PROGRAMME SPECIFICATION

Awarding body	Glyndŵr University
Teaching institution (if different from above)	
Details of accreditation by a professional, statutory or regulatory body (including link to relevant website)	The MSc provision will be applied to be accredited by the following professional bodies: IMechE - http://www.imeche.org/ IET - http://www.theiet.org/ RAeS - http://aerosociety.com/ EI -www.energyinst.org/
What type of accreditation does this programme lead to?	On achieving accreditation, it is intended that the programmes will lead to Chartered Engineer (CEng) status with the IMechE or IET or RAeS or EI (depending on programme studied)
Is accreditation in some way dependent on choices made by students?	No
Final award/s available, eg BSc/DipHe/CertHE	MSc, PG Dip, PG Cert
Award title	MSc / PGD Aeronautical Engineering MSc / PGD Aircraft Design MSc / PGD Mechanical Manufacturing MSc / PGD Aircraft Structure MSc / PGD Renewable Engineering and Sustainable Energy MSc / PGD Electrical Power Engineering MSc / PGD Electronic Engineering MSc / PGD Mechatronics PG Cert Engineering
JACS 3 code	H900
UCAS code (available from Admissions)	N/A
Relevant QAA subject benchmark statement/s	Subject Benchmark Statement Engineering February 2015 http://www.qaa.ac.uk/assuring-standards-and-quality/the-quality-code
Other external and internal reference points used to inform the programme outcomes	*General Regulations* Glyndŵr University Academic Regulations The UK Standard for Professional Engineering Competence (UK-SPEC) Subject Benchmark Statement Engineering February 2015 http://www.qaa.ac.uk/assuring-standards-and-quality/the-quality-code

	The Higher Education Academy https://www.international.heacademy.ac.uk/
Mode/s of study *(p/t, f/t, distance learning)*	Part Time and Full time
Language of study	English
Date at which the programme specification was approved, please include original approval date and dates of any revisions	September 2015

Criteria for admission to the programmes

Normal entry requirements 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, experiences.

In addition to the academic entry requirements, overseas students require a UKVI Approved Secure English Language Test (SELT) achieving an overall score of 6.0 with no component below 5.5. If arranging a test, applicants must ensure they book an 'IELTS for UKVI' test. For further information see: http://takeielts.britishcouncil.org/ielts-ukvi/book-ielts-ukvi. Applicants are asked to note that only an IELTS for UKVI test result will be accepted.

*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 relevant to the scheme to be pursued.'

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.

Aims of the programmes

The programmes aim to facilitate the needs of a range of diverse industries at local, national and international levels, to provide them with potential future employees of th+e highest calibre. The programme has been devised to give students the opportunities to demonstrate their relevant technical expertise, innovation, commitment and sound judgment. Thereby producing students who are Engineering professionals and a sought after asset to future employers.

Distinctive features of the programmes

The MSc Engineering provision is design to be accredited by Professional Bodies in order to provide a Chartered Engineer status. The table below shows the professional bodies expected to be involved in accreditation of the MSc Engineering provision.

MSc Programme	*Accreditation by Professional Bodies*		
MSc Aeronautical Engineering	IET	IMechE	RAS
MSc Aircraft Design	IET	IMechE	RAS
MSc Mechanical Manufacturing	IET	IMechE	
MSc Aircraft Structure	IET	IMechE	RAS
MSc Renewable Engineering and Sustainable Energy	IET	EI	
MSc Electrical Power Engineering	IET	EI	
MSc Electronic Engineering	IET		
MSc Mechatronics	IET		

IET -Institute of Engineering and Technology; IMechE -Institute of Mechanical Engineers;
RAS - Royal Aeronautical Society; EI - Energy Institute

Students can choose to develop their skills in particular aspects through their choice of MSc research project, which would be aligned with one of the *University Research Centre for Applied Science, Engineering and Computing's* specialist research groups.

As for students intended to obtain PG Certificate in Engineering, they can gain this qualification combining any thee modules form different programmes. This feature of the MSc Engineering provision aims the students attending master's study for a short period of time (normally one trimester) in the framework of mobility agreements.

MSc Aeronautical Engineering

Aircraft aerodynamics and flying and handling performances are always the most important and challenging aspects for aircraft designs, particularly with the consideration of advanced materials and advanced aircraft technologies. At Glyndŵr University, the MSc in Aeronautical Engineering will enable candidates to develop a deep understanding and solid skills in aerodynamics and aerodynamic design of aircraft, grasp detailed knowledge and application principles of composite materials and alloys, critically review and assess the

application and practice of advanced materials in modern aircraft, model and critically analyse aircraft flight dynamic behaviour and apply modern control approaches for control-configured aircraft. Candidates will have access to state-of-art Merlin flight simulator for design and testing their own aircraft, will learn and use cutting-edge design, analysis and simulation software: MATLAB/Simulink, CATIA v5, ANSYS, and ABAQUS, and will have access to subsonic and supersonic wind tunnel facilities and rapid prototyping facilities. Glyndŵr University is located nearby to one of the largest aircraft company in the world, Airbus and also has close link with aviation industries, such as Rolls-Royce, Raytheon, Magellan, and Airbus. The MSc in Aeronautical Engineering is to be accredited by Royal Aeronautical Society (RAeS) and the Institution of Mechanical Engineers (IMechE), and provide candidates the required training for registering for Chartered Engineers.

MSc Aircraft Structure & MSc Aircraft Design

In the next 20 years the demand for new passenger and freight aircraft is expected to be over 31,000 units globally. With an industry that is valued at £24Bn to the UK economy it is of paramount importance that Universities continue to equip the next generation of graduates and engineers with the required skills and knowledge to keep the country at the fore of the technology. At Glyndŵr University we are on the door step of one of the largest aircraft manufacturers in the world, Airbus, with a large number of first and second tier suppliers in the locality. Many of the academic staff have industrial experience spanning a broad range of engineering areas and working levels. The programmes are to be accredited by the Engineering Council and many students from previous years are now in jobs at top international companies such as Rolls-Royce, Raytheon, Magellan and Airbus. Aside from major manufacturers, North Wales and North West England have numerous maintenance companies, keeping the UK flying safely and efficiently. With the average life of an aircraft expected to be over 30 years, maintenance and overhaul engineers will continue to be in high demand in the future.

Students can choose between as structures or system design streams with common taught elements of the programme including, advanced materials, design, and stress and fluid dynamics analysis, using state of the art commercial software: CATIA V5, ABAQUS and ANSYS. The MSc in Aircraft structures allows students to learn techniques on how to design aircraft components to ensure airworthiness and to understand the loading that aircraft must be able to withstand. The MSc in Aircraft Design equips students with the required knowledge and understanding of typical aircraft systems their power requirements and how they interface with other on-board and ground based systems.

