

Bachelor of Architecture

CURRICULUM AND SYLLABI OF FIRST YEAR COURSES

(Applicable from 2023 Admission onwards)



**Department of Architecture and Planning
NATIONAL INSTITUTE OF TECHNOLOGY CALICUT
Kozhikode - 673601, KERALA, INDIA**

The Program Educational Objectives (PEOs) of Bachelor of Architecture

PEO1	Prepare students to apply design principles and techniques to create innovative, functional, and sustainable architectural solutions that respond to the social, cultural, economic, and environmental context.
PEO2	Equip students to work collaboratively in interdisciplinary teams, respecting diverse perspectives and engaging in constructive dialogue to address complex architectural problems.
PEO4	Train students to demonstrate a strong work ethic, integrity, and ethical responsibility towards society and environment in their professional practice.
PEO3	Infuse a strong analytical foundation in students with the ability to conduct research, use evidence-based practices to inform their design decisions, and continuously learn and adapt to emerging trends and challenges in the field.

Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) of Bachelor of Architecture

PO1	Architectural Knowledge: Apply the knowledge of design development, building technology, structural systems, environmental studies, humanities and management to develop architectural design solutions.
PO2	Problem analysis: Identify, formulate, research, and analyse complex architectural problems using cultural, historical, and theoretical design discourses to reach substantiated inferences.
PO3	Design/development of solutions: Design solutions for complex architectural problems and design system components or processes that meet the specified needs and standards with appropriate consideration for cultural, societal, environmental, economic and aesthetic considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods, including the design of experiments, analysis, interpretation of data, and synthesis of the information to arrive at rational & valid conclusions.
PO5	Modern tool usage: Apply traditional and contemporary design tools and techniques to formulate and communicate creative and innovative architectural design solutions.
PO6	Architect and the society: Apply reasoning supplemented by the contextual knowledge to assess the societal health, safety, legal and cultural issues and the consequent responsibilities relevant to the profession.
PO7	Environment and sustainability: Understand the impact of Architectural solutions in societal and environmental contexts, and demonstrate the knowledge & need for sustainable development.
PO8	Ethics: Apply ethical principles, commitment to professional ethics, responsibilities, and norms of professional practice in Architecture.
PO9	Individual and team work: Function effectively as an individual, member, or leader in diverse groups and multidisciplinary settings.
PO10	Communication: Communicate effectively on architectural design solutions with the community and with society at large, such as being able to comprehend, document design, make effective presentations, and give/receive instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the project management and finance principles and apply these to work, as a member and leader in a team, to manage projects in multidisciplinary environments.
PO12	Life-long learning: Recognise the need and ability to engage in independent and life-long learning in the context of rapid changes in technology

PSO2	Legal Knowledge - Knowledge of local by-laws, national and international codes & regulations related to the architectural profession.
PSO1	Fine art skill – Grasp fine arts (local, regional, national and international) as an influence on the quality of architectural design.
PSO4	Entrepreneurial skill – Enable establishing an independent practice, organising & manage an office while remaining accountable to society.
PSO3	Quantitative/Analytical skill – Capable of quantifying and analysing complex building systems and performance.

CURRICULUM

The total credits required for completing the Bachelor of Architecture course is 220.

COURSE CATEGORIES AND CREDIT REQUIREMENTS:

Sl. No.	Course Category	Number of Courses	Minimum Credits
1.	Institute Core (IC)	4	9
2.	Program Core (PC) and Program Electives (PE)	45	183
3.	Open Electives (OE)	3	9
4.	Institute Electives (IE) (Entrepreneurship Innovation (EI) + Digital / Automation Technologies (DA) + Humanities, Social Science, Management (HM))	5	15
5.	Activity Credits (AC)	--	4

COURSE REQUIREMENTS

The effort to be put in by the student is indicated in the tables below as follows:

L: Lecture (One unit is of 50-minute duration)

T: Tutorial (One unit is of 50-minute duration)

P/D: Practical/Design or Drawing (One unit is of one-hour duration)

O: Outside the class effort/self-study (One unit is of one-hour duration)

1. INSTITUTE CORE (IC)

Sl. No.	Course Code	Course Title	L	T	P/D	O	Credits
1.	MA1005D	Applied Mathematics	3	1	0	6	3
2.	AP1092E	Workshop	0	0	2	2	1
3.	MS1001E	Professional Communication	3	0	0	6	3
4.	AP4005E	Professional Practice and Ethics	2	0	0	4	2
Total							9

2A. PROGRAMME CORE (PC)

Sl. No.	Course Code	Course Title	Pre - Requisites	L	T	P/D	O	Credits
1	AP1001E	Ergonomics	Nil	3	0	0	6	3
2	AP1002E	Theory of Design	Nil	2	0	0	4	2
3	AP1003E	Architectural Graphics	Nil	2	0	3	8	4
4	AP1004E	Introduction to Design - I	Nil	2	0	6	14	6
5	AP1091E	Visual Art Studio	Nil	2	0	3	8	4
6	AP1005E	Applied Mechanics	Nil	3	1	0	6	3
7	AP1006E	Introduction to Building Materials & Systems	Nil	2	0	0	4	2
8	AP1007E	Cultural Studies	Nil	3	0	0	6	3
9	AP1008E	Introduction to Design -II	AP1004E	2	0	6	14	6
10	AP1009E	Introduction to Computer Graphics	Nil	2	0	2	6	3
11	AP1093E	Surveying and Levelling	Nil	2	0	2	6	3
12	AP1094E	Material Testing Lab	Nil	0	0	2	2	1
13	AP2001E	History of Architecture I	AP1007E	3	0	0	6	3
14	AP2002E	Site Planning and Building Regulations	Nil	3	0	0	6	3
15	AP2003E	Theory of Structures I	AP1005E	3	1	0	6	3
16	AP2004E	Building Climatology and Solar Architecture	Nil	3	0	0	6	3
17	AP2005E	Building Construction and Materials I	AP1006E	2	0	3	8	4
18	AP2006E	Architectural Design and Field Tour III	AP1008E	0	0	9	18	6
19	AP2007E	History of Architecture II	AP2001E	3	0	0	6	3
20	AP2008E	Theory of Structures II	AP2003E	3	1	0	6	3
21	AP2009E	Building Services I (Water Supply, Sanitation and Air-conditioning)	Nil	3	0	0	6	3
22	AP2010E	Building Construction and Materials II	AP2005E	2	0	3	8	4
23	AP2011E	Architectural Design and Field Tour IV	AP2006E	0	0	9	18	6
24	AP3001E	Structural Design I	AP2008E	3	1	0	6	3
25	AP3002E	Contemporary Architecture	AP2007E	3	0	0	6	3
26	AP3003E	Building Services II (Acoustics and Illumination)	Nil	3	0	0	6	3

27	AP3004E	Building Construction and Materials III	AP2010E	2	0	3	8	4
28	AP3005E	Landscape Architecture Studio	Nil	1	0	3	7	3
29	AP3006E	Architectural Design and Field Tour V	AP2011E	0	0	9	18	6
30	AP3007E	Estimation, Costing, and Specifications	Nil	3	0	0	6	3
31	AP3008E	Structural Design II	AP3001E	3	1	0	6	3
32	AP3010E	Building Construction and Materials IV	AP3004E	2	0	3	8	4
33	AP3011E	Architectural Design and Field Tour VI	AP3006E	0	0	9	18	6
34	AP3091E	Building Systems and Science Lab	AP2004E AP3003E	3	0	2	7	4
35	AP4001E	Urban Design	Nil	3	0	0	6	3
36	AP4002E	Interior Design	Nil	1	0	3	7	3
37	AP4003E	Working Drawing	AP3010E	0	0	3	6	2
38	AP4004E	Architectural Design and Field Tour VII	AP3011E	0	0	9	18	6
39	AP4006E	Research Seminar	Nil	0	0	3	6	2
40	AP4007E	Architectural and Field Tour VIII	AP4004E	0	0	9	18	6
41	AP4091E	Parametric Design /Simulation Lab	Nil	1	0	2	5	2
42	AP5001E	Office Training	AP4007E					8
43	AP5002E	Construction Site Study and Innovative Details Documentation	Nil				9	2
44	AP5003E	Critical Appraisal of Buildings	Nil				6	1
45	AP5004E	Thesis	AP4007E	0	0	15	30	10

2B. PROGRAMME ELECTIVES (PE)

The following courses may be credited under the categories mentioned in the table below, in addition to the Programme Electives.

