PROGRAMME SPECIFICATION PROFORMA

glyndŵr
PRIFYSGOL GLYNDŴR WRECSAM
GLYNDŴR UNIVERSITY WREXHAM

Awarding body/institution	University of Wales/ Glyndŵr University
Teaching institution	Glyndŵr University
Details of accreditation by a professional, statutory or regulatory body	Seeking accreditation from IMechE in 2011
Final award/s available	MSc Mechanical Engineering MRes Mechanical Engineering Postgraduate Diploma in Mechanical Engineering Postgraduate Certificate in Mechanical and Manufacturing Engineering
Award title	MSc Mechanical Engineering MRes Mechanical Engineering Postgraduate Diploma in Mechanical Engineering Postgraduate Certificate in Mechanical and Manufacturing Engineering
UCAS code	
Relevant QAA subject benchmark statement/s	QAA Qualification Descriptor for Masters Degrees
Other external and internal reference points used to inform the programme outcomes	Institute of Mechanical Engineers UK-Spec Specific Learning Outcomes
Mode/s of study	Full-Time and Part-Time
Language of study	English
Date at which the programme specification was written or revised	February 2010

Aims of the programme
The aims of the MSc programme are to provide the students with programmes of the necessary advanced, technical, professional and specialised study skills within the fields of Mechanical Engineering. The aims of the MRes programme is to develop a critical awareness of the advanced techniques and technological advances available to conduct state of the art research in the areas of Mechanical and Manufacturing

Engineering and to provide a programme of the necessary advanced, technical, professional and specialised study skills within the fields of Mechanical and Manufacturing Engineering. The programme is targeted towards those who wish to progress to a doctoral level of study in order to pursue subsequently an academic or industrial career. Candidates undertaking the MSc & MRes programmes will acquire the required skills in preparation for:

1. A career at an advanced level which involves academic research, including study at Doctoral level;
2. An active contribution to the development of new ideas and techniques in Aeronautical and Composite Materials 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, thus to provide the depth of knowledge, skills and attitudes to meet the rapidly changing needs of a high technology industrial environment.

Intended learning outcomes of the programme*

Knowledge and understanding

<u>Postgraduate Certificate of Mechanical and Manufacturing Engineering, Postgraduate Diploma/MSc in Mechanical Engineering</u>

Students will be able to demonstrate knowledge and understanding of:

A1. theoretical principles and application techniques;

A2. current problems, being treated in a critical and evaluative manner;

A3. mathematical principles relevant to advanced concepts of mechanical engineering systems;

A4. the range of methodologies and computer tools available for analysis and design of mechanical engineering systems;

A5. the role of the engineer as a manager of himself/herself and of others;

A6. current research and recent developments in mechanical engineering systems, and the context within which mechanical engineering is applied.

The PG Certificate will particularly focus on learning outcomes A1, A2 and A3; the PG Diploma will have an additional focus on learning outcome A4, while the MSc will ensure that students achieve all six learning outcomes.

<u>Postgraduate Certificate of Mechanical and Manufacturing Engineering/MRes in Mechanical Engineering</u>

Students will be able to demonstrate knowledge and understanding of:

A1. theoretical principles and application techniques;

A2. current problems, being treated in a critical and evaluative manner;

A3. mathematical principles relevant to advanced concepts of mechanical systems;

A4. the range of methodologies and computer tools available for analysis and design of mechanical systems;

A5. the role of the engineer as a manager of himself/herself and of others;

A6. current research and recent developments in mechanical engineering, and the context within which mechanical engineering is applied.

The PG Certificate will particularly focus on learning outcomes A1, A2 and A3, while the MRes will ensure that students achieve all six learning outcomes.

Skills and other attributes

<u>Postgraduate Certificate of Mechanical and Manufacturing Engineering, Postgraduate Diploma/MSc in Mechanical Engineering</u>

- Intellectual Skills

Students will:

B1. apply advanced engineering principles to the solution of design and operation problems and the investigation of new and emerging technologies in mechanical and manufacturing systems;

B2. plan, conduct and report on an original programme of work (dissertation);

B3. 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;

B5. make sound decisions in complex and unpredictable situations, both familiar and unfamiliar.

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

The PG Certificate will particularly focus on learning outcomes B1, B3 and B4; the PG Diploma will have an additional focus on learning outcome B5, while the MSc will ensure that students achieve all six learning outcomes.