MSc Mechanical Manufacturing

Government is focusing heavily on boosting the UK manufacturing industry; failure to meet demands for engineering skills could cost the UK £27bn a year. 58% of all new jobs will be STEM related, and the number of those studying for degrees in science, engineering and technology must increase by over 40% on current levels if demands are to be met. Of all STEM skills, those in mechanical and manufacturing engineering are becoming increasingly highly valued. Here at Glyndŵr University, we aim to ensure that the *MSc in Mechanical Manufacturing* comprises fit-for-purpose teaching and research experience to provide a solid background for a career in the engineering and manufacturing industry sector. Many of the academic staff have industrial experience spanning a broad range of engineering areas and working levels. The programme is to be accredited by the Engineering Council and many students from previous years are now in jobs at top international companies such as Rolls-Royce, Siemens, Alstom, and Airbus.

The taught element of the programme includes design, and stress and fluid dynamics analysis, using state of the art commercial software: CATIA V5, ABAQUS and ANSYS. Students can choose to develop their skills in particular aspects through their choice of MSc research project, which would be aligned with one of the *University Research Centre for Applied Science, Engineering and Computing's* specialist research groups.

MSc Renewable Engineering and Sustainable Energy

To meet the 2050 carbon reduction targets to control climate change, member states of the EU have signed legally binding targets to transition from traditional fossil fuel energy sources to renewable and sustainable energies. This MSc programme offers a graduate a chance to access this exciting, dynamic and highly innovative field.

The programme provides an up-to-date overview of all the major renewable energy sources. This includes the engineering skills associated with selecting, designing and installing the apparatus to capture, as well as store, convert and transfer it into useful forms.

The programme also looks at the engineering aspects of clean energy, energy economics and markets. The cost/ benefit/ tariff/risk analysis of renewables is compared with traditional fossil fuel and nuclear energy sources. Socio-economic, energy security and political issues are addressed as well as environmental factors of different energy sources.

The future of renewable energy will rely on innovative forward thinking businesses, politicians, engineers and managers and as such this programme also encourages creativity and entrepreneurship to produce solutions to real world problems.

MSc Electrical Power Engineering

The usage of motor drive systems has grown immensely over the past few years in both industrial and domestic applications. This domination of electric drives is based on recent advances in electric motors, power electronics and control engineering. It has been observed that almost half of the global electrical energy is consumed today by electric motors and electric motion systems.

Modern electric drives are very complex systems comprising new types of electrical machines, power electronics based on fully controlled switches and digital control utilising new strategies and algorithms.

Therefore these advances in the area of electric drives and motion control require engineers to gain new knowledge and skills relevant to these developments. To reflect this demand this programme will focus the students on subjects in system modelling and simulation, control engineering and electrical power systems design and analysis.

Specialisms within this programme feature modern power electronics and drive systems combined with their controlling mechanisms and modelling using MATLAB and state space models.

MSc Electronic Engineering

Electronics is now an important part of many leading edge industries.

In the automotive industry**,** for example electronic engineers are required to design engine control units, dashboard indicators, air-conditioning, safety, braking, and infotainment systems.

Electronic engineers are also involved with signalling and advanced railway control systems, as well as telecoms, for mobile phone applications. There are also many roles for them in the energy industries, for example designing and running complex control systems such as those needed to run the National Grid or to control a nuclear power station.

Electronic engineering graduates are also desired for the fast moving consumer goods industry e.g. development of the latest smart screens and the use of intelligent transducers in both and industrial and a home automation environment.

To prepare students for these fast changing roles, the Electronics programme covers design, modelling and test algorithms for complex electronic assemblies. Analysis of electronic circuit design for both low and high frequencies is an important element of the course content.

Software development is an integral part of a modern Electronic Engineers role and to support this, software tools such as VEE, MULTISIM and MATLAB are used extensively in the course. Consideration of sustainability, compliance with RoHS directives and obsolescence solutions are also considered.

MSc Mechatronics

Mechatronics is a modern fusion of electrical and electronic, mechanical and software engineering.

The interface between electrical and mechanical environments is the role of a Mechatronics engineer. It combines precision engineering, automatic control and real-time computing to produce innovative products, such as smartphones, the manufacture of semiconductors, electron microscopes and medical equipment. Robotic manufacturing processes, automatic vision based and vehicle navigation systems also use Mechatronics principles.

There is increasing industry demand for graduates who can work in this interdisciplinary engineering environment. International companies such as Siemens, Volkswagen, and Micron Semiconductors etc. all recruit graduates with a Mechatronics profile.

To develop Mechatronics graduate skills, the programme covers design and modelling of electromechanical systems such as positioning of robotic arms, pick and place technology using vision, recognition and feedback sensing.

The programme also includes real time control system modelling and embedded systems design, development and implementation. Programming includes both high and low level languages such as Python, C or C++, and VHDL for FPGA applications.

Programme structures and requirements, levels, modules, credits and awards

The programmes have been developed to encompass several divergent engineering routes and devise methods to streamline delivery, thereby greatly improving the efficiency of the department and the available resources. Contrary to diminishing the student experience, the programme team believe the proposed schemes will provide the students with an enriched overall experience, which will broaden their engineering capabilities and develop interdisciplinary skills.

The details relating to each of the routes are expanded later in this document, this section provides an overview of the structure only. The routes allotted to this proposal are:

MSc Aeronautical Engineering
MSc Aircraft Design
MSc Mechanical Manufacturing
MSc Aircraft Structure
MSc Renewable Engineering and Sustainable Energy
MSc Electrical Power Engineering
MSc Electronic Engineering
MSc Mechatronics

With the exception of the Mechatronics route, all of the above routes are replacements for existing individual MSc programmes. However there are no direct mappings as some aspects have been amalgamated within routes/modules, whereas some have been split and incorporate developing technologies. The Mechatronics

route has been developed to satisfy the existing European market requirements and the emerging UK requirements for this specialism.

All of the routes have undergone a rigorous development which has involved input from the University's staff expertise, past and current students, and industry consultation. The University has close links with various related industries, which have contributed to the MSc programmes over several years. Their input, suggestions and indeed requirements have all been carefully considered, which has led to this MSc proposal. The provisions of the MSc programmes are also consistent with the stated requirements of the Engineering Council, in the UK-SPEC standard (The UK Standard for Professional Engineering Competence).

Included in each of the above routes are common modules and specialist modules. The content of the common modules is generic to all, however the application can be made specific to the route. For example, the theory of a theme can be taught which applies to all, with an assignment which should utilise the theory but bias it towards the individual's route.

The following table indicates the modules for each route and illustrates the commonality between the routes.

