OFFICE USE ONLY	
Date of validation event:	05 February 2018
Date of approval by Academic Board:	19 June 2018
Approved Validation Period:	*5 years from September 18*
Date and type of revision:	02/07/19 Administrative correction to part-time route, module error

PROGRAMME SPECIFICATON

1	**Awarding body**
	Glyndŵr University
2	**Teaching institution**
	Glyndŵr University
3	**Award title**
	MSc Unmanned Aircraft System Technology
4	**Exit awards available**
	PG Dip Unmanned Aircraft System Technology PG Cert Engineering
5	**Professional, Statutory or Regulatory Body (PSRB) accreditation**
	The programmes have been developed in line with PSRB requirements, including IMechE, RAes & IE, refer to the university PSRB register for up to date details of current accreditation. IMechE - http://www.imeche.org/ RAeS - http://aerosociety.com/ EI -www.energyinst.org/
	Accreditation available
	Please add details of any conditions that may affect accreditation (eg is it dependent on choices made by a student?)
6	JACS3 **codes**
	MSc Unmanned Aircraft System Technology - H410
7	UCAS **code**
	N/A
8	**Relevant QAA subject benchmark statement/s**
	QAA Subject Benchmark Statement Engineering (2015) [Although UG it has been used for reference]

http://www.qaa.ac.uk/en/Publications/Documents/SBS-engineering-15.pdf
QAA Master's degree characteristics.

9 Other external and internal reference points used to inform the programme outcomes

Engineering Council, UK-SPEC third edition (2014)

Engineering Council, UK-SPEC document "The Accreditation of Higher Education Programmes" third edition

Sector Skills Council for Science, Engineering and Manufacturing Technologies (SEMTA)

CAA CAP 393 Air Navigation: The Order and the Regulations
CAA CAP 722 Unmanned Aircraft System Operations in the UK Airspace- Guidance

10 Mode of study

Full & part time

11 Language of study

English

12 Criteria for admission to the programme

Standard entry criteria

Entry requirements are in accordance with the University's admissions policy https://www.glyndwr.ac.uk/en/media/FINAL%20ADMISSIONS%20POLICY%202017.pdf

The University's entry requirements are set out at http://www.glyndwr.ac.uk/en/Undergraduatecourses/UCAStariffchange2017/

International entry qualifications are outlined on the National Academic Recognition and Information Centre (NARIC) as equivalent to the relevant UK entry qualification.

In addition to the academic entry requirements, all applicants whose first language is not English or Welsh must demonstrate English language proficiency.

European students are able to provide this evidence in a number of ways (please see http://www.glyndwr.ac.uk/en/Europeanstudents/entryrequirements/ for details), including IELTS.

International students require a UKVI Approved Secure English Language Test (SELT) (please see http://www.glyndwr.ac.uk/en/Internationalstudents/EntryandEnglishLanguageRequirements/ for details).

Normal entry requirements for full time, part time, and summer intake will be one of:

(a) A Bachelor of Engineering Honours degree, or other Bachelors Honours degree, normally with a 1st or 2nd class award in a relevant subject area;

(b) Academic qualifications at a lower level than honours degree but supported by a maturity of experience at a professional level in a relevant specialist area*;

(c) Equivalent qualifications of another overseas country which are deemed satisfactory by the program team.

Normally, the applicants applied through entry points (b) and (c) will be required to attend for an interview. This is not always possible, e.g. overseas students, in which case the application form and 'home' tutor's recommendations will be used to decide suitability; phone, internet and video conferencing may also be used. Places on the programmes will be offered on the basis of applicants' background qualifications and, where appropriate, experience.

International entry qualifications

Qualifications outlined on the National Academic Recognition and Information Centre (NARIC) as equivalent to the above UK entry qualification.

Programme specific requirements

N/A

Non-standard entry criteria
(e.g. industry experience)

According to the Regulations for Glyndŵr University: 'Taught Masters Degrees', it is possible for a non-graduate to be admitted to candidature provided that:

• he/she has a non-graduate qualification which Glyndŵr University has deemed to be of a satisfactory standard for the purpose of post graduate admission,
and
• he/she has held, for a minimum of two years, a responsible position which is relevant to the programme to be pursued within the previous five years.'
Irrespective of a candidate's entry qualifications, the student must provide evidence to the satisfaction of the interview panel of his/her ability to complete academic work of the required standard to complete successfully the scheme of study proposed.

13 Recognition of Prior (Experiential) Learning

Applicants may enter the programme at various points with Recognition of Prior Learning (RPL) or Recognition of Prior Experiential learning (RPEL) in accordance with the University General Regulations. Any programme specific restrictions are outlined below.

Programme specific requirements

N/A

14 Aims of the programme

The key aim of the programmes is to develop the intellectual and application skills of individuals by means of personal management, knowledge acquisition, complex problem analysis, critical evaluation, deductive skills, synthesis and evaluation of solutions, and including an awareness of social and environmental implications, in preparation for:

- Entrepreneurial success in the growing Unmanned Aircraft System (UAS) industry sector.
- A career in the design, manufacture or maintenance of UAS.
- The application of UAS technology to specialist scientific, research and data gathering missions.

The programme provides the breadth of learning, skills and attitudes for candidates to meet the future needs of rapidly changing technology and business environments.

15 Distinctive features of the programme

The MSc in Unmanned Aircraft System Technology is designed to equip practitioners of the future with the in-depth knowledge required to safely and legally design, manufacture and operate SUA (up to 20kg MTOM) here in the UK.

