Alberti, Leon Battista – On the Art of Building in Ten Books** (for theoretical grounding)
9. **CIBSE Guide A – Environmental Design** (Chartered Institution of Building services Engineers)
10. **ASHRAE Handbook – Fundamentals of HVAC & IAQ** (relevant sections)
11. **Lechner, Norbert – Heating, Cooling, Lighting: Sustainable Design Methods for architects**
12. **Berge, Bjorn – Ecology of Building Materials**
13. **GRIHA Manuals, LEED v4 Guide, IGBC Rating System Manuals** – from official websites for Indian certification systems.

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.NO.	COURSE OUTCOME	DESCRIPTION
1	CO1	Analyze and interpret environmental factors and climatic data to take design decisions by understanding various climate scale and their influence on site and building.
2	CO2	Apply passive design strategies, including building orientation, massing, shading devices for energy efficiency and environmental control in various building typologies.
3	CO3	Design for effective natural ventilation and comprehend airflow dynamics around and through buildings to enhance interior comfort and air quality.
4	CO4	Evaluate human thermal comfort conditions and critically assess the psychological, social, and environmental implications of creating technologically augmented and interactive spaces.
5	CO5	Integrate advanced responsive technologies such as sensors, electronics, and intelligent building systems, applying sustainable building principles to create innovative and energy-positive design solutions.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	3	3	3	1	1	2	1	1	1	2	-
CO2	2	2	1	4	-	-	-	-	1	-	2	-
CO3	2	3	1	2	-	3	4	-	1	2	4	1
CO4	4	1	1	2	1	2	2	3	2	3	3	1

1 – Low Correlation; 2 – Moderate Correlation; 3 – Substantial Correlation

AR22B8.4C: ARCHITECTURAL PRACTICE-I

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
3	0	3	3	50	50	100	W

Objectives of the Course:

- A. Introduction about the evolution of the architectural profession.
- B. To give familiarity about the role of professional, statutory bodies and Ethics of Profession
- C. To give exposure to the larger implications of professional practice in the globalised world today.

Course Contents:

Unit -I: EVOLUTION OF ARCHITECTURAL PROFESSION

Historical evolution of the architectural profession and the changing role of architects in society: the registration of architects, the role of the Indian Institute of Architects in professional development, the Architects Act, 1972—its intent, objectives, and key provisions regarding practice; The role and functions of the Council of Architecture in regulating education, registration, and professional conduct;

Unit -II: ETHICS IN ARCHITECTURE PRACTICE

Importance of ethics in professional architectural practice and the moral responsibilities of architects; the code of conduct prescribed for architects and its role in guiding professional behaviour; Duties of architects towards clients, society, and the profession; punitive actions for professional misconduct as per regulatory provisions.

Unit -III: SOCIAL RESPONSIBILITIES AND DUTIES

Social responsibilities of the architectural profession and its role in community development; contributions to non-profit organizations; initiatives that promote public awareness of critical architectural issues; inclusive design principles that ensure accessibility and equity in the built environment; Architecture as an agent of socio-economic change and transformation.

Unit -IV: ARCHITECTURAL PROFESSION IN THE GLOBAL MARKET

Introduction of international architectural competitions and the impact of globalization, advantages and relevance to practice in India;

Architectural practices in the US, UK, Middle East, and South Asian countries, offering comparative insights. Key prerequisites for Indian architects to work abroad and for foreign

professionals to practice in India; Emerging trends in global collaborations and cross-border professional exchanges;

Unit -V: NATIONAL BUILDING CODES

Introduction of the National Building Code (NBC) and its role in regulating design and construction; building bye-laws, approval procedures, landuse, FSI, and requirements for open green spaces; building classifications, permissible uses, and codes for special zones; Key fire safety provisions such as norms for protection systems, exit ways, and fire zoning etc.; code-compliant drawings.

ASSIGNMENTS TO BE FORMULATED:

- Presentations on the different topics with reference to syllabus.
- Case studies of different projects done by Architects
- Discussion sessions on policies, rules and regulations by COA
- Representations of various laws and Monitoring bodies
- Internal exam

Reference:

1. Roshan Namavati, 'Professional Practice', Lakhani Book Depot, Mumbai, 2016.
2. Ar. V.S. Apte, 'Architectural Practice and Procedure', Mrs. Padmaja Bhide, 2008
3. Madhav Deobhakta, 'Architectural Practice in India', COA, 2007.
4. Manual of Architectural Practice 2022 (Published by Registrar Council of Architecture, India).
5. Banerjee, D.N. Principles and Practice of Valuation, 5th ed. Eastern Law House Calcutta 1998.
6. Dalton, J. Patrick. Land Law, 4th ed. Pitman Publication, London, 1996.
7. Indian Institute of Architects. H.B. Professional Practice, The Architects PUB, Bombay.
8. Professional Practice— K G Krishnamurthy & S V Ravindra— PHI Learning Private limited,
Rimjim House, 111 Patparganj Industrial Estate, 2022
9. TS-bPass.
10. Hyderabad Municipal Bye Laws.
11. The National Building Code of INDIA 2016

E-resources:

1. <https://www.coa.gov.in/index1.php?lang=1&level=0&linkid=177&lid=765>
2. https://www.academia.edu/33938052/Professional_Practice_in_Architecture
3. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SAR1504.pdf
4. https://www.researchgate.net/publication/281296080_Case_Study_Standards_of_Professional_Practice_in_Architecture_VS_the_Actual_Practice
5. https://ideasnagpur.edu.in/wpcontent/uploads/2020/05/The_Architects_Handbook_of_Professional-Practise.pdf

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.NO.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand the evolution of the architectural profession.
2	CO2	Develop awareness of the role and responsibilities of an architect in all realms.
3	CO3	Assess issues and aspects related to the architectural profession.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	3	3	1	-	-	2	-	2	3	3	-	2
CO2	2	3	1	1	1	2	1	3	2	2	-	2
CO3	3	2	-	1	1	2	-	2	3	2	2	2

1-Low Correlation; 2-Moderate Correlation; 3 –Substantial correlation

AR22B8.xE: PROFESSIONAL ELECTIVE- V

AR22B8.1E: STRUCTURAL PROJECT

Periods per week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	J

Objectives of the course:

- To understand the concepts of structural Design of a low-rise building
- Understand the loading calculations and Analysis of different structural elements of the building
- Equipping with design philosophies and calculation related to structural components
- Developing skills to draw structural drawings of design components as per standard

Course content:

Students have to design any structure, either RCC or steel. RCC structures can be a building up to G+3 floors: residential apartment, shopping complex, school etc.; Steel structures can be a small function hall to accommodate 1000 people, small factory or any other suitable structure measuring upto 1000 sq.m.

Students have to use relevant IS codes and standards in designing these structures and loading parameters.

For RCC structures, students have to do Analysis and design of all elements from slab to footing and draw structural drawing; For steel structures, truss analysis columns design and its bases with all connections in detail.

Reference:

- A.K.Jain.** Reinforced Concrete: Limit State Design, 5th ed. New Chand and Bros., Roorkee, 1999.
- Ramamrutham. S.** Theory of Structure 11th ed., DhanpatRai Publishing Company Ltd. January 2020.
- Timoshenko.S. and Young, D.H.** Theory of Structures, McGraw-Hill, International Editions
- Ramamrutham. S.** and Narayan, R. Design of RCC Structures, 12th ed. DhanpatRaiPub. Co. Pvt. Ltd., Delhi, 1998.
- Krishna Raju. N and PraneshNR.,** Reinforced Concrete Design: Principles And Practice., 1st ed., New Age International Pvt Ltd Publishers, 2018.

