Module specification

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Module Code	ENG764
Module Title	UAS Sensor Technology
Level	7
Credit value	20
Faculty	FAST
HECoS Code	100117
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
MSc Unmanned Aircraft System Technology MSc Unmanned Aircraft System Technology with Advanced Practice	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	30 hrs
Placement tutor support	0 hrs
Supervised learning e.g., practical classes, workshops	0 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**30** hrs
Placement / work-based learning	0 hrs
Guided independent study	170 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	Jun 2018
With effect from date	Sept 2022
Date and details of revision	Aug 2022: learning outcomes and assessment update in engineering revalidation
Version number	3

Module aims

- To gain a knowledge of flight control and payload / mission sensor technology at a conceptual and working level.
- To be able to specify and select a suitable sensor technology and sub-system components suitable to a particular UAV mission application.
- To gain a knowledge of optical metrology, photogrammetry and 3D imaging techniques in the context of UAV operations.

Module Learning Outcomes - at the end of this module, students will be able to:

In addition, to the module learning outcomes, student will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: **M3** & **M5**

1	Critically analyse flight control and payload / mission sensor technology
2	Critically evaluate the specification and selection of suitable sensor technologies and sub-system components for a particular UAV mission application.
3	Critically assess calculations relating to coherence, Lasers, IR and UV sensors and ultra-sonic transducer technologies.

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment One: A time constrained examination covering all learning outcomes. Analytical and descriptive problem-based questions proposed, the student will not have the choice in the questions to be answered to fully assess the whole learning outcomes. Assessment one is a written examination (3 hrs.) and represents 100% of the overall module mark.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1-3	Examination	100%

Derogations

Credits shall be awarded by an assessment board for those Level 7 modules in which an overall mark of at least 50% has been achieved with a minimum mark of 40% in each assessment element.

Learning and Teaching Strategies

A series of workshop style lectures with student-led seminars and small group activities. Directed learning using library and internet resources will be facilitated using Moodle and MS Teams. This module will also follow the ALF (Active Learning Framework) guidelines, which will include alternative methods of assessment and a blended approach to delivery, with some theory and software sessions being delivered online (depending on requirements and student experience).

Indicative Syllabus Outline

Flight Control Sensors:

- The measurement of altitude, airspeed and ground speed using pitot-static sensors, radio transmissions and GPS.
- Inertial Measurement Units (IMU), magnetometers and Micro Electro-Mechanical Systems (MEMS) technology.
- Limitations and comparisons of GPS and locally sensed positional data.
- Controlling positional path accuracy in waypoint flying.
- FPV flying, The concept of digital images. Time-of-Flight imaging and stereo vision systems for depth perception and 3D imaging.
- Use of telemetry for UAV systems and the integration of control and payload / mission data systems.

Payload / Mission Sensors:

- Data capture, logging and transmission systems.
- The electromagnetic spectrum, the concept of coherence, Lasers, IR and UV sensors and ultra-sonic transducer technologies.
- Optical measurement techniques: photography, holography, TV holography, Interferometry, LIDAR systems, LASER triangulation and applications of commercially available 3D imaging software.

Indicative Bibliography:

Essential Reads

S. Zhang, *Handbook of 3D Machine Vision: Optical Metrology and Imaging (Series in Optics and Optoelectronics).* CRC Press, 2013.

Other indicative reading

R.C. Gonzalez and R. E. Woods, *Digital Image processing.* 4th ed. Pearson, 2017.

W. D. De Silva, *Sensor Systems: Fundamentals and Applications.* CRC Press, 2016.

R. Vepa, *Nonlinear Control of Robots and Unmanned Aerial Vehicles: An Integrated Approach.* CRC Press, 2016.

Plus, various others to be signposted on Moodle.

Employability skills – the Glyndŵr Graduate

Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

Core Attributes
Engaged
Enterprising
Creative
Ethical

Key Attitudes
Commitment
Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets
Digital Fluency
Organisation
Critical Thinking
Emotional Intelligence
Communication