- Professional Practical Skills

Students will:

C1. demonstrate self-direction and originality in tackling and solving mechanical engineering systems problems;

C2. prepare in-depth reports at a professional level;

C3. act autonomously in planning and implementing experiment design and evaluative testing;

C4. specify and use laboratory and workshop equipment competently and safely.

The PG Certificate will particularly focus on learning outcomes C1 and C2; the PG Diploma will provide a moderate focus on learning outcome C3, while the MSc will ensure that students achieve all six learning outcomes.

- Transferable/Key Skills

Students will:

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. to 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 used in mechanical engineering applications;

D5. apply the independent learning ability required for continuing professional development;

D6. exercise autonomy and self direction regarding own performance and self management.

The PG Certificate will particularly focus on learning outcomes D1 to D4; the PG Diploma will have an additional focus on learning outcome D5, while the MSc will ensure that students achieve all six learning outcomes.

Postgraduate Certificate of Mechanical and Manufacturing Engineering/MRes in Mechanical Engineering

- Intellectual Skills

Students will:

B1. apply advanced engineering principles to the solution of design and operation problems and the investigation of new and emerging technologies in mechanical engineering;

B2. plan, conduct and report on an original programme of work (dissertation);

B3. 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;

B5. make sound decisions in complex and unpredictable situations, both familiar and unfamiliar.

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

The PG Certificate will particularly focus on learning outcomes B1, B3 and B4, while the MRes will ensure that students achieve all six learning outcomes.

- Professional Practical Skills

Students will:

C1. demonstrate self-direction and originality in tackling and solving mechanical systems problems;

C2. act autonomously in planning and implementing experiment design and evaluative testing;

C3. prepare in-depth reports at a professional level;

C4. specify and use laboratory and workshop equipment competently and safely.

The PG Certificate will particularly focus on learning outcomes C1 and C2, while the MRes will ensure that students achieve all four learning outcomes.

- Transferable/Key Skills

Students will:

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. to 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;

D5. apply the independent learning ability required for continuing professional development;

D6. exercise autonomy and self direction regarding own performance and self management.

The PG Certificate will particularly focus on learning outcomes D1 to D4, while the MRes will ensure that students achieve all six learning outcomes.

**A curriculum map is appended showing how the overall programme outcomes are achieved and where skills are developed and assessed within individual modules.*

Distinctive features of the programme

The proposed programmes are schemes in which students on the MSc level will study a common module (Research Design and Methods) which is the existing module and will be shared by the currently running MSc Aeronautical Engineering and MSc Electrical programmes. The Mechanical students will jointly study four common modules (Structure and Numerical Analysis; Advanced Manufacturing Technologies; Advanced Materials; Advanced CFD) which are also the existing modules, shared by MSc Aeronautical Engineering Programme except for an individual module, Viscous Flow and Heat Transfer. For the Manufacturing students, they will also study two common modules (Advanced Materials; Advanced Manufacturing Technologies) shared by the Mechanical programme and two different new modules accounting for the practical needs. Thus, the two proposed programmes are complementary to the existing provisions in Engineering.

The modules introduced in MSc and MRes Mechanical Engineering programmes reflect the progresses on advanced Computational Fluid Dynamics (CFD), advanced Finite Element (FE) analysis and the updated knowledge of viscous flow and heat transfer. The structure of the MSc Mechanical Engineering programme contains two stages. Part 1 consists of the six 20-credit taught modules and these must have been completed successfully before the students can proceed to Part 2, the MSc dissertation. The structure of the MRes programme also contains two stages. Stage 1 consists of the four 20-credit taught modules, which includes a 20 credits research based module namely Research Design and Methods, while Stage 2 is a 100 credit module, the MRes dissertation. The programme taught part is constituted with three core modules and one optional module selected by candidates and approved by supervisors to inform more closely the specialist area covered in the individual dissertation. In the meantime, some modules of these two programmes can be easily modified to serve as short courses to meet the needs of CPD in industry.

Learning, teaching and assessment strategies used to enable outcomes to be achieved and demonstrated

The nature of the programmes including common and specialist elements necessitates the use of a wide range of teaching techniques. Lectures are used as the main delivery mechanism, typically supplemented by case study and practical lab classes, and group discussion. Some modules include group and small-scale project work, with student-led seminars and presentations. Blackboard and a range of other online tools are used to support teaching. The School also operates a number of computer labs, with teaching and industrial application based software.

