

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

Effective Term

Semester A 2025/26

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

To ensure the quality and maintainability of critical manufacturing processes and industrial assets, the application of non-destructive testing techniques is crucial. This methodology is supported by advanced non-destructive evaluation methods with their related measurement methods and testing tools. In this course, the students will learn how to select 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 will also learn how 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	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	Design a basic health monitoring system and perform basic signal processing techniques for fault diagnosis.	30		x	
3	Explain 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	Students will engage in 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. Students will demonstrate in the form of a short and concise technical report.	3, 4	3 hrs/week for 2 weeks
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Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Test and Assignments	1, 2, 3	20	3 assignments to be submitted.	No
2	Laboratory Reports	3, 4	20	2 reports to be submitted	No

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

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.