6. **Punmia BC, Ashok Kumar Jain, Arun Kumar Jain**, Limit State Design of Reinforced Concrete, Revised ed., Laxmi Publications, 2016.
7. **Krishna Raju. N and PraneshNR.**, Reinforced Concrete Design: Principles And Practice., 1st ed., New Age International Pvt Ltd Publishers, 2018.
8. **MuthuK.U, IbrahimAzmi, JanardhanaMaganti , Vijayanand M.**, 1st ed., Prentice Hall India Learning Private Limited, January 2016.
9. **J.P. Annie & P. Easwary Dr. Y.R.M. Rao** Prestressed Concrete Analysis and Design, 1st ed., SK Kataria Publishing House, January 2018.
10. **Krishna Raju.** N Prestressed Concrete 6th ed., McGraw Hill Education, April 2018.
11. **Varghese P.C.** Limit State Design Of Reinforced Concrete, 2nd ed., Prentice Hall India Learning Private Limited, January 2018
12. **Duggal SK**, Limit State Design of Steel Structures, 2nd ed., McGraw Hill Education, 2017.
13. **Dayaratnam**, Design of RCC Structures, Allahabad, Wheelers Publishers
14. **Ramachandra**, Design of Steel Structures Vols. 1 and 2, Standard Publications, New Delhi
15. **Vazirani and Raywani**, Design of Steel Structures, Khanna Publishers, New Delhi

E-resources:

https://www.ultratechcement.com/home-building-explained-single/the-right-way-to-install-rcc-footings-for-a-strong-home	Right way to install R.C.C footings. Step by step process of laying foundations.
cademya.edu/12715036/IS_456_2000	Indian Standard PLAIN AND REINFORCED CONCRETE CODE OF PRACTICE Fourth Revision
https://www.civilprojectsonline.com/building-construction/introduction-to-design-of-rcc-structures/	Introduction to R.C.C. , Components of R.C.C., examples of R.C.C. structures
https://www.linkedin.com/pulse/components-rcc-frame-structure-four-em-marketing?trk=organization-update-content_share-article	Structural components of typical R.C.C. framed structure
https://tribby3d.com/blog/one-way-slab-and-two-way-slab/#:~:text=In%20a%20one%20way%20slab,it%20occurs%20in%20both%20directions.	R.C.C One way Slab and Two way Slab
https://www.keuka-studios.com/types-of-stairs-2/	Types of Staircases, advantages and disadvantages
https://bmtpc.org/DataFiles/CMS/file/PDF_Files/61_PAC_Urbaanic_Final.pdf	Precast concrete technology

Course Outcomes

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	<i>Understand</i> IS code provisions to evaluate design concepts of RCC and structural steel.
2	CO2	<i>Understand</i> the loading calculations & Analysis of different structural elements of the building with design philosophies.
3	CO3	<i>Evaluate</i> the behavior and design capacity of compression members. <i>Perform</i> the design calculations for flexure members, beams and slabs.
4	CO4	<i>Draw</i> the structural drawings of design components and elements as per standard.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

AR17B4 .3C	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO-1	3	2	2	-	2	2	2	-	1	-	1	-	2	-
CO-2	3	2	2	-	1	2	-	1	2	1	-	2	2	2
CO-3	3	2	2	2	1	3	1	1	2	2	2	2	2	3
CO-4	3	2	2	1	1	2	-	-	2	2	-	2	2	2

AR22B8.2E WORKSHOP IN TALL BUILDINGS

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	J

Objectives of the Course:

- A. Analyze** the historical evolution and typologies of tall buildings.
- B. Evaluate** various structural systems suitable for high-rise construction.
- C. Integrate** sustainable design principles into tall building projects.
- D. Apply** knowledge of building services and fire safety to complex vertical structures.
- E. Design** a conceptual tall building project, addressing site, function, and technical challenges.

Course Content:

Unit-I: INTRODUCTION TO TALL BUILDINGS AND HISTORICAL CONTEXT

Definition and Typology: Defining "tall" in different contexts (regional, historical, technological). Historical Evolution: Tracing the development from early skyscrapers to contemporary supertalls; Key Precedents: Case studies of influential tall buildings (e.g., Empire State Building, Seagram Building, Burj Khalifa, etc.); Urban Impact: The role of tall buildings in urban density, landuse, and the cityscape. (Hands on practice - Tall Building models)

Unit-II: STRUCTURAL SYSTEMS AND ENGINEERING PRINCIPLES

Fundamental Forces: Understanding wind loads, seismic forces, and gravity in tall building design; Structural Typologies: Exploration of common structural systems, including shear walls, framed tubes, bundled tubes, and dia grids; Foundation Design: Deep foundations and their role in supporting massive structures; Materials: The use of high-strength concrete, steel, and composites.

Unit-III: FACADE AND ENVELOPE DESIGN

Introduction to the Building Envelope: Definition, purpose, and its role as the building's first line of defence; Historical Context: Traditional masonry to modern systems; Performance Criteria: A deep dive into the critical functions of a façade; Structural Performance: Wind loads, seismic forces, and material strength; Thermal Performance, Acoustic Performance: Sound transmission class (STC) and noise reduction; Moisture Control: Rain screen principles, vapour barriers, and water penetration; Fire Safety: Fire ratings and regulations; Daylighting and Visual Comfort: Glazing types, shading, and glare control; Curtain Walls and Glazing Systems : Types of Curtain Walls, Structural Components, Glazing Technology, Joints and Sealants, Performance index; Double-Skin Facades- Principles of Double-Skin Facades (DSFs): The concept of a buffer zone and its impact on thermal and acoustic

performance; Tall Building Facades and Engineering - Tall Building Anatomy, Extreme Environmental Loads, Acoustic and Vibration Control, Case Studies: Analysing the facade systems of iconic tall buildings;

Unit- IV: SUSTAINABILITY AND ENVIRONMENTAL DESIGN

Green Building Strategies: Incorporating passive and active systems for energy efficiency; Renewable Energy Integration: Use of solar panels, wind turbines, and other renewable sources; Indoor Environmental Quality: Designing for daylight, natural ventilation, and occupant comfort; Life Cycle Analysis: Evaluating the environmental impact of tall buildings from construction to demolition;

Unit- V: DESIGN AND INTEGRATION

Zoning and Regulations: Navigating codes and urban planning guidelines specific to tall buildings; Programmatic Challenges: Designing for mixed-use programs (residential, commercial, retail); Design of the Core for vertical transport system and services. Aesthetics and Expression: Developing a design philosophy for tall buildings that addresses form, function, and cultural context; The Future of Tall Buildings: Exploring new materials, technologies, and conceptual designs.

GUIDELINES FOR LEARNING:

- **Visual Learning:** Tall buildings are highly visual. Actively seek out diagrams, photographs, and architectural drawings. Pay close attention to how different structural systems, facade components, and environmental features are represented visually.
- **Hands-on Practice (Model Making):** As mentioned in Unit I, creating physical models is invaluable. Build simple study models of different structural systems (e.g., shear walls vs. diagrids) to understand how they work in three dimensions. This will make abstract concepts more concrete.
- **Create a Timeline:** Develop a personal timeline of key skyscrapers. Include the year, location, architect, and the key innovation of each building (e.g., the elevator in the Equitable Life Building, the steel frame in the Home Insurance Building).
- **Debate the "Definition of Tall":** Research and be prepared to discuss why the definition of a "tall building" has changed over time and varies by location. Consider factors like technology, urban density, and cultural significance.
- **Become a Detail-Oriented Designer:** This unit requires you to think about small, intricate details. Study facade sections and connections closely. Understand the difference between a stick-built and unitized curtain wall system, not just in theory but in terms of assembly and performance.
- **Analyze Performance Data:** Get comfortable with terms like U-value and STC. Research how different materials and glazing types influence these values. Use online calculators or software demonstrations to see how changing a parameter (like the number of glass panes) affects performance
- **Compare and Contrast:** Research two different tall buildings, one known for its "active" sustainability systems (e.g., a building with many integrated technologies) and another known for its "passive" design strategies (e.g., using natural ventilation and day lighting). Analyze the pros and cons of each approach.

- **Read the Codes:** Familiarize yourself with the basic concepts of zoning codes and building regulations. Understand how they place constraints on a tall building's height, floor area, and setbacks.
- **Imagine a Project:** For your final project, don't just "design" a building. Develop a clear design philosophy for it. Articulate how the form, function, and materials you chose address the cultural context and programmatic challenges of your site. This will help you synthesize all the knowledge from the previous units.

ASSIGNMENTS TO BE FORMULATED: for reference

- 1) Selecting two tall buildings from different historical periods (e.g., one from the pre-1970s and one post-2000s). For each building, create a presentation that includes: Context, Definition, Influence, Diagrams, physical or digital model, A 10-15 slide presentation (PowerPoint/PDF) and the physical/digital models
- 2) To analyze and compare the efficiency and design principles of different tall building structural systems for modern tall buildings.
- 3) Design a facade system for a conceptual 30-story tall building in a specific climate (e.g., a hot, arid climate or a cold, temperate climate).
- 4) A final portfolio (digital or physical) including site analysis, floor plans, sections, elevations, detailed drawings of the structural and facade systems, and a design narrative. This assignment serves as a culmination of the skills learned throughout the course
- 5) Best Practices & Hands on practice models.

INTEGRATION:

The course is not a standalone subject it has foundational understanding of the historical context and urban impact of skyscrapers, which directly informs the design philosophy and a building's urban role. This initial concept is then made possible by selecting an appropriate structural system, which not only resists extreme environmental loads but also defines the building's form and directly influences the design of the facade and envelope. The facade, as the building's skin, is the critical component where performance criteria like thermal, acoustic and moisture control are addressed, and these choices are intrinsically linked to the sustainability strategies that govern the building's energy efficiency and environmental footprint. Ultimately, all these elements—urban context, structure, facade, and sustainability—converge in the final design integration, where students synthesize their knowledge to create a cohesive, technically sound, and contextually sensitive architectural solution.

