

MNE6134: ADVANCED RISK AND RESILIENCE ASSESSMENT

Effective Term

Semester A 2026/27

Part I Course Overview

Course Title

Advanced Risk and Resilience Assessment

Subject Code

MNE - Mechanical Engineering

Course Number

6134

Academic Unit

Mechanical Engineering (MNE)

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 goal of the course is to present the methodologies that allow the integrated assessment of risk and resilience. In particular, the course intends to offer adequate technical-scientific knowledge on advanced risk and resilience assessment methods. This course lays emphasis on the students' acquisition of theoretical basis of identifying, formulating and solving engineering, societal and financial risk problems.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe basic notions of probability and statistics concepts within the context of their use in risk and resilience assessment.		x		
2	Describe definitions of risk, vulnerability and resilience, and articulate the processes of risk assessment.		x	x	
3	Understand the mathematical formulation of probabilistic risk measures and present advanced methods for risk and resilience assessment.			x	
4	Apply the concepts, principles, and methods learned for the risk modelling and assessment in engineering, societal and financial risk problems.			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	To take place in the classroom. The main teaching activities will be in the form of lectures, which will be given related to the topics in the keyword syllabus.	1, 2, 3, 4	3 hrs/week

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Test/Assignments	1, 2, 3	20		
2	Mini-projects and Presentations	2, 3, 4	30		

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

Assessment Rubrics (AR)**Assessment Task**

Test/Assignments

Criterion

Ability to understand the basic concepts related to risk, vulnerability and resilience, and advanced methods for risk and resilience assessment.

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

Mini-projects and Presentations

Criterion

Ability to understand and explain in details and apply the learned knowledge to the risk modelling and assessment in engineering, societal and financial risk problems.

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 of in-depth understanding of the key concepts, principles, methods, and applications of risk and resilience assessment.

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

Additional Information for AR

Note: For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

Part III Other Information

Keyword Syllabus

Basic notions of probability theory and mathematical statistics

Risk and resilience measurement

Classical Monte Carlo simulation methods for risk and resilience assessment Bayesian inference

Bayesian network

Resilience optimization

Artificial intelligence for risk and resilience assessment

Reading List

Compulsory Readings

Title	
1	E. Zio, The Monte Carlo Simulation Method for System Reliability and Risk Analysis, Springer London, 2012, ISBN 978-1-4471-4587-5.

Additional Readings

Title	
1	Y. Y. Haimes, Risk modeling, assessment, and management. John Wiley & Sons, 2005, ISBN 0470512849.
2	E. Zio, Computational Methods for Reliability and Risk Analysis. Vol. 14. World Scientific Publishing Company, 2009.
3	Omer, Mayada. Resilience of Networked Infrastructure Systems, The: Analysis and Measurement. Vol. 3. World Scientific, 2013.
4	Students are encouraged to find out related publications to widen their knowledge in the subjects.