Small Unmanned Aircraft (SUA) which are more commonly referred to as “Drones”, are being used for civil purposes in a growth business sector predicted to be worth billions of pounds over the next 10 years. UAS are currently revolutionising everything from agriculture to film-making and are increasingly being used to monitor, research and conduct data gathering missions in surveying, mining, forestry, ecology, archaeology virtual reality and computer gaming. This degree is intended to address the looming skills shortage in this field and is ideal for workplace professionals wishing to pursue an interesting and relevant course to enhance their career development.

This is a practical, hands-on course in which the candidate will get to build and fly a drone. An engineering degree qualification is not necessary to enrol on this course. Scientists and practitioners across all disciplines who wish to adapt drone technology to their field of study and people from any industry, employed or self-employed, are eligible and encouraged to join the course. For example, in agriculture, drones can be used to assess crops and yields. This can be achieved by understanding the technologies behind the drone and then adapting it for a specific purpose. The course is not so much about training people to become pilots, it’s about providing the skills to extract and process data in a whole range of subject areas.

The candidate will learn the legal and safety aspects of advanced drone operations and also plan missions and conduct actual operations in the field. Flight tuition will be provided by our Civil Aviation Authority (CAA) qualified staff using our drone simulator and also out on our dedicated flight-test field.

16 Programme structure narrative

The programmes will be delivered on a full and part time basis. The duration of the MSc Degrees will normally be one year (FT) and two and a half years (PT), all at level 7. Part One is the taught part of the course and consists of 120 credits, made up of 20 credit modules. Part Two is the Dissertation and is a further 60 credit module.

Full-time Mode (September Intake)

The taught element, Part One, of the programme will be delivered in two 12 week trimesters and each trimester has a loading of 60 credits. The six taught modules will have lectures and tutorials/practical work on a weekly basis. The module duration will be a total of 200 hours, which includes 40 hours of scheduled learning and teaching hours and 160 independent study hours. Part Two will then take a further 15 weeks having a notional study time of 600 hours. During this time the student will be responsible for managing his/her time in consultation with an academic supervisor.

Part-time Mode

The taught element, Part One, of the programmes will be delivered in two academic teaching years. 80 credits or equivalent worth of modules will be delivered in the first year and 40 credits or equivalent in the second year. The part time students would join the full time delivery with lectures and tutorials/practical work during one day on a weekly basis. The dissertation element (i.e. Part Two) will start in trimester 2 of the second year taking a further 30 weeks having a total notional study time of 600 hours.

During this time the student will be responsible for managing his/her time in consultation with an academic supervisor.

The MSc in Unmanned Aircraft System Technology has a single entry point in September for both full and part time students.

The following exit awards are available to students who achieve the following;

Post Graduate Diploma (PG Dip) requires the achievement of 120 credits taught at level 7 and will be awarded with a Post Graduate Diploma in Unmanned Aircraft System Technology

Post Graduate Certificate (PG Cert) requires the achievement of any combination of modules amounting to 60 credits across any programme and will be awarded with the following generic title of Post Graduate Certificate in Engineering.

Part one of the Unmanned Aircraft System programme consists of two 20-credit common taught modules and four 20-credit specialist modules. Part One must have been completed successfully before the students can formally progress to Part Two, the MSc dissertation.

17 Programme structure diagrams

MSc Unmanned Aircraft System (UAS) Technology (full time)

Semester 1	Mod title	Engineering Research Methods and PG Studies	Mod title	Engineering Design & Innovation	Mod title	UAS Technology and Applications
	Mod code	ENG740	Mod code	ENG765	Mod code	ENG772
	New/Existing	Existing	New/Existing	Existing	New/Existing	New
	Credit value	20	Credit value	20	Credit value	20
	Core/Option	Core	Core/Option	Core	Core/Option	Core
	Mod leader	S. Monir	Mod leader	D. Sprake	Mod leader	R. Bolam
Semester 2	Mod title	UAV Construction	Mod title	UAS Operations and the Law	Mod title	UAS Sensor Technology
	Mod code	ENG763	Mod code	ENG762	Mod code	ENG764
	New/Existing	New	New/Existing	New	New/Existing	New
	Credit value	20	Credit value	20	Credit value	20
	Core/Option	Core	Core/Option	Core	Core/Option	Core
	Mod leader	R. Bolam	Mod leader	R. Bolam	Mod leader	R. Bolam
Summer period	Mod title	Dissertation	Mod title		Mod title	
	Mod code	ENGM66	Mod code		Mod code	
	New/Existing	Existing	New/Existing		New/Existing	
	Credit value	60	Credit value		Credit value	
	Core/Option	Core	Core/Option		Core/Option	
	Mod leader	S. Monir	Mod leader		Mod leader	

MSc Unmanned Aircraft System (UAS) Technology (part time)

Year 1

Semester 1	Mod title	Engineering Design and Innovation	Mod title	UAS Technology and Applications	Mod title	
	Mod code	ENG765	Mod code	ENG772	Mod code	
	New/Existing	Existing	New/Existing	New	New/Existing	
	Credit value	20	Credit value	20	Credit value	
	Core/Option	Core	Core/Option	Core	Core/Option	
	Mod leader	D.Sprake	Mod leader	R.Bolam	Mod leader	

