

## PROGRAMME SPECIFICATION:

<b>Awarding body/institution</b>	Glyndŵr University
<b>Teaching institution</b> (if different from above)	N/A
<b>Details of accreditation by a professional, statutory or regulatory body</b> (including link to relevant website)	<p>ABE (Association of Building Engineers) accreditation to be sought:  <a href="http://www.abe.org.uk/home/">http://www.abe.org.uk/home/</a></p> <p>CIOB (Chartered Institute of Building) accreditation to be sought:  <a href="http://www.ciob.org.uk/">http://www.ciob.org.uk/</a></p> <p>EI (Energy Institute) accreditation:  <a href="http://www.energyinst.org/home">http://www.energyinst.org/home</a></p> <p>IET (Institution of Engineering and Technology) accreditation:  <a href="http://www.theiet.org/">http://www.theiet.org/</a></p> <p>IMechE (Institution of Mechanical Engineers) accreditation:  <a href="http://www.imeche.org/Home">http://www.imeche.org/Home</a></p>
<b>What type of accreditation do these programmes lead to?</b>	<p>The MEng in Renewable Energy and Sustainable Technologies programme <u>fully</u> satisfy the education requirement for CEng (Chartered Engineer) registration.</p> <p>The BEng(Hons) in Renewable Energy and Sustainable Technologies programme <u>partially</u> satisfy the education requirement for CEng (Chartered Engineer) registration. Further learning at Masters level is required.</p>
<b>Is accreditation in some way dependent on choices made by students?</b>	No
<b>Final award/s available</b> eg BSc/DipHe/CertHE	<ul style="list-style-type: none"> <li>a) MEng in Renewable Energy and Sustainable Technologies</li> <li>b) BEng(Hons) in Renewable Energy and Sustainable Technologies</li> <li>c) BEng Renewable Energy and Sustainable Technologies</li> <li>d) Diploma of Higher Education in Renewable Energy and Sustainable Technologies</li> <li>e) Certificate of Higher Education in Engineering</li> <li>f) Glyndŵr University Certificate of Continuing Education (Engineering) ( awarded with a minimum of 40 credits)</li> </ul>
<b>Award title</b>	<ol style="list-style-type: none"> <li>1) <b>MEng in Renewable Energy and Sustainable Technologies</b></li> <li>2) <b>BEng(Hons) in Renewable Energy and Sustainable Technologies</b></li> </ol>
<b>JACS 2 code</b>	<ol style="list-style-type: none"> <li>1) <b>J910: Energy Technologies.</b></li> <li>2) <b>J910: Energy Technologies.</b></li> </ol>

<b>UCAS code</b> (to be completed by admissions)	MEng REST H220 BEng REST HH36
<b>Relevant QAA subject benchmark statement/s</b>	QAA subject benchmark statements – Engineering (Nov - 2010) QAA subject benchmark statement: Engineering – Annex B4, MEng degrees (Jan - 2010) QAA subject benchmark statement: Construction, Property, and Surveying (Mar - 2008) QAA Code of Practice for the Assurance of Academic Quality and Standards in HE - Section 9: Work-based and placement learning (2007)
<b>Other external and internal reference points used to inform the programme outcomes</b>	UK Standard for Professional Engineering Competence (UK SPEC) – Engineering Council UK
<b>Modes of study</b> <i>(p/t, f/t, distance learning)</i>	1) MEng in Renewable Energy and Sustainable Technologies – <b>Full time</b> 2) BEng(Hons) in Renewable Energy and Sustainable Technologies – <b>Full time and Part time</b>
<b>Language of study</b>	English
<b>Date at which the programme specification was written or revised</b>	September 2012 Updated March 2014 Updated September 2015

<b>Criteria for admission to the programmes</b>
<p>The Engineering department welcomes applications from all backgrounds: school or college leavers; people in industry whether employment is relevant or not; European and international students. The aim of the admissions policy is to enable maximum participation from all who are capable of benefiting from a programme of study.</p> <p><b>Entry to Level 4</b> <b><i>BEng(Hons)</i></b></p> <p>The normal entry requirements for Level 4 are 240 UCAS tariff points at GCE A Level or equivalent for BEng(Hons) programmes (To include normally GCE A level in mathematics/physics or equivalent). These could be achieved by combining points from different qualifications so long as they are not in the same subject: Two GCE A Levels at grades AA/A*B or three GCE A Levels at grades CCC/BCD/BBE, etc or Scottish Highers (Two advanced Highers at grades AB or one Advanced Higher at grade A plus two Highers at grades BC worth 245 points, etc).</p> <p>Each BEng(Hons) Level 4 application will be considered individually, taking into account different qualifications including Irish Leaving Certificates, International Baccalaureate, Welsh Baccalaureate, Access Courses, BTEC Nationals (One BTEC Extended Diploma Level 3 at grades MMM, etc), GNVQ, NVQ and VRQ as well as other qualifications from overseas.</p> <p><b><i>MEng</i></b></p> <p>The normal entry requirements for Level 4 are 280 UCAS tariff points from GCE A Level or equivalent (To normally include GCE A level in mathematics/physics or equivalent) with a minimum of 200 points from 2 GCE A-Levels or equivalent for MEng programmes.</p>

Each MEng Level 4 application will be considered individually, taking into account different qualifications including Irish Leaving Certificates, International Baccalaureate, Welsh Baccalaureate (Welsh Baccalaureate Advanced Diploma is welcomed alongside A-Levels or equivalent, to meet the overall course UCAS tariff requirements), Access Courses, BTEC Nationals (One BTEC Extended Diploma Level 3 at grades DMM or one BTEC Diploma Level 3 at grades DM in addition to an A-Level Grade C in a relevant subject to achieve the overall tariff, etc) as well as other qualifications from overseas.

Applications are welcomed from persons who do not possess the standard qualifications but who can demonstrate, through the presentation of a professional portfolio, their capacity to pursue the programme successfully. A significant aspect of selection is the level of commitment, enthusiasm and interest in the subject as well as the requisite key and cognitive skills.

### **Entry to Level 5**

#### ***MEng/BEng(Hons)***

For entry to Level 5 of MEng/BEng(Hons) programmes applicants must satisfy the Level 4 entry criteria by producing documentary evidence that they have achieved a qualification at Level 4 or better in a relevant discipline subject and submit an RP(E)L claim, in line with the University's procedures. Direct entry to Level 5 is subject to approval of the RP(E)L claim. Entry to Level 5 may be sought by students who can present evidence listed below:

- (a). Have passed a Cert HE in a relevant discipline;
- (b). Have passed an HNC/HND (to include a Merit in Mathematics) in a relevant discipline;
- (c). Have passed a French DUT or BTS in a relevant discipline;
- (d). Have passed a qualification from an EU or other overseas country equivalent, as defined as equivalent by NARIC, to a Cert HE or better in a relevant discipline.

Other relevant qualifications or a combination of relevant qualifications and industrial experience may be considered for direct entry to Level 5 in accordance with the University's RP(E)L procedures. The Admissions Tutors can advise.

### **Entry to Level 6**

#### ***MEng/BEng(Hons)***

For entry to Level 6 of BEng(Hons) programmes applicants must satisfy the Level 4 entry criteria by producing documentary evidence that they have achieved a qualification at Level 5 or better in a relevant discipline, and submit an RP(E)L claim, in line with the University's procedures. Direct entry to Level 6 is subject to approval of the RP(E)L claim. Entry to Level 6 may be gained by students who can present evidence listed below:

- (a). Have passed a Dip HE in a relevant discipline;
- (b). Have passed a French DUT with overall average across the two years of 14/20 (i.e.: 70% or better) for MEng programmes or with overall average across the two years of 12/20 (i.e.: 60%) for BEng(Hons) programmes;
- (c). Have achieved a minimum of 150 ECTS credits in a relevant discipline (Only 120 ECTS credits equivalent to 240 UK credits will be counted for AP(E)L claims);
- (d). Have passed a Foundation Degree or HND in a cognate discipline;

Holders of relevant HND and Foundation Degrees will be considered for entry to Level 6 of MEng programmes if overall modules average is at least 70% or higher or BEng(Hons) programmes if overall modules average is at least 60% or higher. Each application will be considered on their own merit with the content / outcomes of the completed programme mapped against Level 4 and 5 of the BEng(Hons) programmes and Glyndŵr University RP(E)L procedures will apply. Direct entry to Level 6 is subject to approval of the RP(E)L claim. Where modules are not sufficiently matched, the applicants may be required to pass a bridging programme of study (Normally a Summer School programme) prior to commencing Level 6 modules.

- (e). Have passed a qualification from an EU or other overseas country equivalent, as defined as equivalent NARIC, to a Dip HE or better in a relevant discipline.

Other relevant qualifications or a combination of relevant qualifications and industrial experience may be considered for direct entry to Level 6 in accordance with the University's RP(E)L procedures. The Admissions Tutors can advise.

European Students wishing to study for an Ordinary degree may be granted direct entry for the final year if they have satisfied the following entry requirements:

- (a). Have passed a French DUT or BTS in a relevant discipline;
- (b). Have achieved a minimum of 120 ECTS credits in a relevant discipline (e.g.: German State Certified Engineering Certificate). Note: only 90 ECTS credits equivalent to 180 UK credits will be counted for RP(E)L claims.

Again, this will be dealt with current Glyndŵr University RP(E)L regulations.

### **English Language**

In addition to technical qualifications, all applicants must be proficient in the use of the English language. European and International candidates must possess a suitable English language qualification in line with Glyndŵr University's English admission requirements. Therefore, 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.

Home students will normally be expected to possess a suitable GCSE/GCE O level in English (or Welsh, if an applicant's first language is Welsh) at grade C or an approved equivalent qualification.

### **Transferability**

All candidates who apply for the BEng(Hons) programmes initially who demonstrate reasonable academic performance at the end of Level 5 (Overall aggregate of 55% or above at Level 5) have the opportunity to transfer to the MEng programmes or to continue with the BEng(Hons) programmes. An interview will be offered by the Programme Leader and the Admissions Tutor in order to provide guidance and support with regards to progression and placement. Please note that a successful interview itself is not a progression requirement.

MEng candidates may also request to transfer to the corresponding BEng programme, noting that if this takes place after completion of Level 6 they will be required to undertake additional Level 6

modules to satisfy the BEng module requirements (please refer to the programme structures). The programme team will offer guidance and support to students in these instances.

