

## MODULE DESCRIPTION FORM

### DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

### ME224 (ME222 Sem1 / ME223 Sem2) Introduction to Aerospace

|                                                                                                                |                                                                      |                   |                          |
|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------|--------------------------|
| Module Registrar: Prof M Fossati<br><a href="mailto:marco.fossati@strath.ac.uk">marco.fossati@strath.ac.uk</a> | Taught To (Course): Cohorts for whom module is compulsory / elective |                   |                          |
| Other Lecturers Involved: Dr J Feng                                                                            | Credit Weighting:<br>10 (ECTS 5)                                     | Semester: 1 and 2 |                          |
| Assumed Prerequisites: 16132 Engineering Mechanics; ME101 Heat and Flow 1 <u>OR</u> other – refer to below     | Compulsory / elective module                                         | Academic Level: 2 | Suitable for Exchange: Y |

#### Required prerequisites

**Note:** It is the responsibility of ALL students to ensure that they satisfy the prerequisite knowledge for this module BEFORE adding as part of curriculum selection. If unsure, please contact the Module Registrar or discuss with your Programme/Year Adviser of Studies.

Knowledge of fundamental principles of fluid mechanics such as conservation of mass and thermodynamics such as ideal gas laws and the concept of thermodynamic cycles, knowledge of dynamics principles, such as Newton's law, balance of forces and moments and kinematics.

#### Alternative codes and credit values for those taking only one semester:

Semester 1: ME222 Introduction to Aerospace (sem1) [5 Credits]

Semester 2: ME223 Introduction to Aerospace (sem2) [5 Credits]

#### Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

| Lecture | Tutorial | Laboratory | Groupwork | External | Online | Project | Assignments | Private Study | Total |
|---------|----------|------------|-----------|----------|--------|---------|-------------|---------------|-------|
| 40      |          |            |           |          |        |         |             | 60            | 100   |

#### Educational Aim

The module aims to give an introduction to aeronautical science in semester 1 by studying some fundamental concepts and disciplines behind the theory of flight and flying machines. In semester 2, the module introduces fundamental principles of astronautics and space systems engineering.

#### Learning Outcomes

On completion of the module the student is expected to have an introductory knowledge of:

- LO1 Identify air-vehicle types and spacecraft systems, their components and modes of operation;
- LO2 Understand the system of forces acting on a vehicle flying either in the atmosphere or above the atmosphere and the means to change these forces to control the dynamics and motion of the vehicle;
- LO3 Use fundamental concepts of aerodynamics, aerospace structures, propulsion, orbital mechanics and space engineering to understand design choices and their impact on the operations.

#### Syllabus

The module will teach the following:

##### Semester 1

- Introduction to air-vehicles, and terminology;
- International Standard Atmospheric model;
- Reference frames, forces, moments, and nondimensional coefficients;
- Aerofoil and Wing aerodynamics and high-Lift devices;

- Aerospace structural components and elements;
- Loads, stresses and materials: stress-strain relation; elastic and plastic regimes; metallic alloys and composites;
- Principles of aerospace propulsion;
- Aircraft propellers and rotors;
- Turbojet and turbofan engines: definitions and characteristics.

#### Semester 2:

- Introduction to history of astronautics and examples of milestone space missions;
- Fundamental concepts of gravity, central motion and orbital mechanics;
- Kepler's laws, conservation laws, orbit geometry, orbit period, reference frames;
- Principles of space mission design and spacecraft system design;
- Concepts of rocket propulsion and derivation of the rocket equation;
- Basic concepts of near Earth and interplanetary orbit transfer trajectories and their calculations;
- Spacecraft subsystems and basic principles of subsystem design;
- Spacecraft payloads examples, their functionalities and integrations.

### Assessment of Learning Outcomes

#### Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

#### LO1

C1 Ability to recognise and identify air-vehicles and spacecraft components and their function.

C2 Be able to explain the atmospheric and gravitational models and their use.

#### LO2

C1 Understanding of the different phases of flight.

C2 Ability to explain the balance of forces during flight and their interaction in the various phase of flight.

#### LO3

C1 Ability to explain the genesis of aerodynamic forces and moments, the meaning and the role non dimensional numbers in relation to Lift, Drag and Moments.

C2 Ability to understand fundamental principles of orbital mechanics and how these affect the space mission design.

