Curriculum

of

Diploma Programme

in

Architectural Assistantship

State Board of Technical Education (SBTE)
Bihar

Semester – IV

Teaching & Learning Scheme

CourseCodes	CourseTitles	Teaching & Learning Scheme (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction(LI)	Notional Hours (TW+SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2437401	Building Construction-I	3	-	4	2	9	6
2437402	Interior Design & Rendering	3	-	4	2	9	6
2437403	Ecology and Environment	3	-	4	2	9	6
2437404	Environmental Engineering	3	-	4	2	9	6
2437405	History of Architecture	3	-	-	2	5	4
2437406	Model Making	-	-	2	2	4	2
	Total	**15**		**18**	**12**	**45**	**30**

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)
Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours) **For Non exam course institute have option to choose any one course (**Cisco/KYP/ST)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

Semester - IV

Assessment Scheme

Course Codes	Course Titles	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term work & Self-Learning Assessment (TWA)		Lab Assessment(LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2437401	Building Construction-I	30	70	20	30	20	30	200
2437402	Interior Design & Rendering	30	70	20	30	20	30	200
2437403	Ecology and Environment	30	70	20	30	20	30	200
2437404	Environmental Engineering	30	70	20	30	20	30	200
2437405	History of Architecture	30	70	20	30	-	-	150
2437406	Model Making	-	-	10	15	10	15	50
Total		**150**	**350**	**110**	**165**	**90**	**135**	**1000**

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities

A) Course Code : **2437401 (T2437401/P2437401/S2437401)**

B) Course Title : Building Construction - I

C) Pre- requisite Course(s) : Building materials

D) Rationale :

The aim is to develop an understanding of the behavior and function of various components of buildings. For this it is essential that the student are taught the various components of the buildings such as foundations, floors, super structure, joints, openings, roofs etc.

Teachers must supplement their lectures with models, audio-visuals and on-site study of various building components.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

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

- **CO-1** Compare several types of stone masonry work.
- **CO-2** Propose suitable types of brick bond for building structures
- **CO-3** Select suitable types of doors and windows for specific purposes.
- **CO-4** Select suitable types of partition wall for specific condition.
- **CO-5** Propose suitable types of flooring as per requirement.

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Lifelong Learning	**PSO-1**	**PSO-2**
CO-1	3	-	-	2	1	-	-		
CO-2	2	3	3	3	2	-	-		
CO-3	3	3	3	2	2	1	1		
CO-4	3	3	3	2	2	1	1		
CO-5	3	2	2	3	3	1	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2437401	Building Construction - I	03	-	04	02	09	06

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method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

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C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

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H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
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		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2437401	Building Construction-I	30	70	20	30	20	30	200

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

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TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty, but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing:

Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2437401

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a Describe the various factors affecting selection of stone TSO 1b Explain the various uses of stone in construction. TSO 1c Differentiate various types of stone masonry.	**Unit-1.0 Stone Masonry** **1.1** Factors affecting selection of stone **1.2** Uses of stone **1.3** Types of stone masonry Rubble Masonry Random Rubble Masonry Coursed Masonry	**CO1**
TSO 2a. Elaborate different technical terms used in Brick Masonry. *TSO 2b.* Differentiate between various types of brick bond. *TSO 2c.* Draw the sketch of various wall Junction. *TSO 2d.* Compare brick work and stone work. *TSO 2e.* Explain the components of Arches and lintels.	**Unit- 2.0 Brick Masonry** 2.1 Technical terms used in Brick Masonry 2.2 Brick Bond English Bond Flemish Bond Rat trap bond 2.3 Wall Junction T-Junction Cross Junction 2.4 Comparison of brick masonry and stone masonry 2.5 Arches & Lintels in brick / stone- Definition, technical terms	**CO2**
TSO 3a. Elaborate different components of Doors and windows. TSO 3b. Describe various types of doors. TSO 3c. Explain various types of windows. TSO 3d. Describe the importance of ventilator.	**Unit 3.0 Opening** 3.1 Technical terms of doors and windows 3.2 Different types of Doors – Panelled door, Metal doors, rolling door, Revolving, Collapsible, Sliding, Revolving door. 3.3 Different types of Windows – glazed, louvered, corner and bay window, 3.4 Ventilators	**CO3**
TSO.4a Understand the requirement of good partition wall. TSO.4b Elaborate the advantages of partition wall. TSO.4c Describe various types of partition wall based on material used. TSO.4d Interpret the benefits of false ceilings. TSO.4e Explain various types of false ceilings based on material used.	**Unit 4.0 Interior Wall and False ceiling** 4.1 Requirements of good partition Wall 4.2 Advantage of Partition Wall 4.3 Different types of partition wall based on material used- Brick, metal, stone, PVC / Plastic Timber Panel and Soft board Partition Partition using Aluminums, Timber Section & Glass block Partition 4.4 False Ceiling- Benefits, Different types of false ceilings based on materials used.	**CO4**
TSO 2f. Describe the various types of flooring and its method of laying. *TSO 2g.* Explain various types of floor finishes.	**Unit-5.0 Flooring** 5.1 Types of Flooring, Method of Laying 5.2 Different Floor finishes with stones, Cement, Colored Cement, mosaic, Terrazzo,	**CO3, CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	-Tiles, Wooden, Bamboo, Ceramic flooring.	

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2437401

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Describe stone masonry construction work.	1.	Prepare a simple stone masonry construction work.	CO1, CO2
LSOs 2.1 Prepare brick wall in english bond LSOs 2.2 Prepare brick wall in flemish bond.	2.	Assemble 1 ½' Brick thick wall in a English Bond, (minimum Course)	CO1, CO2
	3	Assemble 1 ½' brick thick wall in a Flemish Bond. (minimum Course)	
LSO 3.1. Elaborate different components of Doors and windows. *LSO 3.2.* Draw sketch of door and window.	4	Identify various components of doors in the lab in the model to prepare the report with sketches.	CO2, CO3
	5	Identify various components windows in the lab in the model to prepare the report with sketches.	
LSO 4.1. Describe various types of partition wall based on material used. *LSO 4.2.* Explain various types of false ceilings based on material used.	6	Identify various types of used in partition wall in the lab to prepare report.(Part I)	CO4
	7	Identify various types of used in partition wall in the lab to prepare report.(Part II)	
LSOs 5.1 Describe the method of laying of flooring *LSOs 5.2* Identify various types of flooring materials. *LSOs 5.3* Prepare drawing of all records	8	Identify various types of flooring materials in the lab to prepare report.(Part I)	CO5
	9	Identify various types of flooring materials in the lab to prepare report.(Part II)	
	10	Prepare a sketch book consisting of all the sketches from experiment Number I, 2, 3.4, 5	

L) Suggested Term Work and Self Learning: S2437401 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. Micro Projects:

c. Prepare a sketchbook consisting of components of building (for Sketches which are not included in Practical sketch book).

d. Collect the relevant information of recent technologies in building construction and prepare a report on it.

C. Identify the different types of cracks and remedial measures and submit a report on case study.

D. Collect the relevant information of different techniques of demolition of existing structure and submit a report on it.
E. Prepare a summary report with reference nt in any one part of National Building Code.
F. Identify the components of a building by inspecting the available model and prepare a report.
G. Identify types of foundation by inspecting available models and prepare a report.

e. Other Activities:

1. Seminar Topics:
   - Low cost building
   - Ancient stone structures
   - Concept of Interior designing

Visits: Visit to construction site to observe brickwork. Sill. Lintel. Chajja, Slab, Parapet wall and prepare a report.

2. Self-learning topics:
   - Types of wall construction.
   - Various design in door and window.
   - Uses of stones in construction .