### **University's equal opportunities**

Selection to join the programmes will be in accordance with the University's equal opportunities policy and with the programme's Admission and Recruitment policy. The criteria for selection is based upon:

- (a). Academic ability (application form);
- (b). Communication skills (verbal and written), and;
- (c). Ability to cope with both the academic and emotional demands of the programmes.

### **Aims of the programmes**

The MEng/BEng(Hons) in Renewable Energy and Sustainable Technologies programmes are designed to prepare students for their future career by providing them with the initial educational requirements of a Professional Engineer together with a suitable range of management and transferable skills appropriate to the practice of Renewable Energy and Sustainable Technologies field. This will enable graduates to operate effectively in their initial appointment and provide a strong basis for future career development in management and technical leadership.

The BEng(Hons) in Renewable Energy and Sustainable Technologies programme aims to:

- Provide an intellectually stimulating and vocationally relevant teaching environment to facilitate students' development of academic and practical skills;
- Develop specialist knowledge, intellectual, and practical skills that will enable graduates to analyse, design, and investigate robust sustainable solutions to engineering problems encountered in an industrial/manufacturing environment;
- To equip graduates with excellent professional and work related skills in order to respond to the needs of local, national, and global industry;
- Equip students with a range of transferable skills and attributes in the use of IT, team working, communication, time management, and problem solving methodology which will enable them to undertake responsible roles in industry and to engage in the process of lifelong learning;
- Develop relevant study and personal skills so that students progressively take responsibility for their learning and ultimately become independent learners.

In addition to the above, the MEng in Renewable Energy and Sustainable Technologies programme aims to:

- Produce graduates with an increased depth and breadth of knowledge and understanding of Renewable Energy and Sustainable Technologies, management and team work to enable them to assume roles involving technical leadership and management responsibility;
- Give students first-hand knowledge and experience of the practice of Renewable Energy and Sustainable Technologies in industry and the operation of Renewable Energy and/or Sustainable Technologies companies.

## Distinctive features of the programmes

### Benefits studying the programmes:

The programmes have been designed to meet the needs of local, national, and global industries and to develop candidates with knowledge, understanding and skills of Engineering-based disciplines and their applications.

From studying these programmes learners will be able to achieve a number of advanced skills in relation to communication, design and creativity, team work, numeracy, organisational and a variety of workshop skills. They will develop an understanding of the concept and process of engineering design and will apply engineering knowledge to creating and producing designs both as an individual and as part of a team. This ensures that this area of study is varied and on graduation offers excellent, wide-ranging career opportunities. Learners will also have opportunities to acquire business skills.

Career opportunities are wide ranging and the present shortage of practising engineers in the fields of renewable energy systems should lead to an increased demand from industry in future years. Students on these programmes in the past have been successful in seeking employment as engineering personnel with renown organisations such as Alstom, EDF Suez Energy UK, National Grid, Kellogg's Co. of Great Britain Ltd, Kronospan Ltd, Magnox Ltd to name a few.

Benefits of studying the programmes include:

- Computer-aided design laboratories, modern electrical and electronics laboratories, electrical machines and power laboratory, PCB laboratory, industry-standard instrumentation and control laboratory, and mechanical and thermofluid laboratories.
- High level of practical and design contents, which are supported by state-of-the-art equipment including an industry-standard rapid prototyping machine (fused deposition method), a subsonic and supersonic wind tunnel, a gas turbine test cell, a 3D scanner, Feedback electrical machines and power workstations, industry-standard soldering/rework tools and systems, complete temperature process training system, and Microchip microcontroller training boards.
- Use of industry-standard design and modelling software such as Mathcad, Fluent, ProEngineer, Abaqus, Edge-Cam, Flowcode, MATLAB/Simulink and its toolboxes, Multisim/Ultiboard, Altium Designer, Microchip MPLAB, HPVee, Allen Bradley and Siemens PLC software.
- Strong links with local, regional, and national businesses. For our students, this means programmes designed to meet the needs of industry and the market place, and greater choice and quality of industrial placement (MEng). Opportunities to visit local and regional companies to gain invaluable work experience in the engineering industry.
- Access to Glyndŵr University's internationally recognised research Centres - e.g.: the Centre for Solar Energy Research (CSER) based in St Asaph.
- Our programmes and research are aimed at developing the expertise, knowledge, and new ideas and cover the full breadth of renewable energy systems.
- Emphasis on career development, transferable skills, and professional business management.

Graduate employment rate is amongst the best in the country: 100% of our Renewable Energy graduates found employment, or went on to further study, within six months of graduating (HESA Destination of Graduates Leavers Survey 2011).

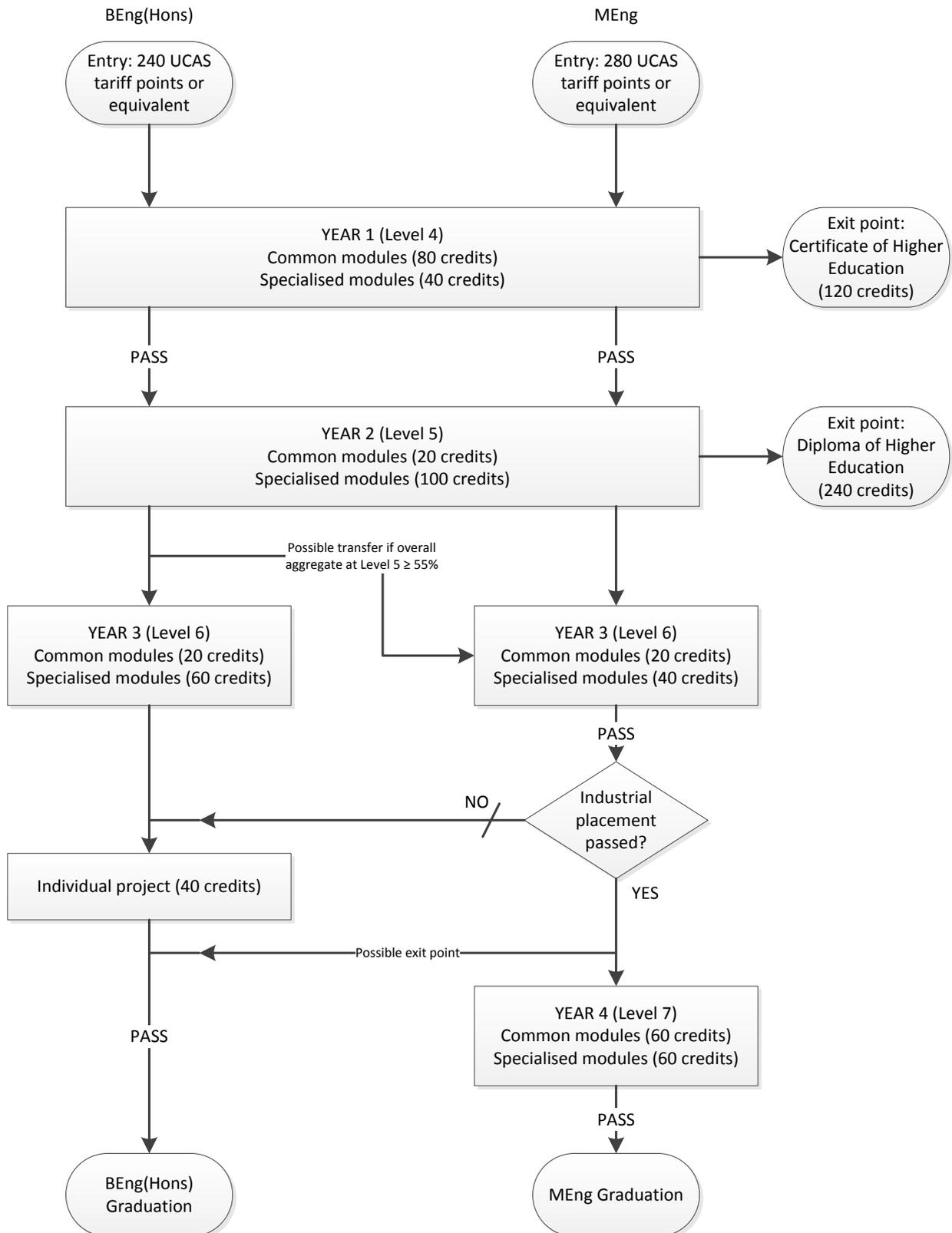
Graduates who wish to pursue in some depth an area of academic interest within the Engineering department could read for an MPhil or PhD postgraduate degree.

Professional Accreditation is a requirement for most Engineering careers. Graduates complete a period of approved employment and further professional development [matching section for BEng(Hons) graduates only] and after a period of four years and depending on which body they join they may have to pass a test of professional competence through an interview in order to achieve Chartered status, C.Eng. These programmes will be submitted for accreditation by the Energy Institute (IE), the Institution of Engineering and technology (IET), the Institution of Mechanical Engineers (IMechE), and the Association of Building Engineers (ABE) via the Engineering Accreditation Board (EAB). The Accreditation visit has already been arranged to take place on 15<sup>th</sup>-16<sup>th</sup> May 2013.

Programme team members are appropriately professionally qualified with relevant prior professional experience and maintain a substantial base of scholarly activity within their professional bodies and related Sector Skills Councils underpinned by academic research.