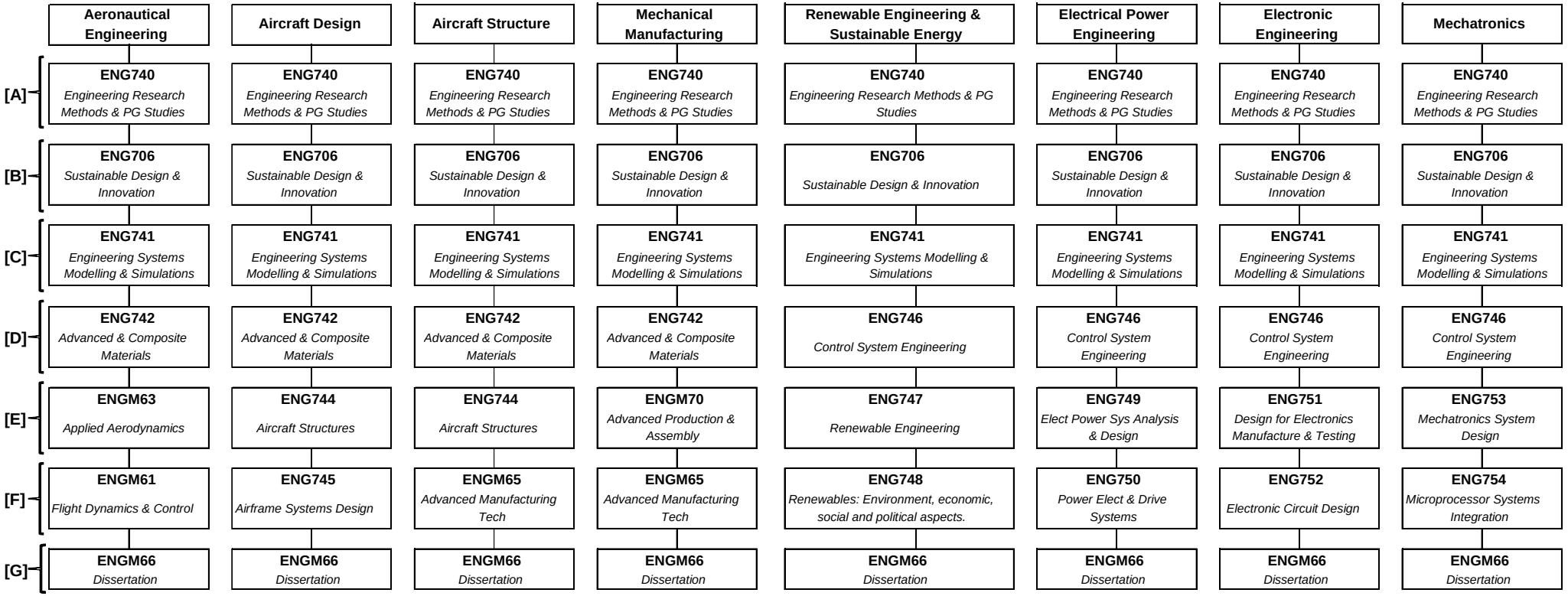

Table 1: MSc programmes structure for individual routes, A to C is common modules & D to F is specialist modules for the selected route. (*The coding A to G is there to illustrate the delivery pattern in Table 2*)

Delivery:

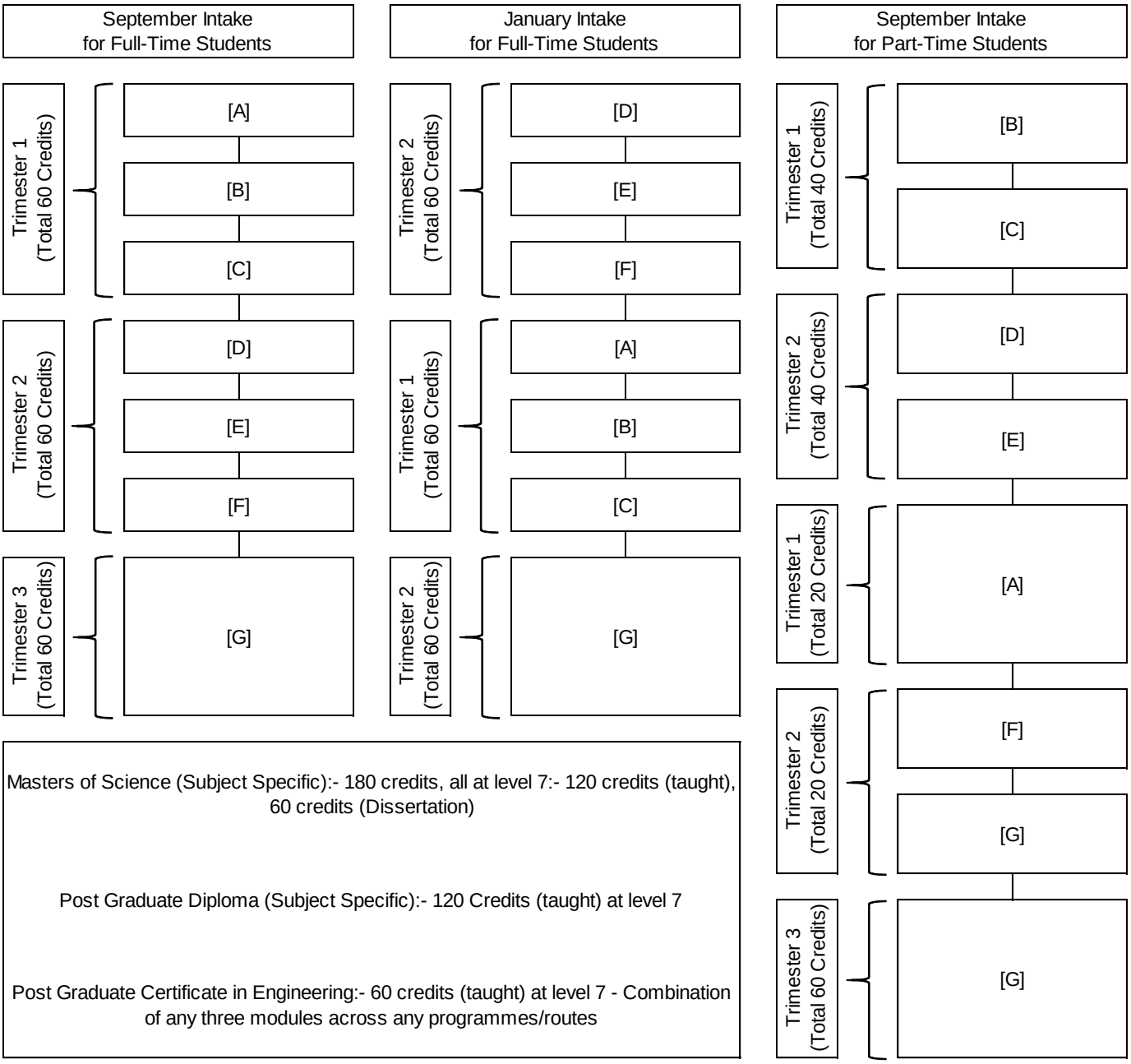

Table 2: MSc programme delivery pattern for the following intakes; full-time September, full-time January and part-time September. (*Modules indicated with letters from A to G can be found from Table 1*)

Every module is level seven and each taught module is 20 credits; the dissertation module is 60 credits, thus the sum of each column in Table 1 amounts to 180 credits – required for the MSc qualification.

The exit points are PG dip and PG Cert:

Post Graduate Diploma (PG dip) requires the achievement of 120 credits taught at level 7

Post Graduate Certificate (PG Cert) requires the achievement of any combination of modules amounting to 60 credits across any programmes/routes.

