MNE3204: NDT TECHNOLOGIES FOR AIRCRAFT STRUCTURES AND MATERIALS

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
NDT Technologies for Aircraft Structures and Materials

Subject Code
MNE - Mechanical Engineering
Course Number
3204

Academic Unit
Mechanical Engineering (MNE)

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
SYE4059 Non-Destructive Testing Technologies for Process Monitoring and Inspection

Exclusive Courses
Nil

Additional Information
#Prerequisites which are not part of the Major Requirement are waived for students admitted with Advanced Standing.

Part II Course Details

Abstract

The course offers an introduction to the importance of inspecting the integrity of aerospace structures and materials. The role of non-destructive testing is key to maintaining safety in the aerospace environment and with the increasing use of composite materials it is important that students are exposed to the key technologies in NDT which form the core of this course and will provide students with an awareness of how NDT and structural health monitoring is used in the aerospace industry and in the lifetime of an aircraft.

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 aerospace environment and assess the key technologies needed to ensure the structural and material integrity of aerospace structures.			x	
2	To be able to design a basic health monitoring system taking into account the commercial and cost effective factors involved.			x	
3	Understand the significance of testing and monitoring the materials used in aerospace structures and systems.			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.			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	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	2-3 assignments to be submitted.
2	Laboratory Reports	3, 4	20	2 reports to be submitted

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

3

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 and Assignments

Criterion

Describe the fundamental concepts of NDT technologies and apply them to the materials and structures used in the aerospace industries.

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 and used to assess the integrity of aerospace materials and structures.

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

An introduction to NDT surface and sub-surface inspection technologies in the aerospace industry, Eddy current technology for conductive materials, Acoustic emission, Ultrasonic/ultrasound technology, Radiography and shearography, thermal imaging/infrared/X-rays, Robotics for NDT, Structural health management, NDT system design.

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.