Semester 2	Mod title	UAV Construction	Mod title	UAS Operations and the Law	Mod title	
	Mod code	ENG763	Mod code	ENG762	Mod code	
	New/Existing	New	New/Existing	New	New/Existing	
	Credit value	20	Credit value	20	Credit value	
	Core/Option	Core	Core/Option	Core	Core/Option	
	Mod leader	R.Bolam	Mod leader	R.Bolam	Mod leader	
Summer period	Mod title		Mod title		Mod title	
	Mod code		Mod code		Mod code	
	New/Existing		New/Existing		New/Existing	
	Credit value		Credit value		Credit value	
	Core/Option		Core/Option		Core/Option	
	Mod leader		Mod leader		Mod leader	

Year 2

Semester 1	Mod title	Engineering Research Methods and PG Studies	Mod title		Mod title	
	Mod code	ENG740	Mod code		Mod code	
	New/Existing	Existing	New/Existing		New/Existing	
	Credit value	20	Credit value		Credit value	
	Core/Option	Core	Core/Option		Core/Option	
	Mod leader	S.Monir	Mod leader		Mod leader	
Semester 2	Mod title	UAS Sensor Technology	Mod title	Dissertation	Mod title	
	Mod code	ENG764	Mod code	ENGM66	Mod code	
	New/Existing	New	New/Existing	Existing	New/Existing	
	Credit value	20	Credit value	60	Credit value	
	Core/Option	Core	Core/Option	Core	Core/Option	
	Mod leader	R.Bolam	Mod leader	S.Monir	Mod leader	
Summer period	Mod title	Dissertation (continued)	Mod title		Mod title	
	Mod code	ENGM66	Mod code		Mod code	
	New/Existing	Existing	New/Existing		New/Existing	
	Credit value	60	Credit value		Credit value	
	Core/Option	Core	Core/Option		Core/Option	
	Mod leader	S.Monir	Mod leader		Mod leader	

18 Intended learning outcomes of the programme

	Knowledge and understanding		
	Post Graduate Certificate	Post Graduate Diploma	Masters
A1	Understand complex mathematical principles relevant to advanced concepts.	Understand complex mathematical principles relevant to advanced concepts.	Understand complex mathematical principles relevant to advanced concepts.
A2	Apply theoretical principles and application techniques.	Apply theoretical principles and application techniques.	Apply theoretical principles and application techniques.
A3	Practise the range of methodologies and computer tools available for analysis and design.	Practise the range of methodologies and computer tools available for analysis and design.	Practise the range of methodologies and computer tools available for analysis and design.
A4			Present an in depth understanding for the role of an engineer manager for himself/herself and others
A5		Explore current unmanned aircraft system (UAS) technology problems, being treated in a critical and evaluative manner.	Explore current unmanned aircraft system (UAS) technology problems, being treated in a critical and evaluative manner.
A6			Conduct research in recent unmanned aircraft system developments and the context in which UAS technology is applied.

	Intellectual skills		
	Post Graduate Certificate	Post Graduate Diploma	Masters
B1	Apply advanced engineering principles to the solution of design and operation problems and the investigation of new and emerging technologies.	Apply advanced engineering principles to the solution of design and operation problems and the investigation of new and emerging technologies.	Apply advanced engineering principles to the solution of design and operation problems and the investigation of new and emerging technologies.
B2	Make sound decisions in complex and unpredictable situations, both familiar and unfamiliar.	Make sound decisions in complex and unpredictable situations, both familiar and unfamiliar.	Make sound decisions in complex and unpredictable situations, both familiar and unfamiliar.
B3	Analyse complex engineering issues in both a systematic and a creative way.	Analyse complex engineering issues in both a systematic and a creative way.	Analyse complex engineering issues in both a systematic and a creative way.

B4		Evaluate data sources and make sound judgements in the absence of complete data.	Evaluate data sources and make sound judgements in the absence of complete data.
B5			Plan, conduct and report on an original programme of work (dissertation)
			Apply planning and management techniques, with an evaluation of commercial financial implications, in the conduct and management of an unmanned aircraft system project.

Subject skills			
	Post Graduate Certificate	Post Graduate Diploma	Masters
C1	Demonstrate self-direction and originality in tackling and solving systems problems.	Demonstrate self-direction and originality in tackling and solving systems problems.	Demonstrate self-direction and originality in tackling and solving systems problems.
C2	Plan and implement experimental design and evaluative testing.	Plan and implement experimental design and evaluative testing.	Plan and implement experimental design and evaluative testing.
C3		Specify and use laboratory and workshop equipment competently and safely.	Specify and use laboratory and workshop equipment competently and safely.
C4			Prepare in-depth reports at a professional level.

Practical, professional and employability skills			
	Post Graduate Certificate	Post Graduate Diploma	Masters
D1	Exercise initiative and personal responsibility.	Exercise initiative and personal responsibility.	Exercise initiative and personal responsibility.
D2	Communicate clearly to specialist and non-specialist audiences.	Communicate clearly to specialist and non-specialist audiences.	Communicate clearly to specialist and non-specialist audiences.
D3	Select and apply mathematical methodologies in the interpretation of problems and evaluation of solutions.	Select and apply mathematical methodologies in the interpretation of problems and evaluation of solutions.	Select and apply mathematical methodologies in the interpretation of problems and evaluation of solutions.
D4	Exercise judgement in the use of information technology - to source information and to model performance	Exercise judgement in the use of information technology - to source information and to model performance using	Exercise judgement in the use of information technology - to source information and to model performance using specialised software

	using specialised software packages, with awareness of the limitations computer models.	specialised software packages, with awareness of the limitations computer models.	packages, with awareness of the limitations computer models.
D5			Apply the independent learning ability required for continuing professional development.