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		**Term Work Assessment (TWA)**			**Lab Assessment (LA)#**	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	**End Theory Assessment (ETA)**	**Term Work & Self Learning Assessment**			**Progressive Lab Assessment (PLA)**	**End Laboratory Assessment (ELA)**
			Assignments	**Micro Projects**	**Other Activities***		
CO-1	15%	10%	15%	-	-	20%	20%
CO-2	10%	20%	10%	25%	-	10%	20%
CO-3	15%	20%	15%	25%	33%	15%	20%
CO-4	30%	20%	30%	25%	33%	15%	20%
CO-5	30%	30%	30%	25%	34%	40%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:
*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.
**: Mentioned under point- (N)
#: Mentioned under point-(O)

Note:
- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (Cl) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Stone Masonry	14	**CO1**	14	2	4	8
Unit-2.0 Brick Masonry	10	**CO2**	16	4	6	6
Unit-3.0 Openings	8	**CO3**	14	4	4	6
Unit-4.0 Interior and False ceilings	6	**CO4**	12	2	2	8
Unit-5.0 Flooring	10	**CO3, CO5**	14	4	4	6
Total	**48**	**-**	**70**	**16**	**20**	**34**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

SN	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Prepare a simple stone masonry construction work.	CO1	40	50	10
2.	Assemble 1 ½' Brick thick wall in a English Bond, (minimum Course)	CO2	40	50	10
3.	Assemble 1 ½' brick thick wall in a Flemish Bond. (minimum Course)	CO2	30	60	10
4.	Identify various components of doors in the lab in the model to prepare the report with sketches.	CO1, CO2	30	60	10
5.	Identify various components windows in the lab in the model to prepare the report with sketches.	CO2, CO3	40	50	10
6.	Identify various types of used in partition wall in the lab to prepare report.(Part l)	CO2, CO3	40	50	10
7.	Identify various types of used in partition wall in the lab to prepare report.(Part ll)	CO2, CO3	30	60	10
8.	Identify various types of flooring materials in the lab to prepare report.(Part l)	CO4	40	50	10
9.	Identify various types of flooring materials in the lab to prepare report.(Part ll)	CO4	40	50	10
10.	Prepare a sketch book consisting of all the sketches from experiment Number l, 2, 3.4, 5	CO2, CO5	30	60	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment and Tools Broad Specifications	Exp. No.
1.	Stone sample	01
2.	Bricks, plumbs, mason square, level tube, line dori	2,3
3.	Models: a. Cut section of building showing components b. Types of bonds in brick masonry c. Types of doors and windows d. Types of stairs e. Various types of material used in flooring	4 to 10

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Building Construction	S K Sharma	S Chand & Co. New Delhi 2008ISBN:9788187433514
2.	Building Construction	B C Punmia A K Jain	Firewall Media, 2005
3.	Building Construction	S.C.Rangwala,	Charotar Publishing House Dist- Anand
4.	Building Construction	S P Arora, and Bindra	Dhanpat Rai Publication Delhi

(b) Online Educational Resources:

1. http://www.asnu.com.au
2. www.youtube.com for videos regarding machines and applications, friction

3. www.nptel.ac.in
4. www.discoveryforengineers.com

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

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A.) Course Code : 2437402 **(T2437402/P2437402/S2437402)**

B.) Course Title : Interior Design & Rendering

C.) Pre- requisite Course(s) : Interior Design

D.) Rationale : In today's built environment, functionality, aesthetics, ergonomics, and sustainability are equally important in shaping quality interiors for residential and commercial projects. Students are required to develop competence not only in planning and detailing of spaces but also in effective visualization and presentation of their ideas.

E.) Course Outcomes (COs): To introduce students to the principles and elements of Interior Design. To develop skills in planning, detailing, and presentation of interior spaces. To train students in manual rendering techniques and digital visualization tools. To integrate functional, aesthetic, and sustainable design aspects in interiors.

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

CO-1 Explain the knowledge of basic architectural fundamentals in building design and interior planning.

CO-2 Explain elements & principles of design in interiors.

CO-3 Apply ergonomics and standards in residential and small commercial layouts

CO-4 Identify appropriate materials, finishes, and lighting for interior.

CO-5 Use rendering techniques (hand + software) for realistic presentations. Prepare professional presentation sheets for interior projects

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Lifelong Learning	**PSO-1**	**PSO-2**
CO-1	3	2	2	-	1	-	1		
CO-2	3	3	3	2	2	-	2		
CO-3	2	-	3	2	-	-	2		
CO-4	2	2	3	3	2	2	3		
CO-5	2	2	3	3	2	1	3		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

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G) Teaching & Learning Scheme:

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2437402	Interior Design & Rendering	03	-	04	02	09	06

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2437402	Interior Design & Rendering	30	70	20	30	20	30	200

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J) Theory Session Outcomes (TSOs) and Units: T2437402

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Explain the scope & role of interior design in architecture. TSO 1b. Differentiate between decoration and design. TSO 1c. Appreciate the importance of interior spaces.	**Unit-1.0 Introduction to interior design** **1.1** Definition, scope& role of interior design. **1.2** Difference: Interior Design vs. Interior Decoration **1.3** Importance of interior spaces in architecture	**CO1**
TSO 2a. Describe the elements & principles of design. TSO 2b. Apply them in analysis of interior examples	**Unit- 2.0 Elements & Principles of Design** 2.1 Elements: Line, shape, form, space, texture, colour, light 2.2 Principles: Balance, rhythm, harmony, contrast, proportion, unity, pattern, symmetry, discord, scale	**CO2**
TSO 3a. Interpret ergonomic data & apply to layouts. Describe various types of doors. TSO 3b. Prepare furniture layouts with circulation spaces. TSO 3c. Plan functional residential & office interiors.	**Unit 3.0 Space Planning & Furniture Layouts** 3.1 Ergonomics & human scale 3.2 Furniture standards 3.3 Planning for living, bedroom, kitchen, toilet, office cabin	**CO3**
TSO.4a Identify suitable materials & finishes for interiors. TSO.4b Explain lighting types & their applications TSO.4c Demonstrate material & lighting selection in small projects.	**Unit 4.0 Materials, Finishes & Lighting** 4.1 Interior materials: wood, glass, metals, tiles, stones, fabrics, uPVC, WPC 4.2 Surface finishes: paints, laminates, veneers, wallpapers 4.3 Lighting types: ambient, task, accent	**CO4**
TSO 5a. Demonstrate manual rendering techniques. TSO 5b. Produce perspective views of interiors. TSO 5c. Represent materials & textures graphically. TSO 5d. Render digitally; Compile presentation sheets.	**Unit-5.0 Rendering Techniques** 5.1 Freehand sketching & shading 5.2 Rendering with pencil, ink, markers, watercolour 5.3 Perspective drawings of interiors (1-point, 2-point) 5.4 Rendering basics in Lumion/V-Ray/Enscape	**CO5**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2437402

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Develop freehand sketches And Conceptualize themes	1.	Sketching basic furniture & fixtures. Preparation of mood board	CO1
LSOs 2.1 Apply elements in sketches LSOs 2.2 Show harmony, balance, contrast	2.	Prepare Colour wheel exercise	CO2
	3.	Identify various type of Rendering textures (wood, glass, fabric, etc)	
*LSO 3.1.*Prepare functional layouts. *LSO 3.2.*Apply ergonomic standards.	4.	Layout exercises with circulation and furniture details.	CO3
	5.	Bedroom, kitchen, toilet, office cabin.	
*LSO 4.1.*Identify materials & finishes; Render textures *LSO 4.2.*Show lighting effects	6.	Identify various type of Rendering surfaces (wood, marble, fabric,etc)	CO4
	7.	Sketch lighting fixtures.	
LSOs 5.1 Produce perspective drawings	8.	Sketch 1-point & 2-point perspective of interiors spaces.	CO5
LSOs 5.2 Freehand Render realistic interiors	9.	Rendering with pencil/markers/watercolour	
LSOs 5.3 Draft professional layouts, Model interiors digitally Rendering of realistic views	10.	Digital Rendering 2D layout on photoshop SketchUp 3D modeling; Lumion/V-Ray rendering.	