Reference:

1. Pelli, Cesar. *Observations for Young Architects: The World of Architecture* (2020)
2. Ali, Mir M. and Moon, Kyoung Sun. *Structural Systems for Tall Buildings: A Primer* (2007)

3. Willis, Carol. *Form, Function, and Formality: A Brief History of the Skyscraper* (2002)
4. Taranath, Bungale S. *Reinforced Concrete Design of Tall Buildings* (2012)
5. Smith, Bryan Stafford and Coull, Alex. *Tall Building Structures: Analysis and Design* (1991)
6. Schlaich, Jörg, and Schober, Hans. *The Design of Tall Buildings: Structural Systems* (2018)
7. Schittich, Christian. *Building Skins: Concepts, Layering, Materials* (2001)
8. O'Connor, John, and Gentry, Travis R. *Facade Design and Engineering: A Handbook for Architects and Engineers* (2019)
9. Bonham, Mary Ben. *Bioclimatic Double-Skin Façades* (2020)
10. Cole, Raymond J., and Lorch, Richard. *The Architecture of Ecology* (2010)
11. Kwok, Alison G., and Grondzik, Walter T. *The Green Studio Handbook: Environmental Strategies for Architecture* (2017)
12. Fletcher, David. *Life Cycle Analysis of Buildings* (2015)
13. Sack, Robert D. *Aesthetics, Form, and Function: An Interdisciplinary Approach to the Architecture of Tall Buildings* (2009)
14. Glaeser, Edward. *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier* (2011)
15. Ford, James. *The Future of the Skyscraper: Architecture in the 21st Century* (2021)

Course Outcomes

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Evaluate Facade Performance: Accurately evaluate the performance of a building envelope system against specified criteria, including thermal (U-value, R-value), acoustic (STC), structural (wind loads), and moisture control.
2	CO2	Design High-Performance Envelopes: Design a high-performance curtain wall, double-skin facade, or other sustainable envelope system that effectively manages heat gain, glare, and air leakage while accommodating structural movement.
3	CO3	Select Appropriate Materials and Technologies: Justify the selection of specific glazing technologies (e.g., Low-E glass, smart glass), framing systems, and facade materials based on performance requirements, cost, and environmental impact.
4	CO4	Document Facade Systems: Produce a comprehensive set of technical drawings, including plans, sections, and detailed connections, along with written specifications for a building facade project.

CO	COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:											
	Core Competence	Problem analysis	Development of design solution	Innovative solution	Appropriate Research	Latest Development in real world situations	Sustainable Development	Ethics	Challenges of Built Environment	Communication	Project management and finance	Lifelong learning
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO 1	1	3	3	2	3	1	-	-	-	3	-	3
CO 2	3	3	3	3	3	3	-	-	3	1	-	2
CO 3	-	2	3	3	3	3	2	-	-	-	-	-
CO 4	3	-	3	2	2	3	2	1	-	-	3	1
1- Low Correlation 2-Medium Correlation 3-High Correlation												

AR22B8.3E DISASTER RESISTANCE ARCHITECTURE

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	J

Objectives of the Course:

- To impart knowledge of Natural and Manmade disasters and their impact on built environment and socio-economic activity of community.
- To introduce concept of earthquakes, to understand the design of built environment to mitigate the effect of earthquakes.
- To understand seismic strengthening of buildings and appropriate construction techniques for earthquake hazard monitoring.
- To impart knowledge of Seismic design strategies and its application in buildings for structural and non-structural damage.
- To make students aware of Advanced design approaches in earthquake resistance design that can be applied to different physical environments.

Course Contents:

Unit-I

Disasters and Hazards, Natural and Manmade Disasters, Impact of Disasters on socio economic activity of community, Built environment and hazard assessment, vulnerability and risk assessment of disasters on communities, Potential consequences of disasters, Building safety from Natural Disasters, Contemporary approaches and technologies in disaster management.

Unit-II

Elementary seismology, global occurrence of Earthquakes, impact of earthquake on built environment, measurement of earthquake - seismograph, acclerograph, sesimoscope, multi SAR,

Earthquake resistance design- Site selection criteria, access to infrastructure, Design consideration for energy access, evacuation route and open spaces, Site Planning, Building forms, Horizontal and vertical circulation, redundancy and setbacks for Earth Quake Resistance.

Unit-III

Seismic strengthening of building – understanding appropriate construction techniques including foundation design, wall construction and roofing systems, use of renewable energy sources to create more resilient and self-sufficient buildings, use of remote sensing and GIS for hazard mapping Earthquake monitoring.

Seismic design factors- torsion, damping, ducting, strength and stiffness, building configuration, soft first storey, discontinuous shear walls, perimeter strength and stiffness.

Unit-IV

Seismic design strategies

Diaphragms, shear walls, braced frames, moment resistant frames, energy dissipating devices, base isolation, building materials and equipment, nonstructural damage control, case study of one or two seismic resistance buildings to understand the seismic design strategies employed.

Unit-V

Advanced design approaches in earthquake resistance design- advanced materials like high performance fiber reinforced composites, memory alloys, geo polymer concrete, innovative design approaches - performance based design, resilience based design, damping systems etc, integration of new technologies- building information modeling (BIM), green building practices for earth quake resistance design, renewable energy systems.

Reference:

1. “Techniques for disaster risk management and miyigation,” Wiley Publising.
2. Ellis I krinitzsky, “ Fundamentals of earthquake resistant construction “, Wiley Publishing House
3. Andrew charleson, “Seismic design for architects”
4. Azer kasimzade, “, Earthquake resistant design, protection, and performance assessment in earthquake engineering.” Springer publications
5. Avi fredman, fundamentals of planning and designing sustainable post-diaster shelters”, springer publications.
6. Yoshitsugu hayashi, “disaster resilient cities “, BH publications.

E-resources:

1. Building Materials and Technology Promotion Council (BMTPC) (bmtpc.org)
2. [Whole Building Design Guide \(WBDG\)](http://wbg.org) (wbg.org)
3. [Auroville Earth Institute's website](http://earth-auroville.com) (earth-auroville.com)
4. [NIUA \(National Institute of Urban Affairs\)](http://niua.org) ([NIUA](http://niua.org))
5. [Parametric Architecture](http://parametric-architecture.com) (parametric-architecture.com)
6. The International *Disaster Resilient Architecture* (INDRA)
7. [Coalition for Disaster Resilient Infrastructure \(CDRI\)](http://cdri.org) , National Disaster Management Authority (NDMA) ([NDMA, GoI](http://ndma.gov.in)), [Building Materials and Technology Promotion Council \(BMTPC\)](http://bmtpc.org) ([BMTPC](http://bmtpc.org))

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Analyze and interpret impact of Natural and Manmade disasters on built environment and understand the socio-economic changes of society after the cause.
2	CO2	To understand the design of built environment and different strategies to be used in mitigate the effect of earthquakes.
3	CO3	To Design and apply appropriate construction techniques for earthquake resistance, monitoring and earthquake mapping to record the impact.
4	CO4	To Evaluate structural and non-structural damages caused by earthquakes and to reconstruct the building for earthquake resistance.
5	CO5	Integrate Advanced design approaches in earthquake resistance design that can be applied to different physical environments.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO 1	1	2	-	-	-	3	3	-	-	-	-	-	1	2
CO 2	3	2	3	-	2	3	3	-	2	1	-	-	-	1
CO 3	2	3	3	2	3	1	3	1	3	1	1	2	1	2
CO 4	-	2	3	2	3	-	2	1	2	1	1	2	2	3
CO5	3	2	3	3	1	3	3	-	2	2	2	3	2	3

1-Low Correlation; 2-Moderate Correlation; 3 –Substantial correlation

AR22B8.4E INTELLIGENT BUILDING SYSTEMS

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	50	100	J

Objectives of the Course:

- A. To introduce students to the principles and applications of intelligent building systems.
- B. To familiarize students with automation in building management systems (BMS).
- C. To study integration of sensors, actuators, and control systems in building design.
- D. To explore energy efficiency, user comfort, safety, and sustainability in intelligent buildings.
- E. To develop design thinking that integrates smart technologies for enhanced performance.

