

## Liverpool John Moores University

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Title: UAV Technology and Operations  
Status: Definitive  
Code: **7200DRO** (124796)  
Version Start Date: 01-08-2020

Owning School/Faculty: Engineering  
Teaching School/Faculty: Engineering

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:** 50 %

### 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.