

MNE3201: AEROSPACE STRUCTURES

Effective Term

Semester A 2022/23

Part I Course Overview

Course Title

Aerospace Structures

Subject Code

MNE - Mechanical Engineering

Course Number

3201

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

MNE2109 Engineering Mechanics

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 allows students to assess and understand the behaviour of real structures and the requirements of structural design. Stresses and strains, load paths, stress and elastic deflection characteristics of statically determinate structures are covered in some detail with a progression to thin walled structures within an aerospace environment.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 DEC-A2 DEC-A3 app.)		
1	Understand and develop the ability to determine load paths, strains and stresses in statically determinate structures, elastic deflections and to analyse thin walled structures typically found in aircraft and aerospace environments.			x
2	To develop an appreciation of the requirements and the philosophy of structural design as applied to aerospace structures.			x
3	Formulate solutions using relevant principles for the analysis of simple structures and hence assess the behaviour of real structures.			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 a range of mechanical and aerospace structural mechanics accompanied by in-class problem solving sessions.	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
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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 structural mechanics and apply them to solve problems with given principles.

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 structural mechanics and apply them to solve the problems for stresses, strains, load paths and elastic deflections of simple structures including box sections.

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

Equilibrium and redundancy as applied to structures, Determination of forces in simple structures, Bending moments, shear forces, and torque, Concepts of stress and strain in 1D and 2D, Young' s modulus, Poisson' s ratio in structural analysis, Centroids, second moments of area, shear centre, Slender members under bending and torsion, An introduction to thin walled structures, Case studies covering the key elements of structural design of aerospace structures.

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	Basic Mechanics with Engineering Applications, Fawcett and Burdess, Butterworth-Heinemann.

Additional Readings

Title	
1	Aircraft Structures for Engineering students, T H Megson, 5th edition, Elsevier