Course Contents:

Unit I: Introduction to Intelligent Building Systems

Definition and characteristics of intelligent buildings; Historical evolution and global trends; Smart cities and smart buildings: interrelation; Intelligent Buildings vs Green Buildings; Stakeholders in intelligent building lifecycle

Unit II: Building Management Systems (BMS) and Integration

Architecture of BMS; Components: controllers, interface devices, sensors, and actuators; Centralized vs decentralized BMS; Integration with HVAC, lighting, security, fire safety; Wired and wireless communication protocols (BACnet, KNX, ZigBee, etc.);

Unit III: Smart Building Technologies and IoT

Role of IoT in intelligent buildings; Types of sensors and their applications; Edge and cloud computing for real-time data analytics; Digital twins and BIM integration; Interoperability and cyber security considerations;

Unit IV: Intelligent Systems for Energy, Comfort, and Safety

Energy management systems (EMS); Automated lighting and HVAC systems; Adaptive shading and daylight control; Smart metering and demand-response systems; Intelligent surveillance and access control; Occupant comfort and indoor environmental quality (IEQ)

Unit V: Case Studies and Future Directions

Case studies of intelligent buildings in India and abroad; Post-occupancy evaluation of intelligent systems; Economic and environmental impact analysis; Barriers to implementation in Indian; context; Future trends: AI, machine learning, robotics in buildings;

Reference:

1. Wang, S. (2009). Intelligent Buildings and Building Automation. Routledge.
2. Sinopoli, J. (2010). Smart Buildings Systems for Architects, Owners, and Builders. Butterworth-Heinemann.
3. Purdy, J. (2016). Building Automation: Control Devices and Applications. ATP.

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand the concept and evolution of intelligent building systems.
2	CO2	Identify components and architecture of Building Management Systems.
3	CO3	Apply knowledge of sensors, IoT, and automation in building design.
4	CO4	Analyze intelligent systems for energy management, security, HVAC, and lighting.
5	CO5	Evaluate case studies and propose design strategies for smart and sustainable buildings.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	2	2	1	1	1	1	1
CO2	2	3	3	2	3	2	2	1	2	2	1	1
CO3	2	3	3	3	3	3	2	1	2	2	2	2
CO4	2	3	3	3	3	3	3	2	2	3	2	2
CO5	3	3	3	3	3	3	3	3	2	3	1	3

AR22B8.xE PROFESSIONAL ELECTIVE –VI

AR22B8.5E ARCHITECTURAL CONSERVATION

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	---	50	----

Objectives of the Course:

- A. To make students understand the historical and cultural significance of Preservation of Cultural and Built Heritage
- B. To introduce the principles, practices, and processes involved in preserving and conserving historic architecture
- C. To enable the students to recognize cultural significance and apply conservation techniques appropriately.

Course Contents:

Unit-I: Introduction to Architectural Conservation

Definition, purpose, and significance of conservation; Historical development of conservation movements; Values in conservation: aesthetic, historical, social, scientific; International charters (e.g., Venice Charter, Burra Charter); Role of UNESCO and ICOMOS

Unit-II: Types and Approaches to Conservation

Preservation, restoration, rehabilitation, reconstruction, adaptive reuse; Preventive conservation and maintenance; Criteria for listing and grading of heritage buildings; Conservation ethics and authenticity; Case studies illustrating various approaches.

Unit-III: Documentation and Assessment

Measured drawings, photography, condition mapping; Material analysis and decay assessment; Building pathology: understanding causes of deterioration; Tools for architectural documentation (manual and digital methods); Heritage Impact Assessment (HIA).

Unit-IV: Techniques and Materials in Conservation

Traditional building materials and construction techniques; Compatibility of materials and techniques in repairs; Structural and non-structural interventions; Use of modern technology in conservation (e.g., laser scanning, 3D modeling); Guidelines for retrofitting heritage buildings;

Unit-V: Policies, Acts, and Case Studies

National and local conservation policies in India; Ancient Monuments and Archaeological Sites and Remains Act (AMASR), 1958; Role of ASI, INTACH, and local bodies; Urban conservation and heritage precincts; Case studies: Hampi, Jaipur, Fort Kochi, etc.

Note : Above mentioned course contents are intended for an introduction only.

Reference:

1. Feilden, M.B., "*Conservation of Historic Buildings*", Architectural Press, (2003)
2. Tyler, Norman., et al. *Historic Preservation: An Introduction to Its History, Principles, and Practice*. 2nd ed. W.W. Norton & Co, 2009.
3. Orbasli, Aylin, *Architectural conservation: principles and practice*, Malden, MA: Blackwell Science, 2008.
4. Jokilehto, Jukka. *A History of Architectural Conservation*. United Kingdom, Taylor & Francis, 2017.
5. *Guide to Recording Historic Buildings*. United Kingdom, Butterworth Architecture, 1990.
6. *Heritage Conservation in Postcolonial India: Approaches and Challenges*. United Kingdom, Taylor & Francis, 2020.
7. Jain Kulbhushan ed, . *Conserving architecture*. Ahmedabad: Aadi Centre. 2017.

E-references:

https://api.pageplace.de/preview/DT0400.9781000296280_A40251920/preview-9781000296280_A40251920.pdf

https://www.iccrom.org/sites/default/files/ICCROM_05_HistoryofConservation01_en.pdf

<http://www.bill-blake.co.uk/files/Download/ICOMOS%20UK%20Guide%20to%20Recording%20Hist%20Blgs.pdf>

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand and explain the principles, ethics, and global charters of architectural conservation.
2	CO2	Identify and evaluate the cultural, historical, and architectural significance of heritage structures.
3	CO3	Apply appropriate documentation techniques for condition assessment and conservation planning.
4	CO4	Analyze and recommend suitable conservation approaches and material interventions based on site-specific needs.

5	CO5	Interpret and apply conservation policies, acts, and guidelines in the context of Indian and international case studies.
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COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	1	-	-	2	3	3	2	-	1	2	-	2
CO2	3	2	-	1	2	-	2	3	3	2	-	2
CO3	3	2	-	3	3	3	2	1	1	3	1	2
CO4	1	2	-	2	2	1	1	2	1	3	-	2
CO5	2	3	3		3	2	2	1	1	3	1	2

AR22B8.6E ARCHITECTURAL PEDAGOGY

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	---	50	----

Objectives of the Course:

- A. To make students aware about Architectural Pedagogy
- B. To understand the fundamentals, contemporary trends and teaching methods in Architecture Pedagogy
- C. To help develop critical thinking, innovation, collaboration and awareness towards pedagogy.

Course Contents:

Unit-I: Introduction to Architecture Education.

Basics to Architecture Education; Principles of Architecture Education; Programs on Architecture education in India and Global context; Transformations and causes of transformation in Architecture Education; Challenges and approaches in Architecture Education

Unit-II: History Architecture Education

Traditions of Teaching Methods; Introduction to History of Architecture Education; History of Contemporary Architecture Education; Shift towards Contemporary Architecture Education

Evolution, Formalization and Modernization of Architecture Education from 19th to 20th century

Unit-III: Appreciation and Criticism in Architecture Education

Appreciation in Architecture; Recognition of strengths, Building confidence, etc.

Criticism in Architecture; Individual critique, Panel/Jury Critiques, Peer reviews, public discussion, etc.

Unit-IV: Learning/Teaching Methods & Techniques

Elements of teaching models; Elements of learning models; Classification of teaching and learning methods; Kolb's Experiential Learning; Maxims of teaching; Four pillars of learning; Blooms Taxonomy, etc.

Unit-V: Communication Skills:

Models of communication; Factors & Barriers of communication; Types of Communication

Visual Communication: Data Visualization, Info graphics, informatics, Illustrative techniques, etc.; Verbal Communication: Speaking Skills, qualities of good speaking, effective tone, body language; public speaking, etc.

AR22B8.7E REGIONALISM IN ARCHITECTURE

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	---	50	----

Objectives of the Course:

- To develop an understanding of how regional factors—climate, culture, materials, and traditions—shape architectural identity.
- To explore contemporary interpretations of regionalism in design.
- To make students understand the integration of regional principles and sustainable design solutions.