Part one of the programmes consists of three 60-credit common taught modules and three 60-credit specialist modules. Part One must have been completed successfully before the students can proceed to Part Two, the MSc dissertation. The student is not able to progress to Part Two if he/she has completed part 1withcompensation of one 20 credit module and is only eligible for the award of a Post Graduate Diploma.

The Aeronautical, Aircraft Design, Aircraft Structure & Mechanical Manufacturing students will jointly study 1 common specialist module -*Advanced and Composite Materials*. Furthermore, Aircraft Design and Aircraft Structure students will jointly study - *Aircraft Structures*. Mechanical Manufacturing and Aircraft Structure students will jointly study *Advanced Manufacturing Technologies*.

The Renewable, Electrical, Electronics & Mechatronics students will jointly study 1 common specialist module – *Control Systems Engineering*.

Full-time Mode (September Intake)

The taught element, Part One, of the programmes 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 expected timetable per module 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.

Full-time Mode (January Intake)

For the January intake, students will study three specialist modules first during the second trimester from January to May. Other three common modules the students will study in the first trimester of the next academic year from September to January. On successful completion of the taught element of the programme the students will be progressed to the Part Two, MSc dissertation to be submitted in April/May

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 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.

Intended learning outcomes of the programme

The programme learning outcomes are consistent with the university's aims as well as complying with the PSRB requirements, in preparation for:

1. A career at an advanced level which may involve academic research, including study at Doctoral level;
2. An active contribution to the development of new ideas and techniques in commercially-based engineering;
3. Personal accountability in a supervisory capacity in the management of projects;

4. Life-long learning and an appreciation of the value of education in continuing professional development;

The programmes provide opportunities for students to achieve the following outcomes. By the end of the programmes the students will have developed critical and evaluative perspectives of engineering, together with analytical and creative problem solving abilities. The following specific intended outcomes are contextualised to be "within selected fields of engineering and specialist areas of study". On successful completion of one of the programmes a graduate should demonstrate knowledge and skills as listed in the following:

Post Graduate Certificate in Engineering

Students will demonstrate the ability to:

A. Knowledge and Understanding – able to:

A1 Understand complex mathematical principles relevant to advanced concepts;

A2 Apply theoretical principles and application techniques;

A3 Practice the range of methodologies and computer tools available for analysis and design;

B. Intellectual Skills– able to:

B1 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

B3 Analyse complex engineering issues in both a systematic and a creative way;

C. Subject Skills– able to:

C1 Demonstrate self-direction and originality in tackling and solving mechanical or electrical systems problems;

C2 Plan and implement experimental design and evaluative testing;

D. Practical/Key Skills - able to:

D1 Exercise initiative and personal responsibility;

D2 Communicate clearly to specialist and non-specialist audiences;

D3 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 using specialised software packages, with awareness of the limitations computer models;

Postgraduate Diploma (Subject Specific)

In addition to meeting the learning outcomes of the Post Graduate Certificate in Engineering outlined above; students will demonstrate the ability to:

A. Knowledge and Understanding – able to:

A4 Explore current problems, being treated in a critical and evaluative manner;

B. Intellectual Skills – able to:

B4 Evaluate data sources and make sound judgements in the absence of complete data;

C. Subject Skills – able to:

C3 Specify and use laboratory and workshop equipment competently and safely.

D. Practical/Key Skills - able to:

D5 Apply the independent learning ability required for continuing professional development;

In addition to meeting the learning outcomes of the Post Graduate Certificate in Engineering (A1-3; B1-3; C1-2 and D1-4) and A4, B4, C3 and D5 of the Post Graduate Diploma, students studying specific pathways will demonstrate the ability to:

Postgraduate Diploma in Aeronautical Engineering

A. Knowledge and Understanding – able to:

A5 Understand in depth knowledge relating to the different types of composites used along with production methods and their advantages and disadvantages compared to traditional engineering materials.

A6 Predict characteristics associated with airflow over aircraft or sections of airframe, such as fuselage contouring and problems, such as shock wave boundary layer interactions, along with mathematical analysis and wind tunnel testing.

A7 Apply fundamental concepts related to the longitudinal and lateral stability control of aircraft, including the effects of the control surfaces and the reaction of the aircraft.

Postgraduate Diploma in Aircraft Design

A. Knowledge and Understanding – able to:

A5 Understand in depth knowledge relating to the different types of composites used along with production methods and their advantages and disadvantages compared to traditional engineering materials.

A8 Apply knowledge of the legislative and regulatory framework of national and international aviation authorities and the relationship between them. Inclusive of familiarisation of the various approaches to the problems of assessing the safety of increasingly complex aircraft systems.

Postgraduate Diploma in Aircraft Structures

A. Knowledge and Understanding – able to:

A5 Understand in depth knowledge relating to the different types of composites used along with production methods and their advantages and disadvantages compared to traditional engineering materials.

A9 Evaluate in depth knowledge of the infrastructure and technologies necessary to improve manufacturing processes.

Postgraduate Diploma in Mechanical Manufacturing

A. Knowledge and Understanding – able to:

A5 Understand in depth knowledge relating to the different types of composites used along with production methods and their advantages and disadvantages compared to traditional engineering materials.

A9 Evaluate in depth knowledge of the infrastructure and technologies necessary to improve manufacturing processes.

A10 Verify and enhance engineering practices, products, systems, services and develop analysis of production methods.

Postgraduate Diploma in Renewable Engineering and Sustainable Energy

A. Knowledge and Understanding – able to:

A11 Analyse and model complex control systems in order to manipulate the desired process outcomes and ensure that all reasonable disturbances have been accounted for thereby developing a stable system.

A12 Develop in depth knowledge and understanding of energy that comes from resources which are naturally replenished

A13 Apply detailed knowledge of renewable energy sources sufficient to make informed judgments relating to the economic viability of the different systems and associated circumstances.

Postgraduate Diploma in Electrical Power Engineering

A. Knowledge and Understanding – able to:

A11 Analyse and model complex control systems in order to manipulate the desired process outcomes and ensure that all reasonable disturbances have been accounted for thereby developing a stable system.

A14 Perform analysis and evaluate the design and operation of power-system plant, transmission networks, and smart low-carbon distribution networks

A15 Apply in depth knowledge of electrical machines and power electronics, coupled with numeric modelling and system integration techniques.

Postgraduate Diploma in Electronic Engineering

A. Knowledge and Understanding – able to:

A11 Analyse and model complex control systems in order to manipulate the desired process outcomes and ensure that all reasonable disturbances have been accounted for thereby developing a stable system.

A15 Develop a critical understanding of electronic circuit design and be able to predict performance based upon analysis and simulation techniques.

A16 Implement design solutions, taking account of critical constraints, whilst considering the means to develop and apply testing strategies.

Postgraduate Diploma in Mechatronics

A. Knowledge and Understanding – able to:

A11 Analyse and model complex control systems in order to manipulate the desired process outcomes and ensure that all reasonable disturbances have been accounted for thereby developing a stable system.