Sl. No.	Course Code	Course Title	L	T	P	O	Credits	Additional Categories			
								OE	EI	DA	HM
1	AP2051E	Computer Applications in Architecture I	1	0	3	7	3	N	N	Y	N
2	AP2052E	Computer Applications in Architecture II	1	0	3	7	3	N	N	Y	N

3	AP3051E	Architectural Start-up and Entrepreneurship	3	0	0	6	3	Y	Y	N	N
4	AP4051E	Construction Management	3	0	0	6	3	N	N	N	Y
5	AP4052E	Urban Planning	3	0	0	6	3	N	N	N	Y
6	AP4053E	Architectural Journalism and Photography	3	0	0	6	3	Y	N	N	Y
7	AP4054E	Behavioural Studies in Built Environment	3	0	0	6	3	Y	N	N	Y
8	AP4055E	Vernacular Architecture	3	0	0	6	3	Y	N	N	Y
9	AP4056E	Barrier Free Design	3	0	0	6	3	Y	N	N	Y
10	AP4057E	Disaster Management and Earthquake Resistant Buildings	3	0	0	6	3	Y	N	N	Y
11	AP4058E	Housing	3	0	0	6	3	Y	N	N	Y
12	AP4059E	Industrial Architecture	3	0	0	6	3	Y	N	N	Y
13	AP4060E	Sustainable Architecture	3	0	0	6	3	Y	N	N	Y
14	AP4061E	Architectural Heritage & Tourism	3	0	0	6	3	Y	N	N	Y
15	AP4062E	Advanced Building Construction	3	0	0	6	3	Y	N	N	N
16	AP4071E	Building Automation, Integration and Management	3	0	0	6	3	Y	N	N	Y
17	AP4072E	Climate Change and Architecture	3	0	0	6	3	Y	N	N	Y
18	AP4073E	Research Methods for Architecture	3	0	0	6	3	Y	N	N	Y
19	AP4074E	Valuation & Arbitration	3	0	0	6	3	Y	N	N	Y
20	AP4075E	Architectural Conservation	3	0	0	6	3	Y	N	N	Y
21	AP4076E	Building Maintenance and Retrofitting	3	0	0	6	3	Y	N	N	N
22	AP4077E	Product Design	3	0	0	6	3	Y	Y	N	N
23	AP4078E	Advanced Building Services	3	0	0	6	3	Y	N	N	N
24	AP4079E	Advanced Architectural Theory and Criticism	3	0	0	6	3	Y	N	N	N
25	AP5051E	Geographical Information System	1	0	3	7	3	Y	N	Y	N
26	AP5052E	Sustainability Assessment systems	1	0	3	7	3	Y	N	Y	N
27	AP5053E	Photogrammetry	1	0	3	7	3	Y	N	Y	N
28	AP5054E	Energy Management	1	0	3	7	3	Y	N	N	N
29	AP5055E	Visual Media in Architecture	1	0	3	7	3	Y	N	Y	N

3. OPEN ELECTIVES (OE)

Courses offered by the Parent Department / Other Departments / Approved Online Platforms, with a limit on the maximum number of courses from such platforms decided by the Institute from time to time. The total number of credits required is nine for the Bachelor of Architecture course.

4. INSTITUTE ELECTIVES (IE)

In the case of the Institute Electives, courses in the appropriate categories offered by other departments/schools/centres also can be credited instead of the courses offered by the Department of Architecture & Planning, subject to the approval from the Course Faculty and Faculty Advisor.

a) Entrepreneurship / Innovation Basket (EI):

Courses are proposed by the Departments/Schools/Centres and approved by Institute Innovation Council. The total number of credits required is 3 for the Bachelor of Architecture course.

b) Digital Automation Technologies (DA):

Courses related to programming/automation tools & techniques / Industry 4.0. The total credit required is six for the Bachelor of Architecture course.

c) Humanities, Social Science, Management (HM):

Courses include Indian and Foreign languages, Economics, Engineering Management, Financial Management and Design Thinking. The total credit required is 6 for the Bachelor of Architecture course.

5. ACTIVITY CREDITS (AC)

A minimum of 80 Activity Points are to be acquired to obtain 4 Activity Credits required in the curriculum.

Activity points acquired should be a minimum of 20 at the end of S4.

Activity points acquired should be a minimum of 40 at the end of S6.

B ARCH PROGRAMME CURRICULUM

SEMESTER I

Course Code	Course Name	L	T	P/D	O	Credits	Category
AP1001E	Ergonomics	3	0	0	6	3	PC
AP1002E	Theory of Design	2	0	0	4	2	PC
AP1003E	Architectural Graphics	2	0	3	8	4	PC
AP1004E	Introduction to Design - I	2	0	6	14	6	PC
MA1005E	Applied Mathematics	3	1	0	6	3	IC
AP1091E	Visual Art Studio	2	0	3	8	4	PC
AP1092E	Workshop	0	0	2	2	1	IC
Total		14	1	14	48	23	

SEMESTER II

Course Code	Course Name	L	T	P/D	O	Credits	Category
AP1005E	Applied Mechanics	3	1	0	6	3	PC
AP1006E	Introduction to Building Materials & Systems	2	0	0	4	2	PC
AP1007E	Cultural Studies	3	0	0	6	3	PC
AP1008E	Introduction to Design -II	2	0	6	14	6	PC
AP1009E	Introduction to Computer Graphics	2	0	2	6	3	PC
MS1001E	Professional Communication	3	0	0	6	3	IC
AP1093E	Surveying and Levelling	2	0	2	6	3	PC
AP1094E	Material Testing Lab	0	0	2	2	1	PC
Total		17	1	12	50	24	

SEMESTER III

Course Code	Course Name	L	T	P/D	O	Credits	Category
AP2001E	History of Architecture I	3	0	0	6	3	PC
AP2002E	Site Planning and Building Regulations	3	0	0	6	3	PC
AP2003E	Theory of Structures I	3	1	0	6	3	PC
AP2004E	Building Climatology and Solar Architecture	3	0	0	6	3	PC
AP2005E	Building Construction and Materials I	2	0	3	8	4	PC
AP2006E	Architectural Design and Field Tour III	0	0	9	18	6	PC
	DA Elective I	1	0	3	7	3	DA
Total		15	1	15	57	25	

SEMESTER IV

Course Code	Course Name	L	T	P/D	O	Credits	Category
	Open Elective I	3	0	0	6	3	OE
AP2007E	History of Architecture II	3	0	0	6	3	PC
AP2008E	Theory of Structures II	3	1	0	6	3	PC
AP2009E	Building Services I (Water Supply, Sanitation and Air-conditioning)	3	0	0	6	3	PC
AP2010E	Building Construction and Materials II	2	0	3	8	4	PC
AP2011E	Architectural Design and Field Tour IV	0	0	9	18	6	PC
	DA Elective II	1	0	3	7	3	DA
	Minor Course I	3	0	0	6	3	MC
Total (excluding minor courses)		15	1	15	57	25	