(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 some designed modules (e.g. Advanced CFD; Structure and Numerical Analysis; Advanced Manufacturing Technologies and Advanced Materials) of the programmes requires students to gain practical skills. This activity takes place in Engineering laboratories as listed in section 7.4. The students would have access to the laboratories on site. They are also provided opportunities to access facilities in industry.

(iv) Group Work

On 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.

(vii) Dissertation

The MSc dissertation serves the primary purpose of integrating technological and research strands, which are developed in the preceding PgD stage, and does so in the context of a substantial research or information systems development project.

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

The MSc 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 dissertation, which include a dissertation proposal, a progress presentation and submission of dissertation.

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

Assessment regulations that apply to the programme

Glyndŵr University Regulations for Taught Masters Degrees and Degree of Master of Research.

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

MSc in Mechanical Engineering

Part 1	SEM 1 (Block Delivery)*	ENGM67 Research Design and Methods 20 credits Core	ENGM60 Advanced Computational Fluid Dynamics 20 credits Core	ENGM68 Viscous Flow and Heat Transfer 20 credits Core
	SEM 2	ENGM64 Advanced Materials 20 credits Core	ENGM62 Structures and Numerical Analysis. 20 credits Core	ENGM65 Advanced Manufacturing Technologies 20 credits Core
Part 2		ENGM66 Dissertation 60 Credits core		

MSc Mechanical Engineering
180 credits, all at level M (7):- 120 (taught) at Part 1, 60 at Part 2 (dissertation).

Post Graduate Diploma in Mechanical Engineering
120 credits (taught) at level M (7).

Post Graduate Certificate in Mechanical and Manufacturing Engineering
60 credits. (taught) at level M (7), combination of any 3 core modules.

MRes in Mechanical Engineering

Part 1	Semester 1	ENGM67 Research Design and Methods 20 credits Core	ENGM60 Advanced Computational Fluid Dynamics 20 credits Core	ENGM68 Viscous Flow and Heat Transfer 20 credits Option	ENGM69 Composite Materials 20 credits Option
	Semester	ENGM64	ENGM62	ENGM65	

	2	Advanced Materials 20 credits Option	Structure and Numerical Analysis 20 credits Option	Advance Manufacturing Technologies 20 credits Core	
Part 2		ENGMXX Dissertation (100 credits for MRes) 100 Credits Core			

MRes Mechanical Engineering
180 credits, all at level M (7):- 80 (taught) at Part 1, 100 at Part 2 (dissertation).

Criteria for admission to the programme

Normally, applicants will be required to attend for an interview. In case of the applicants being not able to attend the interview, e.g. overseas students, alternative ways to conduct an interview or to have personal contact will be implemented via either the telephone or electronically beside the application form and recommendations and references from their existing Institutions will be used to decide suitability. Places on the programmes will be offered on the basis of applicants' background qualifications and, where appropriate, experience. In all cases the programme team will have to be satisfied that the applicant demonstrates the qualities needed to successfully complete the chosen programme.

Normal entry requirements will be one of:

(a) A Bachelor of Engineering Honours degree, or other Bachelors Honours degree, with at least a 2:2 classification 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 deemed satisfactory by the programme team.

Some applicants, for example, those who have achieved an ordinary BEng degree may be required to undertake a bridging programme that will ensure shortfalls in any academic subjects, prior to entry to the MSc can be addressed. The bridging unit may include analytical modules pertinent to the specific programme that the student would wish to undertake (e.g. Stability and Control for Aero MSc) at level six. The total credit value would be 60 of which 40 would be the final year honours level project.

Additionally, international students whose first language is not English are required by Glyndŵr University regulations to hold the IELTS (International English Language Testing System) standard of 6.5, for post-graduate courses.

*According to Glyndŵr University Regulations for Modular Masters Degrees, a non-graduate can be admitted to candidature provided that he/she:

- has held, for a minimum of two years, a responsible position relevant to the scheme to be pursued.

For these two programmes, the programme team would expect a minimum of five years experience from a non-graduate applicant who wishes to join the programmes.

Indicators of quality

The quality of the (previous) programme running has been highly commended by the external examiner. For example, the external examiner commented that

- The programme team has created good MSc programmes which are comparable to those offered by other prestigious institutions such as Brunel and Warwick.

- The examinations for the students have been of a standard commensurate with an MSc Programmes.

