

Liverpool John Moores University

Title: UAV Technology and Operations
Status: Definitive
Code: **7000DRO** (120976)
Version Start Date: 01-08-2017

Owning School/Faculty: General Engineering Research Institute
Teaching School/Faculty: General Engineering Research Institute

Team	Leader
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Academic Level: FHEQ7 **Credit Value:** 40 **Total Delivered Hours:** 80
Total Learning Hours: 400 **Private Study:** 320

Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	30
Practical	40
Tutorial	10

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Practice	DT-AS1	Flight Test of a Drone to BNUC-S Standard including safe operating procedures.	30	
Essay	DT-AS2	A 2000 word essay on the state-of-the-art in an aspect of UAV technology.	30	
Report	DT-AS3	Prepare a proposal (circa 2000 words with supporting figures) for a drone application scenario.	40	

Aims

*To provide a comprehensive overview of drone technology at a conceptual and practical level. Special emphasis is placed upon being able to specify, select, install and deploy sub-systems to fulfil the requirements of an application.
To acquire the skills to safely operate a UAV system.*

Learning Outcomes

After completing the module the student should be able to:

- 1 Have an in-depth knowledge and insight of, and where appropriate use of, the correct technical terminology relating to the component elements of a drone system.
- 2 Demonstrate a full knowledge of the role, limitations and purpose of the various sub-systems that make up a typical drone.
- 3 Perform calculations aimed at determining the power and navigational system requirements for a drone to perform a specified task.
- 4 Specify and select for purchase appropriate systems to create a drone system to complete a specified task.
- 5 Successfully and safely plan and implement a drone mission

Learning Outcomes of Assessments

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

Flight Test of a Drone	1	5			
A 2000 word essay	2	3	4		
Prepare a proposal	1	2	3	4	5

Outline Syllabus

Drone Systems Technology:

Anatomy of a typical drone system. Types of drones; fixed-wing and multi-rotor. Basic aerodynamics of fixed wing drones. Power and propulsion systems. Control systems; radio equipment, flight controllers, auto-pilots. Performance envelop of drone systems. Navigation and location systems; basics of GPS, inertial navigation systems. Gyro stabilisation systems and gain selection.

Payload Systems Technology:

Gimbals; types, specifications, requirements. Cameras; types, specifications, limitations, video storage and real-time transmission. LIDAR systems. Basic photogrammetry. Other sensor systems; gas sensors, sound sensors, RF detectors and trackers etc.

Drone Operation Technology:

Safe drone operation. UAV airspace operating principles. Navigation and charts. Airmanship and aviation safety. Standard manual flight control systems. Way-point operating. Way-point software systems such as "Mission Planner" and "Ground

Control System". Data analysis techniques; mosaicking graphics, common data formats, basic data visualisation techniques. Practical instruction in flying and operating skills.

Learning Activities

The module will be taught by a combination of lectures; practical laboratory based sessions, centred around setting up and maintaining drones, fitting and testing payloads; workshop sessions involving mission planning for way-point flying; fieldwork involving testing actual drones and mission plans in the field centred initially around basic exercises then expanding to mimicking typical operations.

Notes

This module provides knowledge of UAVs at systems level and provides basic skills in safe UAV operation.