SEMESTER V

Course Code	Course Name	L	T	P/D	O	Credits	Category
	Open Elective - II	3	0	0	6	3	OE
AP3001E	Structural Design I	3	1	0	6	3	PC
AP3002E	Contemporary Architecture	3	0	0	6	3	PC
AP3003E	Building Services II (Acoustics and Illumination)	3	0	0	6	3	PC
AP3004E	Building Construction and Materials III	2	0	3	8	4	PC
AP3005E	Landscape Architecture Studio	1	0	3	7	3	PC
AP3006E	Architectural Design and Field Tour V	0	0	9	18	6	PC
	Minor Course II	3	0	0	6	3	MC
Total (excluding minor courses)		15	1	15	57	25	

SEMESTER VI

Course Code	Course Name	L	T	P/D	O	Credits	Category
	EI Elective	3	0	0	6	3	EI
AP3007E	Estimation, Costing, and Specifications	3	0	0	6	3	PC
AP3008E	Structural Design II	3	1	0	6	3	PC
AP3009E	Building Construction and Materials IV	2	0	3	8	4	PC
AP3010E	Architectural Design and Field Tour VI	0	0	9	18	6	PC
AP3091E	Building Systems and Science Lab	3	0	2	7	4	PC
	Minor Course III	3	0	0	6	3	MC
Total (excluding minor courses)		14	1	14	51	23	

SEMESTER VII

Course Code	Course Name	L	T	P/D	O	Credits	Category
	Programme Elective - I	3	0	0	6	3	PE
	HM Elective I	3	0	0	6	3	HM
	HM Elective II	3	0	0	6	3	HM
AP4001E	Urban Design	3	0	0	6	3	PC
AP4002E	Interior Design	1	0	3	7	3	PC
AP4003E	Working Drawing	0	0	3	6	2	PC
AP4004E	Architectural Design and Field Tour VII	0	0	9	18	6	PC
	Minor Course IV	3	0	0	6	3	MC
Total (excluding minor courses)		13	0	15	55	23	

SEMESTER VIII

Course Code	Course Name	L	T	P/D	O	Credits	Category
	Programme Elective II	3	0	0	6	3	PE
	Programme Elective III	3	0	0	6	3	PE
	Programme Elective IV	3	0	0	6	3	PE
AP4005E	Professional Practice and Ethics	2	0	0	4	2	IC
AP4006E	Research Seminar	0	0	3	6	2	PC
AP4007E	Architectural and Field Tour VIII	0	0	9	18	6	PC
AP4091E	Parametric Design /Simulation Lab	1	0	2	5	2	PC
Total		12	0	14	51	21	

SEMESTER IX

Course Code	Course Name	L	T	P/D	O	Credits	Category
AP5001E	Office Training				*	8	PC
AP5002E	Construction Site Study and Innovative Details Documentation	0	0	0	9	2	PC
AP5003E	Critical Appraisal of Buildings	0	0	0	6	1	PC
Total						11	

* Office training duration will include the summer vacation preceding the Monsoon Semester. Per week hours will be based on the policy of the organisation where office training is done.

SEMESTER X

Course Code	Course Name	L	T	P/D	O	Credits	Category
AP5004E	Thesis	0	0	15	30	10	PC
	Programme Elective V	1	0	2	5	3	PE
	Open Elective – III	3	0	0	6	3	OE
	Activity Credits (minimum of 80 points)	-	-	-		4*	AC
Total		4	0	17	41	20	

ELECTIVES

Sl. No.	Course Code	Course Title	L	T	P	O	Credits	Additional Categories			
								OE	EI	DA	HM
1	AP2051E	Computer Applications in Architecture I	1	0	3	7	3	N	N	Y	N
2	AP2052E	Computer Applications in Architecture II	1	0	3	7	3	N	N	Y	N
3	AP3051E	Architectural Start-up and Entrepreneurship	3	0	0	6	3	Y	Y	N	N
4	AP4051E	Construction Management	3	0	0	6	3	N	N	N	Y
5	AP4052E	Urban Planning	3	0	0	6	3	N	N	N	Y
PROGRAMME ELECTIVE I-IV											
6	AP4053E	Architectural Journalism and Photography	3	0	0	6	3	Y	N	N	Y
7	AP4054E	Behavioural Studies in Built Environment	3	0	0	6	3	Y	N	N	Y
8	AP4055E	Vernacular Architecture	3	0	0	6	3	Y	N	N	Y
9	AP4056E	Barrier Free Design	3	0	0	6	3	Y	N	N	Y
10	AP4057E	Disaster Management and Earthquake Resistant Buildings	3	0	0	6	3	Y	N	N	Y
11	AP4058E	Housing	3	0	0	6	3	Y	N	N	Y
12	AP4059E	Industrial Architecture	3	0	0	6	3	Y	N	N	Y
13	AP4060E	Sustainable Architecture	3	0	0	6	3	Y	N	N	Y
14	AP4061E	Architectural Heritage & Tourism	3	0	0	6	3	Y	N	N	Y
15	AP4062E	Advanced Building Construction	3	0	0	6	3	Y	N	N	N
16	AP4071E	Building Automation, Integration and Management	3	0	0	6	3	Y	N	N	Y
17	AP4072E	Climate Change and Architecture	3	0	0	6	3	Y	N	N	Y
18	AP4073E	Research Methods for Architecture	3	0	0	6	3	Y	N	N	Y
19	AP4074E	Valuation & Arbitration	3	0	0	6	3	Y	N	N	Y
20	AP4075E	Architectural Conservation	3	0	0	6	3	Y	N	N	Y
21	AP4076E	Building Maintenance and Retrofitting	3	0	0	6	3	Y	N	N	N
22	AP4077E	Product Design	3	0	0	6	3	Y	Y	N	N
23	AP4078E	Advanced Building Services	3	0	0	6	3	Y	N	N	N

24	AP4079E	Advanced Architectural Theory and Criticism	3	0	0	6	3	Y	N	N	N
PROGRAMME ELECTIVE V											
25	AP5051E	Geographical Information System	1	0	3	7	3	Y	N	Y	N
26	AP5052E	Sustainability Assessment systems	1	0	3	7	3	Y	N	Y	N
27	AP5053E	Photogrammetry	1	0	3	7	3	Y	N	Y	N
28	AP5054E	Energy Management	1	0	3	7	3	Y	N	N	N
29	AP5055E	Visual Media in Architecture	1	0	3	7	3	Y	N	Y	N

SEMESTER I

AP1001E ERGONOMICS

Pre-requisites: NIL

L	T	P/D	O	C
3	0	0	6	3

Total Lecture Sessions: 39

Course Outcomes:

CO1: Comprehend Environmental factors and human behavioral aspects in a design process.

CO2: Assess the standards and principles of accessibility in universal design.

CO3: Demonstrate knowledge of relevant design standards and their application in Architectural design.

CO4: Analyze and design any space according to the ease of use and comfort of the user.

CO5: Apply anthropometry and rational thinking while designing for different building types.

CO6: Review the existing condition of the built environment for universal access and suggest measures to address those.

Human Factors

Introduction to Human Factors: Relevance of human factors in design; Man-the prime system component; Human being in manmade world; Man-machine – environment interactions. Fundamentals of Ergonomics: Physical Aspects - Gross human anatomy, Structure and function, Posture and movements, Static and dynamic Anthropometry, Bio mechanics - Physiological Aspects, Behavioral aspects, Cognitive aspects, Mental workload; Psychological Aspects- Muscles and work physiology, Static and dynamic work including maximum capacity.

Environmental Factors

Environmental Factors: Introduction to Environmental conditioning - basics on thermal, illumination, noise and vibration; Occupational Hazards in the work environment; Visual stress, Postural stress and stress due to commuting. Anthropometric study and ergonomics of human figure, dimensions of furniture - relationship with human anthropometrics - static and dynamic anthropometrics.