L) Suggested Term Work and Self Learning: **S2437402** Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. Micro Projects:

Project 1

- Objective: To apply ergonomic standards in real interior planning.
- Tasks:

a. Take room dimensions of a student's own bedroom/living room.
b. Prepare 2D furniture layouts manually & in AutoCAD.
c. Ensure circulation spaces and ergonomic standards are followed.

- Expected Outcome: 1 manual sheet

Project 2

- Objective: To practice manual rendering techniques.
- Tasks:

a. Draw a 1-point perspective of a small room (bedroom or office cabin).
b. Render it using pencil + colour (markers/water colour).

- Expected Outcome: A rendered A3/A2 sheet showing realistic textures & lighting.

Project 3

- Objective: To integrate all learning in a small real-life project.

- Tasks:

a. Select a local shop/café/boutique in your area.
b. Prepare space planning, furniture layout, material selection, and rendered views.
c. Present as final sheets + 3D renderings.

- Expected Outcome: Complete mini-project (manual + CAD + renderings)

c. Other Activities:

1. Seminar Topics:

- Smart homes and automation in interiors
- Sustainable materials for interior finishes
- Role of colour psychology in interiors
- Traditional Indian crafts and their application in modern interiors

2. Visits:

Visit to Retail Interiors shops – boutiques, malls, branded stores. Visit to some Local craft & furniture workshops – to understand material & joinery.

3. Self-learning topics:

- Study of famous interior designers (Indian & International) and their works.
- Study of energy-efficient lighting systems in interiors.
- Making a cost estimate for furnishing a small living room.

M) **Suggested Course Evaluation Matrix:** The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	15%	10%	15%	-	-	20%	20%
CO-2	10%	20%	10%	25%	-	10%	20%
CO-3	15%	20%	15%	25%	33%	15%	20%
CO-4	30%	20%	30%	25%	33%	15%	20%
CO-5	30%	30%	30%	25%	34%	40%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.
**: Mentioned under point- (N)
#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (Cl) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Introduction to interior design	6	**CO1**	12	2	4	8
Unit- 2.0 Elements & Principles of Design	10	**CO2**	14	4	6	6
Unit 3.0 Space Planning & Furniture Layouts	10	**CO3**	16	4	4	6
Unit 4.0 Materials, Finishes & Lighting	8	**CO4**	14	2	2	8
Unit-5.0 Rendering Techniques	14	**CO3, CO5**	14	4	4	6
Total	**48**	**-**	**70**	**16**	**20**	**34**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

SN	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Sketching basic furniture & fixtures. Preparation of mood board	CO1	40	50	10
2.	Prepare Colour wheel exercise	CO2	40	50	10
3.	Identify various type of Rendering textures (wood, glass, fabric, etc)	CO2	30	60	10
4.	Layout exercises with circulation and furniture details.	CO3	30	60	10
5.	Bedroom, kitchen, toilet, office cabin.	CO3	40	50	10
6.	Identify various type of Rendering surfaces (wood, marble, fabric,etc)	CO4	40	50	10
7.	Sketch lighting fixtures.	CO4	30	60	10
8.	Sketch 1-point & 2-point perspective of interiors spaces.	CO3,CO5	40	50	10

SN	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
9.	Rendering with pencil/markers/watercolour	CO3,CO5	40	50	10
10.	Digital Rendering 2D layout on Photoshop, Sketch Up, 3D modelling; Lumion/V-Ray rendering.	CO3,CO5	30	60	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment and Tools Broad Specifications	Exp. No.
1.	Drawing board, drafter, pencils(HB-6B), colour pencils/markers/watercolor set, ruler, A2 sheets	1, 2
2.	Software : • AutoCAD • Sketch up • Photoshop • Lumion/ V-ray	2,3

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Interior Design Principles and Practice	Pratap Rao	Standard Publishers, New Delhi
2.	Interior Design Illustrated	Francis D.K. Ching	Wiley
3.	Rendering with Pen and Ink	Robert W. Gill	Thames & Hudson

(b) Online Educational Resources:

1. http://www.swayam.gov.in
2. www.youtube.com for videos regarding interior design ideas.
3. www.nptel.ac.in
4. www.linkedin.com/learning

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

******

A) Course Code : **2437403 (T2437403/P2437403/S2437403)**

B) Course Title : Ecology and Environment

C) Pre- requisite Course(s) : Ecology and Environment

D) Rationale :

- Ecology and Environment plays a vital role in architecture. Understanding ecological balance, natural resources, environmental pollution, and sustainability is essential for architects to design buildings and settlements that are environmentally responsible and resource efficient. The subject introduces students to ecosystems, biodiversity, climate change, sustainable development, and environmental laws, thereby enabling them to integrate ecological concepts in architectural design.
- Teachers should supplement their lectures with case studies, field visits, models, documentaries, and interaction with environmental experts.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

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

CO-1 Explain the concept of ecology, ecosystem, and biodiversity.

CO-2 Analyze various types of environmental pollution and their impact on human health and architecture

CO-3 Propose sustainable solutions for resource management in building design.

CO-4 Interpret environmental policies, acts, and legal frameworks related to architecture.

CO-5 Integrate ecological and environmental principles in architectural projects for sustainability**.**

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Lifelong Learning	**PSO-1**	**PSO-2**
CO-1	3	2	1	1	2	-	1		
CO-2	2	3	2	2	3	1	1		
CO-3	3	3	3	3	3	2	1		
CO-4	3	2	2	2	3	2	2		
CO-5	3	3	3	3	3	3	3		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

***** PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2437403	Ecology and Environment	03	-	04	02	09	06

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2437403	Ecology and Environment	30	70	20	30	20	30	200

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty, but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of

Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2437403

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Define ecology and explain its scope and importance. **TSO 1b.** Describe structure and function of ecosystems. **TSO 1c.** Explain types of ecosystems and ecological relationships. **TSO 1d.** Interpret energy flow through food chains, food webs, and ecological pyramids	**Unit-1.0 Ecology and Ecosystem** **1.1** Definition, scope and importance of ecology **1.2** Structure and function of ecosystem **1.3** Types of ecosystem (natural & artificial) **1.4** Food chains, food webs and ecological pyramids **1.5** Energy flow in ecosystem	**CO1**
TSO 2a. Explain the concept and levels of biodiversity. **TSO 2b.** Discuss importance of biodiversity in architecture and planning. **TSO 2c.** Identify threats to biodiversity. **TSO 2d.** Interpret conservation methods (in-situ and ex-situ).	**Unit- 2.0 Biodiversity and Conservation** **2.1** Levels of biodiversity (genetic, species, ecosystem) **2.2** Importance of biodiversity in architecture and planning **2.3** Threats to biodiversity **2.4** Conservation methods (in-situ and ex-situ)	**CO2**
TSO 3a. Define types of environmental pollution. **TSO 3b.** Explain causes, effects, and control measures. **TSO 3c.** Assess impact of pollution on architecture, human health, and building materials. **TSO 3d.** Analyze case studies of polluted environments	**Unit 3.0 Environmental Pollution** **3.1** Types of pollution: air, water, soil, noise, thermal and radiation **3.2** Causes, effects and control measures **3.3** Impact of pollution on architecture, human health and materials **3.4** Case studies of polluted environments	**CO3**
TSO 4a. Explain concept of sustainable development in architecture. **TSO 4b.** Differentiate between renewable and non-renewable resources. **TSO 4c.** Suggest sustainable building materials and green building concepts. **TSO 4d.** Interpret energy-efficient building design strategies. **TSO 4e.** Describe climate change and its impact on built environment.	**Unit 4.0 Sustainable Development and Resource Management** **4.1** Concept of sustainability in architecture **4.2** Renewable and non-renewable resources **4.3** Sustainable building materials and green building concept **4.4** Energy-efficient building design **4.5** Climate change and its impact on	**CO4**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	built environment	
TSO 5a. Explain Environmental Protection Act and related laws. **TSO 5b.** Discuss role of Pollution Control Boards. **TSO 5c.** Interpret Environmental Impact Assessment (EIA) in architectural projects. **TSO 5d.** Analyze case studies of eco-friendly buildings	**Unit-5.0 Environmental Laws and Practices** **5.1** Environmental Protection Act, Air and Water Act, Noise Pollution Rules **5.2** Role of pollution control boards **5.3** EIA (Environmental Impact Assessment) in architectural projects **5.4** National and international case studies on eco-friendly buildings	**CO4, CO5**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2437403