Course Contents:**Unit-I: Introduction to Regionalism**

Definition and concept of regionalism; Vernacular architecture as a foundation of regional expression

Critical vs. sentimental Regionalism; Impact of globalization on architectural identity

Key theorists: Kenneth Frampton, Paul Ricoeur, Amos Rapoport

Unit-II: Climatic and Geographic Influences

Relationship between climate, geography, and built form; Typologies across different climatic zones; Passive design strategies rooted in regional traditions; Orientation, materiality, and spatial organization in response to environment; Case studies: desert, coastal, tropical, and cold climates

Unit-III: Cultural and Socio-economic Context

Architecture as an expression of cultural identity; Influence of rituals, customs, and local lifestyles on space-making; Socio-economic factors in shaping local building practices; Community participation and local knowledge in design; Traditional vs. contemporary interpretations

Unit-IV: Regionalism in Contemporary Practice

Integration of traditional elements in modern design; Role of regionalism in sustainability and contextual design; Notable architects and works: Laurie Baker, B.V. Doshi, Geoffrey Bawa, Hassan Fathy; Balancing innovation with tradition; Case studies from India and abroad

Unit-V: Regionalism and Urban Context

Regionalism in urban design and planning; Heritage and identity in contemporary cities; Urban interventions preserving regional character; Conflicts between modernity and tradition in growing urban centers; Place-making and cultural landscapes

Reference:

1. Doshi, B. V. (2011). Paths uncharted. Mapin Publishing.
2. Kanvinde, A., & Miller, H. J. (1969). Campus design in India: Experience of a developing nation. Jostens American Yearbook Company.
3. Prakash, V. (2002). Colonial modernities: Building, dwelling and architecture in British India and Ceylon. Routledge.
4. Menon, A. G. K. (1998). Regional modernism: Rethinking critical regionalism in the Indian context. Journal of the Indian Institute of Architects, 63(10), 13–17.
5. Canizaro, V. B. (Ed.). (2007). Architectural regionalism: Collected writings on place, identity, modernity, and tradition. Princeton Architectural Press.
6. Tillotson, G. H. R. (1989). Paradigms of Indian architecture: Space and time in representation and design. Curzon Press.
7. Pandya, Y. (2024). Concepts of Space in Traditional Indian Architecture. Mapin Publishing.
8. Bahga, S. (2014). Modern Regionalism: The Architecture of Sarbjit Bahga. Mapin Publishing.
9. Sohoni, P. (2018). The Architecture of a Deccan Sultanate: Courtly Practice and Royal Authority in Late Medieval India. I.B. Tauris.
10. Prakash, V. (2020). One Continuous Line: Art, Architecture and Urbanism of Aditya Prakash. Mapin Publishing.

E-recourses:

https://prometheus.library.iit.edu/index.php/journal/article/view/150/128
https://cales.arizona.edu/oals/ALN/aln28/matter.html
https://digital.lib.washington.edu/researchworks/items/062ecaa3-9815-49ff-a9b2-

[c698c6963fa8](#)

[https://digital.lib.washington.edu/researchworks/items/9cdb4f13-c38c-47eb-850f-
cee1803a88df](https://digital.lib.washington.edu/researchworks/items/9cdb4f13-c38c-47eb-850f-cee1803a88df)

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand and explain the core principles and theoretical foundations of regionalism in architecture
2	CO2	Analyze how climate, geography, and cultural practices influence regional architectural forms.
3	CO3	Identify and interpret regional characteristics in vernacular and contemporary architecture.
4	CO4	Evaluate the role of regionalism in sustainable and context-responsive design.
5	CO5	Apply regional design strategies in architectural design and urban planning projects.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	1	-	-	2	3	3	2	-	1	2	-	2
CO2	3	2	-	1	2	-	2	3	3	2	-	2
CO3	3	2	-	3	3	3	2	1	1	3	1	2
CO4	1	2	-	2	2	1	1	2	1	3	-	2
CO5	2	3	3	1	3	2	2	1	1	3	1	2

AR22B8.8E ARCHITECTURAL CRITICISM

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	---	50	---

Objectives of the Course:

- To introduce the concept of architectural criticism and its significance in evaluating and understanding architectural works.
- To explore various frameworks and theoretical approaches used in architectural critique, focusing on aesthetic, functional, and social perspectives.
- To develop critical thinking and analytical skills for assessing architectural projects using multiple criteria such as design, functionality, cultural context, and user experience.
- To provide students with tools and methods for conducting a detailed and structured critique, including visual, spatial, and contextual analysis.
- To enhance students' writing and presentation skills for articulating informed and balanced critiques through essays, reviews, and oral presentations.

Course Contents:

Unit-I: Introduction to Architectural Criticism

Definition, purpose, and scope of criticism; History and evolution of architectural criticism; Purpose and role of criticism in architectural practice and education; Types of criticism: formal, functional, technical, contextual, experiential; Role of the critic and the audience; Ethics in criticism; Contribution of the critics – Alan Colquhoun, Charles Jencks, understanding works of Violet- le-la-Duc, Eric Mendelson, Antoni Gaudi, Alvar Alto, Frank Lloyd Wright, etc.

Unit-II: Frameworks and Theories for Critique

Criteria for architectural evaluation; Theoretical foundations: Modernism, Postmodernism, Structuralism, Phenomenology; Critique as interpretation vs. judgment; Social and cultural critique; Introduction to semiotics in architecture.

Unit-III: Tools and Methods of Criticism

Visual and spatial analysis; Reading plans, sections, and context; Analyzing function, form, structure, materiality, and symbolism; Comparative studies and benchmarking; Written and verbal presentation techniques.

Unit-IV: Criticism of Architectural Works

Evolution of Indian architectural criticism; critiquing historical landmarks vs. contemporary architecture; critical writings by Indian architects and scholars (e.g., Charles Correa, B.V. Doshi, Gautam Bhatia); Case studies of iconic buildings and their critical reception; Critiquing colonial, post-independence, vernacular, and contemporary architecture.

Unit-V: Writing and Presenting Criticism

Structure and tone of architectural writing; Critical essays, reviews, and articles; Argument building and supporting analysis with evidence; Style, objectivity, and originality; Publishing options; study of Indian and global case studies: built projects, competitions, public structures.

Reference:

1. Frampton, Kenneth. Modern Architecture: a Critical History. London: Thames and Hudson,. 1985.
2. Alan Colquhoun, Essays in Architectural Criticism: Modern Architecture and Historical Change. *Juan* - 1983 - *Journal of Aesthetics and Art Criticism* 41 (3):350-351.
3. Author, Christian Norberg-Schulz ; *Genius Loci: Towards a Phenomenology of Architecture* ; Edition, illustrated ; Publisher, Academy Editions, 1980 ; Original from, University of Minnesota
4. Jencks, Charles, the language of post-modern architecture, New York: Rizzoli, 1984.
5. Nesbitt, Kate (1996) *Theorizing a New Agenda for Architecture. an Anthology of Architectural Theory 1965-1995*, December 1, 1997 by Princeton Architectural Press.
6. Correa, Charles, *A Place In The Shade: The New Landscape & Other Essays*, Charles Correa Foundation (2018).
7. Bhatia, Gautam Laurie Baker: Life, Work and Writings, Penguin Books India, 1994
8. Benninger Christopher, *Letters to a Young Architect*, Christopher Charles Benninger Architects Pvt. Ltd, 2011.
9. Burte, Himanshu, *Space for engagement : the Indian artplace and a habitational approach to architecture* , Seagull Books, 2008

e-resources:

1. https://www.researchgate.net/publication/328407091_An_account_of_critical_region_alism_in_diverse_building_types_in_postcolonial_Indian_architecture
2. <https://www.sciencedirect.com/science/article/pii/S2095263520300212>
3. <https://www.youtube.com/watch?v=S0U8CYvO3Jw>

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Develop an understanding of the fundamental principles and history of architectural criticism
2	CO2	Analyze architectural works using various theoretical frameworks and critical perspectives.
3	CO3	Apply methods of visual, spatial, and contextual analysis to assess the form, function, and meaning of buildings.
4	CO4	Formulate and articulate well-structured architectural critiques, balancing subjective opinions with objective analysis.
5	CO5	Communicate critiques effectively through written essays, reviews, and oral presentations, considering the ethical responsibilities of architectural critics.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	1	-	-	2	3	3	2	-	1	2	-	2
CO2	3	2	-	1	2	-	2	3	3	2	-	2
CO3	3	2	-	3	3	3	2	1	1	3	1	2
CO4	1	2	-	2	2	1	1	2	1	3	-	2
CO5	2	3	3	-	3	2	2	1	1	3	1	2

NINTH SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B9.1C	Design Thesis	PC	16		16	16	300	300	600	J
2	AR22B92C	Architectural Practice - II	AEC	2	1	3	3	50	50	100	W
3	AR22B9.xE	Professional Elective – VII	PE	4		4	4	50	-	50	-
				22	1	23	23	400	350	750	

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

Professional Elective -VII

1	AP22B9.1E	Architectural Office Management
2	AP22B9.2E	Real Estate Planning
3	AP22B9.3E	Project Formulation

AR22B9.1C DESIGN THESIS

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
16	0	16	16	300	300	600	J

Objectives of the Course:

- A. To develop the ability to independently conceptualize and design an architectural project of significant complexity and relevance.
- B. To integrate knowledge from previous coursework (design, theory, technology, and sustainability) into a unified design solution.
- C. To imply critical thinking and research for formulating design responses
- D. To strengthen technical detailing and integration skills for structural systems, services, and materiality.
- E. To develop communication and presentation skills through detailed drawings, models, reports, and presentations.