Design requirements

Disability, Ageing and Inclusive Design: Built environment for the differently abled people; Ramp, toilets and corridor design; Spatial requirements for wheelchair movements; Old age and built environment design issues; Design for visually challenged - User friendly design process; Human compatibility, comfort and adaptability - User-centered design.

Design standards and Applications

Standards for different Building types - Residential, Institutional, Cultural, Health, Public buildings, Commercial, Transportation, Recreational - Case study analysis - Short project work involving Ergonomic design aspects for different architectural building types - research, analyze and provide solutions.

References:

1. S. R. Gillam, *Design Fundamentals*, McGraw Hill, 2003.
2. M. Sims, *Sign Design: Graphics, Materials, Techniques*, Thames and Hudson, 1991.
3. E. Grandjean, *Ergonomics of the Home*, London, Taylor & Francis Ltd.,1973.
4. A. R. Tilley, Henry Dreyfuss Associates, *The Measure of Man & Woman*, Whitney Library of Design,2002.
5. Department of Architecture, *Architects Hand Book*, College of Engineering, Trivandrum, 1989.
6. P. K. Nag, *Ergonomics and work design*, New Age, 1996.
7. A. Fereydoun, *Trends in Ergonomics/Human Factors*, North Holland, NY, 1988.
8. J.E. Harrigan, *Human Factors Research: Methods and Applications for Architects and Interior Designers*. Elsevier Science, 2014.
9. J. De Chiara, J. H. Callender, *Time-saver Standards for Building Types*. McGraw-Hill International Book,1983

AP1002E THEORY OF DESIGN

Pre-requisites: **NIL**

L	T	P/D	O	C
2	0	0	4	2

Total Lecture Sessions: 26

Course Outcomes:

CO1: Identify theoretical grounds in design thinking.

CO2: Analyze the design process in various ways.

CO3: Apply functional concepts of design.

CO4: Critique aesthetical aspects of design.

CO5: Develop design concepts based on a thorough understanding.

CO6: Demonstrate theoretical approaches in the design process and decision-making.

Perception of Design

Introduction to the perception of Design – affordance, anthropomorphic form, color, consistency, figure-ground relationship, layering, legibility, proximity. Three-dimensional projection – visibility – visuospatial resonance

Functionality of Design

Accessibility in design – Usability effect of aesthetic – confirmation, control, cost-benefit, errors in design - Interference effects in design – mental model, mimicry, performance load, readability, progressive disclosure, and wayfinding.

Aesthetic of Design

Increase the appeal of a design through attractive bias, cognitive dissonance, and classical conditioning. Exposure effect in design – face-ism ratio, golden ratio- proportional density - Red effect, similarity, storytelling, symmetry in design.

Decision making in Design

Design decisions by convergence, design by committee – expectation effect – factor of safety – iteration– life cycle – prototyping – redundancy – structural forms and uncertainty principles.

References:

1. M. Macnab, *Design by nature: using universal forms and principles in design*. New Riders, 2011.
2. M. F. Story, *Principles of universal design*, Universal design handbook, 2, 2001.
3. W. Lidwell, J. Butler and K. Holden, *Universal principles of design: a cross-disciplinary reference*, Rockport, 2003.
4. W. Lidwell, K. Holden and J. Butler, *Universal principles of design, revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design*. Rockport Pub, 2010.
5. W. Wong, *Principles of form and design*, John Wiley & Sons, 1993.
6. W. Wong, *Principles of two-dimensional design*, John Wiley & Sons, 1991.

AP1003E ARCHITECTURAL GRAPHICS

Pre-requisite: NIL

L	T	P/D	O	C
2	0	3	8	4

Total Sessions: 26L+ 39D

Course Outcomes:

CO1: Construct lines for different purposes, to do lettering and dimensioning of drawings

CO2: Apply the concept of orthographic projection to represent lines, planes, solids and development of surfaces

CO3: Present three-dimensional objects with the help of orthographic and axonometric projections.

CO4: Create different types of perspective projections of simple and complex solids, buildings and interiors

CO5: Prepare different types of presentation drawings with or without sciography

Familiarizing with Conventions, Techniques and Standards

Introduction to architectural graphics, different type of lines, lettering and dimensioning. Familiarization with current BIS code of practice for architectural drawing. Basic geometric constructions.

One drawing exercise

Orthographic Projections

Introduction to orthographic projections - Principles of first angle and third angle projections, projection of points, lines, planes and solids, auxiliary projection – sections of solids, intersection of surfaces and development of surfaces.

Five drawing exercises

Pictorial Projections

Introductions to pictorial projections – axonometric and isometric projection of solids from orthographic projection – pictorial views of simple building elements, furniture etc.- Perspective projections – different methods, perspective view of solids, buildings, and interiors - Approximate methods of perspective drawings.

Five drawing exercises

Presentation Drawings and Sciography

Introduction to architectural presentations drawings - principles of shades and shadows, application of sciography on pictorial views.

Two drawing exercises

References:

1. F.D. Ching, *Architectural Graphics*, John Wiley and Sons, 2003.
2. K. C. John and P. I. Varghese, *Engineering Graphics*, Trichur, India, Jet Publications, 2004.
3. N. D. Bhatt, *Engineering Drawing*, India, Charotar Publising House, Anand, 2003.
4. K. L.Narayana and P. Kannaiah, *Engineering Graphics*, Chennai, Sci Tech Publishers, 2003.
5. S. Mulik, *Perspectives and Sciography*, India, Allied Publishers, 1999.

AP1004E INTRODUCTION TO DESIGN - I

Pre-requisites: NIL

L	T	P/D	O	C
2	0	6	14	6

Total Sessions: 26L + 78D

Course Outcomes:

- CO1: Enhance the use of freehand drawing and lettering for design communication
- CO 2: Understand and analyze and drawing conventions
- CO 3: Interpret and apply elements and principles of design
- CO 4: Interpret, evaluate and apply anthropometrics in design
- CO 5: Represent three dimensional objects with the aid of plan, elevations, sections and views
- CO 6: Apply the process of design and create a simple architectural form

Design Process

Study of an everyday object- representation in two dimensional format- design interpretation in terms of Fitness for purpose- Choice of materials- Durability - Efficiency -Maintenance - Environmental and Social considerations - Technological opportunity- redesign for improving any one aspect- representation and design communication

Principles of Design

Principles of Design-emphasis- balance- contrast- repetition-proportion- movement- figure/ground- rhythm-pattern-hierarchy-variety- unity- harmony- Study of designed objects in terms of principles of design

Anthropometry

Static anthropometry- functional anthropometry- application of anthropometry in design- standards- factors affecting anthropometric data- concept of percentile in Indian standards, documentation of a piece of furniture-analysis of the piece with respect to anthropometry.

Design and Representation

Design generation- refinement- 3D studies- schematic development- study models-architectural drawings- line-types, line-weights, symbols, Lettering, rendering presentation- design communication.

References:

1. W. Lidwell, K. Holden and J. Butler, *Universal principles of design, revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design.* Rockport Pub, 2010.
2. E. Tenner, The design of everyday things by Donald Norman. *Technology and Culture*, 2015, 56(3), 785-787.
3. F.D. Ching, *Architecture: Form, space, and order.* John Wiley & Sons, 2023.
4. E. Neufert and P. Neufert, *Architects' data.* John Wiley & Sons, 2012.
5. Architectural Graphic Standards by the American Institute of Architects and Dennis J. Hall.

MA1005E APPLIED MATHEMATICS

L	T	P/D	O	C
3	1	0	6	3

Pre-requisites: NIL

Total Sessions: 39L +13T

Course Outcomes:

CO1: Appreciate the role of differentiation and integration in architectural parameters like area, volume, etc.