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

The tables below present programme structures, levels, modules, credits and awards, where,  
 MEng REST – MEng in Renewable Energy and Sustainable Technologies  
 BEng REST – BEng(Hons) in Renewable Energy and Sustainable Technologies



**Level 4 (Year 1)**

Code	Title	Credits	MEng REST	BEng REST	Module Leader
ENG458	Mechanical Science	20cr	c	c	ZC
ENG459	Electrical Science	20cr	c	c	RH
AUR428	Construction Technology 1	20cr	c	c	DC
ENG461	Engineering Mathematics	20cr	c	c	CB
ENG462	Introduction to Engineering Design and Practice	20cr	c	c	FRW
ENG469	Introduction to Energy Systems and Sustainability	20cr	c	c	CB

c = core                      o = option

**Level 5 (Year 2)**

Code	Title	Credits	MEng REST	BEng REST	Module Leader
ENG536	Business and Research Development	20cr	c	c	XY
ENG551	Engineering and Mechanism Dynamics and Eng Design	20cr	c	c	ZC
ENG565	Electrical Power Engineering	20cr	c	c	YV
ENG537	Further Engineering Mathematics	20cr	c	c	CB
ENG50L	Renewable Energy	20cr	c	c	DC
<i>Optional Modules</i>					
ENG564	Electrical Machines	20cr	o	o	YV
AUR507	Construction Technology 2	20cr	o	o	DC
ENG568	Thermal Energy Systems	20cr	o	o	KD
SCI508	Sustainability and Resource Management	20cr	o	o	AC

c = core                      o = option

**Level 6 (Year 3)**

Code	Title	Credits	MEng REST	BEng REST	Module Leader
ENG603	Inter-Professional Studies in Engineering	20cr		c	AO
ENG646	Wind Turbine Design and Analysis	20cr	c	c	XY
AUR612	Construction Technology 3	20cr	c	c	DC
AUR601	Dissertation	40cr		o	CS
ENG609	Individual Project (Honours)	40cr		o	RJG
ENG610	Individual Project (Ordinary)	20cr		o	RJG
ENG611	Industrial Placement	60cr	c		RD
<i>Optional Modules</i>					
ENG645	Power Electronics and Electric Drives	20cr	o	o	YV
AUR642	Urban Renewal	20cr	o	o	DC
ENG647	Energy and Power Generation	20cr	o	o	KD
SCI605	Science and Technology in Society	20cr	o	o	JY

c = core                      o = option

**Level 7 (Year 4)**

Code	Title	Credits	MEng REST	BEng REST	Module Leader
ENG715	Employability and Entrepreneurship	20cr	C		CB
ENG716	Group Design Project	40cr	C		RJG
ENGM12	Advanced Electric Drives and Power Electronics	20cr	o		YV
ENG707	Electrical Power and Distributed Generation	20cr	o		YH
ENG705	Energy and the Environment: Economics and Policies	20cr	C		CB
ENG706	Sustainable Design and Innovation	20cr	C		CB

c = core

o = option

### Requirements for the satisfaction of each award, including exit awards:

The requirements for each award are defined in the Glyndŵr University Academic Regulations. In this, the FHEQ levels are mapped to the qualifications. However, in this Engineering Proposal, distinction is made between the four qualifications of Diploma of Higher Education, Ordinary Degree (which requires a minimum of 60 credits at level 6), Honours Degree, and Integrated Masters of Engineering Degree. This is illustrated in the table below. Reference is also made to level definitions in the QAA publication 'The Framework for Higher Education Qualifications in England, Wales and Northern Ireland, August 2008'. In particular, in this table the ordinary degree is shown as having the level 6 component.

Qualifications in this proposal	Academic Level FHEQ	Credits Attained	Professional Status associated with the level**	Corresponding FQ-EHEA Cycle
Certificate of Higher Education in Engineering	Level 4	<b>120</b> Any 120 from Level 4 or higher	N/A	N/A
Diploma of Higher Education	Level 5	<b>240</b> 120 from Level 4 or higher 120 from Level 5 or higher	Incorporated Engineer (IEng) plus further learning to Degree level	Short cycle qualification
Ordinary Degree*	Level 6	<b>300</b> 120 at Level 4 100 (minimum) at Level 5 60 (minimum) at Level 6	Incorporated Engineer (IEng)	First cycle qualification
Honours Degree	Level 6	<b>360</b> 120 at Level 4 120 at Level 5 120 at Level 6	Chartered Engineer (CEng) plus further learning to Master's level	
Integrated Master's Degree***	Level 7	<b>480</b> 120 at Level 4 120 at Level 5 120 at Level 6 120 at Level 7	Chartered Engineer (CEng)	Second cycle qualification

\* BEng Ordinary: Achievement of 300 credits of which a minimum of 60 and maximum of 80 should be at level 6, a maximum of 120 credits at level 4 and the remainder from level 5.

\*\* Students with the relevant academic credits and vocational/professional experience are encouraged to apply to Professional Bodies for those levels of membership. The consistent successful student application from existing programmes is a source of confidence for the Programme Team.

\*\*\* The Integrated Master's degree programme includes study equivalent to four full-time academic years, of which study equivalent to one full-time academic year is at Level 7. Thus study at Bachelor's level is integrated with study at Master's level and the programme has been designed to meet the Levels 6 and 7 qualification descriptors in full.

There are no specific modules defined for the exit awards of Certificate and Diploma in order to allow maximum flexibility for the student to complete. The only constraint is that for the Diploma of Higher Education where the modules must be part of the programme being studied.

For the ordinary degree a 20-credit Individual Project (Ordinary) is essential (or a 40-credit Individual Project (Honours)/dissertation) but otherwise the same flexibility in choice of modules applies.

The programme also provides for exit awards a Glyndŵr University Certificate of Continuing Education (Engineering) which will be awarded to students who successfully complete 40 credits from anywhere in the programme.

## **1. MEng in Renewable Energy and Sustainable Technologies**

Modes of study: Full-time, four years. The programme structure and the arrangement for module delivery are shown in Figure 1 (a) below.

## **2. BEng(Hons) in Renewable Energy and Sustainable Technologies**

Modes of study: Full-time or part-time.

The planned length for the full-time mode is three years. The programme structure and the arrangement for full-time delivery are shown in Figure 4 (b) below.

No part-time for the level 4.

Part-time delivery for level 5 modules is based on a one-day-release pattern (See Figure 4 (c)). Part-time students are subject to the same regulations as full-time students. However, each level of study takes place over two years and follows the pattern defined in the table below. The part-time students study level 5 with 'Year 1' offered alternately with 'Year 2' – on a rolling basis. Students can commence with either of these thus two intakes will typically be studying together.

At level 6, the module delivery is based on a two-year one-day-release pattern.

### ***Two-year one-day-release pattern:***

The project is always taken in Year 2 at Level 6. The module Construction Technology 3 will be delivered in a 'long-thin' pattern which lasts for two semesters. The two sets of modules (start with year 1 or start with year 2) alternate.

