Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।
NAAC Accredited-2022
'B++' Grade (CGPA-2.96)

Science & Technology

CHOICE BASED CREDIT SYSTEM STRUCTURE 2021 PATTERN

Bachelor of Architecture
B.Arch. Fifth year – Sem. IX and Sem. X

Teaching Schemes and Detailed Syllabus
W.E.F 2025 -26

Grade and Grade Point Average:

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

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

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

Computation of SGPA and CGPA

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

Computation of SGPA and CGPA

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

$$SGPA = \frac{\sum Course\ Credits \times Grade\ Points\ or\ all\ the\ Courses\ in\ that\ Semester}{\sum Course\ Credits\ for all\ the\ Courses\ in\ that\ Semester}$$

$$CGPA = \frac{\sum Course\ Credits \times Grade\ Points\ for all\ Courses\ excluding\ those\ with\ F\ grades\ until\ that\ Semester}{\sum Course\ Credits\ for\ all\ Courses\ excluding\ those\ with\ F grades\ until\ that\ semester}$$

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

Illustration for Computation of SGPA and CGPA
Sem. I

	(a) SGPA and CGPA Calculations: An Illustrative Example for one academic year						
Semester (Odd:I,Even:II)	**Course Number**	**Credits**	**Marks scored**	**Grade Points**	**Grade**	**Credit points**	**SGPA**
	1	**2**	**3**	**4**	**5**	**(2x4) 6 (2x4)**	**7**
SEM.I	**21 AR1-01**	**8**	**45**	**0**	**F**	**8X0 =0**	**SGPA = 132/30 = 4.40**
SEM.I	**21 AR1-02**	**6**	**48**	**5**	**C+**	**6x5 = 30**	
SEM.I	**21 AR1-03**	**2**	**50**	**6**	**B**	**2x6 = 12**	
SEM.I	**21 AR1-04**	**2**	**50**	**6**	**B**	**2x6=12**	
SEM.I	**21 AR1-05**	**4**	**50**	**6**	**B**	**4x6=24**	
SEM.I	**21 AR1-06**	**3**	**64**	**8**	**A**	**3x8 = 24**	
SEM.I	**21 AR1-07**	**3**	**53**	**6**	**B**	**3x6 = 18**	
SEM.I	**21 AR1-08**	**2**	**54**	**6**	**B**	**2x6 = 12**	**SGPA = 4.40**
		30 (*22)				**132**	

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

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

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

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

CGPA = 6.15

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

Sem. I

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

Sem.II

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

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

CGPA = 6.25

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

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

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

CGPA = 7.46

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Faculty of Science & Technology

Choice Based Credit System structure of Fifth Year B.Arch with effect from - w.e.f - A.Y. - 2025 -26

As per Council of Architecture ,New Delhi (COA) Guidelines

Scheme of Teaching and Examination of B.Arch. Fifth year - Semester IX - w.e.f. - June - 2025

Subject Code	Subject category	Subject Title	Teaching scheme in Periods /Week			Examination Scheme										
			60 minutes/L/P/S			Theory					Practical/Viva-voce				Total	Credits
			Lectures /Week	Practical,Studio /week	Total periods /week	Paper duration in hours	ISE		ESE		ICA		ESE			
			L	P/S	T		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.		
								50%		45%		50%		45%		
21 AR9-01	PC	Environmental Design	1	3	4	_	_	_	_	_	100	50	150	67	250	4
21 AR9-02	PC	Architectural Design Thesis I	1	7	8	_	_	_	_	_	100	50	100	45	200	8
21 AR9-03	EC/PAEC	Project Management	3	_	3	3	30	15	70	31	_	_	_	_	100	3
21 AR9-04	PC	Professional Practice - II	3	_	3	3	30	15	70	31	_	_	_	_	100	3
21 AR9-05	PC	Advanced Building Construction & Services	1	3	4	_	_	_	_	_	100	50	100	45	200	4
21 AR9-06	EC/PAEC	Elective- XI A. Wada Architecture of Maharashtra B. Scientific Vastushstra C. Valuation of Immovable Properties	_	2	2	_	_	_	_	_	50	25	_	_	50	2
21 AR9-07	EC/PAEC	Elective - XII A. High Rise Building B. Barrier Free Architecture C. Architectural Conservation	_	2	2	_	_	_	_	_	50	25	_	_	50	2
					26		60		140		400		350		**950**	**26**

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

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

Number of subjects / Head - 07	Number of Theory Examination - 02	Number of Practical/Viva-Voce Examination - 03

Note :

1. Theory exam - ISE -Internal Tests - marks to be awarded by conducting Minimum Two Test by the subject teacher , ESE - University Theory examination
2. Practical/ Viva-Voce exam - Prograsive marks (ICA) to be awarded by the subject teacher . Practical/ Viva - Voce examination (ESE - Oral) shall be conducted by one internal and two external examiner appointed by the university

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

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Choice Based Credit System structure of Fifth Year B.Arch with effect from w.e.f - A.Y. - 2025 -26

As per Council of Architecture ,New Delhi (COA) Guidelines

Scheme of Teaching and Examination of B.Arch. Fifth year - Semester X - w.e.f - Nov. - 2025

Subject Code	subject category	Subject Title	Teaching scheme in Periods / week			Examination Scheme										
			60 minutes/L/P/S			Theory					Practical/Viva-voce				Total	Credits
			Lectures /Week	Practical, Studio/ Week	Total periods /week	Paper duration in hours	ISE		ESE		ICA		ESE			
			L	P/S	T		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.		
								50%		45%		50%		45%		
21 AR10-01	PC	Architectural Design Thesis - II	1	9	10	_	_	_	_	_	300	150	200	90	500	10
21 AR10-02	EC/PAEC	Elective XIII- A. Waste Water Treatment & Management B. Entreprenuership Skills for Architects C. Sustainable cities and communities (SDG-11)	1	3	4	_	_	_	_	_	100	50	50	23	150	4
	Total				14	_	_	_	_	_	400	_	250	_	**650**	**14**

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

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

Number of subjects / Head - 02	Number of Theory Examination - 00	Number of Practical/Viva-Voce Examination - 02

Note :

1. Theory exam - ISE -Internal Tests - marks to be awarded by conducting Minimum Two Test by the subject teacher , ESE - University Theory examination
2. Practical/ Viva-Voce exam - Prograsive marks (ICA) to be awarded by the subject teacher . Practical/ Viva - Voce examination (ESE - Oral) shall be conducted by one internal and two external examiner appointed by the university

Pass percentage shall not be less than 50% in aggregate of the total marks of the year .

B. ARCH -SEM.IX

21 AR9 – 01: Environmental Design

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	03	03	ISE	ESE	ICA	ESE	
Total	04	04	--	--	100	150	250

Course Objective:

1. To understand the relationship between human activity, built environment, and environmental impact.
2. To study the role of urban morphology in shaping city structures.
3. To develop an understanding of volumetric analysis and its relation to building bylaws and regulations.
4. To explore residential planning strategies, subdivision layouts, and cluster design.
5. To integrate built and unbuilt spaces considering socio-cultural and environmental aspects

Course Outcome:
At the end of semester students should be able to:

1. Conduct environmental appraisal of urban and residential areas.
2. Documentation and analysing morphological aspects of built and unbuilt spaces of city.
3. exhibit understanding in applying volumetric analysis and bylaws in urban planning.
4. design residential layouts, incorporating social and cultural contexts.
5. Integrate environmental, landscape, and infrastructural elements in planning.

Course Curriculum:

Unit 1	Environmental Appraisal & Site Context	Relationship between human activity and built environment.
		Study of social units in residential and commercial areas.
		Topographical analysis, climatic considerations, and landscape integration.
		Road layouts, sections, and urban services.
Unit 2	Morphological Approach to Planning	Documentation and analysing urban morphology of city area
		Analysis of built and unbuilt spaces of city area planning with respect to socio -cultural and economic aspect
		Influence of planning bylaws and regulations.
Unit 3	Residential Area Planning & Layouts	Subdivision layout planning (upto 25 Acre plot area)
		Cluster design principles and case studies.
		Socio-cultural factors influencing residential planning.
	Integration of Built & Unbuilt Spaces	Planning for green spaces and landscape elements.
		Sustainable development strategies in urban planning.
		Road networks and accessibility design.
Unit 4	Volumetric Analysis & Building Bylaws	Understanding formal and informal urban environments.
		Application of bylaws in planning and development.
		Density concepts, ground coverage, height restrictions, and marginal spaces.

