CA5696: ADVANCED TOPICS IN STRUCTURAL AND MATERIAL DESIGN

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Advanced Topics in Structural and Material Design

Subject Code
CA - Civil and Architectural Engineering
Course Number
5696

Academic Unit
Architecture and Civil Engineering (CA)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
NIl

Part II Course Details

Abstract

This course aims to introduce and let students explore the strengths and limitations of different structural and non-structural materials and their associated systems, including concrete, steel, timber, masonry, and other new materials and construction methods. The course emphasizes the student's ability to formulate special study areas in structural and material design and conduct case studies or special studies of the subject matter.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the advantages and disadvantages of various types of materials and structural systems			x	
2	Delineate the structural design concepts specific to different materials and structural systems			x	
3	Select appropriate construction materials to fulfill the functional and aesthetic requirements of an architectural design project			x	
4	Develop sustainable and innovative material and system applications		x		x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Students will engage in lectures that covers topics such as characteristics and behaviors of different construction materials; advantages and disadvantages of various types of structural systems.	1, 2, 3	

2	Tutorials	Students will engage in tutorial discussions to determine the selection of construction materials to fulfill the functional and aesthetic requirements of an architectural design project; and the development of healthy and effective spatial systems.	3, 4	

Additional Information for LTAs

Semester Hours: 3 hours per week

Lecture/Tutorial/Laboratory Mix: Lecture (Mix); Tutorial (Mix); Laboratory (-)

Mixed lecture and tutorial sessions

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3, 4	100		Yes

Continuous Assessment (%)

100

Examination (%)

0

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

0

Assessment Rubrics (AR)

Assessment Task

Assignments (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to describe the advantages and disadvantages of various types of materials and structural systems;

Ability to delineate the structural design concepts specific to different materials and structural systems;

Ability to select appropriate construction materials to fulfill the functional and aesthetic requirements of an architectural design project

Develop sustainable and innovative material and system applications

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Assignments (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to describe the advantages and disadvantages of various types of materials and structural systems;

Ability to delineate the structural design concepts specific to different materials and structural systems;

Ability to select appropriate construction materials to fulfill the functional and aesthetic requirements of an architectural design project

Develop sustainable and innovative material and system applications

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus
Construction materials; structural systems; architectural expressions; concrete material and structures; steel material and structures; timber systems; brick material and masonry structures, advancement in material and technology

Reading List

Compulsory Readings

	Title
1	NIl

Additional Readings

	Title
1	AISC (2010). Steel Construction Manual. AISC. ISBN: 1564240606
2	Charleson (2005). Structure as Architecture - A Source Book for Architects, Elsevier. ISBN: 0 7506 6527 0

3	Chopra (2010). Dynamics of Structure - Theory and Applications to Earthquake Engineering, 4th edition. Pearson. ISBN: 0-13-285803-7
4	FEMA 454 (2006). Designing for Earthquakes - A Manual for Architects, FEMA.
5	Hibbeler (2010). Mechanics of Materials, 8th Edition. Pearson. ISBN: 0-13-602230-8
6	Nilson, Darwin and Dolan (2003). Design of Concrete Structures,13th edition. McGraw-Hill. ISBN: 0072483059
7	Schierle (2008). Structure and Design, Cognella. ISBN: 978-1-93426-937-4
8	Taly (2010). Design of Reinforced Masonry Structures. McGraw Hill. ISBN: 978-0-07-159367-0
9	Viljakainen (1999). The Open Timber Construction System - Architectural Design. ISBN: 952-15-0184-7