19 Curriculum matrix

	Module Title	Core or option?	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	D1	D2	D3	D4	D5
Level 7	Engineering Research Methods & PG Studies	Core	☐	■	■	■	■	■	☐	■	☐	■	■	■	■	■	■	☐	■	☐	■	☐	☐
	Sustainable Design & Innovation	Core	☐	■	☐	■	■	■	■	☐	☐	■	☐	■	■	■	■	☐	■	☐	☐	■	■
	UAS Technology & Applications	Core	■	■	■	■	■	■	■	■	■	☐	☐	■	■	■	■	■	■	■	■	■	■
	UAV Construction	Core	■	■	■	■	☐	■	■	■	■	■	☐	■	☐	■	■	■	■	■	■	■	■
	UAS Operations and the Law	Core	■	■	■	■	☐	■	■	■	■	■	☐	■	■	■	■	■	■	■	■	☐	■
	UAS Sensor Technology	Core	■	■	■	■	☐	■	■	☐	■	■	☐	■	☐	■	■	■	■	■	■	■	■
	Dissertation	Core	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

MSc Engineering programmes - summary of Accreditation of Higher Education Programmes learning outcomes by module

MSc in Engineering: **MSc in Engineering (Aeronautical)** **MSc in Engineering (Mechanical Manufacturing)** **MSc in Engineering (Automotive)** **MSc in Engineering (Composite Materials)** **MSc in Engineering (Renewable & Sustainable Energy)** **MSc in Engineering (Electrical & Electronic)** **MSc in Engineering (Mechatronics)** **MSc Unmanned Aircraft Systems Technology**		ENG740 Engineering Research Methods & PG Studies	ENG7XX Engineering Design & Innovation	ENG741 Engineering Systems Modelling & Simulation	ENGM66 Dissertation	ENG742 Advanced & Composite Materials	ENG7XX Advanced Control Engineering and Systems Analysis	ENG7XX Structural Integrity & Operations	ENG7XX Power Electronics, Drive and Energy Systems	ENG7XX Circuit Design and Electronic Testing	ENG7XX Applied Aerodynamics & Flight Mechanics	ENG7XX Industry 4.0 Manufacture and Production	ENG7XX Advanced Automotive Chassis, Engine, Powertrain and Control	ENG757 Design with Composites	ENG758 Assembly and Repair of Composites	ENG7XX Analysis of Renewable and Sustainable Systems	ENG753 Mechatronics System Design
Science and Mathematics (SM)																	
SM7M	A comprehensive understanding of the relevant scientific principles of the specialisation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	
SM8M	A critical awareness of current problems and/or new insights most of which is at, or informed by, the forefront of the specialisation	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SM9M	Understanding of concepts relevant to the discipline, some from outside engineering, and the ability to evaluate them critically and to apply them effectively, including in engineering projects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Engineering Analysis (EA)																	
EA6M	Ability both to apply appropriate engineering analysis methods for solving complex problems in engineering and to assess their limitations	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

EA5m	Ability to use fundamental knowledge to investigate new and emerging technologies	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
EA7M	Ability to collect and analyse research data and to use appropriate engineering analysis tools in tackling unfamiliar problems, such as those with uncertain or incomplete data or specifications, by the appropriate innovation, use or adaptation of engineering analytical methods	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Design (D)																	
D9M	Knowledge, understanding and skills to work with information that may be incomplete or uncertain, quantify the effect of this on the design and, where appropriate, use theory or experimental research to mitigate deficiencies	✓		✓	✓			✓	✓					✓			✓
D10M	Knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓			✓
D11M	Ability to generate an innovative design for products, systems, components or processes to fulfil new needs	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓		✓	✓
Economic, legal, social, ethical and environmental context (EL)																	
EL8M	Awareness of the need for a high level of professional and ethical conduct in engineering	✓	✓		✓	✓					✓			✓	✓	✓	
EL9M	Awareness that engineers need to take account of the commercial and social contexts in which they operate	✓	✓		✓						✓					✓	
EL10M	Knowledge and understanding of management and business practices, their limitations, and how these may be applied	✓	✓		✓							✓				✓	

	in the context of the particular specialisation															
EL11M	Awareness that engineering activities should promote sustainable development and ability to apply quantitative techniques where appropriate	✓	✓		✓					✓					✓	
EL12M	Awareness of relevant regulatory requirements governing engineering activities in the context of the particular specialisation	✓	✓		✓					✓	✓				✓	
EL13M	Awareness of and ability to make general evaluations of risk issues in the context of the particular specialisation, including health & safety, environmental and commercial risk	✓	✓		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓
Engineering Practice (P)																
P12M	Advanced level knowledge and understanding of a wide range of engineering materials and components			✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓
P9m	A thorough understanding of current practice and its limitations, and some appreciation of likely new developments	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
P10m	Ability to apply engineering techniques, taking account of a range of commercial and industrial constraints	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
P11m	Understanding of different roles within an engineering team and the ability to exercise initiative and personal responsibility, which may be as a team member or leader	✓	✓		✓												
Additional general skills (G)																
G1	Apply their skills in problem solving, communication, information retrieval,	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

	working with others, and the effective use of general IT facilities																
G2	Plan self-learning and improve performance, as the foundation for lifelong learning/CPD	✓	✓		✓												
G3m	Monitor and adjust a personal programme of work on an on-going basis	✓	✓		✓												
G4	Exercise initiative and personal responsibility, which may be as a team member or leader	✓	✓		✓												

20 Learning and teaching strategy

The learning and teaching strategy has been developed within Glyndŵr University's Teaching and Learning Framework, the QAA Subject Benchmark statement for Engineering (2015) and the QCA (Qualifications and Curriculum Authority). Although the benchmark statement applies to undergraduate programmes it was also referred to and built on in the development of these post graduate programmes.