Submission/Assignments format:

Environmental appraisal and Morphological Approach
-group work, sketches and hand drawings
ii) Study of social units / residential /commercial area – topography, climate, services, landscape, road layout, road section and services
iii) volumetric analysis and building bye laws – individual work, sketches, views planning of residential areas – sketch files, case study reports, data collection, critical analysis in file form, portfolio, model – block model and final model

Design Portfolio Submission

1. Site analysis and environmental appraisal report.
2. Conceptual sketches and morphological studies.
3. Volumetric analysis and compliance with bylaws.
4. Residential layout planning (subdivision & cluster design).
5. Integration of built and unbuilt spaces in the design.

Reference Books:

1. Urban Design: A Typology of Procedures and Products – A.E.J. Morris
2. The Image of the City – Kevin Lynch
3. Responsive Environments: A Manual for Designers – Ian Bentley
4. Site Planning – Kevin Lynch & Gary Hack
5. Time Saver Standards for Urban Design – Donald Watson
6. The Death and Life of Great American Cities – Jane Jacobs
7. Design with Nature – Ian McHarg
8. Planning for Sustainable Cities and Regions – Karen Chapple
9. Residential Landscape Architecture – Booth & Hiss
10. Building and Urban Space Regulations – Government Publications & Local Bylaws

SEM.IX

21 AR 9-02: ARCHITECTURAL DESIGN THESIS - I

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	07	07	ISE	ESE	ICA	ESE	
Total	08	08	---	---	100	100	200

Course Objective:

1. To explore and develop an in-depth architectural topic of personal or societal relevance.
2. To demonstrate the ability to integrate theory, research, and design.
3. To encourage the exploration of technologies, and design methodologies in solving architectural problems.
4. To emphasize the importance of laws, building codes, barrier free environment in architectural design.
5. To encourage continuous improvement through feedback and critique from peers, faculty, and external reviewers.
6. To develop the ability to present and articulate design ideas clearly and professionally. Also to present a coherent, well-documented conceptual architectural proposal.

Course Outcome:

At the end of the semester students will be able to;

1. Develop an in-depth architectural selected topic.
2. Integrate theory, research, and design.
3. Use technologies, and design methodologies in solving architectural problems.
4. Apply laws, building codes, barrier free environment in architectural design.
5. Take feedback and critique from peers, faculty, and external reviewers and do design development.
6. Present design ideas clearly and professionally. Also to present a coherent, well-documented conceptual architectural proposal.

Course Curriculum:

Unit 1	Topic selection	Topic selection- Students will give 3 topics of their choice which will be presented in front of panel and one topic will be selected.
		Design methodology -Student will present their methodology in front of panel.
		Guides will be allotted to every student
Unit 2	Literature study Case studies	Literature study of selected topic- primary information, interviews, case study methodology will be finalised.
		3 case study (1 live case study as per methodology selected) and (2 book case studies will be done)
		Comparative analysis of case studies will be done with inferences
Unit 3	Site selection Programme analysis	Students will present two or three options of cities first and three site location for selected city.
		Block program will be finalised on the basis of case studies
		Final program will be finalised along with program analysis on the basis of literature review and case studies.

Unit 4	Conceptual design development	Students will present conceptual proposal to their guide and panel with minimum two options.
		Final conceptual proposal to be presented along with design development
Unit 5	Portfolio making	Minimum 15 days will be given to students for final presentation for jury.

Submission/ Assignment:

1. Spiral bound book

A) A typewritten book must be presented in neatly spiral bound 2 copies out of which one copy will be retained by college & one will be returned back to student. The size of the book should be A4 size on sunlit bond or equivalent paper. The printed blank page of the certificate which will be supplied by the college will be bound along with other typewritten pages in the beginning of the book. This will be certified and signed by the college authorities as authentication of the work by the guide who has guided the work.

The index page must contain the following sequence & paging the volume must follow this sequence. Attach either reduced size Xerox or photocopies of drawing (if legible) and prints neatly folded to suit the size of the volume.

1) Introduction (the why & what of the project)
2) Synopsis
3) Research
4) Case Studies (3 total, 2 live & 1 book)
5) Site selection
6) Design Programme (Requirement listing)
7) Programme analysis
8) Site analysis
9) Data collection
10) Design methodology
11) Photocopies of conceptual drawings

2. Drawing requirements

The final submission for the semester shall be in 4'x8' panel format or a neat portfolio, sheet size Mini A1 and Max A0, all plans should be to the scale (readable scale), site plan scale can be decided by the students with the help of guide.

1. Three topics of interest and selected one topic.
2. Following work expected of selected topic
3. About the topic & research
4. Two Live & one Book Case Study presentation & comparative.
5. Data Collection
6. Climate data
7. Technical Data –relevant to your topic.
8. Programme Analysis
9. Site selection and Analysis
10. Design Concept
11. Conceptual Drawings development including plan section and elevation (single line).
12. Block / Concept model.

Reference Books:

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

21 AR9 – 03: PROJECT MANAGEMENT

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

Course Objective:

1. Understand the fundamental concepts of project management and the roles of stakeholders in construction projects.
2. Develop construction planning and scheduling skills using various project management techniques and software.
3. Apply site planning principles for efficient space utilization, logistics, and environmental considerations.
4. Identify and mitigate construction risks while ensuring quality control and compliance with industry standards.
5. Understand and implement safety regulations, legal frameworks, and labour laws in construction.
6. Learn techniques for project execution, monitoring, control, and optimization using tools like Earned Value Management (EVM) and crashing methods.

Course Outcome:

At the end of semester students should be familiar to:

1. Explain the project life cycle, analyse the roles of stakeholders and classify types of construction projects.
2. Develop construction schedules using techniques like CPM, PERT and Gantt charts and apply resource allocation methods for efficient project management.
3. Design an efficient site layout by integrating logistics, safety, movement planning and environmental considerations.
4. Identify and assess construction risks and implement quality control measures to ensure compliance with project standards.
5. Apply safety management plans and interpret legal regulations, including labour and environmental laws in construction.
6. Demonstrate knowledge of project monitoring techniques, analyse Earned Value Management (EVM) and apply crashing methods to optimize project schedules.

Course Curriculum:

Unit-1	Fundamentals of Construction Project Management	Introduction to Project Management in Construction.
		Project life cycle: Initiation, Planning, Execution, Monitoring, Closure
		Roles and responsibilities of stakeholders: Client, Architect, Contractor, PMC.
		Types of Construction Projects: Residential, Commercial, Educational etc.
Unit-2	Construction Planning & Scheduling	Work Breakdown Structure (WBS) in building construction
		Project scheduling techniques: Bar Charts, Critical Path Method (CPM), PERT.
		Resource planning: Materials, Manpower, Machinery, and Money.
		Gantt Charts & Network Diagrams for project scheduling.
		Use of Project Management Software (MS Project, Primavera, BIM tools).
Unit-3	Site Planning & Management	Introduction to Site Planning: Importance in construction project management.
		Site Layout Planning: Optimizing space for material storage, labour accommodations, and movement.
		Temporary Facilities & Site Infrastructure: Site offices, worker amenities, water & power supply, drainage.
		Construction Logistics & Material Handling: Planning for deliveries, storage, and movement.
		Traffic & Equipment Movement Planning: Safe and efficient movement of vehicles and construction machinery.
		Waste Management & Environmental Considerations: Disposal strategies, recycling, and minimizing site impact.

Unit-4	Risk Management & Quality Control in Construction	Identification of Risks: Financial, Legal, Environmental, Safety Risks
		Methods of Risk Assessment and Mitigation Strategies
		Construction Quality Management: ISO standards, Material Testing, Site Supervision.
Unit-5	Construction Safety & Legal Framework	Construction Site Safety Regulations (OSHA, NBC, IS codes).
		Safety management plan and accident prevention measures.
		Labour laws and building by-laws in India.
		Environmental laws and sustainability guidelines in construction.
Unit-6	Project Execution, Monitoring & Control	Techniques of Project Monitoring and Progress Reporting.
		Earned Value Management (EVM) for tracking cost & schedule performance (Project crashing theory only).
		Construction productivity improvement techniques.
		Commissioning and Handover procedures in construction projects.