CO2: Associate the fundamental structure of 2D plane and 3D space and the properties of different structures in plane and space.

CO3: Represent lines, planes and three-dimensional objects using different coordinate systems

CO4: Comprehend various probability distributions

CO5: Apply the concept of sampling and testing methods for different kinds of studies

CO6: Perform Testing of hypothesis and tests for goodness of fit.

Basic Calculus

Applications of differentiation, Definite integrals, Volumes using cross sections, Solids of revolution, Arc length, Areas of surface of revolution. Double integrals, Area and Volume by double integration, Triple integrals, Applications.

Geometry

Conic sections, Coordinate systems: Cartesian, Polar, Spherical and Cylindrical, Vectors, Lines and planes in space, Spheres and Cylinders, Curves in space and their tangents, Arc length in space, Curvature, normal, velocity and acceleration.

Probability and Distributions

Probability distributions, Random variables, Expectation of a function of a random variable, Mean, Variance and Moment generating function of a probability distribution, Chebyshev's theorem, Binomial distribution, Poisson distribution, Geometric distribution, Normal Distribution, Uniform distribution.

Statistics

Population and samples, the sampling distribution of the mean, Sampling distribution of the variance, Point estimation, Interval estimation, Tests of hypothesis, Hypothesis tests concerning one mean and two means. Hypothesis tests concerning one variance and two variances, Estimation of proportions, Hypothesis tests concerning one proportion and several proportions, Analysis of $r \times c$ contingency tables, Chi-square test for goodness of fit.

References:

1. G.B. Thomas and R.L. Finney, *Calculus and Analytical Geometry*, Addison-Wesley, 1998.
2. S. B. Rao and C. K. Shantha, *Differential Calculus*, Wiley Eastern Ltd, 2002.
3. V. Gutenmacher and N. B. Vasilyev, *Lines and Curves: A Practical Geometry Handbook*, Birkhäuser, Boston, 2004.
4. R. A. Johnson, Miller and Freund's *Probability and Statistics for Engineers*, 8 th edition, New Delhi, Prentice Hall of Indian, 2011.
5. W. W. Hines, D. C. Montgomery, D. M. Goldsman and C. M. Borror, *Probability and Statistics in Engineering*, 4th edition, New York, John Wiley & Sons, Inc., 2003
6. S.M. Ross, Introduction to *Probability and statistics for Engineers and Scientists*, 5 rd edition, New Delhi, Academic Press (Elsevier), 2014.

AP1091E VISUAL ART STUDIO

Pre-requisites: NIL

L	T	P/D	O	C
2	0	3	8	4

Total Sessions: 26L + 39D

Course Outcomes:

CO1: State the design principles within different visual compositions.

CO2: Create two-dimensional compositions with appropriate media.

CO3: Create three-dimensional compositions in various media.

CO4: Choose suitable materials for various two-dimensional and three-dimensional compositions.

CO5: Critique visual relationships of different compositions.

CO6: Distinguish between different genres of applied art.

Fundamentals

Elements and Principles of Design- Gestalt principles in basic composition- Theory of Color: Chromatic Values, Color Wheel, Color Chart- Exploration of various media & materials for art Pencil, ink, crayon, pastels and watercolors. Suggested exercises: Compositions using lines, shapes and colours in various media, creation of colour palette inspired by natural objects at micro and macro scale

Art

Visual properties of Two-dimensional forms- Application of color theory and visual grammar in composition- Elements of painting- Techniques of rendering-. Perspective views, Quick sketches, Sciography- Introduction to Indian aesthetics / Canonical principles of Indian Art, Sculpture, Painting. Suggested exercises: Outdoor sketching of objects, spaces and massing, 2d and relief murals with different materials, analysis of components of artforms in in India with respect to principles of design.

Sculpture

Art in 3D- Form, texture, mass and volume- Sculpture by casting, modeling, additive/ subtractive techniques and fabrication- Material exploration- clay, plaster of Paris, paper, wire etc. Suggested exercises: Creation of additive forms using predetermined modules, subtractive forms from predetermined volume, casting, linear structures, dynamic models.

Applied Art

Different genres of applied art - Architecture, Interior Design, Graphics, Fashion Design etc.

Art appreciation- aesthetics, perception, symbolism, expression, style, fashion, appropriateness, and values- critical appraisal of examples. Suggested exercises: Analysis and appreciation of movements and specific works of art, understanding underlying aesthetic sensibilities in different genres within the same movement.

References:

- 1.F.D. Ching, *Architectural Graphics*, John Wiley and Sons, 2003.
- 2.F.D. Ching, *Form, Space and order*, John Wiley and Sons, 2007.
- 3.S. R. Gilliam, *Design Fundamentals*, McGraw-Hill, 1951.
4. V. S. Parmer, *Design fundamentals in Architecture*, New Delhi, Somaiya Publications Private Limited, 2010.
- 5.A. L. Guptill, *Rendering with Pen & Ink*, Watson-Guption Publications, 1997.

AP1092E WORKSHOP

Pre-requisites: NIL

L	T	P/D	O	C
0	0	2	2	1

Total Practical Sessions: 26

Course Outcomes:

- CO1: Identify the appropriate tools, materials and techniques used in different trades.
- CO2: Explore the value of physical models as an integral part of a design process
- CO3: Gain knowledge about effective communication of design ideas through three-dimensional visualization and modelling
- CO4: Encourage to be imaginative and innovative in the representational approaches while using physical and digital fabrication skills
- CO5: Apply the skills and knowhow of using different media and scales creatively and innovatively in architectural model making
- CO6: Demonstrate the understanding and importance of aesthetics and structural stability in building design models

Carpentry, Sheet Metal and Foundry

Hands-on training on carpentry: Introduction to various tools and processes used for carpentry exercise on marking, cutting, planning etc. - preparation of simple models and carpentry joints.

Sheet Metal: Study of tools, selection of different gauge sheets, types of joints.

Foundry: Study of tools, sand preparation - Moulding practice using the given pattern and demonstration on Casting.

Electrical

Hands on training on Electrical Wiring: Introduction to various tools and processes used for electrical wiring- Introduction to wiring systems - Wiring of one lamp - Selection of fuse, MCB and ELCB - Wiring of a fluorescent lamp controlled by one switch from a panel with ELCB & MCB.

Plumbing

Introduction to various tools and processes used for plumbing using PVC pipes and accessories connecting PVC pipes and plumbing fittings.

Architectural Model making

Introduction to basics of model making: Need - Scale of the models- type of the models- block models and detailed models – Use of different tools, materials and techniques

Hands on training on Architectural model making: understanding finishing and joinery with basic geometrical forms and Model making of buildings- Computer aided model making using 3D printing, CNC machines etc.

References:

1. N. Burbank, *House Carpentry Simplified*, NY, McGraw Hill Publications, 1986.
2. L. N. Krendlise, *Wood working*, Moscow, MIR Publications, 1984.
3. S. K. Husain, *Text book of Water supply and sanitation engineering*, Oxford & IBH, 1995.
4. K. B. Raina and S.K. Bhattacharya, *Electrical Design Estimating and Costing*, New Delhi, New Age International Publishers, 2005.
5. S. L. Uppal, *Electrical Wiring & Estimating*, Khanna Publishers, 5th edition, 2003.
6. G. R. Slone, *Tab Electronics Guide to Understanding Electricity and Electronics*, McGraw-Hill, 2000.
7. J. C. Whitaker, *The Resource Handbook of Electronics*, CRC Press, 2001.
8. D. Nick, *Architectural Model making*, Laurence King, 2010. (Portfolio Skills: Architecture)

SEMESTER II

MS1001E PROFESSIONAL COMMUNICATION

Pre-requisites: NIL

L	T	P/D	O	C
3	1	0	6	3

Total Lecture Sessions : 39

Course Outcomes:

CO1: Distinguish the role and purpose of communication at the workplace and for academic purposes.