The team recognises that the learning and teaching strategy should reflect the different requirements of the students. In order to achieve this the team have agreed the following strategy:

1. To ensure that the teaching methods adopted for classroom and related activity are planned to ensure that tutors use a range of examples, reflecting the diversity of experiences when explaining the application of theory to practise.

2. To ensure that group discussions, case study / problem solving activity relate to and reflect the different aspects of practice represented within the classroom.

3. Where guest lecturers are used, they will be briefed by the module tutor to ensure that they are aware of the student profile and that the proposed presentation accommodates this.

4. Students will be supported by tutorial discussions between the tutor and student to ensure that the proposed learning reflects the practice needs of the student.

5. To ensure that the assessment strategy and methods of assessment are sufficiently flexible to enable students to apply and demonstrate their learning in a context which is relevant to them.

The learning and teaching methods adopted reflect the QAA Master's degree characteristics descriptors in the following ways:

- Lectures are used to impart key information and show case new ways of working which will enable students to develop a sound understanding of the principles of their field of study as well as identifying new ways of working.
- Case studies, role plays and group working will be used to facilitate application of the principles more widely. They will also be used to prompt discussion and Practise problem solving skills. This will also allow students to evaluate the appropriateness of different approaches to solving problems.
- The use of portfolios facilitates reflection on the qualities necessary for employment, requiring the exercise of personal responsibility and decision making. Additionally they will allow students to identify the limits of their knowledge and skills and identify strategies for development.
- Assessments are used to facilitate learning as well as providing an indication of student achievement.

The programme team has developed a strategic approach to delivering learning and teaching which meets the needs of the student group, enables skills development, allows for the practical application of knowledge and encourages students to become reflective and critically evaluative practitioners. The balance between face-to-face lectures and directed study is detailed within the module specifications. Students will be encouraged, through classroom activities and assessments, to reflect on both their own and organisational behaviour in order to improve their performance as well as

giving them the knowledge and confidence to contribute towards the development of their organisational performance.

Learning and Teaching are activities which operate at different levels simultaneously. To the student the immediate activity relates to the explicit topics being studied. However, transferable skills are also inherent in order for the student to both carry out the tasks and to develop. These elements are built into the modules comprising the programme as what might be called embedded issues. Other embedded issues, such as awareness of environmental impact, sustainability and commercial implications are also integrated in modules throughout the programme.

Knowledge and Understanding
Acquisition of knowledge is by means of lectures, practical and laboratory-based exercises, investigative exercises involving searching of various sources, directed reading and further reading. Pre-written notes will have a role in supporting these activities. Understanding is developed through tutorials, discussion, evaluation exercises and individual exercise sheets.

Intellectual Skills
These skills are developed by the students undertaking individual activities, within tutorials and practical sessions, or by being required to contribute to group activities. In each case, throughout the course a range of problems are set requiring the student to carry out information searches, analysis, design formulation, synthesis, test definition, modelling (software based), a methodology or by calculation. Reflective self-evaluation forms part of this. Critical evaluation is encouraged via debate and discussion in the tutorials.

Key Skills
Key skills include: communication skills, ability to work in a group or on one's own, management of time, use of computers and other technology, the application of calculations (the discipline of regularly attending and contributing to classes exercises the transferable skills of self-management and time management). Each module specification provides examples of transferable skills covered within its learning outcomes. Beyond this most modules require performance in several skill areas including self-management, communication and use of computer packages. All of these are monitored by the module tutors and feedback given.

VLE (Virtual Learning Environment)
Extensive use is made of Glyndŵr University's VLE, Moodle, to enhance the learning experience.

Moodle is used by staff to provide information about the courses and individual modules, and also as a repository of lecture notes and links to other sources of information.

21 Work based/placement learning statement

There are no placements on these programmes.

22 Welsh medium provision

Students are entitled to submit assessments in the medium of Welsh. Where a need for Welsh medium assessment has been identified and no appropriate Welsh speaking

tutor/assessor is available, the written assessment will be translated into English. This translation will be conducted by University qualified translators.

23 Assessment strategy

The programme provides opportunities for formative, diagnostic and summative feedback. The assessment methods used reflect the needs of the student group and allows for the knowledge and learning outcomes of the programme to be tested as well as allowing for the development and assessment of practical and transferable skills.

Where assessed group work is undertaken, students will be expected, through the production of meeting notes and action plans, to demonstrate that they have contributed equally to the task. This element of personal contribution will determine the individual's overall module assessment. i.e. not all students within a group should expect the same mark.

Assessment Methods

Formal Written Examinations
These have been defined as being at a maximum length of 3 hours for a module which has no assignment element. The examinations are formally defined and centrally conducted via Glyndŵr University's Assessment Office.

Coursework
This is a single task given to the student in the form of a 'brief' defining the assignment requirements at or near the beginning of the module. This may require the student to carry out investigations and literature searches in their own time and under their own initiative or it may require independent problem solving based on work covered in the lectures/tutorials. The work is normally required in the form of a formal report submitted by a given deadline. Sometimes a presentation, either individually or as a group forms part of the assessment.

