SYE3101: BASIC METHODOLOGIES AND TOOLS FOR RISK ENGINEERING

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Basic Methodologies and Tools for Risk Engineering

Subject Code
SYE - Systems Engineering
Course Number
3101

Academic Unit
Systems Engineering (SYE)

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
MA1200 Calculus and Basic Linear Algebra I / MA1300 Enhanced Calculus and Linear Algebra I
AND
MA1201 Calculus and Basic Linear Algebra II / MA1301 Enhanced Calculus and Linear Algebra II

Precursors
Nil

Equivalent Courses
SEEM3101 Basic Methodologies and Tools for Risk Engineering or
ADSE3101 Basic Methodologies and Tools for Risk Engineering

Exclusive Courses
Nil

Part II Course Details

Abstract

This course aims to introduce the basic principles, practices, methodologies and tools for analysing risk in a formal and scientific manner required for engineering applications.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic principles, methodologies and tools in risk engineering	20		x	
2	Select appropriate tools and methodologies for identifying and measuring risks in engineering problems	40		x	
3	Apply quantitative methods for risk assessment of engineering problems	20		x	
4	Demonstrate reflective practice in an engineering context	20	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	Large Class Activities	Delivery of the course will be achieved through a series of formal lectures supported by practical case studies. A series of lectures will introduce basic elements and importance of risk analysis.	1, 2, 3, 4	39 hours/semester
2	Online Tutorial	It will discuss some typical risk analysis problems.	1, 2, 3, 4	13 hours/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3, 4	10	
2	Mini-Project	1, 2, 3, 4	25	
3	Quiz	1, 2, 3, 4	15	

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 the examination should be obtained.

Assessment Rubrics (AR)

Assessment Task

Assignment

Criterion

It assesses students' understanding of fundamental principles and practices for risk measurement.

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-Project

Criterion

The project assesses students' understanding of the methodologies and tools for analysing risk formally and scientifically. Also, it assesses the student's ability to apply quantitative methods for risk assessment of engineering 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
Quiz

Criterion
Quiz questions assess students' understanding of the tools and methodologies for risks and hazard 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
Examination questions are designed to assess student's level of the appropriate tools and methodologies for identifying andmeasuring risks in engineering 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

Additional Information for AR

The grading is assigned based on students' performance in assessment tasks/activities.

The 2-hour examination (50%), assignment (10%), mini-project (25%) and quiz (15%) will be marked numerically and final grades will be awarded accordingly.

Part III Other Information

Keyword Syllabus

- Definition of risk and uncertainty; measures of risk
- Steps in managing risk in engineering applications
- Methods for risk identification and measurement: Failure mode, effects, and criticality analysis (FMECA), Hazard and operability study (HAZOP)
- Quantitative methods for Risk Assessment: Event tree, Fault Tree Analysis (FTA), Probabilistic Risk Assessment

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Paul R. Garvey, Analytical Methods for Risk Management: A Systems Engineering Perspective, CRC Press, 978-1-58488-637-2.
2	Enrico Zio, An Introduction to the Basics of Reliability and Risk Analysis, World Scientific Publishing Co., ISBN978-981-270-639-3.
3	Terje Aven, Foundations of Risk Analysis: A Knowledge and Decision-oriented Perspective, John Wiley and Sons, ISBN 978-0-4714-9548-2.
4	Paul Hopkin, Fundamentals of Risk Management: Understanding, Evaluating and Implementing Effective Risk Management, Kogan Page Publishers, 978-0-7494-5942-0.
5	David Vose, Risk Analysis: A Quantitative Guide, John Wiley, 978-0-470-51284-5.