SEMESTER S4

ARCHITECTURAL ENGINEERING

Course Code	**PECET415**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	5/3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	PBCET304, PCCEL218 (or equivalent)	**Course Type**	Theory

Course Objectives:

1. To enable students to develop creative and sustainable building design and management solutions based on sound engineering principles and ethics.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Definition of architecture –Historical development of architecture. Principles of architectural composition – Unity/ harmony – character– balance – proportion – scale –rhythm — Accentuation and contrast. Organising principles in architecture – Symmetry – hierarchy – axis – linear – concentric, radial – and asymmetric grouping – primary and secondary masses. Form and Space in architecture – Positive and negative space – Defining space with horizontal and vertical elements -qualities of architectural space Architecture Design Process: The 7 phases : The pre-design phase: The schematic design phase: The design development phase: The construction documents phase: The building permit phase: The bidding and negotiation phase: The construction administration phase.	9
2	Acoustics, fundamentals: Intensity of sound- Watts/m2- Bel- Decibel scales-dBA-Phon. Addition of sound levels. Acoustical Defects- Echoes, Reverberation, Foci and Dead Spots, Loudness, Noise Acoustics, applications: Recommended sound levels for interiors - Air and structure born noises-Measures of noise control- Source-path and receiving end. TL value and computation of TL value, Flanking paths. Sound absorption-materials and fixings. Reverberation-Sabines formula-Eyrings modification.	9

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	Natural lighting: Visual task requirements, Units of Light, Light, Vision and Buildings, Standards of Lighting and Visual comfort-The sky as a source of light, Daylight factor, Recommended daylight factors for interiors. Design of side-lit windows using Daylight factor graphs Artificial lighting: Artificial lighting- illumination requirements-lux meter – lamps and luminaries – polar distribution curves Design of artificial lighting – lumen method – point by point method.	
3	Thermal comfort: Factors affecting thermal comfort- effective Temperature Thermal comfort indices-ET-CET Charts- Bioclimatic chart- Psychrometry and Psycrometric chart. Earth-Sun relationship: Sun's apparent movement with respect to the earth. Solar angles Computation of solar radiation on different surfaces-solar path diagram-shadow-throw concept and design of shading devices Thermal design of buildings: Thermo physical properties of building materials and thermal control-. Concept for electrical load calculation of structures Basic concept of HVAC load calculation Functional protection: Causes of fire, Mechanism of fire spread in buildings, classification of fire-High temperature effects and combustibility of building materials and structure- Fire alarm system, and means of escape. Firefighting installations	**9**
4	Architecture Design aspect: basic anthropometrics- human functions and their implications for space requirements- movement and circulation diagrams-special interpretations- various activities and their relationship with spaces Perspective views of form: 2-point perspective and 3-point perspective Climate responsive architecture Traditional Architecture of Kerala- Scope of Vastuvidya Dimensional system in Vastuvidya – concept of selection of perimeter - proportions Energy efficiency in buildings – Energy assessment in buildings – Green building rating guidelines – case studies.	**9**

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Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	*Internal Ex*	*Evaluate*	*Analyse*	*Total*
5	**15**	**10**	**10**	**40**

Criteria for Evaluation(Evaluate and Analyse): 20 marks

Assignment

Students should Identify a real word requirement for a residential building. Develop detailed architectural drawing of it incorporating details, selecting a suitable site, using the concepts learned in the course. Finally, a complete file with documents ready to submit to the authorities and a drawing set which will give the client a 3D concept of the structure should be submitted.

Criteria for evaluation:

1. **Problem Definition (K4 - 4 points)**
   a. Clearly defines the requirements and constrains.
2. **Problem Analysis (K4 - 4 points)**
   a. Compare and justify the proposed schemes with evidence and logical reasoning.
3. **Evaluate (K5 - 4 points)**
   a. Thoroughly evaluate the proposed solutions.
   b. Compares trade-offs, advantages, and disadvantages.
   c. Considers feasibility, scalability, and practical implications.
4. **Design and drawing (K6 - 8 points)**
   a. Demonstrates proficiency in creating drawings for technical requirements including approval.
   b. Demonstrates proficiency in creating visually impressive presentation drawings for the clients

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Scoring:

1. Accomplished (4 points): Exceptional analysis, clear implementation, and depth of understanding.
2. Competent (3 points): Solid performance with minor areas for improvement.
3. Developing (2 points): Adequate effort but lacks depth or clarity.
4. Minimal (1 point): Incomplete or significantly flawed.

End Semester Examination Marks (ESE):

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. Each question carries 9 marks. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Use principles of architectural composition and organization for development of building form and planning of functional spaces in buildings.	**K3**
CO2	Show good understanding of the comprehensive architectural design process, from the pre-design stage to construction management.	**K3**
CO3	Adopt principles of acoustics, lighting and thermal comfort for efficient functional design of buildings.	**K3**
CO4	Show good understanding of basic service load calculations and fire protection methods for efficient and safe function of buildings.	**K3**
CO5	Apply traditional, passive, climate conscious architectural principles for creating energy efficient buildings.	**K5/K6**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										2
CO2	2	1										2
CO3	2	1					2					2
CO4	2	1										2
CO5	3	2					2					2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	A global history of architecture	Francis D. K. Ching , Mark M. Jarzombek , Vikramaditya Prakash	Wiley	3rd edition 2017
2	Architecture: Form, Space, and Order	Francis D. K. Ching	Wiley	5th edition 2023
3	Architecture And Town Planning	Satish Chandra Agarwala	Dhanpath Rai &Co	2018
4	Architectural Engineering Design: Mechanical Systems	Robert Butler Brown	Mc Graw Hill	1st edition
5	Building Services Engineering	David Chadderton	T&F India	6th Edition 2017
6	Architectural Acoustics	Marshall Long	Academic Press	2014
7	Lighting	Pritchard, D.C	Longman Scientific & Technical, Harlow	1995
8	Daylight in Architecture	Benjamin Evans	McGraw - Hill Book Company	1981
9	Building Environment	AjithaSimha.D	Tata McGraw Hill Publishing Co	1985
10	Design and Installation of Services in Building complexes &High Rise Buildings	Jain. V.K.,	Khanna Tech. Publishers	1986
11	A text book of Vastuvidya	A. Achyuthan, Balagopal. T.S. Prabhu	Vastuvidyaparatishthanam	1996
12	Manual of tropical Housing and Building Part I – Climatic design	Koenigseberger	Orient Longman	2011

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Architecture: From Prehistory to Climate Emergency	Barnabas Calder	Pelican	2021
2	Building construction illustrated	Francis D. K. Ching	**Wiley**	6th edition 2017
3	Architectural Engineering Design: Mechanical Systems	Robert Butler Brown	Mc Graw Hill	1st edition
4	Acoustical Design in Architecture	Knudsen V.O. and Harris C.M	John Wiley	1980
5	Energy Efficient Buildings: Architecture, Engineering, and Environment	Wayne Forster and Dean Hawkes	W.W. Norton Company Inc	2002
6	Bureau of Indian standards, Handbook on Functional Requirement of Buildings – SP:41(S and T)-1987			
7	National Building Code of India (latest revisions to be refered)			
8	Bureau of Energy Efficiency, India. Design Guidelines for Energy Efficient Multi-Storey Buildings,2014.			

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Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/124/107/124107005/ https://nptel.ac.in/courses/124107012
2	https://archive.nptel.ac.in/courses/105/102/105102175/
3	https://archive.nptel.ac.in/courses/105/107/105107156/
4	https://nptel.ac.in/courses/101104065 https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ar03/