A17 Develop synergistic combinations of precision engineering, electronic control and mechanical systems

A18 Apply in depth knowledge of microprocessor systems and embedded design techniques, utilising the latest technologies and a range of software tools.

Masters of Science

In addition to meeting the learning outcomes of the Post Graduate Diplomas outlined above (A1-18; B1-4; C1-3; D1-5) students who achieve the MSc will demonstrate the ability to:

A. Knowledge and Understanding – able to:

A19 Present an in depth understanding for the role of an engineer manager for himself/herself and of others;

A20 Conduct research in recent engineering developments and the context within which engineering is applied;

B. Intellectual Skills – able to:

B5 Plan, conduct and report on an original programme of work (dissertation);

B6 Apply planning and management techniques, with an evaluation of commercial financial implications, in the conduct and management of an engineering project;

C. Subject Skills – able to:

C4 Prepare in-depth reports at a professional level;

D. Practical/Key Skills - able to:

D6 Exercise autonomy and self-direction regarding own performance and self-management.

The learning outcomes, above, are exhibited in a tabular form below.

CURRICULA MATRIX demonstrating how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules

	Common Modules	A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	A 10	A 11	A 12	A 13	A 14	A 15	A 16	A 17	A 18	A 19	A 20	B 1	B 2	B 3	B 4	B 5	B 6	C 1	C 2	C 3	C 4	D 1	D 2	D 3	D 4	D 5	D 6
LEVEL 7	Engineering Research Methods & PG Studies		✓		✓															✓	✓		✓		✓	✓	✓	✓	✓	✓		✓		✓	✓		✓
	Sustainable Design & Innovation		✓		✓															✓	✓	✓			✓		✓	✓	✓	✓		✓					
	Engineering Systems Modelling & Simulation	✓	✓	✓	✓																✓	✓		✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Dissertation	✓	✓	✓	✓															✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

	Option Module Titles	A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	A 10	A 11	A 12	A 13	A 14	A 15	A 16	A 17	A 18	A 19	A 20	B 1	B 2	B 3	B 4	B 5	B 6	C 1	C 2	C 3	C 4	D 1	D 2	D 3	D 4	D 5	D 6
LEVEL 7	Advanced & Composite Materials	✓	✓	✓	✓	✓															✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Applied Aerodynamics	✓	✓	✓	✓		✓														✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Flight Dynamics & Control	✓	✓	✓	✓			✓													✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Aircraft Structures	✓	✓	✓	✓				✓												✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Airframe Systems Design	✓	✓	✓	✓				✓												✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Advanced Manufacturing Technologies	✓	✓	✓	✓				✓		✓									✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓		
	Advanced Production & Assembly	✓	✓	✓	✓				✓	✓	✓									✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Control Systems Engineering	✓	✓	✓	✓							✓									✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Renewable Engineering	✓	✓	✓	✓								✓							✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓		
	Renewables: Environment, economic, social and political aspects		✓	✓	✓									✓							✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓		
	Electrical Power Systems Analysis & Design	✓	✓	✓	✓										✓						✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Power Electronics & Drive Systems	✓	✓	✓	✓											✓					✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Design for Electronics Manufacture & Testing	✓	✓	✓	✓												✓				✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Electronic Circuit Design	✓	✓	✓	✓													✓			✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Mechatronics System Design	✓	✓	✓	✓													✓			✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		
	Micro Processor Systems Integration	✓	✓	✓	✓														✓		✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	✓		

Learning and Teaching Strategy

In accordance with sound educational research and current best practice, the programmes will be delivered through a broad range of learning and teaching strategies. The delivery of the programmes and their assessment will reflect the spirit of Glyndŵr University's Learning, Teaching and Assessment Strategy and in particular emphasises:

- The development of autonomous learners
- Provision of learning opportunities that are personally and professionally relevant and quality assured
- The maintenance of a supportive learning environment
- The promotion of the scholarship of teaching

At this level of study students are encouraged to take responsibility for their own learning with staff facilitating the learning process. The aim is to encourage a high level of student autonomy in learning and the capacity to apply this within the wider environment. These overall aims are achieved through the use of a variety of learning and teaching techniques which include lectures, seminars, workshops, discussions, debates, group tutorials, case studies, problem-based learning and visiting speakers.

The broad aim of the Academic Subject Area in its postgraduate teaching is to focus on depth of study, and critical awareness and evaluation, in selected areas of current research and advanced scholarship within the academic discipline of Engineering; while at the same time ensuring a more general all round ability. In addressing these aims, the postgraduate programmes in Engineering include material on the theory, design and implementation of systems while at the same time focusing on particular specialist areas of research within the academic discipline Engineering routes.

The broad nature of the programme including common and specialist elements necessitates the use of a broad range of teaching techniques. Lectures are used as the main delivery mechanism, typically supplemented by supervised problem and lab classes, and group discussion. Some modules include group and small-scale project work, with student-led seminars and presentations. Moodle and a range of other online tools are used to support teaching. The School also operates a number of specialist labs, providing practical and analytical facilities.

(i) Lecture

This is usually a formal discourse for the purposes of dissemination of information, the demonstration of techniques and the discussion of supporting ideas and consequences. The lecture is supported by a full range of equipment including blackboard, whiteboard, OHP, video and computer projection facilities where appropriate. Although this type of presentation is suitable for a one-sided discourse ample opportunity exists for questions, interaction and discussion.

(ii) Seminar and Tutorials

These activities encompass a wide range of activities, each suited to the particular module. On the one hand, some tutorials will consist of the staff supporting students engaged in problem solving. On the other hand a tutorial may involve group exercises where each group is encouraged to allocate responsibilities, allocate tasks, etc.

Generally, this type of teaching is used to support the lecture, clarify the material and experiment with the techniques and skills required.

(iii) Laboratory

The nature of the engineering elements of all courses requires students to gain practical skills in the use of module related software and design and testing facilities. There are two computer laboratories, four specialist laboratories and a project laboratory. Activity takes place in the laboratories are supported by a staff member, practising skills in the use of sophisticated application software and design tools.

(iv) Group Work

For some modules, students are encouraged to work in groups to achieve set objectives. Assessment of these activities includes both group and individual elements. In this way, students learn to work as a team to achieve a common goal whilst at the same time individual contribution is recognised and evaluated.

(v) Dissertation

The dissertation serves the primary purpose of integrating technological and research strands, and does so in the context of a substantial research.

The dissertation typically involves the development and evaluation of the solution to a problem. The problem is original to the student and its solution therefore requires the innovative application of knowledge and techniques either studied in the previous taught stage or acquired through independent research of recent and relevant literature.

The dissertation provides a vehicle for integrating specialist knowledge with analytic, problem solving, managerial and communication skills. All of these are exercised and evidenced through the execution and outcomes of the project, which include a project proposal, dissertation, final oral presentation and project "viva" (demonstration).