Portfolio
This is a term referring to a collection of small, and perhaps diverse, exercises whose individual marks are brought together in a single folder to form a single in-course mark. Examples are where a series of laboratory exercises form part of the module. Feedback is given after each exercise (called formative assessment) so that a student is aware of progress made on an on-going basis.

Continuous Assessment
Some modules use continuous assessment whereby a set of progressive exercises are used to build up to the achievement of a major task. Each exercise is given a mark (called summative assessment) and feedback given, usually during class, in order to help with the next stage. The final mark is a combination of these marks. It is also the preferred method of assessment for the project, as the student project develops there are interim points for assessment which are inclusive of VLE quizzes, presentations, log books, and staged formal reports. The feedback to the student is thus also continuous and assists the students to achieve their potential.

Case Study
For some modules, a case study might be the most appropriate form of assessment whereby the student would investigate a particular scenario, software programme or an instrumentation system. They would analyse the 'subject' and convey their critical opinions, this could be verbally (oral presentation) or a short report. Frequently the

student is given three or four scenarios to consider simultaneously, thereby enabling comparison of advantages and disadvantages.

Feedback to students

Formative assessment is essential to learning in its aim is to give appropriate and timely feedback to students on their learning, and to help them to improve their future work.

Feedback, both formal and informal is given to students throughout the programme. Feedback may be verbal, given during tutorials or lab exercises, where both student and lecturer can identify problems and steps can be taken to improve future work. Feedback is presented as part of a continuous assessment plan, such as the development of Journals or Learning Logs; this may be verbal or written feedback, or it may be formal written feedback, as in the case of assignment marking with comments.

It should be noted that much of the feedback, not only identifies problems along with suitable guidance, but also highlights the student's achievements. This approach usually works better than simply "must try harder".

In some cases 'progressive feedback' is the most suitable approach, particularly when there are many problems with an individual student's work. i.e. do not try to mend everything all at once, as this can lead to the student becoming demoralised, but rather work on the most important aspects first, whilst introducing other improvements later.

The following diagram provides an overview of module assessments and indicative submission dates.

Module title	Assessment type and weighting	Assessment loading	Indicative submission date
ENG740 Engineering Research Methods & PG Studies	*50% Report* *50% Research Proposal*	*2,500 words* *2,500 words*	*Wks 16-21 Tri 1*
ENG765 Engineering Design & Innovation	*50 %Group Project* *25% Reflective Practice* *25% Presentation*	*2,500 words* *1,500 words* *5 mins*	*Wks 10-20 Tri 1*
ENG772 UAS Technology & Applications	*50% Coursework* *50% Report*	*2,500 words* *2,500 words*	*Wks 20-25 Tri 1*
ENG763 UAV Construction *Version 2*	*50% Learning Logs/Journals* *50% Practical*	*2,500 words* *1 hour, 1000 words*	*Wks, 27 -40, Tri 2*
ENG762 UAS Operations and the Law *Version 2*	*Examination 50%* *50% Essay*	*2 hrs* *2,500 words*	*Wk 33-34, & 40-42, Tri 2*

ENG764 UAS Sensor Technology *Version 2*	*Examination 50%* *Essay 50%:*	*2 hours* *2,500 words*	*Wk 42, Tri 2* *Wk 36-37*
ENGM66 Dissertation	*20% Presentation* *80% Dissertation*	*20 mins* *15,000 words*	*Wk 4, Tri 3*

24 Assessment regulations

The regulations for Taught Masters programmes apply to these programmes.

Derogations

Derogation 1
For Engineering Masters degrees, 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.

Restrictions for trailing modules (for taught masters programmes only)

A student may progress to Part Two when 120 credits have been studied and at least 100 credits have been passed and the referred module is eligible to be trailed, apart from ENG740 Engineering Research Methods and Postgraduate Studies module which is not eligible to be trailed.

25 Programme Management

The programmes will be managed under the auspices of the school of Applied Science, Computing and Engineering and the programmes will develop and operate within the terms of the overall management of curriculum within the school. The designated Programme Leaders for the proposed MSc programmes will be responsible for the day-to-day running of the programme, including the following:

- The management and development of curriculum and the course portfolio,
- Student tracking and student records
- Collation of assessment data, presentation of data at assessment boards
- Management/co-ordination of overall assessment activities across the programmes
- Liaison with external bodies and agencies,
- Quality assurance and annual monitoring, including compilation of the Annual Monitoring Report
- Co-ordination of admissions activities and other recruitment activities, including relevant publicity activities
- The programme leaders are responsible for preparing the Annual Monitoring Report on the MSc Engineering provision.

The module leader takes responsibility for the following:

- The maintenance and development of teaching and learning materials for all students enrolled on the module,
- The publishing and updating of module timetables,
- The setting, marking and collation of marks for all module assessments and examination papers, including resit assessments, and submission of student results to the Programme Leader
- Tutorial support for students taking the module which they are responsible
- Quality monitoring, including processing of annual student feedback questionnaires and, where appropriate, student feedback for individual modules

The programme team meeting

The Programme team meeting is held regularly, consisting of the staff from the teaching team, the programme leader, student representatives, invited representatives of other departments (such as Learning Resources and Information Services) and the Head of School. Colleagues from Industry will also be invited where appropriate. Programme team meetings will take place at least three times per year and will respond to the on-going needs of the programmes as they arise, reporting directly to the Subject, School and University management when appropriate.

