Liverpool John Moores University

Title: Flight dynamics and Simulation
Status: Definitive
Code: **7103UAS**   (126087)
Version Start Date: 01-08-2019

Owning School/Faculty: Maritime and Mechanical Engineering
Teaching School/Faculty: Maritime and Mechanical Engineering

Team	Leader
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Academic Level:	FHEQ7	**Credit Value:**	20	**Total Delivered Hours:**	33
Total Learning Hours:	200	**Private Study:**	167		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	22
Practical	3
Tutorial	8

Grading Basis: 50 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Aerodynamics calculation and simulation	40	
Portfolio	AS2	Modelling and Simulation of the flight dynamics of a conventional UAV	60	

Aims

To develop the mathematical and scientific framework of the stability, control, and dynamics characteristics for flight physics; to be able to model and simulate such systems using linear and nonlinear approaches.

Learning Outcomes

After completing the module the student should be able to:

1 Demonstrate the knowledge and analytical skills required to create a simulation model of a fixed-wing UAV.
2 Demonstrate the knowledge and analytical skills required to create a simulation model of a rotary-wing UAV.
3 Critically analyse how aircraft configuration and aerodynamics affect performance, stability, and controllability.
4 Analyse and apply principles of feedback control to flight control system design.
5 Evaluate & formulate appropriate analytical tools for solving representative flight dynamics and control problems.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Aerodynamics simulation	1	2	3		
Flight dynamics simulation	1	2	3	4	5

Outline Syllabus

• *Introduction to UAV flight control system (fixed-wing and rotary)*
• *Modelling of fixed-wing UAVs*
• *Modelling of rotary-wing UAVs*
• *Longitudinal flight dynamics, Lateral/directional flight dynamics*
• *Introduction to linear systems theory*
• *UAV flight stability (fixed-wing and Rotary)*
• *Introduction to Automatic Flight Control System (AFCS).*
• *UAV simulation architecture*

Learning Activities

This is a knowledge-based module and will be taught by a combination of one weekly 2hr lecture lectures; practical laboratory-based sessions. which employs practical sessions as the basis of gaining hands-on experience using analytical and experimental methods.
–Material provided on the VLE
–Lectures will cover theory and solve problems using software
There will be clearly focused activities that are designed to elicit fundamental principles of flight dynamics, with emphasis on analysis and simulation.

Notes

This module provides a course in flight dynamics, and the use of simulation to study them.