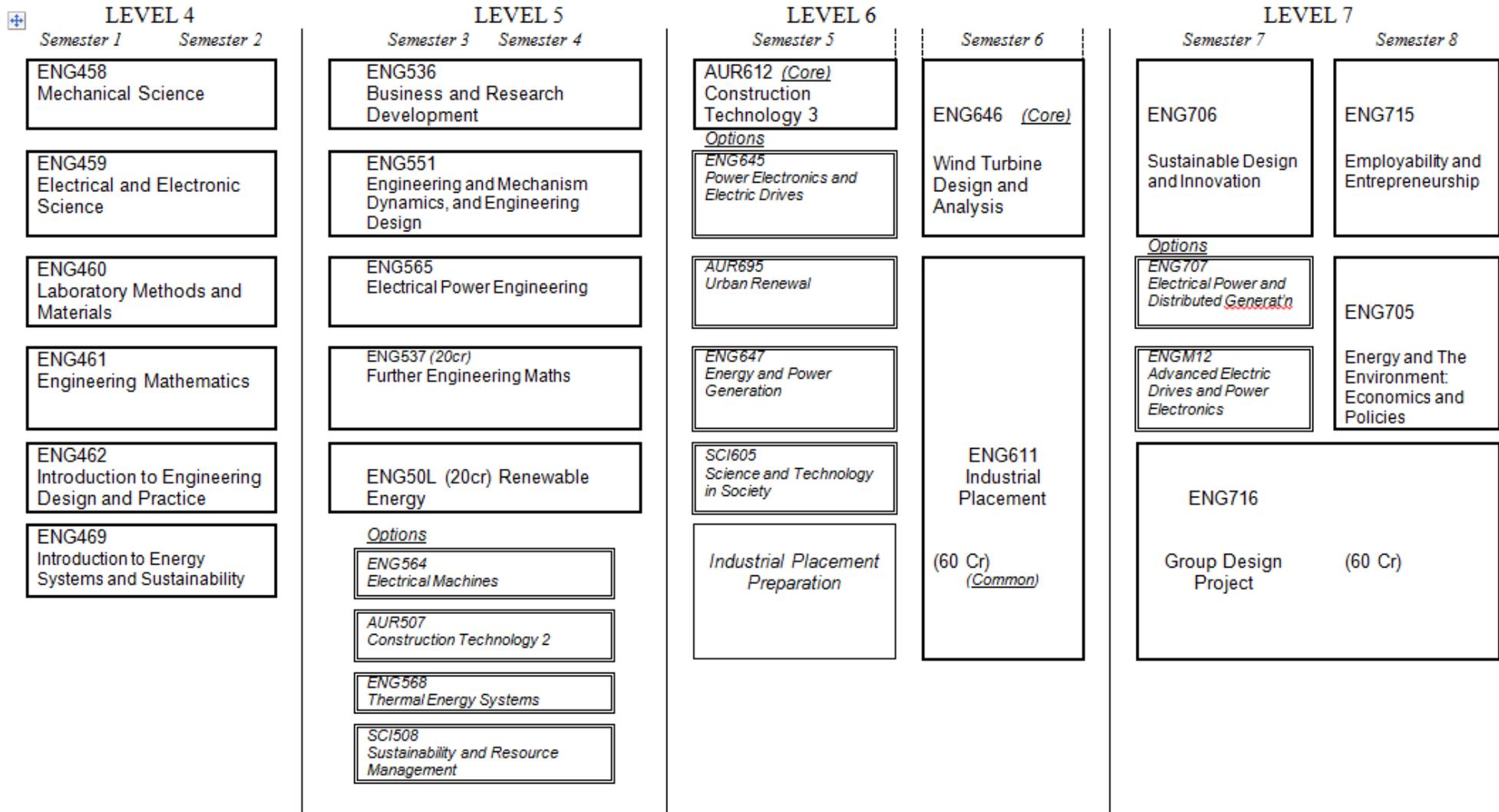


Figure 4(a) MEng in Renewable Energy and Sustainable Technologies

## BEng(Hons) in Renewable Energy and Sustainable Technologies Full-Time

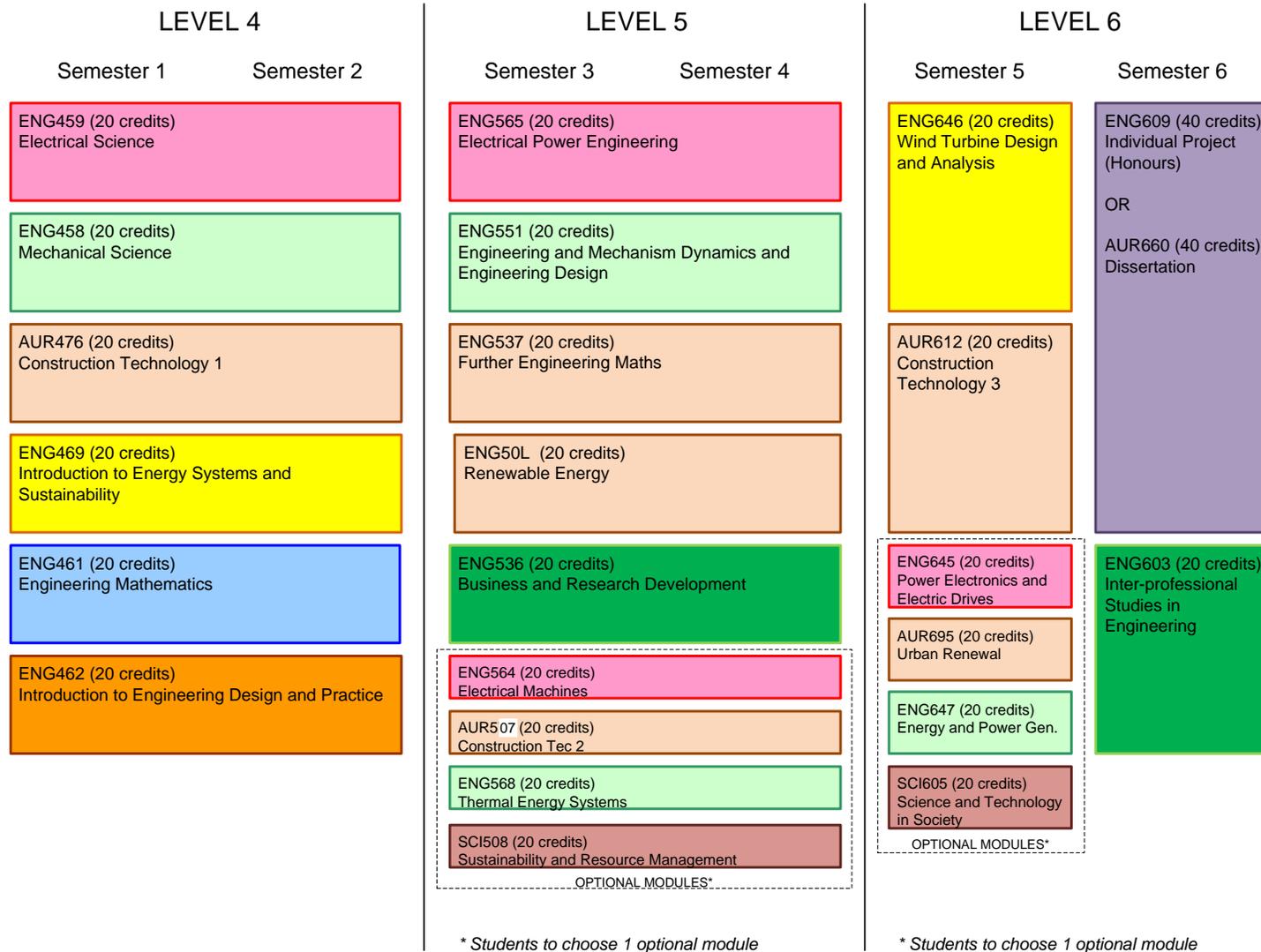


Figure 4(b)

## BEng (Hons) in Renewable Energy and Sustainable Technologies Part-Time

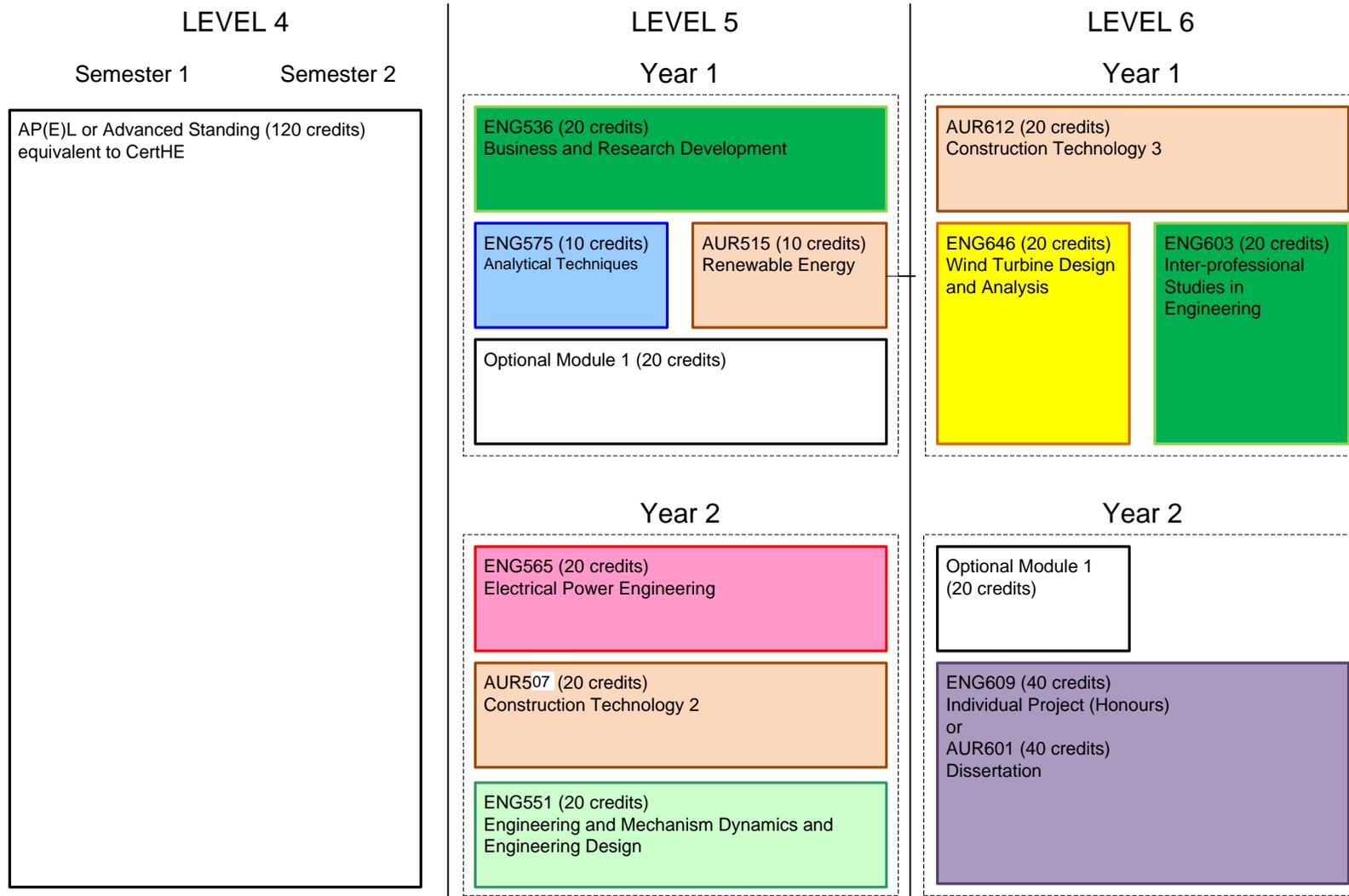


Figure 4 (c)

## Intended learning outcomes of the programmes

The intended learning outcomes for these programmes follow a spiral curriculum with the intention being that outcomes are built upon at each Level. The following learning outcomes have been differentiated according to the QAA Framework for HE qualifications and the Engineering Council UK SPEC programme learning outcomes:

### Intended Programme Learning outcomes for the Certificate of Higher Education in Engineering

#### **A) Knowledge and Understanding (Underpinning Science and Mathematics):**

Students must be able to:

- A1. Describe the essential scientific principles and methodology, including: electricity, circuit theory, properties of materials, fundamentals of mechanics, construction technology, and energy systems, necessary to underpin their education in Renewable Energy and Sustainable Technologies;
- A2. Describe the basic mathematical principles necessary to underpin their education in Renewable Energy and Sustainable Technologies and to enable them to apply mathematical methods, tools, and notation in the analysis and solution of simple engineering problems.

#### **B) Intellectual Skills (Engineering Analysis):**

Students must be able to:

- B1. Identify and describe the basic engineering principles and apply them to given key engineering processes;
- B2. Identify and describe the performance of systems and components through the use of fundamental analytical methods and modelling techniques.

#### **C) Subject and Practical Skills (Design and Engineering Practice):**

Students must be able to:

- C1. Solve given problems and understand constraints including health and safety and risk assessments;
- C2. Use specified design processes;
- C3. Use specified materials, equipment, processes, or products;
- C4. Work safely in a systematic supervised workshop or laboratory environment while using specified tools and techniques.

#### **D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):**

Students must be able to:

- D1. Demonstrate awareness of health and safety issues;
- D2. Understand the need for a professional and ethical conduct in engineering;
- D3. Understand the need for high standards of engineering practice and ethical conduct.

## **Intended Programme Learning outcomes for the Diploma of Higher Education in Renewable Energy and Sustainable Technologies**

### ***A) Knowledge and Understanding (Underpinning Science and Mathematics):***

Students must be able to:

- A1. Identify and explain the essential scientific principles and methodology, including: electricity, circuit theory, properties of materials, fundamentals of mechanics, construction technology, and energy systems, necessary to underpin their education in Renewable Energy and Sustainable Technologies to enable appreciation of its scientific and engineering context;
- A2. Identify and explain the essential mathematical principles necessary to underpin their education in Renewable Energy and Sustainable Technologies and to enable them to apply mathematical methods, tools, and notation in the analysis and solution of engineering problems;
- A3. Apply principles of Renewable Energy and Sustainable Technologies, engineering dynamics, electrical power engineering and/or electrical machines and/or sustainable development practice, thermal energy systems, sustainability and resource management depending upon their chosen options;

### ***B) Intellectual Skills (Engineering Analysis):***

Students must be able to:

- B1. Analyse, evaluate, and identify engineering principles and apply them to analyse essential key engineering processes;
- B2. Identify, classify, and describe the performance of systems and components through the use of analytical methods and modelling techniques;
- B3. Apply given quantitative methods and computer software tools relevant to the Renewable Energy and Sustainable Technologies discipline in order to solve engineering problems;

### ***C) Subject and Practical Skills (Design and Engineering Practice):***

Students must be able to:

- C1. Solve straightforward problems and understand constraints including health and safety and risk assessments;
- C2. Understand customer and user needs;
- C3. Accept responsibility for implementing given cost drivers;
- C4. Use specific design processes and evaluate outcomes;
- C5. Use specific materials, equipment, processes, or products;
- C6. Work safely in a supervised workshop or laboratory environment while using specific tools and techniques.

