CA3421: DECISION MAKING AND OPERATIONAL TECHNIQUES FOR ENGINEERING MANAGEMENT

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Decision Making and Operational Techniques for Engineering Management

Subject Code
CA - Civil and Architectural Engineering
Course Number
3421

Academic Unit
Architecture and Civil Engineering (CA)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
BC3421/BC3421F/BC3421P Decision Making and Operational Techniques for Engineering Management; CA3422 Decision Analysis and Rick Management for Construction

Exclusive Courses
Nil

Part II Course Details

Abstract

The course aims to provide a comprehension of the advanced decision making theories, and operational research techniques in the management of construction; develop the ability to utilize advanced mathematical techniques in research studies.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	recognize the methodology and related conduct in carrying out a research study;		x	x	
2	identify the different kinds of decision making theories;			x	
3	discover an appropriate operational research technique for particular managerial problems;			x	
4	discover and apply advanced mathematical techniques to solve managerial problems;			x	
5	analyze characteristics of optimizing techniques for construction engineering.			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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	1. Introduction of research methodology and conduct; 2. Introduction of relevant decision making theories and methods; 3. Assessment of operational techniques for managerial problems	1, 2, 3, 4, 5	
2	Tutorials	In-class discussions of operational techniques for managerial problems	2, 3	

3	Scenario type tutorials	1. Discuss and analyze advanced mathematical models, apply these models to handle practical problems in construction management; 2. Compare and analyze optimizing techniques, employ these methods in construction engineering via case study, etc.	4, 5	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Course works: scenario type question(s) - request students to exercise analyzing technique and provide solution	1, 2, 3, 4, 5	20	
2	Mid-term Test: question(s) in related topics	1, 2, 3, 4, 5	30	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

To pass a course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%

Assessment Rubrics (AR)

Assessment Task

Course works: scenario type question(s) - request students to exercise analyzing technique and provide solution

Criterion

ABILITY to UNDERSTAND, ANALYZE, and SOLVE the problem in applied sense

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
Mid-term Test: question(s) in related topics

Criterion
ABILITY to ANALYZE and SOLVE assigned questions related to application of statistical analysis

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
Examination

Criterion
ABILITY to ANALYZE and SOLVE assigned questions independently

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

Part III Other Information

Keyword Syllabus

Research Methodology and Conduct. Project Resource Optimization. Statistics for construction management. Managerial decision and operational research tools in construction. Advanced topics in construction engineering.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Tam C M, Tong K L Thomas, and Zhang H, Decision Making and Operations Research Techniques for Construction Management, City University of Hong Kong Press, 2007.
2	Spata, C., Statistics – Tales of Distributions, Wadsworth, Cengage learning, 2011.
3	Pritsker, A.A., Introduction to Simulation & SLAM-II, John Wiley, 1985.
4	Hand, D.J., Statistical Method of Discrimination and Classification: Advances in Theory and Applications, New York: Pergamon, 1986.
5	Pidd, M, Computer Simulation in Management Science, John Wiley, 1987.
6	Kaufmann, A. & Gupta, M.M., Fuzzy Mathematical Models in Engineering & Management Science, North-Holland, 1988.
7	Adeli, H., Expert Systems in Construction & Structural Engineering, Chapman & Hall Ltd., 1988.
8	Ciarlet, P.G., Introduction to Numerical Algebra and Optimisation, Cambridge, 1989.
9	D.E. Goldberg., Genetic Algorithms in Search, Optimization, and Matching Learning. Addison-Wesley, Reading, Mass. 1989.
10	Taha, H.A., Operations Research: An Introduction, 5th Edition, Macmillan, 1992.
11	Halpin, D.W., Planning & Analysis of Construction Operations, John Wiley, 1992.
12	Zadeh, L.A., An Introduction to Fuzzy Logic Applications in Intelligent Systems, Kluwer Academic, 1992.
13	R.C. Eberhart, Y. Shi., Tracking and optimizing dynamic systems with particle swarms. Proc. IEEE Congress on Evolutionary Computation (CEC 2001), Seoul, Korea, 2001; 94-97.
14	Haung, F.J. , Methods of Engineering Mathematics, Englewood Cliffs, N.J. Prentice Hall, 1993.
15	Expert System and Optimisation, Aldershot, Hants, England, Avebury Technical, 1994.
16	Harvey, R.L., Neural Network Principles, Englewood Cliffs, Prentice Hall, 1994.