C3 Understanding of the fundamental elements of aircraft structures and its ability to withstand loads generated during flights.

C4 Ability to explain the how thrust is generated by different propulsive systems and the main components of propellers, jet engines and rockets.

C5 Understanding of the basics of spacecraft subsystems and how they are designed according to space mission requirements.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

### Principles of Assessment and Feedback

(within Assessment and Feedback Policy – search for 'Academic policies & procedures' at: <https://www.strath.ac.uk/>)

Assessment will be a 60 minute online examination using Myplace, with multiple choice questions. During this assessment NO access to the course material or any other online resource will be available and NO formula sheet will be provided. Students will be able to assess their progress and obtain feedback by a number of online quizzes that will not be assessed. For students taking both semesters, to pass the exam, it is necessary that a mark of at least 40% is obtained in **both** examinations individually otherwise a Fail Overall mark will be given. The final mark will be an average of the marks in the two examination sessions.

### Standard Assessment Method(s) Including Percentage Breakdown and Duration of Exams (individual weightings)

| Examination     |          |          |           | Coursework |           | Practical |           | Project |           |
|-----------------|----------|----------|-----------|------------|-----------|-----------|-----------|---------|-----------|
| Number          | Month(s) | Duration | Weighting | Number     | Weighting | Number    | Weighting | Number  | Weighting |
| 1               | Dec      | 1hr      | 50% each  |            |           |           |           |         |           |
| 1               | Apr/May  | each     | (100%)    |            |           |           |           |         |           |
| * LO1, LO2, LO3 |          |          |           | *          |           | *         |           | *       |           |

\* **L/Os:** Indicate which Learning Outcomes (LO1, LO2, etc) are to be assessed by exam/coursework/practical/project as required.

**Coursework / Submissions deadlines (*academic weeks*):****Resit Assessment Procedures:**

**For students who have not passed the module by the Exam Board:** 1.5hr examination (online quiz via Myplace) in July/August diet.

**For students registered as Academic Assessment Only or carrying the module into year 3:** Standard assessment will apply.

**For students who are Reattending or Registered With Attendance:** Standard assessment will apply.

**PLEASE NOTE:**

Students must gain a summative mark of 40% in each semester to pass the module. Students who fail the module at the first attempt will be re-assessed during the July/August exam diet. This re-assessment will consist entirely of an exam. No marks from any previous attempts will be transferred to a new resit attempt.

**Recommended Reading**

**\*\*\*Purchase recommended      \*\*Highly recommended reading      \*For reference**

1. "Introduction to Flight" by Anderson, McGraw Hill, ISBN 007-123818-2 (\*\*);
2. "Aircraft Flight" by Barnard & Philpott, Longman, ISBN 0-582-00338-5 (\*\*);
3. "Introduction to aerospace flight vehicles" by Leishman, e-book ISBN 979-8-9852614-0-0 (\*\*);
4. "Theory of Wing Sections" by Abbot & Doenhoff, Dover, ISBN 978-0486605869 (\*\*);
5. "Gas Turbine Theory" by Saravanamuttoo & Rogers & Choen & Straznicky, Prentice Hall, ISBN 1292093099;
6. "Fundamentals of Astrodynamics and Applications" by Vallado, Space Technology Library, ISBN 978-1881883180;
7. "Spacecraft Systems Engineering" by Fortescu & Swinerd & Stark, Wiley, ISBN 978-0470750124.

**Additional Student Feedback**

*(Please specify details of when additional feedback will be provided)*

| Date | Time | Room No                              |
|------|------|--------------------------------------|
|      |      | Check timetable webpages for details |

Session: 2026/27

**Approved:**

**Programme Lead/Director Signature: Dr Andrew McLaren**

**Date of Last Modifications: 08 September 2026**

## MODULE TIMETABLE

**Module Code:**

**ME224 / ME222 / ME223**

**Module Title:**

# Introduction to Aerospace

### Brief Description of Assessment:

- Online 1hr (60mins) examination in the December diet with theory and applied questions
- Online 1hr (60mins) examination in the April/May diet with theory and applied questions

### Assessment Timing:-

Indicated on the table below are the start/submission dates for each assignment/project and the timing of each exam/assessment.

**Please note: Timings could change during unforeseen periods of disruption; this should only be used as a guide.**

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