### ***D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):***

Students must be able to:

- D1. Understand commercial and economic context of specific engineering processes;
- D2. Apply business management techniques which may be used to achieve certain engineering objectives within that context;
- D3. Demonstrate awareness of health, safety, and risk issues;
- D4. Apply high standards of engineering practice and ethical conduct.

## **Intended Programme Learning outcomes for the BEng (Ordinary) in Renewable Energy and Sustainable Technologies**

### ***A) Knowledge and Understanding (Underpinning Science and Mathematics):***

Students must be able to:

- A1. Identify and explain, in sufficient detail for the purpose, scientific principles and methodology, including: electricity, circuit theory, properties of materials, fundamentals of mechanics, construction technology, and energy systems, necessary to underpin their education in Renewable Energy and Sustainable Technologies, to enable appreciation of its scientific and engineering context, and to support their understanding of historical and current developments and technologies;
- A2. Identify and explain, in sufficient detail for the purpose, mathematical principles necessary to underpin their education in Renewable Energy and Sustainable Technologies and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of engineering problems, including limited complex ones;
- A3. Apply and integrate knowledge and understanding of some engineering disciplines such as: electrical systems engineering or energy and power generation or urban renewal or bioscience to support study in Renewable Energy and Sustainable Technologies;

### ***B) Intellectual Skills (Engineering Analysis):***

Students must be able to:

- B1. Make judgements by evaluating and identifying the relevance and significance of engineering principles and apply them to analyse key engineering processes;
- B2. Identify, classify, and analyse the performance of systems and components through the use of analytical methods and modelling techniques;
- B3. Apply and select appropriate quantitative methods and computer software tools relevant to the Renewable Energy and Sustainable Technologies discipline in order to solve engineering problems;
- B4. Understand the need of a systems approach when dealing with Renewable Energy and Sustainable Technologies problems;

### ***C) Subject and Practical Skills (Design and Engineering Practice):***

Students must be able to:

- C1. Define problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;
- C2. Understand customer and user needs and the importance of considerations such as aesthetics;
- C3. Take some responsibilities for initiating, identifying, and implementing cost drivers;
- C4. Ensure fitness for purpose for the broad aspects of the problem including production, operation, maintenance and disposal;
- C5. Manage the design process and evaluate outcomes;
- C6. Select and use a range of materials, equipment, processes, or products;
- C7. Operate safely in a workshop or laboratory environment while using specific tools and techniques;
- C8. Identify and use the professional engineering principles applicable to the management of engineering projects;
- C9. Include academic publications to collect and evaluate technical literature and other information sources;
- C10. Demonstrate awareness of nature of intellectual property and contractual issues;

C11. Understand the codes of practice and industry standards.

***D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):***

Students must be able to:

- D1. Identify commercial and economic context of engineering processes;
- D2. Apply management techniques, which may be used to achieve main engineering objectives within that context;
- D3. Understand the constraint associated with engineering activities to promote sustainable development;
- D4. Demonstrate awareness of the framework of key legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
- D5. Understand the need for a high level of professional and ethical conduct in engineering.

**Intended Programme Learning outcomes for the BEng (Honours) in Renewable Energy and Sustainable Technologies**

***A) Knowledge and Understanding (Underpinning Science and Mathematics):***

Students must be able to:

- A1. Identify and explain, in sufficient detail for the purpose, scientific principles and methodology, including: electricity, circuit theory, properties of materials, fundamentals of mechanics, construction technology, and energy systems, necessary to underpin their education in Renewable Energy and Sustainable Technologies, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies;
- A2. Identify and explain, in sufficient detail for the purpose, mathematical principles necessary to underpin their education in Renewable Energy and Sustainable Technologies and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of complex engineering problems;
- A3. Apply and integrate knowledge and understanding of other engineering disciplines such as: electrical systems engineering or energy and power generation or urban renewal or bioscience to support study in Renewable Energy and Sustainable Technologies.

***B) Intellectual Skills (Engineering Analysis):***

Students must be able to:

- B1. Make judgements by critically evaluating and identifying the relevance and significance of engineering principles and apply them to analyse key engineering processes;
- B2. Identify, classify, and critically analyse the performance of systems and components through the use of analytical methods and modelling techniques;
- B3. Apply and select appropriate quantitative methods and computer software tools relevant to the Renewable Energy and Sustainable Technologies discipline in order to solve complex engineering problems;
- B4. Apply a systems approach to Renewable Energy and Sustainable Technologies problems.

***C) Subject and Practical Skills (Design and Engineering Practice):***

Students must be able to:

- C1. Define complex problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;
- C2. Define customer and user needs and the importance of considerations such as aesthetics;

- C3. Take responsibility for initiating, identifying, and implementing cost drivers;
- C4. Use creativity to establish innovative solution;
- C5. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;
- C6. Manage the whole design process and evaluate outcomes;
- C7. Select and use appropriate materials, equipment, processes, or products;
- C8. Operate safely in a workshop or laboratory environment while using a range of tools and techniques;
- C9. Identify and use the professional engineering principles applicable to the management of engineering projects as well as operation and maintenance of industrial processes;
- C10. Include some current research and academic publications to collect and evaluate technical literature and other information sources;
- C11. Demonstrate awareness of nature of intellectual property and contractual issues;
- C12. Apply appropriate codes of practice and industry standards;
- C13. Demonstrate awareness of quality issues;
- C14. Work with technical uncertainty.

***D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):***

Students must be able to:

- D1. Identify commercial and economic context of engineering processes;
- D2. Apply management techniques, which may be used to achieve engineering objectives within that context;
- D3. Understand the requirement for engineering activities to promote sustainable development;
- D4. Demonstrate awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
- D5. Understand the need for a high level of professional and ethical conduct in engineering.

**Intended Programme Learning outcomes for the MEng in Renewable Energy and Sustainable Technologies**

***A) Knowledge and Understanding (Underpinning Science and Mathematics):***

Students must be able to:

- A1. Select and comprehensively explain scientific principles and methodology, including: electricity, circuit theory, properties of materials, fundamentals of mechanics, construction technology, and energy systems, necessary to underpin their education in Renewable Energy and Sustainable Technologies, to enable appreciation of its scientific and engineering context, and to support their awareness of developing technologies related to their specialisations in either electrical or electronic engineering;
- A2. Select and comprehensively explain mathematical principles necessary to underpin their education in Renewable Energy and Sustainable Technologies and to enable them to apply mathematical methods, tools, and notation proficiently in the analysis and solution of complex and conceptually challenging engineering problems;
- A3. Apply mathematical and computer models relevant to the engineering disciplines and evaluate their limitations;
- A4. Extend knowledge and understanding of other engineering disciplines such as electrical systems engineering or power engineering to support study in Renewable Energy and Sustainable Technologies;

A5. Understand concepts from outside Renewable Energy and Sustainable Technologies and to apply them effectively in engineering projects.

**B) Intellectual Skills (Engineering Analysis):**

Students must be able to:

- B1. Make informed judgements by critically evaluating fundamental engineering principles to investigate new and emerging technologies;
- B2. Identify, classify, and synthesise the performance of systems and components through the use of analytical methods and modelling techniques;
- B3. Apply mathematical and computer-based models for solving problems in engineering, and assess the limitations of particular cases;
- B4. Extract data pertinent to an unfamiliar problem and apply in its solution using computer-based engineering tools when appropriate.

**C) Subject and Practical Skills (Design and Engineering Practice):**

Students must be able to:

- C1. Define and deal with complex and conceptually challenging problems and evaluate constraints including environmental and sustainability limitations, health and safety and risk assessment issues;
- C2. Define and evaluate customer and user needs and the importance of considerations such as aesthetics;
- C3. Take full responsibility for initiating, identifying, and amending cost drivers;
- C4. Use creativity systematically to establish innovative solution;
- C5. Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;
- C6. Extend knowledge and understanding of design processes and methodologies, apply and adapt them in unfamiliar situations;
- C7. Generate an innovative design for products, systems, components, or processes to fulfil new needs.
- C8. Thoroughly understand current practice and its limitations, and some appreciation of likely new developments as well as select, use, and evaluate appropriateness of a wide range of engineering materials and components;
- C9. Operate safely in a workshop or laboratory environment while using a range of tools and techniques;
- C10. Apply engineering techniques taking into account a range of commercial and industrial constraints;
- C11. Draw heavily on current research and academic publications to collect and evaluate technical literature and other information sources;
- C12. Appreciate the nature of intellectual property and contractual issues;
- C13. Manage quality issues;
- C14. Work with technical uncertainty.

**D) Professional Skills and Employability Skills (Economic, Social, and Environmental Context):**

Students must be able to:

- D1. Interpret commercial and economic context of engineering processes;
- D2. Extend knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately;
- D3. Recognise the requirement for engineering activities to promote sustainable development;

- D4. Extend awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
- D5. Apply high level of professional and ethical conduct in engineering at all time;
- D6. Make general evaluations of commercial risks through some understanding of the basis of such risks.

**PROGRAMME LEARNING OUTCOME MAP**  
**MEng in Renewable Energy and Sustainable Technologies**

Title	Core or Option	Knowledge and Understanding					Intellectual Skills				Subject and Practical Skills														Professional and Employability Skills							
		A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	D6		
<b>Level 4 CertHE (120 credits)</b>																																
Mechanical Science	C	x	x				x	x			x																					
Electrical Science	C	x	x				x	x			x																					
Construction Technology 1	C	x						x			x		x	x											x	x	x					
Engineering Mathematics	C		x					x																								
Intro. to Eng. Design and Practice	C						x	x			x	x	x	x											x	x	x					
Intro. To Energy Sys. and Sust.	C	x					x	x				x	x	x											x	x						
<b>Level 5 DipHE (240 credits)</b>																																
Business and Research Dvpt	C										x		x	x	x	x									x	x	x	x				
Further Engineering Mathematics	C		x					x																								
Electrical Power Engineering	C	x	x	x			x	x	x		x	x	x	x											x							
Renewable Energy	C												x																			
Construction Technology 2	C												x																			
Eng. & Mech. Dyn. & Eng Des.	C	x	x	x			x	x	x		x	x	x	x	x	x										x	x	x				
Thermal Energy Systems	O	x	x	x			x	x	x		x	x	x	x											x							
Sust. and Resource Management	O	x	x	x			x	x	x		x	x	x	x											x							
Electrical Machines	O	x	x	x			x	x	x		x	x	x	x											x							
<b>Level 6 BEng(Hons) (360 credits)</b>																																
Wind Turbine Design and Analysis	C	x						x	x	x	x	x	x	x	x	x		x	x	x		x	x						x			
Industrial Placement	C								x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
Construction Technology 3	C	x	x	x			x	x		x				x	x																	
Energy and Power Generation	O	x	x	x			x	x		x	x			x		x						x	x									
Pwr Elcn and Electric Drives	O	x	x	x			x	x		x	x			x	x		x					x							x			
Science and Tech. in Society.	O	x	x	x			x	x		x			x	x	x	x		x	x	x		x	x						x			
Urban Renewal	O	x					x			x	x	x	x	x	x	x					x			x	x		x					
<b>Level 7 MEng (480 credits)</b>																																
Employability & Entrepreneurship	C										x				x				x	x	x	x	x		x	x	x	x	x	x	x	
Sustainable Design & Innovation	C																								x	x	x	x	x	x	x	
Group Design Project	C										x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Adv. Electric Drives & Pwr Elecn.	O	x	x	x	x	x	x	x		x				x	x		x					x							x			
Elect. Pwr & Distribut'd Generat'n	O	x	x	x	x	x	x	x		x			x	x	x	x		x	x	x		x	x						x			
Energy & the Env.: Econ. & Poli.	C	x	x	x	x	x	x	x		x			x	x	x	x		x	x	x		x	x						x			