A learner-centred approach will be adopted with the aim of promoting independent learning; as a consequence direct face-to-face teaching contact hours will be supplemented by tutor-guided and independent reading and research which will emphasise the need to work in a critical way with theory and empirical research sources.

Additionally, Moodle VLE will be used for developing interactive activities such as quizzes or forums; it also allows staff and students to create discussion groups. Students are encouraged to make significant use of on-line resources especially journals and e-books.

General:

Feedback is provided continuously to students through informal contact with subject lecturers and tutors in the seminar/tutorial and laboratory settings. In accordance with University Guidance, feedback is provided on assessed practical work normally within three weeks of submission of the work.

Accreditation of the programmes by engineering professional institutions/bodies is a major aspect of the programmes and will be updated for in due course. In anticipation of revised accreditation (for this proposal), the programmes have been designed to meet the requirements for accreditation and this has involved the integration of the skills required into modules across the programmes. The learning and teaching strategy adopts various methods as listed above, and utilises problem based learning and group project working which also supports this. Professionals from industry provide guest lectures at various points throughout the programme delivery, which enables students to develop a range of skills during the programmes to meet the

requirements of engineering professional institutions/bodies as defined in the Engineering Council UK-SPEC and QAA Engineering Benchmark statement.

Welsh Medium provision

Students are entitled to submit assessments in the medium of Welsh. Where a qualified tutor is available, students will then be allocated to a tutor who is able to assess the work in 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.

Additionally the programme team would wish to develop the language skills of students taking this programme. The University already offers modules in Welsh as a second language at HE level to students studying degrees which involve working with the public e.g. social work, nursing, youth and community work. It is anticipated that the MSc students whose first language is not Welsh, or who wish to improve their Welsh skills (either an improver or a new learner) would be offered these sessions as an extra module outside the programmes. The University's investment in its Second Language Learning Centre ensures that this aspiration can be delivered from within existing arrangements.

Assessment strategy

The Postgraduate School has an agreed Assessment Strategy for all engineering programmes which provides a framework for the assessment of students' competence, knowledge and understanding, and the grading of students for progression and the conferring of awards. It allows staff to give feedback to students and to evaluate the effectiveness of their own teaching. This strategy will be closely adhered to in the delivery of the programme and is guided by QAA Code of Practice- Section 7 (February 2015): Teaching, Learning and Assessment of Students, National Qualifications Framework, and Glyndŵr University Assessment Guidelines.http://www.qaa.ac.uk/assuring-standards-and-quality/the-quality-code

Students will receive formative assessment, particularly during the practical and self-study elements of the programmes to ensure they can keep track of their progress and development. This will also be a key factor in ensuring student engagement and retention on the programme of study. In the case of practical assessment, this may be a final summative assessment, so more frequent formative assessment provides academic rigour and increases student awareness and confidence in the subject.

There will be emphasis placed upon students to undertake independent study and research activities, in particular when conducting the project for the Dissertation of the programmes.

Assessment Methods

The assessment of students will be by means of (i) formal written examinations and/or (ii) in-course assignments, which generally have both a formative and a summative function.

The assessment strategy attempts to maintain a balance between an aim to reduce reliance on formal examinations and the need to ensure depth of study, academic rigour and originality. In particular, the professional bodies rely on written unseen examinations as a measure of standards.

There is therefore a requirement for all applicable modules to have a written exam element and an investigative assignment activity. However the team have discussed this issue and have agreed that the common modules; that is, the main Dissertation (60 credits), Engineering Research Methods and PG Studies

(20 credits) and modules that have a more practical approach such as the Engineering Systems Modelling& Simulation (20 credits) and Sustainable Design and Innovation (20 credits) are far more suited to continual assessment due to their nature.

(i) Formal Written Examinations

These have been defined as being at a maximum length of 2 hours for a module which also has an assignment element. None of the modules uses solely examination as its assessment. The examinations are formally defined and centrally conducted via Glyndŵr University's Assessment Office. As noted above, the professional bodies rely on written examinations as a measure of standards, hence their inclusion.

(ii) Assignments

Assignments will be based on the activities discussed above. However the content of a given assessment is subject to change as the programme and subject evolves. The programme team are therefore continually seeking, and experimenting with, further ways of assessing students, including non-formal time-constrained practical or written exercises. In regards to the QAA (February 2015) (http://www.qaa.ac.uk/assuring-standards-and-quality/the-quality-code) assessments are the means by which students are measured against benchmark criteria and also forms a constructive part of the learning process. There is a programme-level approach to assessment that ensures output standards are met. Further information and guidance on assessment and feedback is available from the Higher Education Academy (https://www.heacademy.ac.uk/). The grading for assessment work will be awarded by the module tutor.

Internal Moderation

There is a standard procedure and documentation for internally moderating all assessed work, both before the assignment/exam is set and, by sampling, after the student work has been marked. In general, 'blind' double marking is not used except for the main dissertation.

The following tables show details of module weightings for examinations and assignments.

Schedule of Assessments – Common Modules

Module Code	Module Name	Credits	In Course [%]	Written Eam [%]	Duration [Hrs]	Trimester
ENG740	Engineering Research Methods & PG Studies	20	100	-		T1
ENG706	Sustainable Design & Innovation	20	100	-		T1
ENG741	Engineering Systems Modelling & Simulation	20	100	-		T1

Schedule of Assessments – MSc Aeronautical Engineering

Module Code	Module Name	Credits	In Course [%]	Written Eam [%]	Duration [Hrs]	Trimester
ENG742	Advanced & Composite Materials	20	50	50	2	T2
ENGM63	Applied Aerodynamics	20	50	50	2	T2
ENGM61	Flight Dynamics & Control	20	50	50	2	T2

Schedule of Assessments – MSc Aircraft Design

Module Code	Module Name	Credits	In Course [%]	Written Eam [%]	Duration [Hrs]	Trimester
ENG742	Advanced & Composite Materials	20	50	50	2	T2
ENG7XX	Aircraft Structures	20	50	50	2	T2
ENG7XX	Airframe Systems Design	20	50	50	2	T2

Schedule of Assessments – MSc Aircraft Structure

Module Code	Module Name	Credits	In Course [%]	Written Eam [%]	Duration [Hrs]	Trimester
ENG742	Advanced & Composite Materials	20	50	50	2	T2
ENG7XX	Aircraft Structures	20	50	50	2	T2
ENGM65	Advanced Manufacturing Technologies	20	50	50	2	T2

Schedule of Assessments – MSc Mechanical Manufacturing

Module Code	Module Name	Credits	In Course [%]	Written Eam [%]	Duration [Hrs]	Trimester
ENG742	Advanced & Composite Materials	20	50	50	2	T2
ENGM70	Advanced Production & Assembly	20	50	50	2	T2
ENGM65	Advanced Manufacturing Technologies	20	50	50	2	T2

Schedule of Assessments – MSc Renewable Engineering & Sustainable Energy Futures

Module Code	Module Name	Credits	In Course [%]	Written Eam [%]	Duration [Hrs]	Trimester
ENGM11	Control Systems Engineering	20	50	50	2	T2
ENG7XX	Renewable Engineering	20	50	50	2	T2
ENG7XX	Renewables: Environment, economic, social and political aspects.	20	50	50	2	T2