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Identify and analyze local ecosystems.	1.	Study of local ecosystem through field visit (forest/pond/urban ecosystem) and prepare a report.	CO1
LSOs 2.1 Measure and record environmental quality parameters. LSOs 2.2 Observe and interpret air quality indicators	2.	Measurement of noise, and heat level at different locations using sound level meter, thermometer, anemometer, hygrometer, etc.	CO2,CO3
	3	Observation of air quality (dust, smoke, vehicular emission **survey**).weather report	
LSO 3.1. Demonstrate use of renewable energy applications in buildings. *LSO 3.2.* Conduct a case study of sustainable architecture.	4	Identification and study of renewable energy applications (solar panels, wind turbines).	CO3,CO5
	5	Case study of a green building or eco-friendly campus and preparation of a report.	
LSO 4.1. Illustrate ecological concepts using charts and diagrams. *LSO 4.2.* Analyze environmental management systems.	6	Preparation of chart on energy flow and ecological pyramids	CO1,CO4
	7	Visit to a pollution control facility / water treatment plant and report writing.	
LSOs 5.1 Study biodiversity conservation practices	8	Report on biodiversity conservation project in local area.	CO1,C02

L) Suggested Term Work and Self Learning: S2437403 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. Micro Projects:

i. Ecosystem Study Report

- Select a nearby natural or urban ecosystem (pond, park, campus garden, roadside plantation).
- Document flora and fauna, food chain/web, and prepare an illustrated report.

ii. Noise Mapping of Campus / Local Area

- Measure noise levels at different times of the day in different campus zones or nearby traffic junctions.
- Prepare a graphical noise map and suggest noise reduction strategies.

iii. Air Quality Awareness Project

- Collect data on local air pollution sources (vehicles, construction sites, industries).
- Prepare awareness posters or a digital presentation showing preventive measures

iv. Case Study of an Eco-Friendly Project

- Collect data on any LEED/GRIHA certified building in India.
- Prepare a short case study report and presentation.

c. Other Activities:

Seminar Topics:

- Role of Architects in Environmental Protection
- Sustainable Architecture and Green Buildings
- Climate Change and Its Impact on Built Environment
- Biodiversity Conservation in Urban Development
- Environmental Impact Assessment in Architecture

Visits:

- Visit to a **botanical garden / biodiversity park** to study ecosystems and plant diversity.
- Visit to a **green certified building** (LEED / GRIHA) to observe sustainable features

Self-learning topics:

- LEED and GRIHA rating systems for green buildings.
- Environmental Protection Act, Air and Water Act, and their relevance to architecture
- Case studies of eco-friendly buildings in India and abroad

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	15%	10%	15%	-	-	20%	20%
CO-2	10%	20%	10%	25%	-	10%	20%
CO-3	15%	20%	15%	25%	33%	15%	20%
CO-4	30%	20%	30%	25%	33%	15%	20%
CO-5	30%	30%	30%	25%	34%	40%	20%
Total Marks	**30**	**70**	**20**	**20**	**10**	**20**	**30**
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (CI) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 Ecology and Ecosystem	8	**CO1**	10	2	2	6
Unit-2.0 Biodiversity and Conservation	12	**CO2**	16	4	6	8
Unit-3.0 Environmental Pollution	10	**CO3**	16	4	6	8
Unit-4.0 Sustainable Development and Resource Management	10	**CO4**	14	4	4	6
Unit-5.0 Environmental Laws and Practices	8	**CO3, CO5**	14	2	2	6
Total	**48**	**-**	**70**	**16**	**20**	**34**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

SN	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Study of local ecosystem through field visit (forest/pond/urban ecosystem) and prepare a report.	CO1	40	50	10
2.	Measurement of noise level at different locations using sound level meter.	CO2	40	50	10
3.	Observation of air quality (dust, smoke, vehicular emission survey).	CO2	30	60	10
4.	Identification and study of renewable energy applications (solar panels, wind turbines)	CO3	30	60	10
5.	Case study of a green building or eco-friendly campus and preparation of a report	CO3,CO5	40	50	10
6.	Preparation of chart on energy flow and ecological Pyramids.	CO1	40	50	10
7.	Visit to a pollution control facility / water treatment plant and report writing	CO4	30	60	10
8.	Report on biodiversity conservation project in local area	CO1,CO2	40	50	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment and Tools Broad Specifications	Exp. No.
1.	**Sound Level Meter** Portable digital sound level meter for measurement of ambient noise (30–130 dB range)	02
2.	**Air Quality Monitoring Kit** Compact kit for measuring SO_2, CO, NOx, particulate matter add instruments wrt K?	03

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Environmental Studies	Erach Bharucha	University Press, 2005, ISBN: 9788173715402
2.	Ecology and Environment	P.D. Sharma	Rastogi Publications, 13th Edition, 2010, ISBN: 9788171338573
3.	Environmental Engineering and Management	Suresh K. Dhameja	S.K. Kataria & Sons, 2012, ISBN: 9789350142940
4.	Climate Responsive Architecture	Arvind Krishan, Nick Baker, Simos Yannas	Tata McGraw-Hill, 2001, ISBN: 9780074636318

(b) Online Educational Resources:

1. http://www.cpcb.nic.in
2. www.youtube.com for videos regarding ecosystem, environmental pollution, sustainable architecture.
3. www.nptel.ac.in

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

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A) Course Code : 2437404(T2437404/P2437404/S2437404)

B) Course Title : Environmental Engineering

C) Pre-requisite Course(s) : Basic Chemistry

D) Rationale :

Today's era of globalization and urbanization have a great impact on the natural resources and infrastructures which has created threat to the environment. The goal of environmental engineering is to ensure that societal development and the use of water, land and air resources are sustainable. This goal is achieved by managing these resources so that environmental pollution and degradation is minimized.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/laboratory/workshop/field/industry.

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

CO-1 Determine the physical, chemical and biological properties of a given sample of water.

CO-2 Understand the purification of water using relevant method of water treatment processes.

CO-3 Design a suitable water distribution system for the given locality.

CO-4 Design a sewerage system for a given building project.

CO-5 Explain the treatment of given sample of sewage based on its characteristics.

F) Suggested Course Articulation Matrix (CAM):

Course Outcome (COs)	Programme Out comes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Life Long Learning	**PSO-1**	**PSO- 2**
CO-1	3	2	1	2	3	3	2	-	-
CO-2	2	3	2	2	2	2	2	-	-
CO-3	3	2	1	2	1	2	2	-	-
CO-4	2	3	1	2	3	2	2	-	-
CO-5	3	2	2	2	3	3	2	-	-

Legend: High(3), Medium (2), Low(1) and No mapping(-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional.