**PROGRAMME LEARNING OUTCOME MAP**  
**BEng(Hons) in Renewable Energy and Sustainable Technologies**

Title	Core or Option	Knowledge and Understanding			Intellectual Skills				Subject and Practical Skills														Professional and Employability Skills					
		A1	A2	A3	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	D1	D2	D3	D4	D5	
<b>Level 4 CertHE (120 credits)</b>																												
Mechanical Science	C	x	x				x	x			x																	
Electrical Science	C	x	x				x	x			x																	
Construction Technology 1	C	x						x			x		x	x											x	x	x	
Engineering Mathematics	C		x					x																				
Intro. to Eng. Design & Practice	C						x	x			x	x	x	x											x	x	x	
Intro. To Energy Sys. and Sust.	C	x					x	x				x	x	x											x	x		
<b>Level 5 DipHE (240 credits)</b>																												
Business and Research Dvpt	C										x		x	x	x	x										x	x	x
Further Engineering Mathematics	C		x					x																				
Electrical Power Engineering	C	x	x	x			x	x	x		x	x	x	x												x		
Renewable Energy	C												x															
Construction Technology 2	C												x															
Eng. and Mech. Dynamics and Eng Design	C	x	x	x			x	x	x		x	x	x	x	x	x										x	x	
Thermal Energy Systems	O	x	x	x			x	x	x		x	x	x	x												x		
Sust. and Resource Management	O	x	x	x			x	x	x		x	x	x	x												x		
Electrical Machines	O	x	x	x			x	x	x		x	x	x	x												x		
<b>Level 6 BEng(Hons) (360 credits)</b>																												
Wind Turbine Design and Analysis	C	x						x	x	x	x	x	x		x	x	x		x	x	x		x	x				
Inter-prof. Studies in Eng.	C						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Construction Technology 3	C	x	x	x			x	x			x				x	x												
Energy and Power Generation	O	x	x	x			x	x			x	x					x							x	x			
Pwr Elcn and Electric Drives	O	x	x	x			x	x			x	x				x	x		x					x				
Science and Tech. in Society.	O	x	x	x			x	x			x	x		x	x	x	x		x	x	x		x	x				
Urban Renewal	O	x					x				x	x	x	x	x						x				x	x		x

## Learning and teaching strategy used to enable outcomes to be achieved and demonstrated

The philosophy of the programme reflects and develops the University's mission statement and aims. The approach taken towards teaching and learning is based on a student-centred paradigm of learning designed to enable and maximise the abilities of the students to work in a wide variety of fields and disciplines within engineering. Thus, they are enabled to become independent, autonomous and reflective whilst also developing collaborative, strategic and professional capacities. They will develop and demonstrate critical analytical skills and problem-solving capabilities and the ability to be creative, pro-active and innovative. To this end, a variety of teaching and learning methods will be provided.

The learning and teaching strategy of these programmes accords fully with the University's mission statement and core values (Glyndŵr University Strategic Plan 2009-2014 - <http://glynfo.glyndwr.ac.uk/file.php/51/Strategies/Glyndwr-LearningAndTeachingStrategyPublic.pdf>) which highlight the importance of student centeredness, respect and care for the individual, the expression of ideas and the pursuit of knowledge. The University is also committed to expanding Welsh medium provision (Strategic Theme G in GUSP 2009-14) but the Engineering Team is currently unable to deliver any of the programmes in Welsh (See section: Welsh language below).

The Engineering academic staff strive to treat their students with respect, valuing their life experience and contributions in the classroom. This is further reinforced by the Programme Team making efforts to create a learning environment where students feel safe to ask questions and take part without fear of being embarrassed and where relationships with staff are collegial and friendly. Module Tutors believe that their role is that of facilitator of learning rather than just a transmitter of knowledge which the student receives passively. To this end students are encouraged to actively engage with their learning even in 'formal' lectures by periods of group discussion, by applying themselves in both directed / self-directed study, the use of a personal portfolio and regular dialogue with their Personal Tutor, Year Tutor, and Programme Leader. Some modules [e.g.: **Inter-Professional Studies in Engineering** (L6), **Sustainable Design and Innovation** (L7), **Group Design Project** (L7)] also incorporate problem based learning and the use of technical simulation and/or role play. In such approaches problem solving and team work is emphasised; an essential competency in a Professional Engineer.

However while recognising the importance of the andragogical approach it is recognised that many students who have joined us via a widening participation strategy (Strategic Theme F in the Glyndŵr University Strategic Plan 2009-2014), may not always be equipped initially to learn in this way. Module Tutors are sensitive to this need and may adapt their teaching style appropriately as well as facilitating the student to obtain help from University support services. Students early on in the programmes are encouraged to find out more about their own learning styles and work on their individual strengths and weaknesses. This is enhanced by the introduction of the University's Enterprise-based modules into years one and two, to encourage students to think about themselves as learners, develop their skills on an individual, peer and strategic level. This will subsequently contribute towards the graduates' employability status and cultivate entrepreneurial thinking [**Employability and Entrepreneurship** (L7)].

Other aspects of the educational process designed to promote active learning are tutorials, seminars, use of technology, for example setting up and contributing to online discussion forums, presentations, debates, case studies, and reflection on engineering practice. This latter aspect also demonstrates how

engineering practice is *par excellence* the medium whereby students actively integrate theory and practice and is a vital component of the learning and teaching strategy.

The use of technology to enhance learning has been widely debated in pedagogic literature, but it has the potential to create more flexible approaches to learning (JISC, 2007) as well as saving on travelling costs and time. To this end, the programme team have explored and proactively used technology to enhance learning in recent years, and the programme will benefit from these experiences. The use of technology to enhance learning has been integrated into the programme across all levels and across each year, along with more traditional methods, to meet a variety of learning styles, and to enable the student to learn within a ...'flexible, accessible and learner centred...' environment (WAG, 2009b. p3) as indicated in the Higher Education Strategy and Plan for Wales.

The theoretical modules are fully integrated with the engineering practice element of the programmes and give confidence that on completion the student will be well prepared to begin their new role as a Professional Engineer within their chosen field of practice. Importantly too, the educational ethos of the programmes will have prepared them as lifelong learners, well able to meet the demands of continuing professional development in the ever changing world of engineering.

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

#### Knowledge and Understanding

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

#### Intellectual Skills

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

#### Subject and Practical Skills

These skills are developed by the students undertaking individual activities mainly within practical sessions. Elementary skills - such as selection and use of appropriate equipment, interpretation and presentation of results, and report writing - are developed at the earliest stage. Higher level skills which require the use of planning, simulations and evaluation culminate in the main project.

### Transferable/key skills

Transferable skills include: communication skills, ability to work in a group or on one's own, management of time, use of computers and other technology, the application of calculations. (In fact, the discipline of regularly attending and contributing to classes exercises the transferable skills of self-management and time management.) Each module specification provides examples of transferable skills covered within its learning outcomes. Students are encouraged to write about their experiences in practice by recording them in their student portfolio. This portfolio, which also serves as a Personal Development Plan, is a repository of acquired knowledge and personal reflection and its careful completion provides a valuable learning tool throughout the programmes [**Introduction to Engineering Design and Practice (L4)**, **Business and Research Development (L5)**, **Industrial Placement (L6)**, **Inter-professional Studies in Engineering (L6)**, **Employability and Entrepreneurship (L7)**]. Information within the portfolio often helps to provide the evidence to allow the student to demonstrate competence in a learning outcome. The portfolio completion process is designed to develop critical faculties, self-awareness, problem solving, team working, autonomy, academic writing and reflective capacity (see also section on Assessment and Student Portfolio).

The first year (Level 4) modules comprise a set of building blocks that introduce students to the range of subject knowledge, understanding (e.g.: **Engineering Mathematics, Electrical Science, Mechanical Science, and Construction Technology 1**), and practical skills (e.g.: **Introduction to Engineering Design and Practice**) required throughout the programme. Subjects are approached from a perspective of practical problem-solving underpinned by theoretical understanding of professional knowledge. Skills development is not confined within modular parameters and students are expected, progressively, to participate in their own learning.

In the second year (Level 5) modules cover subjects of a more complex and specialist nature (e.g.: **Engineering and Mechanism Dynamics and Engineering Design, Electrical Power Engineering, and Renewable energy**) involving appraisal of practical situations, more complex options and computer-based modelling. These require students to prepare for lectures and tutorials and are backed up by the **Business and Research Development** module that assists in linking and aiding coherence across the programme.

Level 6 modules bring students into a range of challenging opportunities that enables them to demonstrate their achievement in variable option analysis and assessment (e.g.: **Inter-Professional Studies in Engineering**), independent learning, critical analysis and synthesis skills (e.g.: **Individual Project (Honours), Dissertation, or Industrial Placement**), and cognate professional knowledge (e.g.: **Construction Technology 3, Wind Turbine Design and Analysis**).

Level 7 (Integrated Master's degree-MEng) modules enable learners to deal with complex issues both systematically and creatively (e.g.: **Sustainable Design and Innovation**), make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences (e.g.: **Group Design Project**). Finally, learners will have the qualities needed for employment in circumstances requiring sound judgement, personal responsibility and initiative in complex and unpredictable professional environments.

