SYE4059: NON-DESTRUCTIVE TESTING TECHNOLOGIES FOR PROCESS MONITORING AND INSPECTION

New Syllabus Proposal

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Non-Destructive Testing Technologies for Process Monitoring and Inspection

Subject Code
SYE - Systems Engineering
Course Number
4059

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
Nil

Precursors
Nil

Equivalent Courses
MNE3204 NDT TECHNOLOGIES FOR AIRCRAFT STRUCTURES AND MATERIALS

Exclusive Courses
Nil

Part II Course Details

Abstract

The aim of this course is to introduce effective non-destructive testing techniques for monitoring critical manufacturing processes and industrial assets so that their quality and maintainability can be guaranteed. The methodology is derived from advanced non-destructive evaluation methods with their related measurement methods and test tools. After completing the course, the students are expected to be capable of selecting suitable method(s) for measuring the health and analyzing the quality of a prime type/piece of process/asset commonly used in industry. The students should also be able to design an effective and practical measurement and test platform for performing the required quantitative analysis on the process/asset.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	To be able to describe the role of NDT within the critical manufacturing processes/industrial assets and assess the key technologies needed to ensure their structural reliability.	20		x	
2	To be able to design a basic health monitoring system and perform basic signal processing techniques for fault diagnosis.	30		x	
3	Understand the significance of testing and monitoring manufacturing processes/industrial assets for quality assurance and maintainability.	20		x	
4	Present results, analyses and conclusions from experiments or simulations in a written report such that a technically qualified person can obtain a clear understanding of the findings.	30		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 and In-class Discussion	This includes a combination of lectures and tutorial classes on NDT technologies, the relevance and the benefits using case studies and implementation methodologies.	1, 2, 3	3 hrs/week

2	Laboratory	Students will carry out practical laboratory exercises covering a range of experimental techniques and applications. These will be reported in the form of a short and concise technical report.	3, 4	3 hrs/week for 2 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Test and Assignments	1, 2, 3	20	3 assignments to be submitted.
2	Laboratory Reports	3, 4	20	2 reports to be submitted

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the final examination should be obtained. And an overall mark of at least 40% in order to be considered for a pass grade.

Assessment Rubrics (AR)

Assessment Task

Test and Assignments

Criterion

Describe the fundamental concepts of NDT technologies and apply them to critical manufacturing processes and industrial assets.

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
Laboratory Reports

Criterion
Ability to explain the methodology and procedures used and analyse the experimental data, discuss the experimental findings with concise conclusions.

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
Demonstrate an understanding of the fundamental concepts of NDT technologies systems, how they function, how they can be implemented in monitoring critical manufacturing processes and industrial assets.

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 the final examination should be obtained. And an overall mark of at least 40% in order to be considered for a pass grade.

Part III Other Information

Keyword Syllabus

Sensors and Diagnostics, Nondestructive Evaluation, Structural Health Monitoring (SHM), Passive and Active Sensing, Acoustic-ultrasound and Wave Propagation

Reading List

Compulsory Readings

	Title
1	Introduction to Nondestructive Testing: A Training Guide, 2nd edition, P Mix, Wiley 2004.

Additional Readings

	Title
1	Structural Health Monitoring in Aerospace Structures, F G Yuan, Woodhead Publishing, 2016.