Advanced UAV Technology and Operations

Module Information

2022.01, Approved

Summary Information

Module Code	7302SDM
Formal Module Title	Advanced UAV Technology and Operations
Owning School	Engineering
Career	Postgraduate Taught
Credits	20
Academic level	FHEQ Level 7
Grading Schema	50

Teaching Responsibility

LJMU Schools involved in Delivery
Engineering

Learning Methods

Learning Method Type	Hours
Lecture	30
Practical	40
Tutorial	10

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
JAN-CTY	CTY	January	12 Weeks

Aims and Outcomes

Aims	To provide an in-depth, quantitative, qualitative and critical understanding of the technology deployed in UAV systems. To be able to model such systems and design elements of them. To fully comprehend the boundaries and limitations of such systems. To be able to safely deliver well planned UAV missions.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Critically evaluate airframe and propulsion systems based on a sound knowledge of the inertial and aerodynamic forces experienced by those systems.
MLO2	2	Analyse static and dynamic stability with regard to UAVs and to be able to use this knowledge.
MLO3	3	Assess and evaluate all component systems within a UAV and make effective judgements of the complete system.
MLO4	4	Assess and integrate aerodynamic, propulsion, control and data systems in a UAV to create new systems.

Module Content

Outline Syllabus	Drone Systems Technology:Structural considerations in UAV design, typical loading scenarios both static and inertial. Aerodynamics of rotary UAVs, ground effect, transitional flight and VRS. Aerodynamics of propellers and criteria of propeller selection. Static and dynamic stability in UAVs, the role, physics and function of stabilisation systems. Power systems, voltage profiles, battery system characteristics. Inertial navigation systems. Datum and coordinate systems in GNSS. Factors effecting the accuracy of GNSS, differential GPS systems.Payload Systems Technology:Payload stability and security. Dynamic balancing of gimbal systems. Static and dynamic modelling of payloads. Data capture, logging and transmission systems. Limitations of 5.8GHz data links, calculating bandwidth requirements. Data security. Non-standard and potentially hazardous payloads. Collision avoidance systems and their integration into the control and navigation systems of the UAV. Synchronised UAV operations, modelling and implementation.Drone Operation Technology:Human factors in UAV operation. Meteorology. Use of telemetry for UAV system monitoring. Integration of control and payload data systems. Measuring altitude, ground speed and airspeed using sensors and GPS, relative advantages. Controlling positional path accuracy in waypoint flying. FPV flying, speed and stereo-systems for depth perception. Further practical instruction in UAV flying and operating skills.
Module Overview	This module aims to provide an in-depth, quantitative, qualitative and critical understanding of the technology deployed in UAV systems. It should enable you to: model such systems and design elements of them fully comprehend the boundaries and limitations of such systems be able to safely deliver well planned UAV missions
Additional Information	This module provides an advanced understanding of UAV sub-system technology. Also a comprehensive skill set for the safe execution of more advanced operations.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping

Essay	Essay	50	0	MLO3, MLO4
Practice	Report	50	0	MLO2, MLO1

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Frederic Bezombes	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings