CA5311: NATURAL HAZARDS AND URBAN RESILIENCE: DESIGN, PLANNING, AND MANAGEMENT

Effective Term
Semester A 2026/27

Part I Course Overview

Course Title
Natural Hazards and Urban Resilience: Design, Planning, and Management

Subject Code
CA - Civil and Architectural Engineering
Course Number
5311

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

Part II Course Details

Abstract

This course investigates how climate change complicates natural disasters (e.g., tropical cyclones, high winds, flooding, landslides, urban heat island) and their impacts on buildings, infrastructures, and urban systems. Students will analyse these hazards through the lens of climate science while exploring resilient design principles, risk assessment methods, and strategic planning frameworks to mitigate disasters at both structural and city scales.

Through case studies and interdisciplinary collaboration, the course aims to foster a holistic understanding of how architects and civil engineers can contribute to building safer, more resilient communities in the face of increasingly volatile natural conditions, and prepares students to integrate these considerations into their professional practices.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Students will understand the impacts of climate change on natural disasters and their cascading effects on built environments and urban systems.	15%	x		
2	Students will analyse urban-scale vulnerabilities to climate-enhanced natural disasters with climate projection tools and observational data	20%		x	
3	Students will evaluate resilient design strategies for infrastructure and buildings in hazard-prone regions	30%			x
4	Students will apply strategic planning frameworks to mitigate urban-scale disasters	20%		x	
5	Students will propose integrated solutions by combining technical design, policy instruments and community engagement for disaster resilience	15%	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	Introduction of basic concepts, ideas, and arguments.	1, 2, 3, 4, 5	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	In-class exam	1, 2, 3	30	-	No
2	Assignment	2, 3	30	-	Yes
3	Group project	3, 4, 5	40	-	Yes

Continuous Assessment (%)
100

Examination (%)
0

Minimum Continuous Assessment Passing Requirement (%)
40

Assessment Rubrics (AR)

Assessment Task
In-class exam (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to answer exam questions

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Low

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

Criterion
Ability to solve problems

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Low

Assessment Task
Group Projects (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to complete the project and present the work

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Low

Assessment Task
Final exam (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to answer exam questions

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Low

Assessment Task
In-class exam (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to answer exam questions

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Basic

Failure (F)
Low

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

Criterion
Ability to solve problems

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Basic

Failure (F)
Low

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

Criterion
Ability to complete the project and present the work

Excellent (A+, A, A-)
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Assessment Task
Final exam (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

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Part III Other Information

Keyword Syllabus
Climate change, natural disasters, resilient infrastructure, urban vulnerability, climate adaptation, risk assessment, strategic planning, disaster mitigation, extreme weather events

Reading List

Compulsory Readings

	Title
1	Keller E. A. and DeVecchio D. E. (2019). Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, 5th Edition, Routledge
2	Bosher L. and Chmutina K. (2017). Disaster Risk Reduction for the Built Environment, Wiley-Blackwell

Additional Readings

	Title
1	Emanuel K. A. (2018). What We Know about Climate Change, MIT Press
2	Pacheco-Torgal F. and Goran-Granqvist C. (2023). Adapting the Built Environment for Climate Change: Design Principles for Climate Emergencies, Woodhead Publishing
3	Sanderson D. and Bruce L. (2020). Urbanisation at Risk in the Pacific and Asia, Routledge
4	National Academies of Sciences, Engineering, and Medicine. (2012). Disaster Resilience: A National Imperative. Washington, DC: The National Academies Press. https://doi.org/10.17226/13457.
5	Baldwin C. and King R. (2018). Social Sustainability, Climate Resilience and Community-Based Urban Development. Routledge