Assignments:
Design an efficient site layout considering logistics, safety, movement planning, and environmental impact.

References:
1. PERT AND CPM - Dr. B. C. Punima
2. Construction Management and Planning - B. Sengupta, H. Gutai
3. Project Management for Construction – Chris Hendrickson
4. Construction Planning, Equipment, and Methods – Robert L. Peurifoy
5. Project Management: A Systems Approach to Planning, Scheduling, and Controlling – Harold Kerzner

21 AR9-04 –PROFESSIONAL PRACTICE II

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	03	03	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	--	--	ISE	ESE	ICA	ESE	
Total	03	03	30	70	--	--	100

Course Objective:

1. To enhance students' understanding of legal concepts related to architectural competitions, arbitration, easements, land acquisition, and property laws, enabling them to navigate the legal landscape of architecture and construction.
2. To develop students' problem-solving abilities by analysing real-life case studies in architectural law, enabling them to apply theoretical knowledge to practical scenarios.
3. To foster critical thinking and innovation through the study of architectural competitions, encouraging students to contribute to design excellence and professional practice.
4. To ensure students acquire competency in dispute resolution mechanisms such as arbitration, allowing them to address construction-related conflicts professionally and ethically.
5. To provide students with a comprehensive understanding of property law, including easements, land acquisition, and the implications of repairs, dilapidations, and fixtures in architecture.
6. To prepare students for professional practice by developing their capacity to interpret and apply legal frameworks in architectural contracts, urban planning, and property management.

Course Outcome:

At the end of semester students should be familiar to:

1. Demonstrate an understanding of the legal frameworks governing architectural competitions, arbitration, easements, land acquisition, and property laws, and will be able to apply this knowledge in architectural practice.
2. Be able to critically analyse and evaluate various legal scenarios related to architectural competitions and dispute resolution, developing an informed perspective on design, ethical issues, and conflict resolution.
3. Apply their knowledge of arbitration to resolve real-world architectural disputes, displaying competence in navigating legal procedures and professional ethics.
4. Assess the impact of legal concepts like easements on architectural design and urban planning, integrating this understanding into their architectural proposals and development strategies.
5. Be able to evaluate and manage land acquisition processes, understanding the legal, ethical, and social dimensions, and applying this knowledge to property development projects.
6. Demonstrate the ability to manage and resolve issues related to repairs, dilapidations, and fixtures in architectural projects, applying property laws to ensure the upkeep and functionality of buildings

Course Curriculum:

Unit 1	Architectural Competition	Significance, purpose, principal requirements of architectural competitions, Promoter, Competitor and assessor- eligibility and their duties, Nature and types of competitions, council of architecture guidelines for the whole process (brief to prizes/termination) of conducting architectural Competitions, Architectural Copyright.
Unit 2	Arbitration and conciliation	Arbitration and conciliation act 1996, (conditions numbers 55 and 56 of IIA form of contract)
		Arbitration, mediation and conciliation, advantages and disadvantages of Arbitration.
		Arbitrator, Arbitral Tribunal -Appointment, power, duties, eligibility and termination.
		Arbitral Agreement, Arbitral Award.
Unit 3	Easement	Indian Easement Act -1982, Easements, dominant and servient heritage, characteristics, rights (Natural and Customary), Methods of Acquiring Easement Rights, Types of Easements (Continuous and Discontinuous). with case studies or examples.

Unit 4	Land acquisition	Land Acquisition Act-1894, principles and acquisition procedure in detail, discussion on pro and cons while acquiring land through acquisition.
Unit 5	Laws relating to Repairs, Dilapidations and Fixtures	Definitions of repairs, dilapidations waste and fixtures, covenants, Maharashtra rent control act 1999, Characteristics of Dilapidations, difference between dilapidated and ruinous building, Voluntary and Permissive waste, Landlord and tenant fixtures.

Submission / Assignment:
1.A study report on architectural competition conducted.
2.Group Discussion o the cases solved by arbitration method.
3. Movie, discussion on Land acquisition.
4.Notes.

Reference Books:
1. “Professional Practice for Architects & Engineers” by Roshan Namavathi
2. “Legal and Contractual Procedures for Architects” by Bob Greenstreet
3. AJ Legal Handbook
4. “Professional Practice” by KG Krishnamurthy and SV Ravindra.

21 AR9 -05–ADVANCED BUILDING CONSTRUCTION AND SERVICES

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	03	03	ISE	ESE	ICA	ESE	
Total	04	04	--	--	100	100	200

Course Objective:

1. Understand and analyse the structural construction details of RCC multilevel basements, including waterproofing and service provisions.
2. Design and calculate ventilation systems for multilevel basements to ensure air quality and efficiency.
3. Select and implement suitable firefighting systems with proper calculations based on basement usage.
4. Plan and integrate security (CCTV) systems for effective surveillance and safety management.
5. Develop electrical layouts with lumen calculations for efficient lighting distribution in basements.
6. Design RCC swimming pools (Overflow or Skimmer type) with calculations for structural and service considerations.

Course Outcome:

At the end of semester students should be familiar to:

1. Apply structural detailing and implement waterproofing techniques for RCC multilevel basements, ensuring space provisions for advanced building services such as HVAC, firefighting, electrical, and security systems.
2. Design and analyze ventilation systems with calculations for air changes, fan capacity, and duct layout to ensure efficient air circulation in multilevel basements.
3. Develop and evaluate a comprehensive firefighting system plan, incorporating appropriate calculations for pipe sizing, water demand, pump capacity, and fire escape routes as per NFPA standards.
4. Integrate and optimize CCTV security systems in basement layouts by determining optimal camera placement, surveillance coverage, and access control integration for enhanced security.
5. Perform lumen calculations and design an efficient electrical layout, ensuring proper lighting distribution, energy efficiency, and compliance with safety standards for multilevel basements.
6. Design and execute RCC swimming pool systems (Overflow or Skimmer type) with accurate calculations for water circulation, filtration rate, and pump capacity to achieve structural and service efficiency.

Course Curriculum:

Unit-1	Structural Construction Details of RCC Multilevel Basement	Structural components: Footings, Columns, Retaining walls, Slabs
		Waterproofing techniques: Membrane waterproofing, Crystalline waterproofing, Drainage systems
		Space provisions for advanced services: HVAC, Firefighting, Electrical, Security Systems
Unit-2	Advanced Mechanical Ventilation Systems for Multilevel Basements	Design considerations: Air changes per hour (ACH), CO_2 extraction, Fresh air intake.
		Calculation methods: Ventilation rate, Fan sizing, Duct layout design.
Unit-3	Fire Fighting System for Multilevel Basements	Fire hazards in basements & prevention methods (NFPA 13 2019)
		Types of firefighting systems: Sprinklers, Fire hydrants, Fire alarms, Smoke management systems etc.
		Design calculations: Water demand, Pipe sizing, Pump capacity, Fire escape routes etc.
Unit-4	Security (CCTV) System in Basements	Types of surveillance systems: Wired, Wireless, IP-based.
		Placement strategy: Coverage area, Blind spot reduction, Integration with access control.
		Data storage & monitoring considerations.
Unit-5	Lumen Calculation & Electrical Layout for Multilevel Basement	Lighting design principles: Lux levels, Uniformity ratio, Zoning.
		Lumen calculations: Fixture selection, Placement strategy.
		Electrical layout planning: Power distribution, Wiring layout, Circuit protection, Backup power requirements.

Unit-6	RCC Swimming Pools (Overflow & Skimmer Systems)	Types of RCC swimming pools: Overflow pool, Skimmer pool
		Structural and service considerations: Water circulation, Filtration, Drainage
		Pool design calculations: Volume, Pump capacity, Filtration rate

Submission /Assignments:

1. An RCC Multilevel basement of approx. 1200 sq.m per floor must be taken for design and A1 size sheets to be completed on:

a. Multilevel plans depicting structural components with reinforcement details, along with waterproofing technique details and space provisions for advanced services, including HVAC, Firefighting, Electrical, and Security Systems.

b. Multilevel plans illustrating Mechanical Ventilation Systems, incorporating design considerations such as Air Changes Per Hour (ACH), CO_2 extraction, and Fresh Air Intake, along with calculations for Ventilation Rate, Fan Sizing, and Duct Layout Design.

c. Multilevel plans depicting the Fire Fighting System, incorporating fire hazards and prevention methods (NFPA 13, 2019), types of firefighting systems such as sprinklers, fire hydrants, fire alarms, and smoke management systems, along with design calculations for water demand, pipe sizing, pump capacity, and fire escape routes.

d. Multilevel plans depicting Security (CCTV) System in Basements incorporating types of surveillance systems such as wired, wireless and IP-based along with placement strategy for coverage area, blind spot reduction and integration with access control.

e. Multilevel plans depicting Lumen Calculation & Electrical Layout incorporating, lighting design principles such as lux levels, uniformity ratio and zoning along with lumen calculations for fixture selection and placement strategy and electrical layout planning for power distribution, wiring layout, circuit protection and backup power requirements.

f. Sections showing RCC structural components with reinforcement details integrating all the above-mentioned services.

2. An RCC Swimming pool of approx. 100 sq.m must be taken for design and A1 Sheets must be completed on:

a. Plan and Section depicting RCC Swimming Pool (Overflow or Skimmer System) incorporating structural and service considerations such as water circulation, filtration and drainage along with pool design calculations for volume, pump capacity and filtration rate etc.

b. Swimming pool lighting layout.

c. Any 3 swimming pool details.

References Books:

1. "Reinforced Concrete Design" – S. Unnikrishna Pillai & Devdas Menon
2. "Advanced Reinforced Concrete Design" – P.C. Varghese
3. "Handbook of Waterproofing Techniques" – Michael T. Kubal
4. "Ventilation for Buildings – Calculation Methods" – CIBSE Guide
5. "Heating, Ventilation, and Air Conditioning: Analysis and Design" – McQuiston, Parker & Spitler
6. "Principles of HVAC" – Ronald Howell
7. "NFPA 13: Standard for the Installation of Sprinkler Systems (2019 Edition)" – National Fire Protection Association
8. "Fire Protection Engineering in Building Design" – Jane I. Lataille
9. "Building Construction for Fire Protection" – Francis Brannigan
10. "CCTV Surveillance: Video Practices and Technology" – Herman Kruegle
11. "Handbook of Security and Surveillance Systems" – Don Philpott
12. "Lighting Design Handbook" – Mark Karlen
13. "Interior Lighting for Designers" – Gary Gordon
14. "Electrical Wiring, Estimating and Costing" – Uppal & Ray
15. "Swimming Pools: Design and Construction" – Philip H. Perkins
16. "Water Chemistry and Filtration in Pools and Spas" – CPO Handbook
17. "Reinforced Concrete Structures" – B.C. Punmia

21 AR9– 06 : ELECTIVE - XI

Teaching Scheme per week		Credits	Examination scheme				
Lecture (L)	00	00	Theory exam		Practical/Oral Exam		Total
Practical/Studio(P/S)	02	02	ISE	ESE	ICA	ESE	
Total	02	02	--	--	50	----	50

The student will opt for any one of the following courses –
A. Wada Architecture of Maharashtra
B. Scientific Vastushastra
C. Valuation of Immovable Properties

A. Wada Architecture of Maharashtra

Course Objective:

1. Introduce the historical significance and evolution of Wada architecture in Maharashtra.
2. Analyse the typology and spatial planning principles of Wadas.
3. Understand the construction techniques, materials, and structural systems used in Wadas.
4. Study climatic and environmental considerations influencing Wada design.
5. Conduct case studies and documentation of prominent Wadas through site visits.
6. Develop analytical and presentation skills through measured drawings and research.

Course Outcome:
At the end of semester students should be familiar to:

1. Demonstrate an understanding of Wada architecture and its historical evolution.
2. Classify different types of Wadas based on spatial planning and usage.
3. Analyze the structural and material aspects of Wada construction.
4. Assess the climatic and environmental adaptations in Wada design.
5. Document and present findings through measured drawings and site visits.
6. Develop critical thinking and presentation skills through expert evaluation.

Course Outline:

Unit-1	Introduction to Wada Architecture	Definition and significance of Wadas in Maharashtra's architectural heritage.
		Evolution of Wadas from the Maratha period to the British colonial era.
		Socio-cultural influences and the role of Wadas in community living.
Unit-2	Typology and Spatial Planning	Classification of Wadas: Brahmin Wadas, Peshwa Wadas, Merchant Wadas, Feudal Wadas.
		Spatial planning principles: Angan (courtyard), Diwankhana, Devghar, Kacheri, Warehouses, Stables.
		Climatic and environmental considerations in Wada design.
Unit-3	Construction Techniques and Materials	Structural systems: Load-bearing walls, timber frameworks, stone and brick masonry.
		Roofing systems: Mangalore tiles, wooden trusses, and flat roofs.
		Ornamental elements: Wooden brackets, carved columns, arches, jharokhas, and murals.
Unit 4	Case Studies and Site Visits	Case studies of prominent Wadas (Shaniwar Wada, Vishram Baug Wada, Raste Wada, Purandare Wada, etc.).
		Documentation and measured drawings of a selected Wada through site visits in your locality.
Unit 5	Final Presentation and Evaluation	Submission of documentation reports and sketches.

Submission/ Assignment:

1. Research report on the historical evolution of Wadas.
2. Comparative analysis of different Wada typologies.
3. Site visit documentation including sketches and measured drawings.
4. Group presentation on case studies.
5. Final submission of detailed documentation and evaluation report.

Reference Books:

1. "The Wada of Maharashtra: A Historical Perspective" – by V.K. Rajwade.
2. "Maratha Architecture and Art" – by M.A. Dhaky.
3. Research papers on Wada architecture and conservation policies in Maharashtra.
4. Reports by INTACH and Maharashtra State Heritage Conservation Committee.

B. Scientific Vastushastra

Course Objective:

1. Understand the Fundamentals of Vastu Shastra – Gain knowledge of the core principles, history, and relevance of Vastu Shastra in architectural design.
2. Explore the Scientific Basis of Panchabutas (Five Elements) – Analyse the role of earth, water, fire, air, and space in spatial planning and their impact on human well-being.
3. Examine Cardinal Directions and Energy Flow – Assess the influence of orientation, directional alignments, and spatial energy distribution in built environments.
4. Evaluate Vastu's Influence on Well-being – Investigate the relationship between Vastu principles and their effects on financial stability, physical health, and mental peace.
5. Apply Vastu Guidelines in Site and Building Planning – Develop an understanding of land selection criteria, entrance positioning, and spatial organization for Vastu compliance.
6. Introduce Astro Vastu and its Architectural Implications – Explore the integration of astrology in Vastu principles for property selection and spatial harmony.

Course Outcome:

At the end of semester students should be familiar to:

1. Introduce fundamental concepts and principles of Vastu Shastra.
2. Develop an understanding of the five elements (Panchabutas) and their scientific significance.
3. Analyze the impact of cardinal directions and energy flow in a built environment.
4. Explore the relationship between Vastu and financial, physical, and mental well-being.
5. Understand land selection, entrance placement, and their role in Vastu compliance.
6. Introduce Astro Vastu and its influence on property selection and spatial planning.

Course Curriculum:

Unit 1	Importance of Vastu and Pancha Tatva	Introduction to Vastu Shastra and its relevance in architecture.
		Understanding the five primordial elements: earth, water, fire, air, and space (Pancha Tatva).
		Influence of these elements on well-being, prosperity, and quality of life.
		Case studies analysing the impact of elemental balance in built environments
Unit 2	Cardinal Directions and Degrees for a Home	Orientation of buildings in relation to cardinal directions: North, South, East, and West.
		Intermediate directions: Northeast, Southeast, Southwest, and Northwest.
		Measurement of directions in degrees and their significance in Vastu.
		Understanding energy flow, light penetration, and cosmic forces affecting living spaces.
Unit 3	Role of Vastu - Finance,	Connection between architectural planning and financial stability, physical health, and mental well-being.