CO2: Decide strategies and modes for effective communication in a dynamic workplace.

CO3: Combine multiple approaches for successful and ethical information exchange.

CO4: Estimate best communication practices to assist productivity and congeniality at the workplace.

Listening and Reading Comprehension

Conversation starters: introductions and small talk - Seek and provide information, clarification, polite enquiries, requests, congratulate people, apologise, give and respond to feedback - Describe graphs, tables, and charts - Words often confused: Lexicon and Meaning - Sense Groups - Listening for specific purposes: Listening to lectures, Summarise academic lectures for note-taking - Appropriate Language to Request and Respond - Public Speaking

Vocabulary and Speaking

Developing professional vocabulary - Basic Sentence Structures from Reading Texts - Concord - Functions of Auxiliary Verbs and Modals - Strategies for Effective Reading - Skimming and Scanning, Determine themes and main ideas, Predicting content using photos, images and titles - Critical Reading: Discussing and Summarising text points - Understanding Text Structures: sequencing, comparing and contrasting, relating cause and effect, problems and problem-solving - Discussing Rhetorical and Cultural Aspects in Texts - Text Appreciation: Drawing inferences, Framing Opinions and Judgments on Reading Text

Effective Writing

Note Making and Summarising: Prepare notes from reading texts, Paraphrasing - Use of Multimedia for Assistive Purposes - Paragraph Writing: cohesive devices to connect sentences in a paragraph - transitional devices - Use Text Structures in Paragraphs: sequencing, comparing and contrasting, relating cause and effect, problems and problem-solving - Avoiding Ambiguity and Cleft Sentences - Applications- Writing Instructions, Descriptions and Explanations - Official Letters of Request and Denial - Official E-mails - Abstract Writing - Digital Resources for Effective Communication

Communication at Workplace

Communication Theory - Process of Communication - Modes of Communication - Verbal and Non-Verbal Communication - Tone in Communication - Formal and Informal Communication at Workplace - Passive, Assertive and Aggressive Styles of Communication - Positive Body Language - Group Discussions - Presentation - Workplace Communication - Active Listening - Giving Feedback - Communication Etiquette - Persuasion - Negotiation - Tone and Voice - Telephone etiquette - Establishing Credibility in Conversations - Digital Communication and Netiquette: Conducting Oneself in Virtual Interactions, Constructive use of Social media - Ethical and Culturally Sensitive Communication: Ethical considerations in professional communication, Addressing diversity, Inclusive Communication Practices

References:

1. Bhatnagar, N., Bhatnagar, M. (2010). *Communicative English for engineers and professionals*. Dorling Kindersley.
2. Foley, M., & Hall, D. (2018). *Longman advanced learners 'grammar: A self-study reference & practice book with answers*. Pearson Education.
3. Garner, B. A. (2012). *HBR Guide to better business writing: Engage readers, tighten and Brighten, make your case*. Harvard Business Review Press.
4. Hewings, M. (2013). *Advanced grammar in use: A reference and practice book for Advanced learners of English*. Cambridge University Press.
5. Ibbotson, M. (2015). *Cambridge English for Engineering*. Cambridge University Press.
6. Kumar, S., & Lata, P. (2015). *Communication Skills*. Oxford University Press.
7. Sudarshana, N., & Savitha, C. (2016). *English for Technical Communication*. Cambridge English.

AP1005E APPLIED MECHANICS

Pre-requisites: NIL

L	T	P/D	O	C
3	1	0	6	3

Total Sessions: 39L +13T

Course Outcomes:

CO1: Describe fundamentals of mechanics and equivalent force systems

CO2: Classify statically determinate and indeterminate structures

CO3: Analyse statically determinate structures including trusses using equations of equilibrium

CO4: Compute the shear force and bending moment for various loading conditions

CO5: Compute frictional forces acting on a body

CO6: Determine sectional properties for various sections

Fundamentals of Mechanics and Force Systems

Fundamentals of mechanics: Introduction - basic dimensions and units of mechanics - law of dimensional homogeneity- dimensional relations between force and mass - units of mass -idealizations of mechanics - vector and scalar quantities - equality and equivalence of vectors - laws of mechanics.

Important vector quantities: Elements of vector algebra - position vector - moment of a force about a point - moment of a force about an axis - the couple and couple moment - couple moment as a free vector - addition and subtraction of couples - moment of a couple about a line.

Equivalent force systems: Translation of a force to a parallel position - resultant of a force system - simplest resultant of special force systems - distributed force systems.

Equations of Equilibrium

Equations of equilibrium: Space and Freebody diagram-free bodies involving interior sections - general equations of equilibrium - problems of equilibrium – Lami's theorem- static indeterminacy.

Introductions to structural mechanics

Introduction to structural mechanics: Trusses-The structural model - the simple truss - solution of simple trusses - method of joints - method of sections.

Section forces in beams: Different types of beams - shear forces and bending moment diagrams for simply supported, cantilever and over hanging beams.

Friction Forces and Properties of surfaces

Friction forces: Laws of Coulomb friction - simple contact friction problems.

Properties of surfaces: First moment —Centroid and Moment of Inertia- Simple and composite areas, transfer theorems- rotation of axes - polar moment of area - principal axes - concept of second order tensor transformation.

References:

1. I. H. Shames and G.K.M. Rao, *Engineering Mechanics—Statics and Dynamics*, Person Education India, 2005.
2. F.P. Beer and E.R. Johnston, *Vector Mechanics for Engineers — Statics*, McGraw Hill Book Company, 2013.
3. J.L. Meriam and L.G. Kraige, *Engineering Mechanics — Statics*, 6th edition, John Wiley & Sons, 2010.
4. S. Timoshenko, D. H. Young, J.V. Rao and P. Sukumar, *Engineering Mechanics*, McGraw Hill Book Company, 2013.

AP1006E INTRODUCTION TO BUILDING MATERIALS AND SYSTEMS

Pre-requisites: NIL

L	T	P/D	O	C
2	0	0	4	2

Total Lecture Sessions: 26

Course Outcomes:

CO1: Identify the various building materials and systems present in a building.

CO2: Comprehend the characteristics, properties, and applications of various building materials.

CO3: Differentiate between structural and non-structural building systems.

CO4: Interpret the various building system functioning in a building.

CO5: Gain a comprehensive understanding of construction techniques related to building materials and systems.

CO6: Acquire knowledge required for suggesting appropriate materials and systems for various spaces in buildings.

Introduction to Building Materials

Brick: Types, properties, uses and standards, market and ISI, requirements and tests for good bricks.

Fire clay bricks - varieties; Different uses of brick in construction; Building Tiles: Roof, floor and wall tiles; Stones: Classification of stones, stones used in construction, aggregates, tools used, types of stone dressings defects in stone, Preservation of stone work; Sand: Pit, river, sea, Manufactured sand, ISI standards, use in mortar and concrete; Cement: Ingredients and properties of cement, Types of cement, Grades of cement, Initial and final setting time, Test of cements, ISI Standards; Mortars: Types, handling and uses of mortars; Concrete: Concrete and its constituents, Mixes, uses and standards.

Introduction to Building Materials-Metals

Ferrous Metals - Various metals, manufacturing processes and casting. Uses of cast iron, wrought iron and steel. Galvanizing, oxidation and casting of metallic products, corrosion of iron and their prevention. Metallic protective coatings; Nonferrous Metals: Basic idea of important ores, properties and uses of Aluminum, Zinc, Copper, Tin and Lead

Introduction to Building systems

Structural systems: Introduction, Evolution of building systems, Need and Importance of building systems, Types - Building elements, various components of a building explored through a typical section.