Course Contents:

Each student is expected to prepare a design thesis based on the preliminary work undertaken in the Pre-Thesis, under an approved guide/ supervisor and topic by the department.

Thesis should reflect the knowledge gained from the courses learnt in the previous semesters. The particulars of schedule, content, presentation, format etc., is to be decided by the department, from time to time and shall be strictly followed.

At the end of the semester, each student is expected to submit all original drawings prepared as per the department's specifications. Three copies of the report in the specified format along with a model submitted to the department, after obtaining the approval of the respective guides / supervisor.

The department shall schedule the final viva-voce, at its convenience, only after the receipt of the thesis submission by a student. For End exam, viva-voce is to be conducted by a jury comprising of an external examiner, one internal examiner and guide. Internal Evaluation is to be taken-up by means of periodic panel reviews by internal members.

In continuance of the Pre-Thesis, Design Thesis shall demonstrate the student's ability to synthesize the objectives and outcomes related to Architectural Design through the following units.

Unit – I

Thesis Orientation and Framework Development- Refinement of approved thesis topic and formulation of design brief; Defining objectives, methodology, and design approach; Review of literature, case studies, and site analysis;

Unit – II

Concept Development and Design Approach- Evolution of design concept; Thematic, contextual approach; Functional and spatial organization; Design exploration: sketches, models, diagrams;

Unit – III

Schematic Design and Spatial Planning- Zoning, circulation, and spatial design strategy; form development and experiential design; Initial integration of services and sustainability; Preliminary drawings: plans, sections, elevations, 3D views;

Unit – IV

Design Detailing and Technical Integration- Structural systems; Building services: plumbing, electrical, etc.; Universal design and environmental responsiveness; Landscape and site planning integration; Preparation of working drawings and details;

Unit – V

Final Presentation and Documentation- Final design drawings, models, and renderings; Report writing: design intent, process, and analysis; Thesis defense and Jury evaluation.

Reference:

1. Ching, F. D. K. (2014). *Architecture: Form, Space, and Order*. John Wiley & Sons.
2. Neufert, E. (2000). *Architects' Data*. Blackwell Science.
3. De Chiara, J., Panero, J., & Zelnik, M. (2001). *Time Saver Standards for Building Types*. McGraw-Hill.
4. D'Costa, A. (1990). *Architectural Thesis: A Guide to Preparation*. McGraw-Hill Education.
5. Seely, John. *The Oxford guide to effective writing and speaking*, 2nd ed., Oxford; New York: Oxford University Press, 2005.
6. Mukhi, H.R. *Technical Report Writing: Specially prepared for Technical and Competitive Examinations*, New Delhi: Satya Prakashan, 2000.
7. Barrass, Robert. *Writing At Work a guide to better writing in administration, business and management*, London: Routledge, 2003.
8. Seely, John. *The Oxford guide to effective writing and speaking*, 2nd ed., Oxford; New York: Oxford University Press, 2005.
9. Jo Ray McCuen, Anthony Winkler. *Readings for writers*, 9th ed., Fort Worth: Harcourt Brace College Publishers, 1998.
10. Treece, Malra. *Effective reports*, 2nd ed., Boston: Allyn and Bacon, 1985.

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	To demonstrate independently the development of comprehensive architectural design project
2	CO2	To consider contextual, cultural, environmental, and user-specific elements during the design process.
3	CO3	To use technical knowledge, such as structure, services, materials, and sustainability for better design choices.
4	CO4	To create precise architectural drawings, models, and visual representations for effective design.
5	CO5	To demonstrate and defend the thesis project during juries using clear verbal, written, and graphic communication.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
01	3	3	3	2	2	2	2	1	1	3	2	3
02	2	3	2	3	2	2	1	2	1	3	2	2
03	3	2	3	2	3	3	2	2	2	3	2	3
04	2	2	2	1	3	2	1	3	2	2	3	2
05	2	2	2	1	2	3	3	2	3	2	3	3
Average	2.4	2.4	2.4	1.8	2.4	2.4	1.8	2	1.8	2.6	2.4	2.6

AR22B9.2C: ARCHITECTURAL PRACTICE-II

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
2	1	3	3	50	50	100	W

Objectives of the Course:

- A. To understand the basic aspects of running an architectural practice.
- B. To inform about legal aspects and legislations associated with the profession.
- C. To introduce the basic aspects of running an architectural practice – fees, services, project management, etc.
- D. To understand the Professional responsibilities within the ambit of laws of the land, contract documents, valuation and arbitration.

Course Contents:**Unit -I: ARCHITECT’S SERVICES, SCALE OF FEES and COMPETITIONS**

Modes of engaging an architect, including comprehensive, partial, and specialized services, along with their scope of work and schedule of services: the scale of fees, modes of payment, terms and conditions of engagement, and the use of letters of appointment; the importance of architectural competitions, their types—opens, limited, ideas, single-stage, and two-stage—and the Council of Architecture guidelines for conducting competitions;

Unit -II: PROJECT MANAGEMENT - TENDER, CONTRACT.

Emphasis on the fundamentals of tenders, definition, types (open and closed), conditions, tender notices, documents, submission, scrutiny, analysis, and issuance of work orders; e-tendering, advantages, procedure, and regulatory requirements; Contracts, their necessity, and key contents such as articles of agreement, terms and conditions, bills of quantities, specifications, and appendices, addresses certification of contractors, emphasizes the architect’s role in project execution and management, details of the Indian Contract Act, 1872, along with its subsequent revisions.

Unit -III: LEGAL ASPECTS

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

Unit -IV: QUALITY ASSESSMENT AND AUDITING

Quality assessment and auditing in construction, inventory management, bill verification, quality audits, handover procedures, and final certification; the role of supervision and contract management through regular site visits, meetings, and coordination with various agencies; Documentation practices such as maintaining site books, issuing site instructions, and the functions of the clerk of works and site office;

Unit -V: LAND & BUILDING VALUATION

Introduction of land and building valuation, including definitions, objectives, and the architect's role in preparing valuation and dilapidation reports and certifications; essential characteristics, classifications, and purposes of classifications in property valuation; Various methods of valuation, standards, and construction costs; easements, different types of easement rights, and the architect's role in protecting these rights.

ASSIGNMENTS TO BE FORMULATED:

- Presentations on the different topics with reference to syllabus.
- Case studies of different projects done by Architects
- Discussion sessions on policies, rules and regulations by COA
- Representations of various laws and Monitoring bodies
- Internal exam

Reference:

1. Acts and Regulations of Council of Architecture.
2. Roshan Namavati, 'Professional Practice', Lakhani Book Depot, Mumbai, 2016.
3. Ar. V.S. Apte, 'Architectural Practice and Procedure', Mrs. Padmaja Bhide, 2008
4. Madhav Deobhakta, 'Architectural Practice in India', COA, 2007.
5. Manual of Architectural Practice 2022 (Published by Registrar Council of Architecture, India).
6. R1. Roshan, H. N. (2013) Professional Practice: With elements of Estimating, Valuation, Contract, and Arbitration.
7. Dalton, J.Patrick .Land Law, 4th ed. Pitman Pub, London, 1996.
8. Indian Institute of Architects. H.B. Professional Practice, The Architects PUB, Bombay.
9. Professional Practice– K G Krishnamurthy& S V Ravindra– PHI Learning Private limited, Rimjim House, 111 Patparganj Industrial Estate, 2022
10. J.J. Scott, 'Architectural Practice', Butterworth, London 1985.
11. Consumer Protection Act, 1986.
12. Arbitration Act, 1996.
13. Factories Act, 1948.
14. Persons with Disabilities Act, 1995.
15. Architectural Practice in India by Prof. Madhav Deobhakta and Meera Deobhakta

E-resources:

1. <https://www.coa.gov.in/index1.php?lang=1&level=0&linkid=177&lid=765>
2. https://www.academia.edu/33938052/Professional_Practice_in_Architecture
3. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SAR1504.pdf
4. https://www.researchgate.net/publication/281296080_Case_Study_Standards_of_Professional_Practice_in_Architecture_VS_the_Actual_Practice
5. https://ideasnagpur.edu.in/wpcontent/uploads/2020/05/The_Architects_Handbook_of_Professional-Practise.pdf
6. Architects Act & Our Future (Recording) <https://www.acedge.in/courses/architects-act-and-our-future>

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand the legal system and an architect's role in this system
2	CO2	Familiarity with the laws related to architecture.
3	CO3	Handle the basic simple architectural practices in future
4	CO4	Give a descriptive overview of the supervision, contract administration, and valuation

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	3	2	1	-	-	2	-	2	3	3	-	2
CO2	2	3	1	1	1	2	1	3	2	2	-	2
CO3	2	3	-	1	1	2	-	2	3	2	2	2
CO4	3	2	1	2	-	-	1	1	2		3	3

1-Low Correlation; 2-Moderate Correlation; 3 –Substantial correlation

AR22B9.xE Professional Elective VII

AR22B9.1E: ARCHITECTURAL OFFICE MANAGEMENT

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	-	50	-

Objectives of the Course:

- To understand the structure and functioning of architectural firms in India.
- To introduce legal, professional, and ethical responsibilities of an architect.
- To understand project and office management processes, including contracts, finance, HR, and communication.
- To prepare students for running or working efficiently in an Indian architectural practice.