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+ SL)	Total Credits (C)
		L	T				
2437404	Environmental Engineering	03	-	04	02	09	06

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture(L), Tutorial(T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme(Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work& Self Learning Assessment(TWA)		LabAssessment(LA)		
		Progressive Theory Assessment(PTA)	End Theory Assessment(ETA)	Internal	External	Progressive Lab Assessment(PLA)	End Laboratory Assessment(ELA)	
2437404	**Environmental Engineering**	**30**	**70**	**20**	**30**	**20**	**30**	**200**

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes) PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like Green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2437404

Theory Session Outcomes (TSOs)	Units	Relevant Cos
TSO1a Identify the possible sources of water for a given locality. TSO1b Justify the need of planned water Supply system for a given locality. TSO1c Forecast the population at the end of specified decade for a given city using relevant method of estimation. TSO1d Carryout the testing for the given physical, chemical properties of water.	**Unit – 1: Sources, Demand and Quality of Water** 1.1 **Sources of water**: Surface and subsurface sources of water, Intake structures: Types, Purposes and its Location. 1.2 **Water demand**: Various types of Water demand, Per capita demand, factors affecting per capita demand, Water supply scheme and its flow diagram, Variations in demand. 1.3 **Population forecasting**: Design period, Methods of population forecasting, (Simple problems on population forecasting). 1.4 **Characteristics and Testing of water**: Necessity of water analysis, Characteristics of water: Physical, Chemical ; Physical Testing of water – Turbidity &color, Chemical Testing of water - Total Solids (TS),Hardness, Chlorides, Dissolved oxygen (D0), pH, Fluoride.	CO1
TSO2a Explain the process of water treatment to make it potable. TSO2b Identify relevant type of filter used in water purification process. TSO2c Suggest the relevant method of disinfection process for a given sample of water. TSO2d Explain the flow diagram of water treatment plant.	**Unit-2: Purification of water** 2.1 **Water Treatment:** Water Treatment-Concept, Screening, settling operation, Sedimentation and its types, Sedimentation tank, Coagulation and its Mechanism, Coagulants, Flocculation, Mechanism of Flocculation, Sedimentation aided with coagulation. 2.2 **Filtration**: Theory, Purposes and Types of Filters, Construction, Mechanism and Operation of Slow Sand, Rapid Sand and Pressure Filter. 2.3 **Disinfection**: Methods of Disinfection, Chlorination and Practices of Chlorination, Calculation of Doses of chlorine. 2.4 **Water treatment plant**: Purpose, Construction and its flow diagram.	CO2

TSO3a Explain a relevant type of pipe material for the conveyance of water for the given locality. TSO3b Explain the relevant method of water distribution with labeled sketch. TSO3c Determine the equivalent size of pipe for the given distribution system.	**Unit-3: Distribution and Conveyance of water** 3.1 **Conveyance system**: Need, Purposes and advantages, Pipes Material used for conveyance of water, Plumbing system, House Water Connection, Different Cocks and valves, pipe fixtures and fittings, Types of joints. 3.2 **Distribution System**: Need, Purposes and Advantages, Methods of Distribution- Gravity, Pumping (Pressure)and Combined System. Layout of distribution networks- Need of distribution layout, Types- Dead end system, Grid iron system, Radial system and Circular System; Detection of leakage in the distribution pipes. 3.3 **Pipe network Analysis**: Hardy-Cross method, Equivalent pipe method, Appurtenances in the distribution system.	CO3
TSO4a Explain need and importance of sanitation for the given building. TSO4b Select the relevant type of pipe for a given sewerage system. TSO4c Suggest the relevant type of sanitary fittings suiting for the given location in a building. TSO4d Identify relevant type of sewers for a given sewerage system. TSO4e Carryout testing and maintenance for a given sewerage system.	**Unit-4: Domestic Sewages and Sewage system:** 4.1 **Building Sanitation**: Need and importance of sanitation, Definitions- Sewage, Sullage, Types of sewage, Definition of the terms related to building sanitation. 4.2 **Pipes for sewerage system**: Soil pipe, Sullage pipe, Vent pipe. 4.3 **Building Sanitary Fittings**: Water closets – Indian and European type, flushing cistern, washbasin, sinks, Urinals; Traps- types, qualities of good trap; Systems of plumbing - one pipe, two pipe, single stack; Drainage systems: Principle, Need and Layout of drainage system. 4.4 **System of Sewerage and Sewer appurtenances**: Types of Sewers, System and Layout of sewerage, self-cleansing velocity and non-scouring velocity, Laying. 4.5 **Testing and Maintenance of sewers**: Inspection chambers and Manholes- component parts, location and spacing; Sewer Inlets, Street Inlets.	CO4
TSO5a Determine BOD and COD of a given sample of sewage water. TSO5b Explain sewage treatment processes. TSO5c Describe various component of sewage disposal process. TSO5d Explain the sludge treatment process. TSO5e Explain the various activities involved In solid waste disposal process.	**Unit-5: Sewage Treatment and Waste Management**- 5.1 **Analysis of sewage**: Characteristics of Sewage-B.O.D., C.O.D, and its Significance; Aerobic and Anaerobic Processes; Objective of sewage treatment and flow diagram of conventional sewage treatment plant.	CO5

	5.2 **Treatment of Sewage**: Screening, Types of Screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and Anaerobic process, Sludge digestion, Trickling filters. 5.3 **Sludge and its treatment**: Activated sludge process, Disposal of sewage, Oxidation-Pond, Oxidation ditch, Septic tank, Recycling and Reuse of domestic waste, Sludge characteristics, Sludge treatment process, disposal of sludge. 5.4 **Solid waste disposal:** composting, incineration, Introduction to sanitary landfill.	

Note: One major TSO may require more than one theory session/period.

K) Suggested Laboratory(Practical) Session Outcomes (LSOs) and List of Practical: P2437404

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant Cos Number(s)
LSO1.1. Determine PH value of given water sample.	1.	Determine pH value of given sample of water.	CO1
LSO2.1. Determine the turbidity of given water sample using turbidity meter.	2.	Determine the turbidity of the given sample of water.	CO1
LSO3.1. Determine suspended, dissolved and total solids of given sample of water.	3.	Determine suspended, dissolved and total solids of given sample of water.	CO1
LSO4.1 Determine the dissolved oxygen in a given sample of water using DO apparatus.	4.	Determine the dissolved oxygen in a sample of water.	CO1
*LSO5.*1 Determine residual chlorine in a given water sample.	5.	Determine residual chlorine in a given sample of water.	CO2
LSO6.1 Determine the optimum dose of coagulant in a given raw water sample.	6.	Determine the optimum dose of coagulant in a given raw water sample by jar test.	CO2
LSO7.1 Prepare a report on water treatment plant.	7.	Prepare a report of field visit to nearby water treatment plant.	CO2
LSO8.1 Draw labeled sketch of valves used in water supply pipe line.	8.	Draw sketches of various valves used in water supply line.	CO3
LSO9.1 Prepare a report on plumbing system.	9.	Prepare a report on plumbing system by site visit of nearby newly constructed building.	CO4
LSO10.1 Draw a flow diagram of conventional sewage treatment plant.	10.	Draw a flow diagram of conventional sewage treatment plant.	CO5
LSO11.1 Determine BOD of given sample of sewage water using BOD apparatus.	11.	Determine BOD of given sample of sewage water using BOD apparatus.	CO5

L) Suggested Term Work and Self Learning: **S2437404** Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments:

1. Explain the various sources of water.
2. Enlist the various methods of population forecast. Explain any one with suitable example.
3. Discuss the physical and chemical characteristics of water.
4. Differentiate between slow sand and rapid gravity filter.
5. Write short notes on the following-
   (i) Hardy cross method of pipe network analysis.
   (ii)Activated sludge process.
   (iii) Trickling Filter.
   (iv)Oxidation Pond.

b. Micro Projects:

1. Prepare a report on physical, chemical and biological characteristics of given sample of water.
2. Draw a plan and elevation of Septic tank for 50 users.
3. Enlist the various units used in water treatment process and draw a neat sketch of each unit.
4. Prepare a model of water treatment plant.
5. Prepare a model of Trickling filter.

c. Other Activities:

1. Seminar Topics:

- **(a)** Treatment of wastewater.
- **(b)** Population forecasting methods.
- **(c)** Layout of distribution network.
- **(d)** Bihar state pollution control board norms for disposal of treated sewage.
- **(e)** Sludge and its treatment.