Non-Structural systems

Introduction to Non-Structural Systems, Need and Importance, Types - Enclosure & Protection, Mechanical Systems, Mechanical transportation systems

For effective learning in this subject student shall be exposed to practical application. The faculty/course coordinators have to organize practical orientation lectures/seminars by industry or trade related organisations/field/site visits. A weightage of 5% in the overall Internal Assessment in the subject should be reserved for students attending these seminars/site visits and maintaining the records/ observations as required by the subject faculty.

References:

- 1.R. Moxley, *Mitchell's Elementary Building Construction*, Technical Press Ltd.
- 2.S. C. Rangwala, *Building Construction*, 34th ed. Charotar Pub. House, Anand, 2022.
- 3.E.A. Allen, *Fundamentals of building construction materials and methods*, John Wiley & Sons, 2009.
- 4.F. Ching, *Building Construction Illustrated*, John Wiley & Sons, 2008.
- 5.S. Emmitt and C. Gorse, *Barry's Advanced Construction of Buildings*, Blackwell Publishing, 2006.
- 6.M. Mehta, et. al., *Building Construction*", USA, Pearson, 2013.

AP1007E CULTURAL STUDIES

Pre-requisites: NIL

L	T	P/D	O	C
3	0	0	6	3

Total Lecture Sessions: 39

Course Outcome:

CO1: Acquire a fundamental understanding of culture and its key elements that contribute to the cultural fabric.

CO2: Comprehend the impact of cultural beliefs on the built environment

CO3: Recognize architecture as a reflection of cultural values and beliefs.

CO4: Appreciate diverse Traditional Knowledge Systems.

CO5: Grasp the principles of designing culturally sensitive architecture.

CO6: Analyze cultural influences on the built environment and architectural design.

Introduction to Cultural Studies

Exploring culture: definition, components, and significance. Defining cultural studies: scope, importance, and its interdisciplinary nature with a focus on architecture. Approaches to cultural studies: anthropological, sociological, and semiotic perspectives.

Cultural Influences on Society

Understanding the dynamic relationship between culture and society: the reciprocal impact of culture on society and vice versa. Examining the influence of cultural norms on social institutions such as family, religion, education, economy, and politics. Exploring the role of Faith, Power/Patronage, and Commerce as significant generators of cultural fabric. Illustrating examples from early and medieval societies as well as Indigenous societies worldwide.

Cultural Influences on Built Environment

Exploring how cultural beliefs shape architectural principles: Investigating the connection between cosmological models, architectural forms, and cultural beliefs, Analysing the influence of cultural beliefs on house forms, architecture in context, and the roles of Faith, Power/Patronage, and Commerce. Examining the impact of geo-cultural regions on the built environment. Exploring the interactions between nature and culture and the emergence of various Traditional Knowledge Systems. Highlighting case studies that demonstrate the application of Indian Knowledge systems in architecture.

Cultural sensitivity in Architectural Design

Understanding the importance of cultural sensitivity in architecture. Promoting cultural diversity and cultivating cultural awareness in architectural design. Addressing the issue of cultural appropriation and its avoidance. Examining contemporary examples of culturally sensitive architecture.

References

1. I. Cooper, *Traditional Buildings of India*, London,Thames and Hudson Ltd., 1998.
2. D. L. Manuel, *A Thousand Years of Nonlinear History*, New York, Zone Books, 2019.
3. Kostof, Spiro. *A History of Architecture: Settings and Rituals*, New York, Oxford University Press, 2010.
4. M. A. Mcadams, J. T. Cantu, and I. Vassoler-froelich, *The Geography, Politics, and Architecture of Cities: Studies in the Creation and Complexification of Culture*, N.Y, Lewiston, Edwin Mellen Press, 2012.
5. A. Rapoport, *House Form & Culture*. Prentice Hall, 1969.
6. L. M. Roth, and A. C. R. Clark. *Understanding Architecture: Its Elements, History, and Meaning*. Routledge, 2018.
7. M. Vellinga and L. Asquith. *Vernacular Architecture in the Twenty-First Century*, Taylor & Francis, 2005.

AP1008E INTRODUCTION TO DESIGN - II

Pre-requisites: AP1004E

L	T	P/D	O	C
2	0	6	14	6

Total Sessions: 26L + 78D

Course Outcomes:

CO 1: Analysis of precedents to arrive at programmatic requirements make design decisions

CO 2: Understanding and application of human scale in design

CO 3: Analysis and application of site and other contextual determinants of architecture

CO 4: Prioritize design choices arising from the requirements of firmness, commodity and delight

CO 5: Understand and apply design process informed by behavioral needs

CO 6: Efficient communication of the design ideation, development and presentation for multifunctional spaces

Use of precedents

Understanding elements of architecture by studying the immediate environment- understanding of human scale in different contexts-arriving at programmatic requirements through case studies, standards, functional requirements

Determinants of architecture

Understanding of the context- stakeholders, climate, site characteristics- environment- personal experiences- behavioral needs

Weighing design choices

Making informed design choices by careful weighing of priorities of firmness, commodity, delight and others- spatial organization- circulation- form and space- crafting functional spaces through robust elements put together in an aesthetic manner

Multi-functional space design

Space definition- planes, lines, point- degree of enclosure- play of light-visual relationships- articulation of space- design development process- Modulation of elements- floors, walls, roofs, fenestration-effective design communication through drawings and models

References:

1. D. Watson, Time-saver standards for architectural design. Tenner, E. (2015).
2. F. D. Ching, *Architectural graphics*, John Wiley & Sons, 2015.
3. C. Gänshirt, *Tools for ideas: Introduction to architectural design*, De Gruyter, 2007.
4. F.D. Ching, *Architecture: Form, space, and order*, John Wiley & Sons, 2023.
5. E. Neufert, and P. Neufert, *Architects' data*. John Wiley & Sons, 2012.
6. Architectural Graphic Standards by the American Institute of Architects and Dennis J. Hall

AP1009E INTRODUCTION TO COMPUTER GRAPHICS

Pre-requisites: Nil

L	T	P/D	O	C
2	0	2	6	3

Total Sessions: 26L + 26P

Course Outcomes:

CO1: Identify and differentiate different computer graphics formats, techniques and tools and choose the right ones for the task at hand.

CO2: Create raster and vector-based graphics and create page layouts for design communication

CO3: Create 2D CAD drawings

CO4: Create 3D models

Essentials of computer graphics

Historical development of computer graphics and its application architecture, Computer representation of graphics- Raster, vector, pixels, resolution, computer display standards – VGA, HD, UHD. Colour representation – RGB, CMYK, digital representation of colour, colour depth- 8, 10, 12 and 16 bit colour depths and applications, HDR images. Common Image formats – bmp, jpeg, tiff, png, Printing computer graphics – printing techniques, plotters, colour profiles and calibration.

Computer hardware for graphical applications – Desktop vs Graphic workstations, processors, RAM, graphics cards, render farms. Suggested Projects: Prepare a documentation of prevailing and developing display technology, A market survey of computer hardware and suggest optimum hardware configurations for beginner and advanced levels of computer applications in architecture.

Raster & Vector Image manipulations and layout

Raster image creation and manipulation – Image setup, choosing right resolution, colour depth. Brushes – brush types, transparency, Selecting parts of images – selection tools like lasso, magic wand, Concept of layers – layer blending, curves, filters etc. Suggested software: Gimp, Photoshop

Vector Image creation and manipulation – graphic setup, selection techniques, creating basic shapes-manipulating shapes, paths, combining shapes, pen tool, colour- colour strokes, gradients, Text manipulations – text styles, wrapping, text over paths, Layers – stacking, blends, Suggested software: Inkscape, Illustrator.

