# MODULE SPECIFICATION

| Part 1: Information | | | |
|---|---|---|---|
| Module Title | Aerodynamics and Flight | | |
| Module Code | UFMFY6-30-2 | Level | Level 5 |
| For implementation from | 2018-19 | | |
| UWE Credit Rating | 30 | ECTS Credit Rating | 15 |
| Faculty | Faculty of Environment & Technology | Field | Engineering, Design and Mathematics |
| Department | FET Dept of Engin Design & Mathematics | | |
| Contributes towards | | | |
| Module type: | Standard | | |
| Pre-requisites | Engineering Mathematics 2018-19, Introduction to Aeronautics 2018-19 | | |
| Excluded Combinations | None | | |
| Co- requisites | None | | |
| Module Entry requirements | None | | |

## Part 2: Description

**Overview**: This module covers theoretical and practical aspects of aerodynamics, performance, static stability and orbital mechanics.

**Educational Aims:** See Learning Outcomes

**Outline Syllabus:** This module will cover:

Elements of Aeroplane Performance: Equations of Motion, Thrust and Power required for Level, Unaccelerated Flight, Thrust and Power available and maximum velocity, Altitude Effect on Power required and available, Rate of Climb, Gliding Flight, Time to Climb, Range and Endurance - Breguet Equation, Takeoff and Landing Performances.

Principles of Stability and Control: Static Stability, Dynamic Stability.

Static Stability: Longitudinal Stability, Neutral Point, Static Margin, Calculation of Elevator Angle to Trim, Stick-fixed versus Stick-free Static stability, Elevator Hinge Moment, Lateral Stability.

Subsonic Flow over Aerofoils and wings: flow field characteristics; influential flow field and shape parameters; stall and separation; boundary layer flows.

Potential theory, 2D aerofoil and 3D wing theory including vortex systems.

Transonic and Supersonic Flows over aerofoils: compressible flows, shock waves.

High lift profiles and devices, effects of leading and trailing edges.

Introduction to computational fluid dynamics (CFD): relevant equations, principles of discretisation, turbulence models, mesh generation, boundary conditions, accuracy and convergence, post-processing, validation and assessment of results.

**Teaching and Learning Methods:** See Assessment

**Part 3: Assessment**

Component A, a two hour exam on aerodynamics to test student understanding of theoretical knowledge and calculation skills in controlled conditions.

Component B contains an assessment portfolio demonstrating key skills. It reinforces theory by giving students practical experience in applying the theoretical principles in a real context. It includes:

Aerodynamics assignment including computational fluid dynamics (CFD), and physical testing of flows,

Performance, stability assignment,

Basic spacecraft trajectories and manoeuvres.

| First Sit Components | **Final Assessment** | **Element weighting** | **Description** |
|---|---|---|---|
| Portfolio - Component B | | 75 % | Portfolio |
| Examination - Component A | ✓ | 25 % | Examination (2 hrs) |
| Resit Components | **Final Assessment** | **Element weighting** | **Description** |
| Portfolio - Component B | | 75 % | Portfolio |
| Examination - Component A | ✓ | 25 % | Examination (2 hrs) |

**Part 4: Teaching and Learning Methods**

Learning Outcomes

On successful completion of this module students will be able to:

| | **Module Learning Outcomes** |
|---|---|
| MO1 | Use aerodynamic theory for describing subsonic, transonic and supersonic flows. |
| MO2 | Acquire basic knowledge in flight theory for performance, stability and design of aircraft and spacecraft. |
| MO3 | Use of numerical models to produce simulations of aerodynamic flows for basic geometries in different flow regimes. |
| MO4 | Demonstrate key transferable skills in problem formulation and decision making, self-management and communication. |
| MO5 | Demonstrate an awareness of, and access to professional literature. |

Contact Hours

| **Contact Hours** | |
|---|---|
| | |
| **Independent Study Hours:** | |
| Independent study/self-guided study | 228 |
| **Total Independent Study Hours:** | 228 |
| **Scheduled Learning and Teaching Hours:** | |
| Face-to-face learning | 72 |
| **Total Scheduled Learning and Teaching Hours:** | 72 |
| **Hours to be allocated** | 300 |
| **Allocated Hours** | 300 |

Reading List

*The reading list for this module can be accessed via the following link:*

https://uwe.rl.talis.com/modules/ufmfy6-30-2.html