Course Contents:

Unit -I: INTRODUCTION TO OFFICE MANAGEMENT

Architectural practice in India has evolved from traditional master builders to modern firms as shaped by colonial, post-independence, and global trends; regulated by the Council of Architecture (COA) under the Architects Act, 1972, and supported by the Indian Institute of Architects (IIA); firms as proprietorships, partnerships, Limited Liability Partnerships, or private limited companies with distinct legal structures; hierarchical system in offices; principals/partners, associates, project architects, junior architects, interns, and support staff.

Unit -II: PROFESSIONAL STUDIO ORGANIZATION AND OPERATIONS

Establishing an architectural office: selecting suitable office space (owned or rented) in a well-connected location, infrastructure; planning an efficient layout for workflow; arranging essential facilities; and fostering a studio culture that supports creativity, collaboration, and professionalism; Preparing office manuals for clarity and accountability; effective human resource management through structured hiring, defined roles, internships, and performance evaluations for a sustainable work environment;

Unit -III: FINANCE & ACCOUNTING FOR ARCHITECTS

Finance and accounting for architects: fee structures (COA norms, percentage-based, lump-sum, time-charge); financial processes (billing, invoicing, GST compliance, budgeting); analysis of profitability, overheads, and break-even points; and use of financial management tools for effective planning, tracking, and decision-making.

Unit -IV: PROJECT PLANNING AND MANAGEMENT

Project management: entire lifecycle from concept to execution with structured planning and delivery; resource management of people, time, and finances; scheduling tools for monitoring timelines; quality control, documentation, and site coordination for successful project outcomes.

Unit -V: ETHICAL PRACTICE & APPLIED LEARNING

Integration of professional ethics, contemporary practice, and practical exposure for real-world practice; ethical issues: copyright, originality, architect's liability for failures, delays, safety; client relations and public responsibility; emerging models: Design-Build, EPC, PMC; collaborative and multidisciplinary approaches, and new modes of practice: sustainability-focused work, freelancing, remote studios, and digital portfolios;

REFERENCE:

1. Manual of Architectural Practice 2022 (Published by Registrar Council of Architecture, India).
2. Roshan Namavati, 'Professional Practice', Lakhani Book Depot, Mumbai, 2016.
3. Ar. V.S. Apte, 'Architectural Practice and Procedure', Mrs. Padmaja Bhide, 2008
4. Madhav Deobhakta, 'Architectural Practice in India', COA, 2007.
5. Letters to a Young Architect – Christopher Charles Benninger
6. R1. Roshan, H. N. (2013) Professional Practice: With elements of Estimating, Valuation, Contract, and Arbitration.
7. D Professional Practice of Architecture – Prof. S.C. Garg & Dr. Yogesh Garg.
8. Indian Institute of Architects. H.B. Professional Practice, The Architects PUB, Bombay.
9. Professional Practice– K G Krishnamurthy & S V Ravindra– PHI Learning Private limited, Rimjim House, 111 Patparganj Industrial Estate, 2022
10. Professional Practice – K.G. Krishnamurthy
11. Architects Act & Our Future (Recording) <https://www.acedge.in/courses/architects-act-and-our-future>
12. Architectural Practice in India by Prof. Madhav Deobhakta and Meera Deobhakta
13. Architect's Handbook of Professional Practice (15th Ed.) – AIA

COURSE OUTCOMES

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand the legal, ethical, and regulatory frameworks governing architectural practice in India
2	CO2	Apply office management principles to efficiently run an architectural firm.
3	CO3	Develop skills in project management, financial planning, and budgeting for architectural projects.
4	CO4	Analyze and adapt to emerging practice models and contemporary trends in Indian architecture.

AR22B9.2E REAL ESTATE PLANNING

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	---	50	---

Objectives of the Course:

- To understand the fundamentals of real estate development, including its scope, stakeholders, and impact on urban growth.
- To familiarize students with legal, regulatory, and policy frameworks governing land acquisition, zoning, and building approvals.
- To equip students with skills for market analysis and feasibility studies for real estate projects.
- To develop competency in planning and managing real estate projects, from conceptualization to implementation.
- To introduce financial, marketing, and operational aspects of real estate ventures for informed architectural decision-making.

Course Contents:

Unit-I: Introduction to Real Estate: Definition, scope, and components of real estate; Types of real estate: residential, commercial, industrial, and special-purpose; Stakeholders in real estate development; Role of architects in real estate; Real estate and urban development trends – past to present;

Unit-II: Legal Framework and Land Acquisition: Land tenure systems in India; Land acquisition process and laws (LARR Act, RERA, etc.); Zoning regulations, FAR/FSI, building bye-laws; Title verification and due diligence; Environmental and social impact assessments.

Unit-III: Market Analysis and Feasibility: Real estate market dynamics and demand-supply analysis; Site selection and location analysis; Financial feasibility studies metrics used in assessment of financial feasibility such as IRR, ROI, NPV basics; Tools used for analysis and risk management; Project brief preparation, DPRS;

Unit-IV: Project Planning and Development: Phases of real estate development; Stakeholder coordination and approvals; Project management basics: scheduling, costing; Infrastructure planning: roads, services, utilities; Role of public-private partnerships (PPPs); Types of PPP models such as BOT, BOOT, DBFOT, BOO, DBO, LDO, OMT PPP etc.

Unit-V: Real Estate Finance and Marketing: Sources of finance: banks, NBFCs, REITs, private equity; Construction finance vs project finance; Sales strategies, branding, and marketing channels; Post-construction handover and facility management; Case studies of best practices;

Reference:

1. P.K. Goel - Real Estate Law” – Asia Law House
2. Real Estate (Regulation and Development) Act, 2016 with Rules & Notifications” – Bare Act by Commercial Law Publishers
3. Poonam Pradhan Saxena - Property Law
4. Amitabh Kundu - Urban and Regional Planning in India

E-resources

https://mohua.gov.in	Ministry of Housing and Urban Affairs (MoHUA) Systems for Architects, Owners and Builders
https://rera.telangana.gov.in/	RERA (Real Estate Regulatory Authority) Websites
https://www.naredco.in	National Real Estate Development Council (NAREDCO)
https://credai.org	CREDAI (Confederation of Real Estate Developers' Associations of India)
https://niua.org	NIUA – National Institute of Urban Affairs
https://www.indiastat.com (subscription-based)	IndiaStat Real Estate and Housing Data

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Demonstrate understanding of real estate development concepts and their integration with architectural and urban planning practices.
2	CO2	Analyze land use regulations, legal frameworks, and approval processes relevant to real estate projects in India.
3	CO3	Evaluate project feasibility using market research, site analysis, and basic financial metrics.
4	CO4	Develop a strategic approach to real estate project planning, including stakeholder coordination and infrastructure considerations.
5	CO5	Apply knowledge of real estate finance, marketing, and post-construction management to support informed architectural decisions.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PO -10	PO -11	PO -12	PS O 1	PS O 2
CO 1	3	2	2	2	3	2	3	3	2	3	2	3	2	2
CO 2	3	3	3	2	2	3	2	2	2	2	1	2	3	3
CO 3	3	2	2	2	2	2	2	2	3	2	2	3	2	2
CO 4	3	2	2	2	3	2	2	1	3	3	1	3	2	3
CO 5	3	1	2	1	2	2	3	3	2	2	1	1	3	1

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

AR22B9.3E PROJECT FORMULATION

Periods Per Week			Credits	Marks			End Exam
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
4	0	4	4	50	---	50	---

Objectives of the Course:

- A. To understand financial principles relevant to architecture and development.
- B. To evaluate the economic viability of architectural projects.
- C. To introduce core concepts of project planning, scheduling, and coordination.
- D. To familiarize students with tools and techniques for project management.
- E. To prepare students to formulate comprehensive and executable project proposals.