### **Vocational Themes**

At Levels 5 and 6, students are given the opportunity to take optional modules which follow four specific themes depending upon their own interest:

- 1) Built Environment theme:  
At Level 6 **AUR642 Urban Renewal** (20 credits) This module will also be reflected in the choice of **AUR601 Dissertation** subject to make a vocationally relevant direction to their final year study;
- 2) Science theme:  
At Level 5 **SCI508 Sustainability and Resource Management** (20 credits) with **SCI605 Science and Technology in Society** (20 credits) at Level 6 plus their dissertation that will be science linked will make their choice of theme applicable to their chosen career area;
- 3) Electrical Engineering theme:  
At Level 5 **ENG564 Electrical Machines** (20 credits) with **ENG645 Power Electronics and Electric Drives** (20 credits) at Level 6. These modules will also be reflected in the choice of **Project-based** module to make a vocationally relevant direction towards electrical control system design;
- 4) Mechanical Engineering theme:  
At Level 5 **ENG568 Thermal Energy Systems** (20 credits) with **ENG647 Energy and Power Generation** (20 credits) at Level 6. These modules will also be reflected in the choice of **Project-based** module to make a vocationally relevant direction to their final year study.

Note: The resourcing of optional modules is not an issue as these modules are core (compulsory) on other programmes offered by the University Institute therefore they will always be available.

At all levels use is made of realistic vocational scenarios (e.g.: **Introduction to Engineering Design and Practice, Individual Project (Honours)/Dissertation** or **Group Design Project**) to link individual modules and aid subject coherence at a level appropriate to the student's development. Tutorials support the students and assist them to plan their own work and contribution to learning. Students are also expected to pursue their studies through independent study and research in addition to staff contact time.

### **Industrial Placement**

The Industrial Placement is an integral component of the integrated MEng degree programmes. It will normally be for 16 weeks (including statutory holiday), commencing February to May.

Although it will be the student responsibility to find his/her own placement, the University via its Careers Centre will offer significant help and support. It is anticipated that a placement officer will be appointed to be in regular contact with both students and companies/organisations.

Search for student's industrial placement will commence at the end of Level 5 in order for arrangements to be established in October. By beginning of December, students will visit their intended placement with the Module Leader or his/her Academic Supervisor and the Placement Officer to devise the project outline. The objectives of the work to be undertaken by the student will be discussed and agreed with the employer (or work placement provider), the student and the Industrial Placement Module Leader/Academic Supervisor to ensure that the work to be undertaken by the student is both of value to the employer and meets the requirements of the module learning outcomes. The objectives (learning outcomes), and the means of students achieving them, will be articulated and formalised in a Learning Agreement agreed and signed by all stakeholders. Hence, the Module Leader/Academic Supervisor will

arrange a meeting with the employer / Industrial Supervisor and the student to discuss and agree the following which will be monitored on a regular basis throughout the period of the student's placement:

- How the Industrial Placement module operate;
- How the placement provider will ensure that the student will have access to a working environment that enables him/her to confirm knowledge, develop skills and demonstrate competence to achieve the module learning outcomes;
- How the student will evidence appropriate work;
- The role and responsibility of the module leader in supporting the student and liaising with the employer;
- The role and responsibility of the employer/ Industrial Supervisor in supporting the student at work;
- The role and responsibility of the student in terms of achieving academic objectives and conducting themselves professionally at work.

The employer/ Industrial Supervisor's professional profile will be assessed by the Module Leader to ensure their experience is appropriate to support the student. Separate placement handbooks for employers/ Industrial Supervisor and students will be provided. Additionally, the employer/ Industrial Supervisor will be briefed by the Module Leader on the programme requirements so they will be fully prepared to provide support and guidance to the student.

During the industrial placement, the Academic Supervisor will maintain contact with the student and the employer/ Industrial Supervisor on an on-going basis according to the individual requirements of both either in person, by telephone, by e-mail, or by video conferencing. Irrespective of the amount of informal contact already made during the placement at least three formal meetings will be arranged to enable the Module Leader/Academic Supervisor along with the Placement Officer to discuss the student's progress with the employer/ Industrial Supervisor and student both on an individual and joint basis. Items for discussion at these meetings will include, but not be limited to:

- Student's progress towards previously identified objectives;
- Any additional support needs of the employer or student;
- Student's ability to apply new knowledge and skills;
- Actual benefit to the student and employer of the application of new knowledge and skills;
- Application of practical, professional and employability skills demonstrated by the student;
- Student and employer module-related documentation;

Upon completion of placement the Module Leader will be responsible for marking the assessments with contributions from the employer and will undertake a formal review of the placement with the student making use of the employer/ Industrial Supervisor feedback material. This formal review will discuss, but not be restricted to:

- Success in terms of meeting identified objectives;
- Enabling or limiting factors affecting achievement of objectives;
- Ability to apply new learning and skills at work;
- Ability to apply practical, professional and employability skills;
- Individual reflection leading to identification and definition of academic and vocational progress.

The Module Leader will be responsible for ensuring parity of student experience within the individual placement.

In exceptional circumstances where the industrial placement has been terminated at no fault of the student, it will continue at Glyndŵr University as simulated work-based project.

### **Welsh Medium**

Although the majority of students within the University are English speaking it is recognised that Welsh is the language of many people within Wales and some students and staff members. The University responds positively and constructively to this bilingual situation by creating a welcoming environment within which students from all cultures can interact on the basis of equality and mutual respect. Students have the right to submit assessments in the medium of Welsh; if they wish to do so they must notify the Superintendent of Examinations within two weeks of their commencement of study. The proportion of programmes that can be delivered in Welsh is 0%.

### **Assessment strategy used to enable outcomes to be achieved and demonstrated**

Assessment within the programme has been designed to measure and develop student performance in a variety of contexts. This not only includes assessment in the context of what they have learnt (summative), but also to use assessment as a process of learning, providing the student with the opportunity to improve their performance.

#### **Policy Guidance / University Regulations**

Assessment will also ensure that standards are reached in line with Professional Body requirements (Engineering Council UK, 2011), *The Framework for Higher Education Qualifications in England, Wales and Northern Ireland* (FHEQ) (QAA, 2008) and *The Credit and Qualifications Framework for Wales* (CQFW) (WAG, 2009a). The University's regulations will also be adhered to.

All assessments will be approved by the Programme Leader, Academic Leader, and the External Examiners in line with University regulations, to ensure that each assessment is explicit in its intent, and that it is valid and reliable.

Grade related criteria will be used to assess the students' work, with feedback provided to facilitate individual and group development. All assessment will be internally and externally moderated, to ensure that assessment is fair and consistent.

Module Leaders will collate work and are responsible for presenting this at assessment boards, to enable ratification of results in line with the Universities assessment regulations. External Examiners with *due regard* will attend assessment boards and contribute to the process, to ensure external validity of assessment. Students will be informed of provisional results prior to an assessment board, and in writing following ratification of the results, with re-submission dates if needed.

#### **Modular Assessment**

##### **Information on assessment**

Students will receive information on assessment in the programme handbook, which will include the importance of, and the need to access the University regulations, difficulties that may be encountered and how to avoid/manage these (for example, plagiarism and extenuating circumstances).

Assessment will be made clear, and Module Leaders will provide assignment briefs in written (paper and electronic format) with clear links to module learning outcomes. Assessment criteria/briefs will be discussed face to face and/or in electronic format through Moodle™ (virtual learning environment), to enable the student to clarify the nature of the assessment and raise any concerns/areas for clarification.

### **Range of assessments**

A wide range of assessment strategies have been adopted in the programmes to meet diverse learning styles and enable the students to meet modular and programme requirements, through either individual or group assessment, and students will be informed as to whether assessment is of a diagnostic, formative or summative nature.

Assessment modes include written assignments, case studies, reflective accounts, simulation, examinations (at least one unseen in year one), presentations, projects, online collaboration/contribution. It is considered important to provide flexible approaches to assessment if the needs of students are to be met, (QAA, 2010), and the programme team have acknowledged this.

Professional body requirements have been integrated into module assessment to foster developmental progression on the programmes, with cognisance paid to how these assessments may impact upon the student's final grade achievement (see 'Assessment regulations that apply to the programme').

### **Support in assessment**

Tutorials will be provided as group interactions, and Moodle™ will be utilised where appropriate to conduct synchronous/asynchronous discussion on assessment requirements.

Reasonable adjustments will be made in relation to student's individual needs for assessment and will be considered on an individual level by the Programme Team, whilst maintaining professional body requirements. Students who are struggling academically will be referred to the Student Support Centre, which has been of great benefit in supporting students in their studies. Depending on individual needs, various resources will be put in place and reasonable adjustments made.

Clear University policies exist, and will be adhered to for supporting students with extenuating circumstances, to enable students to engage with assessment on an equal footing with their peers, and to facilitate progression on the programme.

### **Improving Assessment**

In addition to the role of internal and external moderation to identify areas of concern or where improvement can be introduced, module evaluations will be scrutinised for aspects relating to assessment and fed back to the Programme Team through Programme Team meetings. Staff Student Consultative committee meetings will also inform the nature and process of assessment within the programme.

### **Assessment point criteria and assessment**

The assessments for each year have been designed to avoid overloading the student with assessments at any given time in that year (see sample of Assessment and Module duration on the following pages), to enable students to progress to the next level as far as possible, without the risk of trailing too many credits. This also allows the student to receive feedback on assessed work, and progressively develop and improve.

Assessment strategies tend to be module based but with integrated themes wherever practicable. Jointly taught modules are enhanced by correlated learning outcomes so that students are assessed within the context of their individual programme of study. The Engineering Programme Team have a long term substantial base of experience in delivering and assessing within the context of multi-disciplinary groups.

Assessment material (assignment briefs, exams, etc.) are prepared to meet particular outcomes or ranges of outcomes, internally checked for clarity and, in the case of coursework, presented to students at interactive briefing sessions. Submitted elements and complete work is assessed and feedback provided to students. Tutorials discuss group and individual on-going feedback during the course of the work set as well as on completion. Internal verification takes place before distribution of assessment material and prior to reporting of feedback and results.

The programme assessment strategy is designed to assess all relevant subject specific skills, intellectual skills and professional and employability skills. Within that basic framework, assessment is either:-

**Diagnostic:** Designed to provide an indicator of the learner's aptitude and preparedness for a programme of study and identify potential learning problems.