	Health, and Mental Well-being	Placement of rooms and their effects on different aspects of life
		Identifying design flaws and their impact on prosperity and harmony.
		Corrective measures to enhance positive energy and balance in spaces
Unit 4	Selection of Land, Good Entrances & Introduction to Astro Vastu	Land selection: shape, orientation, and natural features influencing suitability.
		Importance of main entrances and their alignment with auspicious directions.
		Basic principles of Astro Vastu: linking astrology with architectural planning.
		Understanding how individual birth charts influence property selection and design.
Unit 5	Final Presentation and Evaluation	Submission of research reports and spatial analysis of Vastu principles.
		Site visit documentation and presentation of findings.

Submission/ Assignment:

1. Research paper on Vastu principles and case studies.
2. Analysis of a real-life built structure based on Vastu guidelines.
3. Site visits and documentation of residential or commercial spaces.
4. Group presentation on Astro Vastu and its application in design.

Final submission of a detailed Vastu-compliant architectural proposal

Reference Books:

1. "Indian Vastu Shastra: Science of Construction & Architecture of Building" – Vaibhav Chawadre.
2. "The Miracles of Vaastu Shastra" – Shanku Shiva Dass.
3. "Golden Rules of Vastu Shastra - Remedies and Solutions" – Suman Pandit.
4. "Vastu: Breathing Life into Space" – Robert E. Svoboda.
5. "A Guide to the Principles of Vastu Shastra" – B. B. Puri.
6. "Vastu Shastra: The Classical Indian Science of Architecture" – Sashikala Ananth.
7. "Vastu Shastra for Harmony and Prosperity" – Ashwini Kumar Bansal.
8. "The Complete Book of Vastu Shastra" – Dr. Puneet Chawla.
9. "MahaVastu Handbook" – Khushdeep Bansal.
10. "Vastu Shastra: Design Theory and Application" – T.S. Ramachandra Iyer.

C. Valuation of Immovable Properties

Course Objective:

1. To understand the fundamental principles of valuation, including market value, supply and demand, and property investment concepts.
2. To analyse various methods of rental value determination and evaluate legal and economic factors affecting rent.
3. To apply different valuation methods for land, buildings, and other property types, including direct comparison, cost, and profit-based valuation.
4. To assess depreciation and compute the life cycle of buildings and infrastructure.
5. To evaluate property valuation for specific financial and legal purposes, including mortgages, bank loans, acquisitions, and probate.
6. To interpret relevant government acts and regulations affecting valuation, taxation, compensation, and land use planning.

Course Outcome:

At the end of semester students should be familiar to:

1. Explain key valuation principles and investment analysis for properties.
2. Conduct rental value assessments considering economic, legal, and financial aspects.
3. Utilize appropriate valuation methods for residential, commercial, and underdeveloped properties.
4. Calculate depreciation and analyse the impact of building age and maintenance on valuation.
5. Prepare valuation reports for mortgage, taxation, finance, and legal purposes.
6. Interpret and apply state and central government acts related to property valuation and acquisition.

Course Curriculum:

Unit 1	Principles of Valuation	Nature of value
		Fair market value and open market price
		Supply and demand in real estate
		Property as an investment
		Property as an investment
		Percentage yield and interest rates on investments in land and buildings
		Development of properties and comparison with other investment types
Unit 3	Rental Value and Net Income	Economics and legal factors affecting rent
		Methods of determining rental value
		Effect of capital improvements on rental value
		Outgoings: Municipal and other taxes, Repairs, Sinking funds
		Nature and use of valuation tables
Unit 3	Methods of Property Valuation	Various methods of valuation
		Analysis of rental and sales trends
		Direct comparison of capital value
		Valuation by reference to cost and profits
		Residual or development method
		Rental method of valuation
		Land and building valuation methods
		Modern developments in valuation
		Valuation of fully tenanted and partly occupied properties
		Valuation of underdeveloped properties and leave & license-based properties
Unit 4	Valuation of Land	Factors influencing land valuation: Situation, Size and shape, Technical and physical conditions
		Methods of valuation of land
		Income reversion and encumbrance on land
		Problems related to continuity of income from land investments
Unit 5		Concept of depreciation in property valuation

	Depreciation in Valuation	Methods of computing depreciation
		Classification of buildings based on depreciation
		Estimation of building life and valuation adjustments
Unit 6	Valuation for Financial and Legal Purposes	Valuation for: Mortgages, Probate, Bank loans, Finance advancements, Compulsory acquisitions, Standard rent court orders , Auction reserves and acquisition valuation
Unit 7	Valuation of Non-Residential Properties	Valuation of commercial properties such as: Theatres, Hotels, Offices, Other business establishments
Unit 8	Legal Aspects in Valuation	Central and state government acts affecting valuation
		Income Tax Act related to land valuation
		Land Ceiling Act and its impact
		Compensation Act and Town Planning Act
		Valuation considerations for property acquisition and compensation

Submission/ Assignment:

Assignment containing all topic notes in handwritten format.

Report containing minimum G +1 construction project report along with site visit and site photos

Reference Books:

1.Theory of Valuation – Roshan H. Namavathi
2. Valuation of Immovable Properties – M.H. Dhange
3. Estimating, Costing and Valuation by Rangawala

21 AR9-07: ELECTIVE XII

Teaching Scheme Per week		Credit	Examination Scheme				
Lecture/ week - L	00	00	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	02	02	ISE	ESE	ICA	ESE	
Total	02	02	--	--	50	---	50

The student will opt for any one of the following courses
A. High Rise Building
B. Barrier Free Architecture
C. Architectural Conservation
The detail syllabus for the above subjects is given hereby

A. High Rise Building
Course Objectives:

1. Introduce the evolution, history, and significance of high-rise buildings.
2. Analyze the structural systems and load distribution in tall buildings.
3. Understand stability, seismic forces, and wind loads affecting skyscrapers.
4. Explore advanced structural and foundation systems for high-rise construction.
5. Study building services, vertical transportation, and fire safety measures.
6. Investigate sustainability strategies and modern construction technologies.

Course Outcomes:

At the end of semester students should be familiar to:

1. Demonstrate knowledge of high-rise building history and design considerations.
2. Analyze structural systems and their role in ensuring building stability.
3. Assess seismic, wind, and environmental impacts on tall buildings.
4. Evaluate material choices and foundation systems for high-rise structures.
5. Apply sustainable design strategies and building service integrations.
6. Conduct case studies and site visits to understand real-world high-rise construction challenges.

Course Curriculum:

Unit 1	Introduction to High-Rise Buildings	Evolution and history of skyscrapers.
		Factors influencing high-rise design (economic, functional, environmental, and safety).
		Zoning regulations and legal frameworks for high-rise development.
		Basics of stability in high-rise structures.
		Interaction between foundation and superstructure.
Unit 2	Structural Systems in High-Rise Buildings	Load distribution in high-rise buildings.
		Gravity and lateral load-resisting systems.
		Structural framing systems: Rigid frame, shear walls, braced frame, core structures.
		Composite structural systems in high-rise buildings.
		Large panel construction and modular structures.
Unit 3	Advanced Structural Systems and Materials	Outrigger systems and belt trusses.
		Tube structures (framed tube, bundled tube, tube-in-tube).
		Hybrid and innovative structural systems.
		Smart structural systems and high-performance materials.
		High-performance concrete, steel, and composite materials in skyscraper construction.
Unit 4	Services, Sustainability, and Safety	Vertical transportation systems (elevators, escalators).
		Fire safety and egress design in tall buildings.
		HVAC, MEP, and building services integration.

		Sustainable design strategies: energy efficiency, facade optimization, wind energy harnessing, vertical greening.
Unit 5	Project Work, Site Visit & Evaluation	Types of foundations for high-rise buildings (mat foundations, pile foundations).
		Soil-structure interaction.
		Report on site visit to a high-rise building under construction or completed project.
		Analysis of structural and service systems in a selected high-rise case study.
		Presentation and expert review of findings.

