

Module Title:	Advanced UAV Operations	Level:	6	Credit Value:	20
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Module code:	ENG693	Is this a new module?	YES	Code of module being replaced:	
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Cost Centre:	GAME	JACS3 code:	H400
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Trimester(s) in which to be offered:	1, 2	With effect from:	September 17
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School:	Applied Science, Computing & Engineering	Module Leader:	R.Bolam
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Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
BEng (Hons) Drone Technology and Operations	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Pre-requisites
None

Office use only

Initial approval February 17

APSC approval of modification

Have any derogations received Academic Board approval?

Version 1

Yes No

Module Aims

- To provide the student with an up to date and in-depth understanding of the legal issues relating to UAV system operations in the UK and abroad.
- To ensure that the student is fully aware of the legal responsibilities of the Pilot in Command of a UAV mission.
- To inform the student about the applicable regulatory bodies and the sources of information and guidance material available to enable UAV missions to be legally and safely conducted in the UK.
- To provide the student with an advanced understanding of: Human Factors in UAV system operations; Meteorology; Telemetry for UAV system monitoring; UAV transmission systems; Payload stability and security.

Intended Learning Outcomes

Key skills for employability

- KS1 Written, oral and media communication skills
 KS2 Leadership, team working and networking skills
 KS3 Opportunity, creativity and problem solving skills
 KS4 Information technology skills and digital literacy
 KS5 Information management skills
 KS6 Research skills
 KS7 Intercultural and sustainability skills
 KS8 Career management skills
 KS9 Learning to learn (managing personal and professional development, self-management)
 KS10 Numeracy

At the end of this module, students will be able to

Key Skills

1	Assess the legal and regulatory aspects of a planned UAV activity and where appropriate be able to advise alternative compliant operational practices.	KS1	KS3
		KS6	
2	Competently supervise UAV operations in accordance with legislation, regulation and published advisory material.	KS2	KS3
		KS7	
3	Explain the implications of data and privacy legislation for UAV operations.	KS1	KS5
		KS9	
4	Explain the effects of human factors on drone operations and describe the operational safety aspects, benefits and restrictions relating to UAV payloads, telemetry and transmission systems.	KS1	KS4
		KS6	KS10

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Assessment:

Assessment 1: The student will be provided with a realistic scenario relating to the deployment of a UAV system on a commercial mission. The student will be asked to provide an essay appraising the legal and safety aspects of this mission and advising alternative solutions wherever deemed applicable.

Assessment 2: An In-class test on UAV operations and Human Factors. Payload stability and security. Understanding meteorology. The implementation of telemetry for UAV system monitoring. UAV signal and data transmission systems.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,2,3	Essay	60		3000
2	4	In-class test	40	90 mins.	

Learning and Teaching Strategies:

This module will be delivered as a series of lectures, case-study seminars and break-out sessions during which students will be encouraged to discuss the legal aspects of various mission scenarios. The student will also be required to undertake significant reading of regulatory material.

Syllabus outline:

Historical milestones in aviation (and drone) legislative history: The Chicago Convention, the Montreal Convention, the Riga Declaration etc. The structure of the ICAO and the major participant airworthiness organisations.

The latest UK Civil Aviation Authority (CAA) and Home Office regulations and guidelines relating to UAV operations. The provisions of the Air Navigation Order CAP 393 and also CAP 722 and CAP 658. The role of JARUS and similar organisations.

The difference between surveillance and non-surveillance UAVs. The responsibilities of the Pilot In Command (PIC) in law. Interpreting restrictions and no-fly zones on Aviation Sector Charts. The transportation of UAV batteries and the law

Nationally recognised qualifications. The requirement to obtain CAA Permission for Commercial Operations (PFCO), NQE organisations and the SUAV pilot competence

assessment process. The role and contents of the Operations Manual. Data Protection and privacy laws and their effect on drone operations.

UAV operations and Human factors. Payload stability and security. Understanding meteorology. The implementation of telemetry for UAV system monitoring. Transmission systems: uses, comparisons and limitations of UKRCC 35 MHz and 2.4 & 5.8 GHz links; Calculating bandwidth requirements; Frequency Hopping Spread Spectrum (FHSS) transmissions and Data security.

Bibliography:

Essential reading

CAA. (2015) *Unmanned Aircraft System Operations in UK Airspace-Guidance: CAP 722*. Civil Aviation Authority, Gatwick, UK. Available at: <http://www.caa.co.uk>

Other indicative reading

Air Navigation Order (2016) CAP 393. Civil Aviation Authority, Gatwick, UK. Available at: <http://www.caa.co.uk>.

Model Aircraft: A Guide to Safe Flying: CAP 658. Civil Aviation Authority, Gatwick, UK. Available at: <http://www.caa.co.uk>.