2. **Self-learning topics**:

- Select relevant method of disinfection for treatment of given sample of water.

Classify different types of pipes used for conveyance of water for the given situations.

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

Cos	Course Evaluation Matrix						
	Theory Assessment(TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/ Mid Sem Test (%)	End Theory Assessment (ETA) (%)	Term Work & Self-Learning Assessment			Progressive Lab Assessment (PLA) (%)	End Laboratory Assessment (ELA) (%)
			Assignments (%)	Micro Projects (%)	Other Activities*(%)		
CO-1	25	25	30	25	20	30	35
CO-2	25	25	20	20	20	20	20
CO-3	15	15	20	15	15	15	15
CO-4	15	15	20	20	25	10	10
CO-5	20	20	10	20	20	25	20
Total Mark	**30**	**70**	**20**	**20**	**10**	**20**	**30**

Legend:

*** :** Other Activities include self-learning, seminar, visits, surveys, product development, software development etc.

****:** Mentioned under point- (N)# :
Mentioned under point-(O)

Note:

- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation in direct assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Relevance Number (s)	Total Marks	Total Hours	ETA(Marks)		
				Remember (R)	Understanding (U)	Application & above(A)
Unit-1.0 Sources, Demand and Water Quality -Assessment.	CO1	18	12	5	6	7
Unit-2.0 Purification of Water.	CO2	14	10	4	4	6
Unit-3.0 Distribution and conveyance of water.	CO3	14	10	4	4	6
Unit-4.0 Domestic Sewages And Sewage system.	CO4	14	10	4	4	6
Unit-5.0 Sewage Treatment and Waste Management	CO5	10	6	3	3	4
Total Marks		**70**	**48**	**20**	**21**	**29**

Note: Similar table can also be used to design class/mid-term/internal question paper for progressive assessment

O) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and EditionwithISBN
1.	Water Supply Engineering - Vol.I	Santosh kumar Garg	Khanna Publishers, New Delhi ,35th edition (1 January 1977) 1. ISBN-10**:** 9788174091208 2. ISBN-13: 978-8174091208
2.	Environmental Engineering, vol.I and II	Dr. B.C Punmia	Laxmi Publishers, New Delhi,2nd Edition, September 1995 1. ISBN-10**:** 9788131807033 2. ISBN-13: 978-8131807033
3.	Environmental Engineering	NN Basak	Mc Graw Hill Publishers, Noida,1stEdition(1 July 2017) ISBN-10 : 0070494630 ISBN-13 : 978-0070494633
4.	Environmental Engineering	S.C Sharma	Khanna Publishing House, New Delhi, 1st edition (28 December 2020) ISBN-10: 9386173573 ISBN-13 : 978-9386173577

5.	Water Supply and Sanitary Engineering	Birdie, G.S. and Birdie	Dhanpat Rai, New Delhi,9thEdition(2011) ISBN-10 : 8187433795 ISBN-13 : 978-8187433798
6.	I.S.10500:2012, Drinking Water Standards,2012.	-	I.S.10500:2012

(b) Online Educational Resources:

1. https://www.youtube.com/watch?v=wI7uvQThX8A&list=PL1BFC82F3A63B4172&index=5
2. https://www.youtube.com/watch?v=PVstxkDkcQY&list=PLLy2iUCG87AZvtaiuD3r4HATrBKhb90P&index=2
3. https://www.youtube.com/watch?v=JOBeeWvludU&list=PLLy2iUCG87AZvtaiuD3r4HATrBKhb90P&index=14
4. https://www.youtube.com/watch?v=Tke_kbdmup0&list=PLLy2iUCG87AZvtaiuD3r4HATrBKhb90P&index=15

Note: Teachers are requested to check the creative commons license status/ financial implications of the suggested, online educational recourses before use by the students.

(c) Others:

1. **IS10500:2012- DrinkingWaterStandards,2012.**
2. **IS2065:1983- Code of Practice for Water Supply In Buildings.**
3. **IS1172:1993 - Code of Basic Requirements For Water Supply, Drainage And Sanitation**

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A) Course Code : **2437405 (T2437405/S2437405)**

B) Course Title : History of Architecture

C) Pre- requisite Course(s) : History of Architecture

D) Rationale :

The study of **History of Architecture** develops an understanding of the evolution of architectural thought, style, and technology across civilizations. It enables students to appreciate how social, cultural, climatic, religious, and technological factors have shaped buildings. Knowledge of architectural history not only builds awareness of heritage but also provides inspiration and reference for modern design practice. This course establishes the foundation for higher studies in architecture, conservation, and design theory.

E) Course Outcomes (COs):

After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

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

CO-1 Explain the significance of studying history of architecture and its relation to present-day design.

CO-2 Identify features of Egyptian pyramids, temples, and tombs; sketch important monuments; explain symbolism and construction methods.

CO-3 Differentiate between Doric, Ionic, and Corinthian orders; sketch Greek temples and civic structures; analyze cultural influence.

CO-4 Illustrate Roman arches, vaults, and domes; describe engineering innovations; explain significance of public buildings.

CO-5 Recognize Buddhist monuments (stupas, chaityas, viharas) and Hindu temple styles (Nagara, Dravida, Vesara); prepare sketches and comparative notes

CO-6 Describe features of Indian Islamic architecture (mosques, tombs, minarets); sketch Mughal and Sultanate monuments; compare with Hindu temples

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Lifelong Learning	**PSO-1**	**PSO-2**
CO-1	3	2	-	-	-	-	1		
CO-2	3	3	2	-	1	-	1		
CO-3	3	3	3	-	2	-	1		
CO-4	2	3	2	2	2	2	2		
CO-5	2	2	3	3	2	2	3		
CO-6	3	2	3	3	3	2	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2437405	History Of Architecture	03	1	-	02	05	04

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the continuous guidance and feedback of teacher to ensure outcome of learning.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2437405	History Of Architecture	30	70	20	30	-	-	150

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- Separate passing is must for progressive and end semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty, but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirement of respective course. For valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW) and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of

Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020 related reforms like green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS) and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: T2437405

