MNE4204: SIGNALS, SENSORS AND COMMUNICATION SYSTEMS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Signals, Sensors and Communication Systems

Subject Code
MNE - Mechanical Engineering
Course Number
4204

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
MNE2204 Aircraft System Design

Precursors
Nil

Equivalent Courses
Nil

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

This course introduces the student to the fundamentals of the types of sensors, signal processing and communication systems that are employed in aircraft and space systems. Students will learn about the principles of operation of aerospace sensors, typical applications and how they are interfaced, safety and fault tolerance requirements. Communication systems and the role of radar and navigational systems as part of the aerospace environment are described.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand the underlying principles of operation of aerospace sensing systems and the role they play in the operation of the aerospace vehicle.			x	
2	To be able to explain how communication systems function, the way in which antennae, receivers operate and how these integrate into flight management and control systems.			x	
3	To understand and explain how the sensors and communication systems integrate with global navigation 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 aerospace sensors, communications and the signal processing involved in flight control and navigation.	1, 2, 3	3 hrs/week

2	Laboratory	Students will carry out exercises to create simple communications systems and study the performance of a range of sensors. 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 ("-" for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3	20	2-3 assignments to be submitted.	Yes
2	Laboratory Reports	3, 4	20	2 reports to be submitted	Yes

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

3

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 both coursework and examination should be obtained.

Assessment Rubrics (AR)

Assessment Task

Assignments

Criterion

To carry out studies of sensor types and applications, design studies into communications and navigational systems.

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 and interpret the results from practical exercises involving aerospace sensors, simple navigation and communications systems.

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 principles of aerospace sensors and sensor systems, communications methodologies and navigational systems and to solve problems relating to the design and use of such aerospace technologies.

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 onboard systems and sensors, navigation, inertial, airspeed, incidence, altitude sensors, Engine and propulsion sensors, Space sensor systems, Communications, transmitters, receivers and signal conditioning, Ground and airborne radar, Global and inertial navigation systems, An introduction to smart sensing technologies and health monitoring.

In addition to the examination and in-class test, students are required to learn through collaborative lab sessions in order to improve their understanding on strategic thinking, problem solving, team working processes, the relationships and interactions between the fields of knowledge that they have learnt in this and other courses.

Reading List

Compulsory Readings

	Title
1	Aerospace sensor systems and applications, S Prosser, IOP (not sure if this is the best choice as it is quite advanced)

Additional Readings

	Title
1	Nil