

Module Title:	Drone Technology and Operations	Level:	4	Credit Value:	20
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Module code:	ENG481	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:	March 18
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School:	Applied Science, Computing & Engineering	Module Leader:	R.Bolam
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Scheduled learning and teaching hours	24 hrs
Guided independent study	176 hrs
Placement	0hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
Stand-alone delivery, to be aligned with BEng (Hons) Drone Technology and Operations for QA and assessment purposes.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Pre-requisites
None

Office use only

Initial approval February 17

APSC approval of modification June 2018

Have any derogations received Academic Board approval?

Version 2

Yes (not including standalone delivery) No

Module Aims

To support the development of the student in the following areas:

- To gain a knowledge of drone technology at a conceptual and working level.
- To be able to specify, select and assemble flight and payload components and sub-systems suitable to a particular UAV application.
- To acquire the skills required to safely operate a drone.

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

At the end of this module, students will be able to		Key Skills	
1	Demonstrate an in-depth knowledge of the correct terminology relating to the component elements of a drone system.	KS1	KS4
		KS6	
2	Explain the role, limitations and purpose of the components that comprise a UAV.	KS1	KS4
		KS5	
3	Calculate the power required for a UAV to carry out a specified task.	KS3	KS4
		KS10	
4	Safely conduct a drone mission.	KS1	KS2
		KS3	KS7

Derogations

None

Assessment:

- 1: Practical: Plan, execute and review a drone mission which complies with safety specifications prevailing within the sector.
2: Report: Prepare a Mission Plan for a drone mission.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,4	Practical	40	N/A	N/A
2	2,3	Report	60	N/A	1500

Learning and Teaching Strategies:

The module will be taught with lectures, laboratory and workshop sessions, actual and simulated flight exercises including, team exercises, mock missions and mission planning using way-point flying techniques.

Students enrolled on the stand-alone delivery mode will be taught over a a six week period in which the first four weeks will be completed via distance learning and includes a three day intensive classroom based teaching block. This will be followed by a further two weeks of coursework and study. Students will have access to the VLE and will be given tasks to complete prior to the block teaching session. Support will be provided during the remainder of the module via the VLE and formative assessment will take place both during the classroom based lessons and via VLE.

Syllabus outline:

Unmanned Air Vehicle (UAV) System Technology

The anatomy of a drone. Types of drones: fixed wing and multi-rotor designs. Aerodynamics. Power storage and Propulsion systems. Control technology: Transmitters and Receivers, Flight Controllers, auto-pilots. Operational and performance envelopes. GPS, Inertial Navigation Systems. Gyro stabilisation and gain selection.

Payload Technology

Freight conveyancing techniques, Camera technology, video storage, Real-time video transmission systems. Photographic equipment capabilities and limitations. LIDAR systems. Time-of-Flight cameras and 3D photographic techniques. Gas detectors, Sonic actuation and sensing technologies. Radio frequency detectors and trackers.

Drone Operations

Mission planning and Risk Assessment for safe drone operation. UK Airspace operating principles. Airmanship and aviation safety. Navigation and charts. Waypoint flying and associated software systems. Practical flying exercises both simulated and real.

Bibliography:

Essential reading

Civil Aviation Publication CAP 393 The Air Navigation Order, CAA.
Civil Aviation Publication CAP 722 Unmanned Aircraft System Operations in UK Airspace, CAA.
Elliott, A. (2016) *Build Your Own Drone Manual. The Practical Guide to Safely Building, Operating and maintaining an Unmanned Aerial Vehicle (UAV)*. Haynes.

Other indicative reading

Juniper, A. (2015) *The Complete Guide to Drones*. Octopus Publishing Group