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Explain the importance of studying history of architecture **TSO 1b.** Relate historical knowledge to present design needs	**Unit-1.0 Introduction** **1.1** Pre-historical architecture and Importance of history in architecture, scope and relevance. **1.2** Overview of ancient to medieval timeline.	**CO1**
TSO 2a. Identify key features of Mesopotamian and Egyptian monuments. **TSO 2b.** Sketch pyramids and temples, ziggurats. **TSO 2c.** Explain the symbolic importance of Egyptian architecture	**Unit- 2.0 Mesopotamian and Egyptian Architecture** **2.1** Introduction of Mesopotamian civilization their social system and silent building types **2.2** Ziggurats, Babylon, cities (ur, khorasabad etc.) **2.3** Introduction of Egyptian architecture, Pyramids, mastabas, temples, tombs **2.4** Symbolism and construction techniques	**CO2**
TSO 3a. Differentiate between Greek Orders. **TSO 3b.** Sketch Greek temples and columns. **TSO 3c.** Explain the cultural influence of Greek architecture	**Unit 3.0 Greek Architecture** **3.1** Introduction of Greek civilization, Orders (Doric, Ionic, Corinthian); **3.2** Temples (the Parthenon) and silent building types. **3.3** Public bath and square; agora, gymnasium, theatre.	**CO3**
TSO 4a. Illustrate Roman arches and domes. **TSO 4b.** Explain Roman construction innovations. **TSO 4c.** Analyze civic and public Roman structures	**Unit 4.0 Roman Architecture** **4.1** Introduction of roman civilization Arches, vaults, domes. **4.2** Pantheon, colosseum. **4.3** Amphitheaters, aqueducts, basilicas. **4.4** Contribution in new materials and new construction / structural system	**CO4**
TSO 5a. Identify Buddhist monuments and temple styles. **TSO 5b.** Sketch plans and elevations of Hindu temples. **TSO 5c.** Compare Nagara, Dravida, Vesara styles	**Unit 5.0 Indian Architecture – Buddhist & Hindu** **5.1** Stupas, chaityas, viharas, rock-cut caves;	**CO5**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	5.2 Hindu temples (Nagara, Dravida, Vesara)	
TSO 6a. Describe Islamic architectural features. **TSO 6b.** Prepare sketches of mosques and tombs. **TSO 6c.** Compare Indian Islamic features with Hindu temples.	**Unit 6.0 Indian Islamic Architecture** Mosques, tombs, minarets; Delhi Sultanate and Mughal architecture; arches, domes, ornamentation.	**CO6**

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: Not Applicable

L) Suggested Term Work and Self Learning: S2437405 Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. Assignments: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with

b. Micro Projects:

- Comparative panel on "Evolution of Arches and Domes" (Egyptian → Roman → Islamic → Gothic)
- Digital presentation on UNESCO World Heritage monuments in India.
- Documentation of a local heritage structure (measured drawings, sketches, photos, report)

Other Activities:

Seminar Topics:

- Symbolism and Geometry in Egyptian Pyramids
- Greek Orders and their influence on Western architecture
- Development of Islamic architecture in India (Delhi Sultanate to Mughals).

Visits:

- Visit to a **Local Heritage Temple (**Nagara, Dravida Style Depending On Region), **Local Mosques and Tomb, Colonial Era Building.**
- Visit to Museums **/ Art galleries** with historical architectural displays

Self-learning topics:

- Geometry and proportions in Egyptian Pyramids and Greek temples.
- Evolution of arches and domes across civilizations
- Famous architects and master builders of ancient and medieval times

M) **Suggested Course Evaluation Matrix:** The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	15%	10%	15%	-	-	-	-
CO-2	10%	20%	10%	25%	-	-	-
CO-3	15%	20%	15%	25%	33%	-	-
CO-4	30%	20%	30%	25%	33%	-	-
CO-5	30%	30%	30%	25%	34%	-	-
Total Marks	**30**	**70**	**20**	**20**	**10**	**-**	**-**
			50				

Legend:

*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.

**: Mentioned under point- (N)

#: Mentioned under point-(O)

Note:

- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) **Suggested Specification Table for End Semester Theory Assessment:** Specification table represents the reflection of sample representation of assessment of cognitive domain of full course.

Unit Title and Number	Total Classroom Instruction (Cl) Hours	Relevant COs Number(s)	Total Marks	ETA (Marks)		
				Remember (R)	Understanding (U)	Application & above (A)
Unit-1.0 introduction	4	**CO1**	8	2	2	2
Unit-2.0 Mesopotamia and Egyptian Architecture	6	**CO2**	14	4	4	6
Unit-3.0 Greek Architecture	5	**CO3**	12	2	4	6
Unit-4.0 Roman Architecture	6	**CO4**	12	2	4	6
Unit-5.0 Indian Architecture – Buddhist & Hindu	8	**CO5**	12	4	4	8
Unit- 6.0 Indian Islamic Architecture	8	**CO6**	12	2	2	6

Total	**48**	**-**	**70**	**16**	**20**	**34**

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirements of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools and Software:

S. No.	Name of Equipment and Tools Broad Specifications	Exp. No.
1.	Drawing sheets & sketching kit, Drafting instrument, Tracing paper & graph sheets, Multimedia projector / Smart board, Reference library & digital archive	-

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
	The Great Ages of World Architecture	G.K. Hiraskar	Dhanpat Rai Publication
	History of Architecture	Sir Banister Fletcher, updated by Dan Cruickshank	Architectural Press
	Early Indian Architecture: Buddhist and Hindu Architecture	Satish Grover	Prakashan Publication

(b) Online Educational Resources:

1. http://www.khanacademy.org
2. www.youtube.com for videos art and architecture.
3. www.nptel.ac.in

Note: Teachers are requested to check the Creative Commons license status/ financial implications of the suggested online educational resources before use by the students.

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A) Course Code : **2437406 (P2437406/S2437406)**

B) Course Title : Model Making

C) Pre- requisite Course(s) : Model Making

D) Rationale :

Model making is a vital skill in architectural education that helps students visualize and communicate design ideas in three dimensions. Through hands-on exercises, students develop creativity, precision, and presentation skills, while gaining a deeper understanding of space, structure, and environment. This subject thus complements core courses and prepares students for professional design practice.

E) Course Outcomes (COs):

After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/ laboratory/ workshop/ field/ industry.

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

CO-1 Create scaled models of building construction elements and details

CO-2 Prepare interior design and rendering-based models to visualize spaces.

CO-3 Demonstrate ecological and environmental concepts through landscape and site models.

CO-4 Represent principles of environmental engineering through schematic models.

CO-5 Interpret historical architectural styles through physical/digital model representations

F) Suggested Course Articulation Matrix (CAM):

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	**PO-2** Problem Analysis	**PO-3** Design/Development of Solutions	**PO-4** Engineering Tools	**PO-5** Engineering Practices for Society, Sustainability and Environment	**PO-6** Project Management	**PO-7** Lifelong Learning	**PSO-1**	**PSO-2**
CO-1	3	2	-	3	2	2	1		
CO-2	2	3	-	2	1	2	1		
CO-3	2	2	3	-	2	-	1		
CO-4	2	2	-	2	2	2	2		
CO-5	2	2	3	3	2	2	3		

Legend: High (3), Medium (2), Low (1) and No mapping (-)

* PSOs will be developed by respective programme coordinator at institute level. As per latest NBA guidelines, formulating PSOs is optional

G) Teaching & Learning Scheme:

Course Code	Course Title	Scheme of Study (Hours/Week)					
		Classroom Instruction (CI)		Lab Instruction (LI)	Notional Hours (TW+ SL)	Total Hours (CI+LI+TW+SL)	Total Credits (C)
		L	T				
2437406	MODEL MAKING	-	-	02	02	04	02

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem-based learning, etc. to deliver theoretical concepts)

LI: Laboratory Instruction (Includes experiments/practical performances /problem-based experiences in laboratory, workshop, field, or other locations using different instructional/Implementation strategies)

Notional Hours: Hours of engagement by learners, other than the contact hours for ensuring learning.

TW: Term Work (includes assignments, seminars, micro projects, industrial visits, any other student activities, etc.)

SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc.

C: Credits = (1 x CI hours) + (0.5 x LI hours) + (0.5 x Notional hours)

Note: TW and SL have to be planned by the teacher and performed by the learner under the teacher's continuous guidance and feedback to ensure learning outcomes.