Submissions/Assignments:

1. Case study report on an iconic high-rise building.
2. Structural system analysis for a proposed skyscraper.
3. Research paper on sustainability practices in high-rise buildings.
4. Site visit documentation and analysis.
5. Final presentation on innovative high-rise design solutions.

Suggested Readings & References:

1. "Structural Design of Tall Buildings" – Bungale S. Taranath.
2. "High-Rise Building Structures" – Wolfgang Schueller.
3. "Seismic Design of Buildings to Eurocodes" – Ahmed Elghazouli.
4. "Tall Building Structures: Analysis and Design" – Bryan Stafford Smith & Alex Coull.
5. "Design of High-Rise Buildings: Past, Present, and Future" – Sri Sritharan.
6. "Sustainable Tall Buildings" – Philip Oldfield.
7. "Fundamentals of High-Rise Structures" – Bryan Stafford Smith.
8. Research papers on high-rise construction, sustainability, and advanced structural systems.
9. Reports by the Council on Tall Buildings and Urban Habitat (CTBUH).

B. Barrier free Architecture

Course Objectives:

1. Introduce the concept, need, and principles of barrier-free architecture.
2. Analyze universal design concepts and accessibility standards for different disabilities.
3. Study barrier-free elements in interiors, urban spaces, and public buildings.
4. Understand national and international standards for barrier-free environments.
5. Develop design solutions incorporating accessibility in architecture and urban planning.
6. Explore access audits, building by-laws, and technological innovations for universal design.

Course Outcomes: At the end of semester students should be familiar to:

1. Demonstrate understanding of barrier-free architecture and its significance.
2. Apply universal design principles to improve accessibility in built environments.
3. Analyze and integrate barrier-free elements in architectural and urban design projects.
4. Evaluate case studies and conduct access audits in public buildings.
5. Interpret and implement guidelines and standards for accessible environments.
6. Incorporate barrier-free design solutions using modern technology and legal frameworks.

Course Outline –

Unit 1	Introduction to Barrier-Free Architecture	Definition and importance of barrier-free design
		Need for accessibility in architecture
		Universal design concepts and types of disabilities
		Design principles for an inclusive built environment
Unit 2	Barrier-Free Elements in Interiors and Urban Spaces	Essential design elements outside buildings:
		Curb ramps, pedestrian crossings, public toilets, parking spaces
		Signage, flooring, and street furniture
		Barrier-free elements within buildings:
		Entrances, corridors, windows, stairways, elevators, and ramps
		Accessible toilets, guiding and warning systems
Unit 3	Standards and Regulations for Barrier-Free Environments	Guidelines and space standards for accessibility in various building types
		Educational institutions, healthcare facilities, public spaces, commercial buildings
		National and international accessibility standards (e.g., ADA, NBC)
		Persons with Disabilities Act and its implications in architectural design
Unit 4	Case Studies and Practical Applications	Study of barrier-free architecture in public buildings (auditoriums, parks, transport hubs)
		Case study analysis and photographic documentation
		Integration of accessibility elements in architectural design projects
		Site visits and real-world assessment of accessibility features
Unit 5	Access Audit and Technological Interventions	Conducting an access audit for existing buildings
		Implementation of barrier-free strategies in architectural projects
		Role of modern technology in universal design (smart assistive devices, tactile guidance, digital wayfinding)
		Presentation and evaluation of barrier-free design proposals

Sessional work:

1. Theory Assignments
2. Application of graphical presentation to explain the barrier-free architecture.

Reference Book:

1. Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons – Central Public Works Department, Ministry of Urban Affairs & Employment, India, 1998
2. IS – 4963 (1987), Recommendations for buildings and facilities for Physically Handicapped
3. Barrier-Free Design: Principles Planning, Examples, by Oliver Heiss, Christine Degenhardt, Johann Ebe (Birkhauser Architecture, 2010)

C: ARCHITECTURAL CONSERVATION

Course Objectives:

1. Understand principles, scope, and significance of architectural conservation.
2. Analyse conservation approaches like preservation, restoration, and reconstruction.
3. Identify causes of deterioration in historic buildings.
4. Learn documentation, research, and assessment methods.
5. Understand structural behavior and materials in heritage buildings.
6. Apply conservation strategies through case studies and projects.

Course Outcomes:

At the end of semester students should be familiar to:

1. Demonstrate knowledge of architectural conservation principles.
2. Evaluate and apply appropriate conservation approaches.
3. Identify and analyse building deterioration causes.
4. Develop skills in documentation and condition assessment.
5. Understand structural aspects of heritage buildings.
6. Apply conservation techniques in real-world projects.

Course Curriculum -

Unit 1	Introduction to Architectural Conservation	Definition, significance, and scope of architectural conservation.
		Role of conservation architects in preserving heritage structures.
		Overview of conservation charters (Venice Charter, Burra Charter, etc.).
Unit 2	Conservation Approaches and Methodologies	Types of conservation: Prevention, Preservation, Consolidation, Restoration, Rehabilitation, Reproduction, Reconstruction.
		Comparative study of conservation approaches in India and worldwide.
Unit 3	Structural Aspects in Conservation	Understanding the structural behaviour of historic buildings.
		Traditional construction techniques and materials in heritage structures.
		Strengthening and retrofitting techniques for conservation.
Unit 4	Causes of Decay and Deterioration	Natural causes: weathering, biological growth, earthquakes, floods, etc.
		Human-made causes: neglect, pollution, improper modifications, vandalism.
		Strategies for mitigating deterioration and prolonging structural life.
Unit 5	Documentation and Analysis in Conservation	Methods of architectural documentation: measured drawings, photography, 3D scanning.
		Inspection and recording techniques.
		Preparing conservation reports with case studies and analysis.
Unit 6	Conservation Project and Implementation	Selection of a building (minimum 150 sqm) for conservation study.
		Detailed documentation and condition assessment report.
		Conservation strategy proposal based on analysis.
		Final report submission and presentation.

References:

1. Jokilehto, Jukka – *A History of Architectural Conservation*, Routledge.
2. Feilden, Bernard M. – *Conservation of Historic Buildings*, Butterworth-Heinemann.
3. Donald Insall – *Living Buildings: Architectural Conservation, Philosophy, Principles, and Practice*, Images Publishing.
4. ICOMOS Charters and Reports on Conservation Practices.
5. Indian National Trust for Art and Cultural Heritage (INTACH) Guidelines.
6. Ashurst, John & Ashurst, Nicola – *Practical Building Conservation*, English Heritage Technical Handbook.

SEM.X

21 AR10 – 01: ARCHTECTURAL DESIGN THESIS -II

Teaching Scheme Per week		Credit	**Examination Scheme**				
Lecture/ week - L	01	01	Theory Exam		Practical oral exam		Total
Practical/Studio -P/S	09	09	ISE	ESE	ICA	ESE	
Total	10	10	--	--	300	200	400

Course Objective:

1. To be efficient in design, technical skills, and communication.
2. To develop detailed architectural drawings.
3. To bridge the gap between conceptual design and practical, technical solutions.
4. To develop a deep understanding of the site's constraints and opportunities and respond appropriately with a site-sensitive design that enhances its surrounding environment.
5. To integrate technical aspects of building design such as structural systems, environmental controls, lighting, acoustics MEP and fire services into the overall architectural solution.
6. To encourage the application of architectural design in real-world contexts, considering aspects such as site response, design requirement, planning etc.

Course Outcome:

At the end of the semester students will be able to;

1. Showcase proficiency in design, technical skills, and communication.
2. Execute detailed architectural drawings (scale models, 3D renderings, material selection).
3. Convert conceptual design and practical, technical solutions.
4. Transform site's constraints, opportunities and produce a site-sensitive design that enhances its surrounding environment.
5. Implement technical aspects of building design such as structural systems, environmental controls, lighting, acoustics MEP and fire services into the overall architectural solution.
6. Develop architectural design in real-world contexts, considering aspects such as site response, design requirement, planning etc.

