MNE4205: AVIONIC CONTROL ENGINEERING

Effective Term
Semester A 2023/24

Part I Course Overview

Course Title
Avionic Control Engineering

Subject Code
MNE - Mechanical Engineering
Course Number
4205

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
MNE2029 Electrical and Electronic Principles I

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 core principles and basic theory for avionics systems in aircraft. The integration and implementation is described together with the safety and integrity requirements. Display technology, fly by wire and digital control systems, Autopilots and Unmanned air vehicles are covered and the use of simple models based on the underlying physics are used to allow students to gain an understanding of the design criteria.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand the basic principles and underlying theory of avionic systems in aircraft, flight management, modern flight control systems, autopilots, UAV’ s, safety and fault tolerance requirements.			x	
2	To be able to explain how avionics plays a role in allowing the crew to perform the aircraft mission and its role in safety, environmental conditions and general aircraft performance.			x	
3	To be able to solve problems using the underlying theory relating to the design and performance of avionics 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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	This includes a combination of lectures and tutorial classes on avionics and the principles and theory relating to modern avionics and avionic systems.	1, 2, 3	3 hrs/week

2	Laboratory	Students will carry out exercises to study avionics systems and their performance. 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

To be able to describe and explain the major functions and processes involved in avionics systems and assess the performance in terms of the roles of avionics.

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 data, discuss the 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 principles of avionic systems covering aspects such as air traffic control, flight management, fly by wire and digital control, autopilots and UAVs, safety and fault tolerance.

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

To understand conventional aircraft control and navigation systems flight and air traffic control, Avionics and control integration, Flight management and data systems, Fly by wire and digital flight control, Autopilots and Unmanned air vehicles, Safety, fault tolerance and mission integrity.

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	Introduction to Avionics, R Collinson, Springer, 2011.

Additional Readings

	Title
1	Nil