Schedule of Assessments – MSc Electrical Power Systems

Module Code	Module Name	Credits	In Course [%]	Written Eam [%]	Duration [Hrs]	Trimester
ENGM11	Control Systems Engineering	20	50	50	2	T2
ENG7XX	Elect Power Sys Analysis & Design	20	50	50	2	T2
ENG7XX	Power Elect & Drive Systems	20	50	50	2	T2

Schedule of Assessments – MSc Electronic Engineering

Module Code	Module Name	Credits	In Course [%]	Written Eam [%]	Duration [Hrs]	Trimester
ENGM11	Control Systems Engineering	20	50	50	2	T2
ENG7XX	Design for Electronics Manufacture & Testing	20	50	50	2	T2
ENG7XX	Electronic Circuit Design	20	50	50	2	T2

Schedule of Assessments – MSc Mechatronics

Module Code	Module Name	Credits	In Course [%]	Written Eam [%]	Duration [Hrs]	Trimester
ENGM11	Control Systems Engineering	20	50	50	2	T2
ENG7XX	Mechatronics System Design	20	50	50	2	T2
ENG7XX	Micro Processor Systems Integration	20	50	50	2	T2

Assessment regulations that apply to this programme

Academic regulations for Taught Masters degrees apply to these programmes.

All modules, with the exception of ENG740 Engineering Research Methods and Postgraduate Studies, are eligible for trailing into Part Two.

Academic Derogation

An academic derogation is in place for all of the programmes inorder to align with the professional bodies (*to be accredited in the near future (2016)*). Students are required to achieve an overall module mark of at least 50% with a minimum mark of 40% in each assessment element.

Programme Management

Programme Team

Mr Barrie Birmingham	Senior Lecturer
Mr Brian Klaveness	Principal Lecturer
Mr David Sprake	Senior Lecturer
Mr Martyn Jones	Lecturer
Mr Nick Burdon	Lecturer
Prof Richard Day	Professor
Mr Robert Bolam	Senior Lecturer
Mr Shafiul Monir	MSc Programme Leader (*Aeronautical/Mechanical Suite*)
Dr Vincent Barrioz	Senior Lecturer
Dr Yuriy Vagapov	MSc Programme Leader (*Renewable/Electrical Suite*)
Dr Zheng Chen	Senior Lecturer

Note: The Aeronautical/Mechanical suite consists of *MSc in Aeronautical Engineering; MSc in Aircraft Design; MSc in Aircraft Structure* and *MSc in Mechanical Manufacturing*. The Renewable/Electrical suite consists of; *MSc in Renewable Engineering & Sustainable Energy; MSc in Electrical Power Engineering; MSc in Electronic Engineering* and *MSc in Mechatronics*.

Dissertation Supervisors

Mr Olivier Durieux	Senior Lecturer
Dr Olaf Niestroj	Lecturere
Dr Chamil Abeykoon	Lecturer
Dr Fatima Mansour	Lecturer
Mrs Natalija Vidmer	Senior Lecturer

Note: The following staff members will provide additional dissertation supervision along with the programme team mentioned above.

Supporting Staff

Mr Phil McDonald	IT Facilities Technician
Mr Arfon Hughes	Workshop Supervisor
Mrs Nataliia Luhyna	Composite Workshop Technician

The Masters staff team members are highly qualified and experienced at post-graduate and post-doctoral level and are research active. They have previous experience from teaching at other universities and are feeding this into Engineering's programmes, such as the proposed Masters programmes. They are contributing to the ever-developing research and scholarship ethos and culture surrounding Engineering at Glyndŵr University. Longer-established members of the team have commensurate specialist qualifications and experience in a professional and consultancy field at a high level.

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
- Both programme leaders are responsible to prepare a joint 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 if this is necessary. It will meet 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 Standards and Quality Committee (SQC) and student feedback (e.g. SPOMs, SSCCs). In practice, the Programme Leader and teaching team will monitor the day-to-day operation with input as necessary from student representatives.

Another forum for discussion is the Staff Student Consultative Committee (SSCC). 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 in an informal manner, and for the staff to react and respond speedily to address their concerns.

Prior to the SSCC meeting an agenda is set and distributed to all participants. The meeting held with the students is minute 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 SSCC 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 Glyndŵr 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 ISDR process to support individual staff development plans.

Staff Research Activity

Most majority of the programme delivery team are members of the Computational Mechanics, Manufacturing Simulation, Design and Optimisation (CoMManDo) research group. The research group encourages and enables all staff who; develop, use or teach software tools in the CoMManDo topic areas to become research active, and to provide mutual support and expertise in order for the research to gain greater impact in the outside world.

The CoMManDo group spans a wide range computational engineering topics, including

- **Simulation and Analysis**
    - Computational Fluid Dynamics (CFD)
    - Finite Element Analysis (FEA)
    - Boundary Element Method (BEM)
    - Electromagnetism analysis
    - Multi-physics analysis and co-simulation
- **Computer Aided Design and Manufacture (CAD/CAM)**
    - CAD of robotic paths
    - Electronic design automation
    - Composite ply design, cutting paths and tessellation
- **Computational Intelligence**
    - Optimization tools and application techniques
    - Evolutionary algorithms
    - Machine learning
    - Data mining
- **Algorithm development and application**
    - Mesh building and geometry manipulation tools
    - Crack and fatigue modelling
    - Spatial transformations and applications
    - Random graph theory and applications
    - Wavelets and fractals

Staff members are also actively engaging in research with the following groups; Advanced Composite Training and Development Centre, Analytical Decision Making Research Group (ADM), The Centre for Solar Energy Research (CSER), National Facility for Ultra Precision Surfaces, and Centre for Water Soluble Polymers.

Staff Research Expertise

Staff Name	Research Expertise
Mr Robert Bolam	Computational Fluid Dynamics, Electromagnetism (for aircraft propulsion), air ionisation for aircraft control, Thermodynamics
Prof Richard Day	Finite Element Analysis, Electromagnetism, composite Materials, Advanced Materials. Manufacturing
Dr Zheng Chen	Aircraft Control Systems, Aircraft Dynamics, Aircraft Structures

Mr Martyn Jones	CAD/CAM, Computational mechanics simulation for stress, and thermal distortion, Composite components for use in extreme environments
Mr Shafiul Monir	Advanced Computational Fluid Dynamics, Large Eddie Simulation. Turbulence Modelling, Two Phase & Multi Phase Flow, MOCVD
Dr Vincent Barrioz	MOCVD, CdTe Thin Film Photovoltaics, Inline Deposition of Thin Films
Dr Yuri Vagapov	Electrical Machines and Drives, Power Electronics and Electrical Power Systems
Dr Chamil Abeykoon	Process monitoring, identification, modelling, optimization and control, Sensors and instrumentation, Advanced manufacturing and materials, Heat Transfer and Heat exchangers
Mrs Natalija Vidmer	CAD/CAM, Mechanical design for optics and holography applications, Design and manufacture simulation, Optimisation
Mrs Nataliia Luhyna	Advanced manufacturing, Composite materials, Carbon nanotubes for advanced nanocomposties, Design of experiments (DOE), Microwave curing technology
Mr Barrie Birmingham	Automated testing of electronic devices, Design and implementation of electronic products
Mr Brian Klaveness	Electrical and electronic circuit analysis, Digital and analogue electronics, RF electronics design