Course Curriculum:

Unit 1	Review of project 2. .	Guides to be allotted for current semester.
		Remarks given by university jury members to be
Unit 2	Design process and single design development	Revision and detail analysis of requirements.
		Laws and guidelines to be studied.
		Finalizationof requirement.
		Final siteanalysis along with site visit.
Unit 3	Site plan, floor plan, sections and elevations.	Design development.
		Block design with model
		Site plan and concept
		Site sections Schematic proposal
		Single line conceptual design
		Site plan finalization
		Floor plan finalization
Unit 4	Dissertation book	Integration of design strategies.
		Conceptual services.

	Details integration in design Services integration in design	Integration of services in site plan, floor plans.
		Integration of structural grid in design.
		Draft presentation of book
Unit 5	Portfolio making	Site plan
		Site sections
		All floor plans with furniture layout.
		All blocks section
		All blocks section
		All elevation
		Services calculations.
		Structural systems and technology to be finalized.
		Services layouts and diagrams in plan sections

Submission/ Assignment:

1.Hard bound book

A typewritten book must be presented in neatly spiral bound 3 copies out of which two copies will be retained by college & one will be returned back to student. The size of the book should be A4 size on sunlit bond or equivalent paper. The printed blank page of the certificate which will be supplied by the college will be bound along with other typewritten pages in the beginning of the book. This will be certified and signed by the college authorities as authentication of the work by the guide who has guided the work.

The index page must contain the following sequence & paging the volume must follow this sequence. Attach either reduced size Xerox or photocopies of drawing (if legible) and prints neatly folded to suit the size of the volume.

a. Introduction (the why & what of the project)
b. Synopsis
c. Research
d. Case Studies (3 total, 2 live & 1 book)
e. Site selection
f. Design Programme (Requirement listing)
g. Programme analysis
h. Site analysis
i. Data collection
j. Design methodology
k. Photocopies of final drawings

2. Drawing requirements

The final submission for the semester shall be in 4'x8' panel format or a neat portfolio, sheet size Mini A1 and Max A0, all plans, sections and elevations should be to the scale (readable scale), site plan scale can be decided by the students with the help of guide.

a. Summary of previous semester design
b. Scaled drawings to explain entire designs including plans, sections, elevations.
c. Master Plan / Site plan along with detail site section.
d. Services conceptual layouts.
e. Views, Model, Sketches etc.

Reference Books:

1. Anthony Di Mari and Nora Yoo, " Operative Design: A Catalogue of Spatial Verbs", BIS Publishers.
2. Bruno Munari,"Design as Art", Penguin UK, 25-Sep-2008.
3. Charles George Ramsey and Harold Sleeper, "Architectural Graphic Standards", 1992, Wiley.
4. Debkumar Chakrabarti, "Indian Anthropometric Dimensions for Ergonomic Design Practice", 1997.
5. Frank Ching, James F. Eckler, "Introduction to Architecture", 2012, John Wiley & Sons, US.
6. Frank D.K. Ching, " Architecture: Form, Space, and Order", 4th Edition, Sep. 2014, John Wiley & Sons.

7. John Hancock Callender, “Time-Saver Standards for Architectural Design Data", 1982, McGraw-Hill.
8. Neufert Architects' Data by Ernst Neufert.
9. Francis D.K. Ching –Elements of Architecture.
10. Walter Gropius – Total Architecture.

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

The student will opt for any one of the following courses-

A. Waste water Treatment & Management
B. Entrepreneurship skills for Architects
C. Sustainable Cities and Communities (SDG-11)

A. Waste water Treatment & Management

RESIDENTIAL WASTE WATER (GREY WATER) MANAGEMENT

Course Objective:

1. To understand sources, composition, and characteristics of greywater.
2. To explore sustainable methods for greywater treatment and reuse.
2. To study regulatory frameworks and environmental impacts.
3. To design efficient greywater management systems for residential applications.

Course Outcome:

At the end of semester students should be familiar to:

1. Explain the sources, composition, and characteristics of greywater generated in residential areas.
2. Identify and compare various greywater collection, treatment, and reuse techniques.
3. Apply environmental regulations and safety guidelines for greywater management in residential buildings.
4. Evaluate the economic feasibility, environmental benefits, and maintenance requirements of greywater systems.
5. Analyze case studies and emerging trends in greywater recycling for sustainable urban development.
6. Design a sustainable greywater treatment and reuse system based on site-specific requirements.

Course Curriculum:

Unit 1	Introduction to Greywater and Its Characteristics	Definition and differentiation: Blackwater vs. Greywater
		Sources of greywater: Kitchen, laundry, bathing, and sinks
		Composition and characteristics: Physical, chemical, and biological parameters
		Quantity estimation and variability in residential setups
		Importance of greywater management in sustainable living
Unit 2	Collection and Treatment Methods	Overview of greywater collection systems.
		Primary, secondary, and tertiary treatment processes.
		Natural treatment methods: Reed beds, constructed wetlands, and biofiltration.
		Mechanical treatment systems: Sand filters, activated carbon, and membrane filtration.
		Comparison of different treatment techniques in terms of efficiency and cost.
Unit 3	Greywater Reuse and Applications	Potential applications: Irrigation, toilet flushing, groundwater recharge, and cleaning.
		Design considerations for reuse systems.
		Health risks and safety measures for greywater reuse.
		Role of decentralized greywater treatment in sustainable urban development.
		Case studies of successful residential greywater reuse projects.
Unit 4	Regulatory Framework and	Indian and international standards for greywater reuse (BIS, CPCB, WHO)
		Policies and guidelines for residential greywater management

	Environmental Impact	Environmental impacts of untreated greywater disposal
		Role of government initiatives and incentives in promoting greywater reuse
		Sustainable Development Goals (SDGs) related to wastewater management.
Unit 5	Design and Implementation of Greywater Systems	Planning and layout of residential greywater systems.
		Selection of materials and components for piping and filtration.
		Cost analysis and economic feasibility of greywater management.
		Maintenance and troubleshooting of greywater treatment units.
		Smart technologies and IoT-based monitoring of greywater systems.
Unit 6	Case Studies, Emerging Trends and Research	Review of greywater management practices in urban and rural areas.
		Sustainable innovations in greywater treatment.
		Integration of greywater recycling with rainwater harvesting.
		Future trends: Artificial intelligence, nanotechnology, and energy-efficient solutions.
		Research opportunities in residential greywater management.

Submission /Assignment:

1. Assignments on all units.
2. Writing at least 5 literature reviews by selecting research articles on the course published in National and International journal.
3. Designing of Residential waste water (Grey Water) Treatment and Reuse by taking any one residential project.

Reference Books:

1. "Wastewater Engineering: Treatment and Resource Recovery" – Metcalf & Eddy, Inc., George Tchobanoglous, H. David Stensel
2. "Environmental Engineering" – Howard S. Peavy, Donald R. Rowe, George Tchobanoglous
3. "Water Supply and Pollution Control" – Warren Viessman & Mark J. Hammer
4. "Decentralized Wastewater Treatment Systems (DEWATS) and Sanitation in Developing Countries" – Ralf Otterpohl, Martina Winker
5. "Biological Wastewater Treatment" – C. P. Leslie Grady, Glen T. Daigger, Henry C. Lim
6. "Constructed Wetlands for Wastewater Treatment" – Donald A. Hammer
7. "Water Reuse: Issues, Technologies, and Applications" – Takashi Asano
8. "Greywater Reuse: Sustainable Wastewater Management" – Amit Gross, Lucas Meili, Ori Lahav
9. "Handbook of Water and Wastewater Treatment Technologies" – Nicholas P. Cheremisinoff
10. "Wastewater Treatment for Pollution Control and Reuse" – Soli J. Arceivala, Shyam R. Asolekar
11. "Guidelines for Water Reuse" – U.S. Environmental Protection Agency (EPA)
12. "Environmental Engineering and Management" – Suresh K. Dhameja
13. "Integrated Design and Operation of Water Treatment Facilities" – Susumu Kawamura
14. "Rainwater Harvesting for Drylands and Beyond" – Brad Lancaster
15. "Smart Water Management: The Guide to Utilizing Greywater Systems" – Daniel H. Kindle
16. "Sustainable Water Management in the Tropics and Subtropics" – K. T. J. Cheng
17. "Alternative Water Supply Systems" – Fayyaz A. Memon, Sarah Ward
18. "Advances in Greywater Treatment and Reuse" – Mu. Naushad

Online Resources -

1. IS 1172:1993 – Code of Basic Requirements for Water Supply, Drainage, and Sanitation (Bureau of Indian Standards)
2. CPHEEO Manual on Sewerage and Sewage Treatment – Ministry of Housing & Urban Affairs, India World Health Organization (WHO)
3. Guidelines for the Safe Use of Wastewater, Excreta & Greywater

Entrepreneurship skills for architects

Course Objective:

1. To develop an entrepreneurial mindset and understanding of the role of entrepreneurship in economic growth.
2. To equip students with fundamental knowledge of entrepreneurship principles and business ethics.
3. To enhance essential entrepreneurial skills such as critical thinking, problem-solving, and communication.
4. To introduce financial management, office administration, and business planning in architectural practice.
5. To explore innovative business models and strategies in architectural entrepreneurship.
6. To provide practical exposure through case studies, assignments, and hands-on projects.

