CA5325: NEXT-GENERATION SMART CITIES

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Next-generation Smart Cities

Subject Code
CA - Civil and Architectural Engineering
Course Number
5325

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

The course provides the fundamental concepts of next-generation engineers, smart cities and emerging technologies. The course also equips students with the necessary skillsets to design and develop innovative applications coupled with emerging technologies for smart cities.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand the attributes of next-generation engineers and concepts of smart cities;		x	x	
2	Understand the next-generation technologies for smart cities development;		x	x	
3	Design innovative use cases for smart cities applications.		x	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	Lecture	Students will gain an understanding on next-generation engineer, smart cities, emerging technologies, and design thinking methodology	1, 2, 3	1.5
2	Workshop	In workshops, students will engage in discussion about the lecture content and practice what they learned by doing exercises to improve their knowledge and design thinking skills.	1, 2	0.5
3	Peer discussion	Students will engage in structured discussion with peers to design an innovative use case for smart cities application	1, 2, 3	1.0

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignment	1, 2, 3	30	Students will complete one assignment to demonstrate their more in-depth understanding and mastery of the subject matter with more difficult exercises
2	Quiz	1, 2, 3	30	Students will sit for one quiz to demonstrate their basic understanding and mastery of the subject matter
3	Group project proposal presentation	1, 2, 3	10	Students will develop and present the group project proposal to demonstrate their basic understanding and application of design thinking to conceptualize an innovative use case for smart cities application
4	Group project	1, 2, 3	30	Students will complete one group project to demonstrate their in-depth understanding, mastery of the subject matter, and ability to apply the acquired skills to design an innovative use case for smart cities application

Continuous Assessment (%)

100

Examination (%)

0

Assessment Rubrics (AR)

Assessment Task

Assignment (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

ABILITY to INVESTIGATE and APPLY acquired skills for problems or topics related to the subject matter

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
Quiz (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
ABILITY to PERFORM and APPLY basic theories and assessments related to smart cities

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
Group project proposal presentation (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
ABILITY to APPLY knowledge and skills acquired in the class to CONDUCT independent problem analysis and conceptualize an innovative use case for smart cities application

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
Group project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
ABILITY to APPLY knowledge and skills acquired in the class to DESIGN innovative use cases for smart cities applications SYSTEMATICALLY

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
Assignment (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
ABILITY to INVESTIGATE and APPLY acquired skills for problems or topics related to the subject matter

Excellent
(A+, A, A-) High

Good
(B+, B,) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

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

Criterion
ABILITY to PERFORM and APPLY basic theories and assessments related to smart cities

Excellent
(A+, A, A-) High

Good
(B+, B,) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Group project proposal presentation (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
ABILITY to APPLY knowledge and skills acquired in the class to CONDUCT independent problem analysis and conceptualize an innovative use case for smart cities application

Excellent
(A+, A, A-) High

Good
(B+, B,) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

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

Criterion
ABILITY to APPLY knowledge and skills acquired in the class to DESIGN innovative use cases for smart cities applications SYSTEMATICALLY

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

Urban water resources; water quality; water analysis; aquatic chemistry; fate and transport of pollutants; urban water management system; engineering design; process and flow analysis; fate and transport of water pollutants; nutrients cycling; degradation and transformation of pollutants

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Fan, C., Xiao, F., & Yan, C. (2015). A framework for knowledge discovery in massive building automation data and its application in building diagnostics. Automation in Construction, 50, 81-90.
2	Xiao, F., & Fan, C. (2014). Data mining in building automation system for improving building operational performance. Energy and buildings, 75, 109-118.
3	Benfer, R., & Müller, J. (2024). Semantic digital twin creation of building systems through time series based metadata inference–A review. Energy and Buildings, 114637.
4	Zhou, X., Du, H., Xue, S., & Ma, Z. (2024). Recent advances in data mining and machine learning for enhanced building energy management. Energy, 132636.
5	Leng, J., Sha, W., Wang, B., Zheng, P., Zhuang, C., Liu, Q., ... & Wang, L. (2022). Industry 5.0: Prospect and retrospect. Journal of Manufacturing Systems, 65, 279-295.
6	Zickert, F. (2021). Hands-On Quantum Machine Learning With PythonGet started.
7	Dykes, B. (2019). Effective data storytelling: how to drive change with data, narrative and visuals. John Wiley & Sons.
8	Liedtka, J., King, A., & Bennett, K. (2013). Solving problems with design thinking: Ten stories of what works. Columbia University Press.