Page layout – Setting up different types of documents – single page, folded brochures, multi-page books, Text content manipulations – text styles, paragraph styles, overflowing text, Manipulating images – text around images, importing MS Word documents, shapes, clipping images to shapes. Suggested software: Scribus, InDesign. Suggested Projects: Prepare a raster artwork, edit and enhance an existing image, create a vector art work like a logo, compare a raster graphics with vector graphics. Prepare a sheet layout for the previous design project using the tools learned. Prepare a folded brochure or multi page report.

Introduction of 2D CAD

Introduction to CAAD, Introduction to CAD user interface, commands for drawing basic elements, modification commands. Layers, arrays, blocks, basic annotation with text, dimensions. Plotting scaled drawings with line weights, drawing standards, sheet layouts, Preparation of 1, 2, 3-point perspective views, and other graphical representation of architectural objects, elements and buildings. Suggested software: IIA CAD, AutoCAD. Suggested Projects: Exercises to familiarize the above features. Drawing simple shapes, digitizing some of the previous design sheets, Preparation of plan, elevation, section, and perspective views of a pre-designed building.

3D Graphics

Overview of 3D graphics application in architecture, concept of different coordinate systems – world, object, hierarchical, viewpoint, model window, screen and view port coordinate systems, Different types of 3D modelling techniques - polygon, splines, blobby. Rendering basics-Scanline, ray tracing, global illumination, AI assisted rendering, Animating things - Animation basics, time line and key frames, over view of simulating gravity, fog, water, hair, cloth etc. Suggested software: Blender, Sketchup. Suggested Projects: Generate simple 3D forms, create a chess set, simple interior space. Simple rendering.

References:

1. Lab Manual

2. J. J. McConnell, *Computer Graphics Theory into Practice*, United Kingdom, National Book Traders, 2006.
3. B. Thiagarajan, *Scribus an introduction*, Google Books, 2020. Available at: https://books.google.com/books/about/Scribus_An_Introduction.html?id=qKH6DwAAQBAJ, (Accessed: 04 June 2023).
4. J. Cruise and K. K. Anton, *Adobe InDesign CS6: Classroom in a Book*. CA, Peachpit Press Berkeley, 2012.
5. B. Wood, *Adobe Illustrator, 2021 Release: The Official Training Workbook from Adobe*. San Jose, CA, USA, Adobe, 2021.
6. G. Omura and B. C. Benton, *Mastering AutoCAD 2018 and AutoCAD Lt 2018*, Sybex, Indianapolis, Indiana, a Wiley brand, 2017.
7. Autodesk User Manual for CAD.

AP1093E SURVEYING AND LEVELLING

Pre-requisites: NIL

L	T	P/D	O	C
2	0	2	6	3

Total Sessions: 26L + 39P

Course Outcomes:

CO1: Understand principles of surveying

CO2: Carry out distance measurements using different survey equipment

CO3: Adopt suitable survey technique and select equipment based on the required level of accuracy.

CO4: Carry out profiling and grid levelling, for generation of profiles, contour maps, and earth works computations.

CO5: Analyze and synthesize survey data from the field notes

CO6: To carry out field surveys for location, design and construction of buildings as well as to work effectively as a team member for completing the assigned field work.

Lecture Sessions:

Surveying - Basic Concept

Surveying definition - principles of surveying - plane surveying - geodetic surveying – Types of errors.

Distance Measurement: Measurement methods (Tape, Tacheometry, EDM) - Taping Equipment - Taping on smooth level ground and sloping ground – Ranging - Systematic errors in taping and corrections (Tape standardization, Temperature, Tension, Sag, Slope and Alignment).

Vertical Control

Levelling - Definitions (Level line, Horizontal line, Datum, Bench mark, Reduced Level) – Curvature and refraction – Methods for establishing vertical control – Direct levelling – Instrument types – Principle of levelling- Methods of Booking (Height of collimation, Rise and fall) - Differential levelling – Reciprocal levelling - Errors in levelling – Applications of levelling (profile levelling and contouring).

Angle and Direction Measurement and Traversing

Definitions (True meridian, Magnetic meridian, Bearings, Azimuths, Interior angles, Deflection angles) – Methods of determining angles and directions (Magnetic compass, Theodolite, Total station) – Prismatic compass – WCB system – Magnetic declination – Local attraction.

Traverse – Traverse stations – Types of traverse – Closed traverse computations and adjustments using Bowditch rule.

Combined Distance and Angular measurement

Tacheometric surveying - Stadia method – Stadia constants – Elevation difference - Staff held vertical - Tangential tacheometry.

Computation of Areas and Volumes: Area Computation – Traverse – Area between traverse and irregular boundary - Area computation from Plans – Areas and Volumes of Cross Section Determination of quantities for excavation.

Practical Sessions:

Practical Exercises:

Setting out of a building

1. Distance measurement – Using Total Station
2. Levelling using Auto level
3. Measurement of horizontal and vertical angles – using Micro-optic Theodolite
4. Contour surveying – Determination of coordinates using Total Station and preparation of contour map using QGIS

5. Tacheometric surveying – Stadia method – Determination of heights and distances using Micro-optic Theodolite
6. Traversing – using Total station
7. Drone and DGPS Survey – Demonstration only

References:

1. J. Anderson and E. Mikhail, *Surveying: Theory and Practice*, McGraw Hill Education, 7th Edition, 2017.
2. W. Schofield and M. Breach, *Engineering Surveying*, Elsevier, CBSPD, 6th Edition, 2007.
3. R. Subramanian, *Surveying and Levelling*, Oxford University Press, 2nd Edition, 2012.
4. K. R. Arora, *Surveying Vol-I*, Standard Book House, 15th Edition, 2015.
5. K. R. Arora, *Surveying Vol-II*, Standard Book House, 14th Edition, 2010.
6. B.C. Punmia, A. K. Jain and A. K. Jain, *Surveying Vol-I*, Laxmi Publications, 17th Edition, 2016.
7. S. K. Duggal, *Surveying Vol-I*, McGraw Hill Education, 4th Edition, 201

AP1094E MATERIAL TESTING LABORATORY

L	T	P/D	O	C
0	0	2	2	1

Pre-requisite: NIL

Total Lecture Sessions: 28

Course Outcomes:

CO1: Identify the type of test depending on the type of material and property to be tested

CO2: Carry out tests with reference to the test procedures as per standards

CO3: Conduct standard tests on different building materials.

CO4: Determine properties of concrete and aggregate for concrete

CO5: Determine properties of mild steel and timber

CO6: To carry out construction of brick masonry and arches

List of Exercises:

1. Tests on aggregate for concrete

(a) Grain size distribution (b) Specific gravity (c) Density (d) Voids (e) Bulking (f) Aggregate crushing value (g) Aggregate impact value

2. Tests on cement

(a) Fineness (b) Normal consistency (c) Setting time (d) Compressive strength

3. Tension Test on Mild Steel

4. Test on Timber beam – Bending test

5. Tests on tiles – Dimension, Transverse Strength, Water Absorption and Crazeing

6. Tests on bricks – Crushing strength, water absorption and efflorescence

7. Workability tests for fresh concrete and compressive strength test on hardened concrete

8. Hands on session on bar bending for lintels and beams

9. Hands on session on brick masonry and arches

References:

1. A. M. Neville, *Properties of Concrete*, Prentice Hall, 2011.

2. M. S. Shetty, *Concrete Technology*, S Chand and Company, 2006.

3. S. U. Pillai and D. Menon, *Reinforced Concrete Design*, Tata Mc GrawHill, 3rd Edition, 2017.

4. Relevant BIS Standards.