Programme monitoring and review

Programme monitoring and review is taken very seriously. It is an on-going process which involves everyone concerned with the programme as well as others within the Subject, Academic Registry, members of the Learning and Teaching Quality Committee (LTQC) and student feedback (e.g. module evaluation and Student Voice Forums). In practice, the Programme Leader and teaching team will monitor the day-to-day operation with input as necessary from student representatives.

The Student Voice Forum (SVF) is a student-staff consultative meeting. Student representatives, who are elected by the students, meet lecturing staff on the programme once a trimester to exchange ideas about the programme. This allows students to communicate their shared concerns, and for the staff to react and respond speedily to address their concerns.

Prior to the SVF meeting an agenda is set and distributed to all participants. The meeting held with the students is minuted and actioned accordingly. Copies of the minutes are uploaded to Moodle and given to the student representatives to disseminate the information back to the group. The points arising at SVF are then discussed at the programme team meeting with the Head of School present. If the raised issues cannot be resolved at this level, it will be referred to other meetings such as Engineering Team meetings. The students representatives will be provided with the written feedback at any stage of the discussion of the issues have to be solved.

In line with the University's QA systems and procedures an annual monitoring report (AMR) will be prepared by the Programme Leaders in November of each academic year and formally discussed and presented to the Subject Team at a meeting which takes place during November/December before it is considered by the School board in Nov/Dec as part of the annual monitoring and review processes (AMR). The AMR will include performance of modules as well as overall programme performance using indicators such as mean, standard deviation, retention data and feedback from students and staff.

There is also staff monitoring and review which is external to the programme which is based on the principles of peer observation and this is fed into the appraisal process to support individual staff development plans.

Programme leaders

Mr. Robert Bolam

Programme team

Mr. David Sprake	Module leader
Mr. Shafiul Monir	Module leader

Quality management

Each module will be assigned to a named module leader who will take responsibility for the delivery of the learning, teaching and assessment of the module. In keeping with the policies and procedures agreed by the University, the key mechanism for quality control and enhancement at programme level will be the processes and procedures associated with the annual monitoring cycle which is formalised through the production of the Annual Monitoring Report (AMR). The AMR evaluates the programme delivery drawing on feedback from students, the professional body, external examiners and employers. Specific methods used for consulting students include the completion of Module Evaluation Questionnaires, Student Voice Forums and end of year group feedback sessions. The outcomes of the AMR are scrutinised and agreed at Programme Level with subsequent monitoring and review being formalised though the School Board and the Learning and Teaching Quality Committee.

Feedback will be provided to students in the following ways:

- Minutes and responses to Student Voice Forum (SVF) will be posted on the VLE.
- External Examiner reports and any associated actions arising will be presented to students in the November SVF.
- An overview of the draft AMR and associated actions will be presented to the SVF in November.
- An update on achievement of AMR Action plans will be provided in the March SVF.

The Programme team meet monthly in order to monitor programme performance. Issues discussed include recruitment and retention, student feedback, assessment calendars, approaches to teaching and learning, coordination of site visits and guest lecture plans. Peer observation is undertaken; this includes classroom based observation as well as peer review of marking, assessment and feedback.

Whilst the Programme Leader is responsible for day to day management of the programme, Personal Tutors will ensure the welfare and development of each student on the programme throughout their period of study.

Feedback from students
Student Representatives will be elected from the student group, and will attend the SVF meetings to provide a student input. The representative will also be able to bring urgent matters to the Programme Leader's attention by a direct approach.

Open Door Policy

Staff operates an open door policy, whereby students may 'pop in' to have a chat about anything they may be concerned about, or need some help with. The feedback from the students, indicate that this is the most useful method of communicating and usually resolves any issues immediately.

Whilst the Programme Leader is responsible for day to day management of the programme, Personal Tutors will ensure the welfare and development of each student on the programme throughout their period of study.

Research and scholarship activity

The team are committed to ensuring that their knowledge remains current and relevant to changing practice. Additionally they ensure that they reflect on and develop their teaching practice through engagement teaching related CPD. The section below provides a brief outline of activities undertaken across the team.

Academic Research
The University Research Centre for Applied Science, Engineering and Computing brings together several strands of inter-related research of national and international standing. Key themes are Materials and Manufacturing (including advanced composites, large scale precision optics, Unmanned Aerial Vehicle optical sensor development, water soluble polymers and photovoltaics), Internet technologies and Communication, and Engineering (fluid dynamics).

The 2014 Research Excellence Framework (REF) deemed more than 90 per cent of Glyndŵr University's electrical engineering, materials and computer science research assessed in a new survey is of international significance.

The Centre's focus is on applied research producing results which can be applied in a wide range of industry sectors.

Staff and research students are based at the University's main Plas Coch Campus in Wrexham, and at the specialist facilities in St Asaph (hosting large scale precision optics and Photovoltaic Research) and Broughton (hosting the Advanced Composite Materials Research).

Research groups with a focus on specific issues include:

- Advanced Composite Training and Development Centre
- Analytical Decision Making Research Group (ADM)
- Centre for Water Soluble Polymers (CWSP)
- Computational Mechanics, Manufacturing simulation, Design and Optimisation Group (CoMManDO)
- National Facility for Ultra Precision Surfaces
- Centre for Ultra-realistic Imaging (CURI)

The recent research undertaken by the School of Applied Science, Computing and Engineering in the area of automation and industrial engineering includes:

PCB Function Testing: investigation and development of automated test equipment for PCB functional testing. Functional PCB test beds have been developed, tested and integrated into manufacturing process of electric drive control systems.