- The (previous) MSc programmes that have been developed is relevant to current aeronautical industry needs. The students future employability should be high due to the raining skills (CFD and FEM) closely related to automotive and motorsport industries apart from aeronautical industry.

- The (previous) courses have been run in a professional manner. The project work involved both modelling and experimental tests.

Methods for evaluating and improving the quality and standards of the programme

- Validation
- Programme scrutiny
- Internal audit
- External examiner system
- Module/programme evaluations.

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 Office, 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

In line with Glyndŵr's QA systems and procedures an annual monitoring report (AMR) will be prepared by the Programme Leader in November of each academic year and formally discussed and presented to the Subject Team at a special review

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), which is also attended by SQC representatives. The AMR includes performance of modules as well as overall programme performance using indicators such as mean, standard deviation, retention data and feedback from students and staff.

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 a non-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.

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 semester 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.

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

Equality and Diversity

The programmes are open to all suitably qualified applicants. There is no discrimination on any grounds other than academic or experiential qualification. Students with a physical disability or learning difference are encouraged to contact the University Disability Adviser to ensure their needs are acknowledged formally. The outcome of such an assessment could result, for example, in additional time

being allowed for examinations, or the provision of further learning support.

CURRICULUM MATRIX

MSc in Mechanical Engineering

		Knowledge and understanding, intellectual skills, subject skills, and practical, professional and employability skills																					
PG Cert	*Module Title*	*Core Option*	***A1***	***A2***	***A3***	***A4***	***A5***	***A6***	***B1***	***B2***	***B3***	***B4***	***B5***	***B6***	***C1***	***C2***	***C3***	***C4***	***D1***	***D2***	***D3***	***D4***	***D5***	***D6***
	Research Methods and Design	*C*	*	*	*		*			*	*	*		*	*		*		*	*	*		*	
	Advanced CFD	*C*	*	*	*	*		*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Viscous Flow and Heat Transfer	*C*	*	*	*			*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Structure and Numerical Analysis	*C*	*	*	*	*		*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Advanced Materials	*C*	*	*	*			*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Advanced Manufacturing Technologies	*C*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
PG Dip.	*Module Title*	*Core Option*	***A1***	***A2***	***A3***	***A4***	***A5***	***A6***	***B1***	***B2***	***B3***	***B4***	***B5***	***B6***	***C1***	***C2***	***C3***	***C4***	***D1***	***D2***	***D3***	***D4***	***D5***	***D6***
	Research Methods and Design	*C*	*	*	*		*			*	*	*		*	*		*		*	*	*		*	
	Advanced CFD	*C*	*	*	*	*		*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Viscous Flow and Heat Transfer	*C*	*	*	*			*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Structure and Numerical Analysis	*C*	*	*	*	*		*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Advanced Materials	*C*	*	*	*			*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Advanced Manufacturing Technologies	*C*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
MSc	*Module Title*	*Core Option*	***A1***	***A2***	***A3***	***A4***	***A5***	***A6***	***B1***	***B2***	***B3***	***B4***	***B5***	***B6***	***C1***	***C2***	***C3***	***C4***	***D1***	***D2***	***D3***	***D4***	***D5***	***D6***
	Research Methods and Design	*C*	*	*	*		*			*	*	*		*	*		*		*	*	*		*	
	Advanced CFD	*C*	*	*	*	*		*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Viscous Flow and Heat Transfer	*C*	*	*	*			*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Structure and Numerical Analysis	*C*	*	*	*	*		*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Advanced Materials	*C*	*	*	*			*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Advanced Manufacturing Technologies	*C*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Dissertation	*C*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

CURRICULUM MATRIX

MRes in Mechanical Engineering

MRes	*Module Title*	*Core Option*	***A1***	***A2***	***A3***	***A4***	***A5***	***A6***	***B1***	***B2***	***B3***	***B4***	***B5***	***B6***	***C1***	***C2***	***C3***	***C4***	***D1***	***D2***	***D3***	***D4***	***D5***	***D6***
	Research Methods and Design	*Core*	*	*	*		*			*	*	*		*	*		*		*	*	*		*	
	Advanced Computational Fluid Dynamics	*Core*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Structure and Numerical Analysis	*Option*	*	*	*	*		*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Advanced Materials	*Option*	*	*	*			*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Advanced Manufacturing Technologies	*Core*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Viscous Flow and Heat Transfer	*Option*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Composite Materials	*Option*	*	*	*			*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	
	Dissertation	*Core*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*