Course Outcome:
At the end of semester students should be familiar to:

1. Demonstrate a strong understanding of entrepreneurial concepts and their application in the real world.
2. Analyze and evaluate business opportunities within the architectural domain.
3. Develop effective communication, leadership, and management skills essential for entrepreneurship.
4. Create and present business models incorporating financial, operational, and marketing strategies.
5. Apply knowledge of business planning, risk management, and funding strategies in real-world scenarios.
6. Exhibit practical entrepreneurial skills through research, case studies, and project-based learning.

Course Curriculum:

Unit 1	Entrepreneurial Mindset and Foundations	Definition and concept of entrepreneurship
		History and evolution of entrepreneurship
		Role of entrepreneurship in economic development
		Factors influencing entrepreneurship
		Types of entrepreneurs and examples
		Overcoming barriers to entrepreneurship
Unit 2	Fundamentals of Entrepreneurship	Core principles of entrepreneurship
		Business ethics and professional responsibility
		Market research and opportunity identification
		Business planning and risk assessment
		Basics of financial management and funding options
Unit 3	Entrepreneurial Skill Development	Lateral thinking and problem-solving strategies
		Effective communication and persuasion skills
		Human resource management and team building
		Time management techniques for productivity
		Office administration and financial management skills
		Introduction to essential software for business operations
Unit 4	Business Models and Architectural Entrepreneurship	Innovative business models in architectural practice
		Emerging trends in architectural entrepreneurship
		Identifying opportunities and challenges in the 21st-century business environment
		Steps in creating a successful business model
		Case studies of successful entrepreneurs in architecture and allied fields
Unit 5	Practical Applications and Assignments	**Assignment 1:** Essay on entrepreneurship concepts and development (1500-2000 words)
		Assignment 2: Case studies on entrepreneurs (one in architecture, one in an allied field) with a seminar presentation
		Assignment 3: Individual or group project focusing on entrepreneurial strategies, presented as a detailed report

Reference Books:

1. Architect and Entrepreneur: A Field Guide to Building, Branding, and Marketing Your Startup Design Business – Eric Reinholdt
2. Architect's Essentials of Starting, Assessing, and Transitioning a Design Firm – Peter Piven
3. Design Professional's Guide to Business Development: Practical Strategies for Architects, Engineers, and Environmental Consultants – Sylvia Montgomery & David H. Maister
4. Architecture Entrepreneurship in Practice: A Guide for Architects, Engineers, and Design Professionals – Rajeev Kathpalia & Nisha Mathew Ghosh
5. The Business of Architecture: A Guide to Successful Practice in India – S. Raghavendra
6. Professional Practice (2018 Edition) – Roshan Namavati
7. Architectural Practice – Prof. Madhav Devbhakt

C.Sustainable Cities and Communities (SDG -11)

Course Objectives:

1. Understand the fundamental concepts of sustainable cities, communities, and their relevance in contemporary urban challenges.
2. Analyze the role of urban design, planning strategies, and architecture in achieving sustainability.
3. Explore green infrastructure, sustainable transportation, and biodiversity conservation in urban development.
4. Examine social sustainability, inclusive design, affordable housing, and community engagement.
5. Develop strategies for climate resilience, disaster preparedness, and urban adaptation to climate change.
6. Apply sustainability principles in architectural design through case studies and real-world examples.

Course Outcomes:

At the end of semester students should be familiar to:

1. Demonstrate an understanding of sustainable urban development concepts and frameworks.
2. Assess the relationship between urban planning, sustainable design, and environmental conservation.
3. Apply sustainable transportation and green infrastructure strategies in urban contexts.
4. Evaluate the social and economic impacts of sustainable cities and propose solutions for inclusive communities.
5. Incorporate resilience and climate adaptation strategies into urban and architectural design.
6. Present case studies and best practices, critically analyzing sustainability in cities worldwide.

Course Outline:

Unit 1	Introduction to Sustainable Cities and Communities	Definition and key concepts of sustainable urban development
		Historical perspectives on urban sustainability
		Sustainable Development Goals (SDGs) with a focus on Goal 11: Sustainable Cities and Communities
		Understanding the impact of climate change on urban development
		Sustainable site selection and development
Unit 2	Urban Planning and Architectural Strategies for Sustainability	Principles of sustainable urban design
		Urban planning strategies for sustainable cities
		Mixed-use development, compact cities, and transit-oriented development
		Sustainable building materials and low-impact construction techniques
		Concepts of biomimicry in architectural sustainability
Unit 3	Green Infrastructure and Sustainable Mobility	Importance of green spaces, urban biodiversity, and ecological corridors
		Sustainable landscaping and stormwater management
		Sustainable drainage systems and flood resilience strategies
		Sustainable transportation planning and non-motorized mobility
		Integration of public transit systems, pedestrian-friendly urbanism, and walkability
Unit 4	Social Sustainability, Community Engagement, and Climate Resilience	Social sustainability and inclusive communities
		Affordable housing and participatory urban development
		Universal accessibility and barrier-free urban design
		Climate change impacts on urban areas and architectural responses
		Designing resilient infrastructure, disaster risk reduction, and urban adaptation strategies
Unit 5	Case Studies, Best Practices, and Application in Architectural Design	Analysis of sustainable cities and communities worldwide
		Case studies of exemplary sustainable architecture projects
		Learning from eco-cities and smart cities
		Application of sustainability principles in architectural design projects
		Lessons learned and implementation of best practices in urban development

Submission/Assignment:

1. Written Assignments: Research on specific sustainability themes
2. Case Study: Analysis and critical review of sustainable urban design projects
3. Class Presentations: Seminar discussions on sustainability challenges and solutions
4. Urban Audit: Site visits and analysis of sustainability parameters in real-world urban areas

Reference Books:

1. Sustainable Development Goals – Goal 11: Sustainable Cities and Communities
2. Sustainable Urbanism: Urban Design with Nature – Douglas Farr
3. The Urban Climatic Map: A Methodology for Sustainable Urban Planning – Edward Ng
4. Green Cities: Urban Growth and the Environment – Matthew E. Kahn
5. Sustainable Urban Development Reader – Stephen M. Wheeler & Timothy Beatley
6. Designing the Sustainable Site: Integrated Design Strategies for Small-Scale Sites and Residential Landscapes – Heather L.Venhaus
7. Urban Design: A Typology of Procedures and Products – Jon Lang
8. The Architecture of the City – Aldo Rossi
9. Cities for People – Jan Gehl
10. The New Carbon Architecture: Building to Cool the Climate – Bruce King
11. Ecological Urbanism – Mohsen Mostafavi & Gareth Doherty
12. Sustainable Cities in India: Challenges and Future Perspectives – Poonam Sharma & Sumita Saxena
13. From Poverty, Inequality to Smart City: Proceedings of National Conference on Sustainable Built Environment – Fumihiko Seta, Joy Sen, Arindam Biswas, Ajay Khare
14. Urbanism in the Age of Climate Change – Peter Calthorpe & William Fulton
15. The Leapfrog Opportunity: India's Pursuit of Sustainable Urban Development – Harshavardhan Bhat & Vinayak Bharne