H) Assessment Scheme:

Course Code	Course Title	Assessment Scheme (Marks)						Total Marks (TA+TWA+LA)
		Theory Assessment (TA)		Term Work & Self-Learning Assessment (TWA)		Lab Assessment (LA)		
		Progressive Theory Assessment (PTA)	End Theory Assessment (ETA)	Internal	External	Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)	
2437406	Model Making	-	-	10	15	10	15	50

Note: Prefix will be added to Course Code if applicable (T for theory Paper, P for Practical Paper and S for Term work)

Legend:

PTA: Progressive Theory Assessment in class room (includes class test, mid-term test and quiz using online/offline modes)

PLA: Progressive Laboratory Assessment (includes process and product assessment using rating Scales and rubrics)

TWA: Term work & Self Learning Assessment (Includes assessment related to student performance in assignments, seminars, micro projects, industrial visits, self-learning, any other student activities etc.

Note:

- Separate passing is a must for progressive and end-of-semester assessment for both theory and practical.
- ETA & ELA are to be carried out at the end of the term/ semester.
- Term Work is to be done by the students under the guidance of internal faculty, but its assessment will be done **internally (40%)** as well as **externally (60%)**. Assessment related to planning and execution of Term Work activities like assignment, micro project, seminar and self-learning is to be done by internal faculty (Internal Assessment) whereas assessment of output/product/ presentation related to these activities will be carried out by external faculty/expert (External Assessment). However, criteria of internal as well as external assessment may vary as per the requirements of the respective course. For a valid and reliable assessment, the internal faculty should prepare checklist & rubrics for these activities.

I) Course Curriculum Detailing:

Course Curriculum Detailing: This course curriculum detailing depicts learning outcomes at the course level and session level and their attainment by the students through Classroom Instruction (CI), Laboratory Instruction (LI), Term Work (TW), and Self Learning (SL). Students are expected to demonstrate the attainment of Theory Session Outcomes (TSOs) and Lab Session Outcomes (LSOs) leading to attainment of Course Outcomes (COs) upon the completion of the course. While curriculum detailing, NEP 2020-related reforms like green skills, Sustainability, Multidisciplinary aspects, Society connect, Indian Knowledge System (IKS), and others must be integrated appropriately.

J) Theory Session Outcomes (TSOs) and Units: (Not applicable)

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2437406

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Understand and demonstrate construction details through scaled models	1.	Model of Brick bonds (English/Flemish bond). Model of simple foundation details.	CO1
LSOs 2.1 Develop skills in making interior components and rendering finishes through models.	2.	Furniture models (chair, table, storage units, bed etc). Rendering surfaces with different finishes (wood, stone, glass)	CO2
LSO 3.1. Demonstrate concepts of sustainable and green design through models.	3.	Model of Solar passive design model (sun path, shading devices). Model of green roof or vertical garden.	CO3
LSO 4.1. Apply engineering solutions to environmental issues via model representation.	4.	Model of water supply system in building. Solid waste management layout mode	CO4
LSOs 5.1 Recreate historic monuments/buildings to understand architectural features	5.	Model of Egyptian pyramid. Model of Greek Doric/Ionic column. Model of Buddhist stupa.	CO5

L) Suggested Term Work and Self Learning: S2437406

Some sample suggested assignments, micro project and other activities are mentioned here for reference.

a. **Assignments**: Questions/Problems/Numerical/Exercises to be provided by the course teacher in line with the targeted COs.

b. **Micro Projects:**

Scaled Residential Unit Model

- Prepare a **1:50 or 1:100 scale model** of a small residential unit.
- Include: basic wall construction (Building Construction), simple furniture placement (Interior Design), and basic site landscape (Ecology & Environment).

Heritage Structure Model (History of Architecture)

- Select a heritage monument (e.g., Stupa, Mughal arch, or Greek column,).
- Prepare a **detailed sectional model** to highlight its architectural features

Visits: visit to local Construction Site, Interior Design Showroom / Modular Furniture Workshop, Heritage Building / Monument Visit.

M) Suggested Course Evaluation Matrix: The course teacher has to decide and use appropriate assessment strategy and its weightage in theory, laboratory and Term Work for ensuring CO attainment. The

response/performance of each student in each of these designed activities is to be used to calculate **CO attainment**.

COs	Course Evaluation Matrix						
	Theory Assessment (TA)**		Term Work Assessment (TWA)			Lab Assessment (LA)#	
	Progressive Theory Assessment (PTA) Class/Mid Sem Test	End Theory Assessment (ETA)	Term Work & Self Learning Assessment			Progressive Lab Assessment (PLA)	End Laboratory Assessment (ELA)
			Assignments	Micro Projects	Other Activities*		
CO-1	-	-	15%	-	-	20%	20%
CO-2	-	-	10%	25%	-	10%	20%
CO-3	-	-	15%	25%	-	15%	20%
CO-4	-	-	30%	25%	-	15%	20%
CO-5	-	-	30%	25%	-	40%	20%
Total Marks	**-**	**-**	**10**	**15**	**-**	**10**	**15**
			25				

Legend:
*: Other Activities include self- learning, seminar, visits, surveys, product development, software development etc.
**: Mentioned under point- (N)
#: Mentioned under point-(O)

Note:
- The percentage given are approximate
- In case of Micro Projects and End Laboratory Assessment (ELA), the achieved marks will be equally divided in all those COs mapped with total experiments.
- For CO attainment calculation indirect assessment tools like course exit survey need to be used which comprises of questions related to achievement of each COs.

N) Suggested Specification Table for End Semester Theory Assessment: (Not applicable)

Note: Similar table can also be used to design class/mid-term/ internal question paper for progressive assessment.

O) Suggested Assessment Table for Laboratory (Practical):

SN	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
1.	Model of Brick bonds (English/Flemish bond). Model of simple foundation details.	CO1	40	50	10
2.	Furniture models (chair, table, storage units, bed etc). Rendering surfaces with different finishes (wood, stone, glass)	CO2	40	50	10
3.	Model of Solar passive design model (sun path, shading devices). Model of green roof or vertical garden.	CO2	30	60	10
4.		CO3	30	60	10

SN	Laboratory Practical Titles	Relevant COs Number(s)	PLA/ELA		
			Performance		Viva-Voce (%)
			PRA* (%)	PDA** (%)	
	Model of water supply system in building. Solid waste management layout mode				
5.	Model of Egyptian pyramid. Model of Greek Doric/Ionic column. Model of Buddhist stupa.	CO5	40	50	10

Legend:
PRA*: Process Assessment
PDA**: Product Assessment

Note: This table can be used for both end semester as well as progressive assessment of practical. Rubrics need to be prepared by the course teacher for each experiment/practical to assess the student performance.

P) Suggested Instructional/Implementation Strategies: Different Instructional/ Implementation Strategies may be appropriately selected, as per the requirement of the content/outcome. Some of them are Improved Lecture, Tutorial, Case Method, Group Discussion, Industrial visits, Industrial Training, Field Trips, Portfolio Based, Learning, Role Play, Live Demonstrations in Classrooms, Lab, Field Information and Communications Technology (ICT)Based Teaching Learning, Blended or flipped mode, Brainstorming, Expert Session, Video Clippings, Use of Open Educational Resources (OER), MOOCs etc.

Q) List of Major Laboratory Equipment, Tools, and Software:

S. No.	Name of Equipment and Tools Broad Specifications	Exp. No.
1.	Knives, steel rulers, cutting mats, white glue, tweezers, and sanding tools for traditional methods, alongside digital tools like 3D printers and laser cutters for complex designs. Essential materials include foam core, cardboard, and balsa wood	1-5

R) Suggested Learning Resources:

(a) Books:

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Model Making for Architects	Matt Driscoll	Crowood Press
2.	Architectural Model Building: Tools, Techniques, Materials	Wolfgang Knoll & Martin Hechinger	Springer
3.	Architectural Model making	Nick Dunn	Laurence King Publishing

(b) Online Educational Resources:

1. http://www.archdaily.com
2. www.youtube.com for videos of Nick Dunn Model making Lectures

Note: Teachers are requested to check the Creative Commons license status/ financial implications of the suggested, online educational resources before use by the students.

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