Staff Development

Staff development is on-going and takes a number of forms. The formalised procedure is the 'ISDR' - Individual Staff Development Review - an annual cycle of guided self-review involving the setting of personal targets. Additionally, some staff members in Engineering are undergoing further study or are using research and attendance at seminars to develop their subject area knowledge. Staff have also joined or are in the process of joining the HE Academy,

Examples of staff development activities include:

(i) Attendance at seminars and on courses of various types. These may vary from a short course to a full year or more leading where possible to the award of further qualifications. (Members of the programme team are involved in PGCPD and training/updating courses and seminars provided by Glyndŵr University)

(ii) The undertaking of a programme of research relevant to Engineering and leading to a higher degree. (three members of programme team are actively pursuing PhD)

(iii) Undertaking research at a personal level and/or the supervision of research students carrying out relevant research. (four members of the programme team supervise research students at PhD level)

(iv) Undertaking consultancy work of a professional nature. (members of the programme team are actively involved in consultancy with our industrial partners)

(v) Release from teaching duties to undertake a pre-defined programme of work within the University, at an industrial location or at another university. (Prof Richard Day is on day-realise to conduct research at the national Composite Centre in Bristol)

(vi) Secondment, full-time, to undertake a programme of work in this country or abroad. (members of the programme team undertake the lecturing and delivering abroad within current masters provision)

(vii) Involvement in relevant professional activities, including professional institutions. (majority of the programme team are members of professional institutions holding chartered engineer status)

(viii) A broadening of the experience of staff to enable them to teach in new subject areas as the teaching requirements of courses shift in their emphasis.

(ix) Attendance at National and International conferences in specialist research topics. (many members of the programme team attend research conference at international level and are also involved in organising committees)

Particular Support for Learning

Students on the programmes will receive the following forms of student support and guidance:

- **Admissions.** All students on the programmes will have the opportunity to discuss their application with staff, and receive appropriate advice and guidance prior to admission. This will include review of expectations of the programme and clarification of workload and requirements.
- **Induction.** New students on the programmes will undergo an induction programme which will provide them with a full introduction to the programme, and will include elements of work on study skills and professional development.
- **Student Handbook**. All students on the programmes will receive a Student Handbook which will contain details and guidance on all aspects of the programme and forms of student support and guidance.
- **Progress Review and Attendance Monitoring**. Student attendance will be subject to regular monitoring through registers, and this will be a means of addressing issues of student support. There will also be regular reviews for each student with personal tutors.

Every student is allocated a personal tutor when he/she has registered for one of the programmes. The personal tutor is someone students can contact to discuss any problems of an academic nature. These may relate to special needs or personal problems that may affect the student's academic performance.

Academic problems should first be addressed to the module leader concerned. If the problem is not resolved or it does not relate to a specific module, then the Programme Leader should be contacted.

Other supports for students include the opportunity to access study skills, mathematics workshops, research seminars and English language training.

University provision and accommodation

There is a commitment at University level to support all aspects of resource provision necessary in the development and implementation of first degrees, post-graduate degrees and research. This has been established over the period of time for which degree programmes have been operating at the University. Thus the intention of providing adequate resources for this MSc programme is clear. The resource framework includes provision across the University and specifically includes the facilities listed below.

Marketing and Student Recruitment (MSR)

A department dealing with all aspects of marketing development of University business, this includes specialists in European Union initiatives for both staff and students.

Edward Llwyd Centre

This building provides:

- A good stock of academic reference and lending books,
- A range of support materials: audio-tapes, videos, microfiche and CD-ROM, on-line resources, academic journals,
- A study area,
- Open-access language facilities,
- A large open-access computer with a comprehensive range of software and self-learning packages based on a college-wide network,
- Photo-copying and printing facilities - report editing and binding,
- An audio-visual aids department (to service all sections of the University),
- To support student self-study and to provide short courses on relevant 'transferable' skills and I.T

In addition Learning Resources and Information Services, Careers and Student Services provide:

- Student counsellors
- Careers counselling and full careers service - including placements and an employment agency
- Advice and issue of grants and student loans

Student Village

Situated within the campus boundary and comprising 215 self-catering flatlets.

Teaching Accommodation

There is now a range of different sized classrooms (for 15 up to 50 students) and lecture theatres (for 80 up to 150 students) equipped with modern multimedia facilities.

Staffing

All sections of the University undergo an on-going review of the course portfolio. Within Engineering this takes the form of a rationalisation which maximises staff contact time. The aim is to combine modules where possible and thus to release staff to undertake student support, research, course development work, and to further develop the laboratory provision.

There are 10 tutoring staff available within Engineering and post-doctoral students supporting the delivery of programmes. This whole set of developments combines to provide a suitable grounding for the support of post-graduate programmes.

The laboratory areas within Engineering are maintained and operated by three demonstrators and five technicians.

Staff development such as scholarly activities is encouraged in the Subject and is made within the staffing budget to cover staff development relevant to these programmes.

Laboratories and equipment

There are approximately 21 engineering laboratory areas. A summary list of the pertinent laboratories relevant to this programme is given below.

E1 & L100	Two computer rooms, approx 48 computers. Extensively used for CAE, CAD and ECAD work, mathematical and system modelling as well as assignment work and report writing. Links to the college network and to the Internet. High and low level programming facilities ('C' and PIC) are also available.
E5	Mechanics and thermo fluids lab numerous computer controlled items of Techquipment kit. Fluid benches flow tanks.
E12	Instrumentation and control laboratory. Continuous 'process' control, servo systems - analogue and digital; Sequential control - robots and PLCs. PCs with digital and analogue interface cards are available here as additional support for E14.
E2e	Electrical Power Engineering Laboratory. The laboratory is equipped by appropriate instrumentations and power devices to provide the laboratory investigations on the following subjects: Electrical Power Systems, Power Electronics, Electrical Machine and Drives. The laboratory equipment composes four work stations where students are able to conduct practical experiments.
E13	Project construction room.
E6	Performance Car Labs
E7	Machine shop, Aerodynamics lab: Low speed wind tunnel, Flight simulator.
C08	Materials test facility electron microscope, computerised tensile test machine, rapid prototyping facility.

Equality and Diversity

The programmes have been developed with the equality and diversity ethos being maintained in accordance with legislation and the University's Aims:

The University is committed to enabling all individuals to benefit from higher education regardless of their personal characteristics of age, disability, race, sex, sexual orientation, gender reassignment, pregnancy or maternity, religion or belief and their status of being married or in a civil partnership.