Induction Motor Diagnostics using DSP: research has recently been completed on induction motor diagnostics, the outcome of the research is a method of DSP analysis of induction motor input currents to detect broken bars of the squirrel cage rotor winding. The proposed method has been successfully verified through a number of laboratory tests and is ready for industrial implementation to monitor the induction motor performance.

Electric Drive Inverter: an investigation and analysis of power electronic invertors for electric drives operating under random pulse width modulation. Implementation of random based control algorithm flats the spectrum density of the invertor output ac voltage and decreases the level of acoustic noise in an induction motor.

Non Linear Processes with dead time: within industrial process control pH can be one of the most challenging parameters to successfully control with conventional proportional plus integral plus derivative (PID) controllers. PID algorithm being unable to successfully cope with the pH's highly non-linear gain and long dead times. Implementing predictive control schemes using mathematical models of the process, incorporating dead time and gain compensation using fuzzy logic and artificial neural networks has been implemented on a 400 Ml/d Water Treatment Works which has providing a robust control system with optimal system response.

Industrial Consultancy and KTPs (Knowledge Transfer Partnerships)
Several members of staff have direct links with individual industries. Many of these have been a consequence of past students obtaining positions of influence. These have resulted in a range of involvements including:

- Individual consultancy to solve specific problems
- Utilising government-funded KTPs to develop longer-term projects
- Production of undergraduate and post graduate student projects

Examples of these activities are:
Use of the Materials Laboratory to investigate failure of components due to corrosion; which although was completed previously, still has relevant information that has been used to inform the Plant Equipment Fundamentals module.

A KTP project aimed at optimising control systems used in water treatment processes for a major utilities supplier has provided real data and insight into real control problems. This has contributed toward the development of the Diagnostics & Testing and Instrumentation & Control modules.

Attendance at seminars and professional training courses
All lecturers are expected to undertake 'scholarly activities' as part of their professional role and this may include research or other activities such as CPD (continuing professional development). Within this each staff member is expected to maintain the currency of knowledge and developments within his/her subject area. To do this, staff is encouraged to attend seminars or to attend training courses. The form of these varies from one-day manufacturers' courses, through short courses to full academic courses, and even study for further degrees.

Information from the IET Power Electronics, Machines and Drives conference has helped inform the content of the Electrical Power Systems and Drives module.
Besides the more measurable forms of scholarly activity, most of the team are involved in day to day activities all of which contribute towards the currency of the curriculum development. This might include reading monthly journals, IET magazines, interesting

internet articles, manufacturers' information and most importantly relevant information from our industrial contacts.

The annual Profibus User Group is attended by team members. This has given an insight into key practical issues arising from the use of digital communications technologies in automated manufacturing and process industry applications. Covering the use of PROFIBUS and PROFINET in key application areas such as pulp & paper, chemical, utilities.

Other External Activity.
ERASMUS participation
Presentation at Conferences

Teaching Related Activity

- External examiners on related programmes
- Assessors on Professional Body Panels
- Engagement in Peer Observation

26 Learning support

Institutional level support for students

The University has a range of departments that offer the support for students as:

- Library & IT Resources
- The Assessment Centre
- Disability Support Team
- Irlen Centre
- Careers Centre and Job Shop
- Zone Enterprise hub
- Chaplaincy
- Counselling & Wellbeing
- Student Funding and Welfare
- International Welfare
- Student Programmes Centre
- Glyndŵr Students' Union

School support for students

All students at Wrexham Glyndŵr University are allocated a Personal Tutor whose main responsibility is to act as the first point of contact for their personal students and to provide pastoral and academic support throughout their studies at the University. It is a vital role to support student engagement and retention, and to help every student to success to the best of his or her ability.

Programme specific support for students

On the individual level, students will be supported in their learning in the following ways:

- Students will have access to the school based specialist resources.
- Students will be provided with a programme handbook which details their programme of study and signposts them to University level support mechanisms, policies and regulations.
- Student academic support needs will be met in the following ways.

i. Individual tutorials with academic tutors to identify individual learning needs and aspirations which will then be monitored throughout the programme.
ii. Following confirmed assessment of learning needs, the team will make reasonable adjustments to assessments in order to reflect the needs of students with support needs.
iii. Tutors will use the VLE as a repository for course material and are actively engaging in developing opportunities to use this to provide feedback to students, promote online discussion and promote a VLE academic community.
iv. Pastoral support will be provided by a named personal tutor who will remain with them for the duration of their study. Should a student wish to change their personal tutor during their period of study this can be accommodated.
v. The University study skills tutor will be available to support and guide students for on-going individual and/or small group support on a self-referral basis throughout the year including the summer period.
vi. Induction programmes will include Study Skills and IT and the VLE.

Each programme will have arrangements in place for a programme student representative. This representative will be invited to attend SVF meetings and where appropriate, relevant Institutional meetings.

27 Equality and Diversity

Glyndŵr University is committed to providing access to all students and promotes equal opportunities in compliance with the Equality Act 2010 legislation. This programme complies fully with the University's Equal Opportunities Policy (http://www.glyndwr.ac.uk/en/AboutGlyndwrUniversity/Governance/TheFile,64499,en.pdf), ensuring that everyone who has the potential to achieve in higher education is given the chance to do so.