Course Content:

Unit-I: Financial Feasibility and Cost Estimation: Introduction to Components of project cost: land, materials, labor, services, overheads; Basics of cost estimation: quantity surveying, rate analysis; Life cycle costing and value engineering; Use of financial feasibility metrics: NPV, IRR, payback period;

Unit-II: Funding, Budgeting, and Real Estate Economics: Sources of funding: banks, private equity, government schemes; Budget preparation and control; Economic impact assessment and market viability; Overview of real estate dynamics and regulatory frameworks: RERA, land acquisition laws;

Unit-III: Project Planning and Scheduling: Project lifecycle and development stages; Preparation of project timelines using Gantt charts and bar charts; Resource allocation and milestone planning; Introduction to project planning software (MS Project/Primavera basics);

Unit-IV: Risk Management and Quality Control: Identification of project risks: financial, technical, legal, environmental; Risk mitigation strategies and contingency planning; Quality standards in architecture and construction; Monitoring and control mechanisms during execution

Unit-V: Stakeholder Coordination and Documentation: Roles of clients, consultants, contractors, and authorities; Communication strategies and conflict resolution; Project documentation: contracts, drawings, approvals, reports; Case studies of successful project formulation and delivery

Reference:

1. William G. Ramroth - Project Management for the Design Professional
2. Harold Kerzner - Project Management: A Systems Approach to Planning, Scheduling, and Controlling
3. Kumar Neeraj Jha - Construction Project Management: Theory and Practice
4. I.M. Pandey - Financial Management

5. B.N. Dutta - Estimating and Costing in Civil Engineering

E-resources

https://smartnet.niua.org	SmartNet (NIUA)
https://mohua.gov.in	Ministry of Housing and Urban Affairs (MoHUA)
	CPWD Schedule of Rates (SOR) – For cost estimation references
https://www.pmi.org	PMI (Project Management Institute) – (for PM tools, standards, certifications)

Codes and Guidelines:

- National Building Code of India (NBC) – Bureau of Indian Standards
- RERA Act, 2016 – Real Estate (Regulation and Development) Act
- URDPFI Guidelines – Urban and Regional Development Plans Formulation and Implementation, MoHUA

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Analyze and prepare financial feasibility reports including cost estimation, budgeting, and funding strategies for architectural projects.
2	CO2	Apply project planning and scheduling techniques using tools like Gantt charts to organize development stages.
3	CO3	Evaluate risks and implement quality control strategies to ensure effective project execution.
4	CO4	Coordinate with multiple stakeholders and manage project documentation for approvals and smooth execution.
5	CO5	Formulate comprehensive project proposals that integrate financial, regulatory, contextual, and functional considerations.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO 1	3	1	1	3	1	2	3	3	1	3	2	3	2	2
CO 2	3	3	3	1	2	1	1	1	1	2	1	1	3	3
CO 3	3	2	3	1	2	3	1	1	3	1	3	3	2	2
CO 4	3	3	1	2	2	2	2	1	3	3	3	2	3	3
CO 5	3	3	1	2	2	2	3	3	1	2	1	2	3	1

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

TENTH SEMESTER
Course Structure for B.Arch.

(Under the OBE and CBCS, Effective from the Academic Year 2022-2023)

Ninth Semester

S.No	Course Code	Course Title	CoA group	Periods/Hours per week			Credits	Marks			End Exam
				L/T/S	P/F/O	Total		Int.	Ext.	Total	W/J/S/P
1	AR22B10.1C	Practical Training	AEC				15	100	100	200	J
2		Open Elective - III									

Note: L/T/S = Lecture/ Tutorial / Studio; P/F/O = Practical / Fieldwork / Others; End Exam W/J/S/P = Written (3 hours) / Jury/ Studio (5 hours) / Practical

AR22B10.1C: PRACTICAL TRAINING

Periods Per Week			CREDITS	Marks			End Exam Type
L/T/S	P/F/O	Total		Internal	External	Total	W/J/S/P
-	-	-	15	100	100	200	J

Objectives of the Course:

- To gain exposure to various facets of architectural design practice through an internship under a licensed architect.
- To develop a practical understanding of building project implementation, including basic knowledge of the construction industry and project management techniques required for professional coordination.
- To actively participate in all possible stages of architectural practice, including project initiation, concept development, schematic drawings, approval processes, presentations, working drawings, office discussions, client meetings, integration of structural and service systems, estimation, tendering, and site supervision during construction.

Course Content:

Every student must work in an Architect's Office as a full-time trainee for the entire duration of the semester (excluding Viva-voce) from the date of commencement of training. The Chief Architect in the firm should be registered with the Council of Architecture and have a minimum of five years of practical/professional experience after her/his registration. The student should involve herself/himself in various aspects of work in an office like working drawings, presentation drawings, quantity and cost estimation, site supervision, municipal drawings, etc.

Note: Detailed instructions which may be given regarding the training, the frequency of reporting to the department, etc. are to be followed strictly.

After completion of training, every student will have to submit a detailed report with a set of drawings on at least four projects on which she/he has worked during the practical training period.

Evaluation:

- The Internal Assessment shall be evaluated based on periodic reports/assessment sent by the mentoring Architect and shall be conducted by the faculty deputed by the department

in the institute.

- The Internal Assessment shall be of 100 marks. Each college can decide on the mode of evaluation of the work, either by deputing a faculty member of the College to visit the architect's office or by assessing the work at the Institute, just preceding the External Assessment. The monthly reports, Log book maintained, and reports from the Architect will be considered for Valuation. Each College will follow a uniform policy for all students in the College.
- The detailed report and drawings prepared during practical Training by students will be evaluated at a viva-voce by a jury consisting of one External member, one Internal member (Practical Training coordinator or Head of the Department or his nominee)

The Department shall arrange for the conduct of the viva-voce examination after submission of the practical training report by the students.

Students who are interested in training abroad are permitted to do so. The Chief Architect should be licensed/registered of that country with appropriate authority and should have been in practice for a minimum of five years. The faculty members may satisfy themselves about the architect's by checking the website but the primary onus of the selection depends on the student. The student and Parent/Guardian must sign an undertaking to be wholly responsible for the expenses, safety and accommodation of the student beforehand.

The student will attempt to learn as much of aspects outlined in the objectives, either first hand or indirectly. The progress of practical training will be assessed periodically internally through submission of log books along with work done by the students in terms of drawings, reports, etc., along with the regular progress report from the employers.

TRAINING REPORT

The student is expected to be exposed to the preparation of working drawing, detailing, preparation of architectural models, computer applications in design and drafting, filing system in respect of documents, drawing and preparation of tender documents. Site experience may be given in respect of supervision of the construction activity, observing the layout on site, the study of the stacking methods of various building materials, the study of taking measurements and recording. The report shall consist of the drawings and the documentary substantiation of the above aspects.

Apart from the training requirements, students may be encouraged to take-up following works for a comprehensive learning

BUILDING STUDY

Students may be encouraged to take-up a detailed critical study of a building designed by the architect with whom the student has worked. It shall include the study of function, aesthetics, context, structure etc., and can be presented through drawings, photographs, write ups etc.

BUILDING MATERIAL STUDY

Students may be encourage to take-up a detailed study of a new or relatively new building material available in the market. A study of its properties, uses, cost, maintenance etc., is expected to be done. Samples of materials shall also be obtained and presented.

DETAILING STUDY

Students may be encourage to take-up interesting detailing done in the firm where the student has undertaken training. This shall include sketches and photographs of the detail.

Reference:

1. Namavathi R. (2016) Professional Practice: With Elements of Estimating, Valuation, Contract and Arbitration, Lakhani Book Depot, ISBN-10 9385492667.
2. Krishnamurthy, K. G. & Ravindra S.V. (2013) *Professional Practice*, India: PHI Learning

COURSE OUTCOMES:

After the completion of this course, students will be able to:

S.No.	COURSE OUTCOME	DESCRIPTION
1	CO1	Understand the various stages of architectural practice, from conceptualization to construction.
2	CO2	Apply professional skills in preparing working drawings, presentations and documentation for real projects.
3	CO3	Integrate technical knowledge with design decisions and coordinate effectively among multidisciplinary teams.
4	CO4	Demonstrate ethical conduct, professional responsibility and effective communication in office and site environments.
5	CO5	Produce a well-documented training report and portfolio that evaluate their learning, exposure and contribution during the internship.

COURSE OUTCOMES PROGRAM OUTCOMES MAPPING:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
CO 1	3	2	3	3	3	3	3	3	2	3	2	3	2	2
CO 2	3	3	2	2	2	1	2	2	3	3	1	3	3	3
CO 3	3	2	3	2	3	3	3	3	3	2	1	3	2	1
CO 4	3	2	3	3	2	3	2	2	3	3	2	3	3	2
CO 5	3	3	3	2	2	2	2	3	3	3	1	3	2	2

1 - Low Correlation 2 - Medium Correlation 3 - High Correlation