**Formative:** Designed to provide the student with feedback on progress and inform development.

**Summative:** Provide a measure of performance in relation to the learning outcomes for the module or programme.

The following learning and teaching methods are used to enable learners to achieve and demonstrate these outcomes:

#### Knowledge and Understanding

Assessment of Knowledge and Understanding in engineering modules is principally by means of unseen examinations at Levels 5, 6, and 7, although experimentation with novel assessment methods such as portfolio preparation and presentation are being introduced. Many modules use 'in-course' assessment involving practical work or written investigative assignments. In **Introduction to Engineering Design and Practice** (L4), **Business and Research Development** (L5), **Inter-professional Studies in Engineering** (L6), in the main **Individual Project (Honours)/Dissertation or Industrial Placement** (L6), **Sustainable Design and Innovation** (L7), and **Employability and Entrepreneurship** (L7), knowledge is assessed by means of presentations and formal report writing.

#### Intellectual Skills

Small-scale and highly specific problems are tested by means of an unseen examination component, particularly prevalent in the mathematical and analytical modules [i.e.: **Engineering Mathematics** (L4), **Further Engineering Mathematics** (L5), **Instrumentation and Control Systems Engineering** (L5), etc]. In many modules, particularly in the **Individual Project (Honours)** (L6), and **Group Design Project** (L7) modules, larger scale design exercises are set and assessed by means of a report reflecting on the activity carried out.

#### Practical Skills

Assessment of practical skills is covered entirely within practical exercises and the associated reporting, particularly project-based modules. The keeping of a personal log is a key part of **Introduction to**

**Engineering Design and Practice (L4), Business and Research Development (L5), Individual Project (Honours)/Dissertation (L6), Industrial Placement (L6) and Group Design Project (L7)** modules. In these modules, practical demonstrations are required as part of a presentation.

Transferable/key skills

Assessment for the **Introduction to Engineering Design and Practice (L4)** and **Laboratory Methods and Materials (L4)** modules is by means of a portfolio compiled by the student. In other specific modules, the assessment profile provides grading criteria based on level descriptors. These include transferable skills both implicitly and explicitly.

**Assessment regulations that apply to the programme**

The Bachelor Degrees, Diplomas, Certificates and Foundation Degrees regulations and Integrated Masters regulations apply to these programmes.

In considering borderline cases for BEng (Hons) programme, the Assessment Board shall raise the classification to the next level if the following criteria are met:

At least 50% of the credits at Level 6 fall within the higher classification.

All Level 6 modules must have been passed at the first attempt.

In addition, the (Level 6) Individual Project (Honours) or Dissertation module must be taken into account and must fall within the higher classification.

Derogation from the Academic Regulations are approved in the following areas:

1. Pass mark of 50% for L7 modules
2. All elements of assessment to be passed with a minimum mark of 30% (Levels 4, 5, 6 & 7)
3. L7 condonement requirements to include a mark of at least 40% to be achieved in the failed modules and all assessed elements of the module have been passed at a minimum of 30%.
4. Masters classification will be determined by the following calculation: % = 50% of (Average % of all Level 7 modules) + 40% of (Average of all Level 6 modules) + 10% of (Average of all Level 5 modules)
5. Capped mark for referred L7 modules to be 50%
6. Classification borderline cases for the MEng programme shall include consideration of:
  - At least 50% of the credits at Level 7 fall within the higher classification and this must include the Group Project module
  - All Level 7 modules must have been passed at the first attempt.
  - The Level 6 module Industrial Placement must fall within the higher classification

**Programme Management**

**Overview**

The Programme Team have vast experience in engineering education, are motivated and always aim to enhance the student experience. The Programme Leaders for each field of engineering will have currency in that field and will be supported by the Programme Team in delivering the programmes, and ensuring that the programmes run smoothly at operational level.

The Programme Team includes:

<b>Engineering Staff</b>			
Prof	Richard DAY	Academic Leader – Engineering	RD
Dr	Zheng CHEN	Programme Leader for: MEng/BEng(Hons) Aeronautical and Mechanical Engineering BEng(Hons) Aeronautical and Mechanical Manufacturing MEng/BEng(Hons) Performance Car Technology BSc(Hons) Motorsport Design and Management (Level 6 Top-up)	ZC
Mr	Des ADAMS	Technician/Demonstrator – Electrical and Electronic Engineering	DA
Mr	Barrie BIRMINGHAM	Senior Lecturer – Electrical and Electronic Engineering Year 3 Tutor (Electrical/Electronic + Renewable Energy) Level 6 Individual Project (Honours)/Industrial Placement Co-ordinator	BB
Mr	Nick BURDON	Lecturer – Aeronautical and Mechanical Engineering	NB
Mr	Steve BYRNE	Senior Lecturer – Aeronautical and Mechanical Engineering	SB
Dr	Kokou DADZIE	Senior Lecturer – Aeronautical and Mechanical Engineering	KD
Mr	Olivier DURIEUX	Senior Lecturer – Automotive Engineering	OD
Dr	Richard GRANT	Principal Lecturer – Aeronautical and Mechanical Engineering Level 6 Individual Project (Honours)/Industrial Placement Co-ordinator	RG
Mr	Roy HARPER	Senior Technician – Electrical and Electronic Engineering	RHa
Mr	Reg HOLME	Senior Lecturer – Electrical and Electronic Engineering Programme Leader (FdEng)	RH
Dr	Xiaobing HUANG	Senior Lecturer – Aeronautical and Mechanical Engineering Year 2 Tutor (Aeronautical / Mechanical and Automotive)	XH
Mr	Brian KLAVENESS	Senior Lecturer – Electrical and Electronic Engineering Programme Leader for: BEng(Ord) Engineering MEng/BEng(Hons) Electrical and Electronic Engineering	BK
Mr	Phil McDONALD	Senior Technician – Aeronautical and Mechanical Engineering	PD
Dr	Ardeshir OSANLOU	Senior Lecturer – Electrical and Electronic Engineering	AO
Dr	Zhishun SHE	Reader – Electrical and Electronic Engineering Year 2 Tutor	ZS
Dr	Lishen SHI	Senior Lecturer – Electrical and Electronic Engineering	LS
Mr	David SPRAKE	Programme Leader for: MEng/BEng(Hons) Renewable Energy and Sustainable Technologies	
Ms	Natalija VIDMER	Senior Lecturer – Electrical and Electronic Engineering	NA
Dr	Yuriy VAGAPOV	Senior Lecturer – Electrical and Electronic Engineering Year 1 Tutor	YV
Mr	Frank WELCOMME	Sessional Lecturer	FW
Dr	Xiaogang YANG	Reader – Aeronautical and Mechanical Engineering Programme Leader MSc/MRes (Aeronautical / Mechanical)	XY

#### **Natural and Built Environment Staff**

Mr	David CHEESBROUGH	Senior Lecturer – Natural and Built Environment
Dr	Colin STUHLFELDER	Senior Lecturer – Natural and Built Environment

#### **BioSciences Staff**

Dr	Amiya Chaudhry	Senior Lecturer – Bio-Sciences
Dr	Joss Bartlett	Senior Lecturer – Bio-Sciences

The Programme Team meet at regular intervals to discuss items relating to the provision of the programme. Typically, items for discussion would include assessment plans/schedules, student

achievement, retention, future recruitment, synchronising timing of delivery, Lab facilities / improvements / requirements, other resources, problems, special circumstances and disability issues, administration etc. Some team members usually attend University committee meetings, where some of the actions from programme meetings can be addressed.

Each module within the programmes will have a centrally located file, within which will be all documentation relating to that module. Typically this will include: module specification, scheme of work, assessment plan, assessments, internal verification for assessments, internal moderation/second marking for assessments (when completed) and archived annual monitoring reports (AMR).

The Programme Team will implement an 'open door policy' whereby students can access Module Leader/Module Tutor/Programme Leader without an appointment, to discuss any issues. This is in conjunction with other feedback methods.

The external examiners' feedback and comments are discussed by the Programme Team and the response is included in the AMR which is produced by the Programme Leaders. This is formally presented to and discussed at the Engineering AMR meeting.

### **Programme Team Meetings**

The Programme Team meeting consists of the teaching team and student representatives. This will meet at least three times per year and responds to the on-going needs of the programme as they arise, reporting directly to the Engineering Team Board when appropriate. Programme evaluation takes place continually - consistent with the University's Quality Assurance procedures. An annual evaluation report will be prepared to a standard format by the Programme Leaders at the end of each academic year.

Issues which may be discussed at the Programme Team meetings are:

- Staff Student Consultative Committee meetings;
- Points arising from previous subject team meeting;
- SPOCs;
- SPOMs;
- Assessment results;
- Resources;
- AMRs.

Issues which cannot be resolved at this level are referred to the Engineering Team meetings.

### **The Programme Team have responsibility for:**

- Implementing recruitment and induction procedures;
- Implementing equal access and equal opportunities policies;
- Effective programme design, implementation and assessment strategies;
- Implementing student support systems;
- Effective liaison with employers;
- Implementing quality control systems:
  - Monitoring the operation of the programme,
  - Monitoring student progress,
  - Implementing review and evaluation procedures.

**The Programme Leader has particular responsibility for:**

- The effective operation and development of the programme team;
- Identifying future resource and team development needs;
- Planning and implementing detailed review and evaluation procedures that incorporate the views of all stakeholders;
- Providing the link between the programme team, students and the external examiner;
- Student tracking and student records;
- Collation of assessment data, presentation of data at assessment boards;
- Quality assurance and annual monitoring of programme;
- Overseeing all internal verification and moderation.

**Each Module Leader is responsible for:**

- The maintenance and development of learning and teaching materials for all students enrolled on the module;
- The setting, marking and collation of marks for all module assessments, including re-sit assessments, and submission of student results to the Programme Leaders;
- Internal verification and moderation of the module;
- Support for students taking the module for which they are responsible;
- Quality monitoring, including processing of annual student feedback questionnaires.(i.e.: SPOMs);
- Annual monitoring report (AMR) for module.

**Year Tutor:**

Each level has a 'Year' Tutor, who is responsible for the day-to-day conduct of that level of the programme and, in particular, the interface with the students. Immediate issues such as organisation of tutorial groups, responding to student concerns, etc are first passed to the Year Tutor, who will then co-ordinate with the timetable coordinator and other departmental staff, including the Programme leaders to solve the problem. The Year Tutor monitors attendance during the year and co-ordinates the marks for that level of the programmes in order to monitor the progress of individuals. He/she is able to co-ordinate feedback about progress from several Tutors and can thus highlight problem students.

**Quality Procedures**

Existing arrangements for quality assurance will apply to the programme. The following annual quality assurance mechanism will operate:

- Annual Monitoring Reports (AMR) are considered at Engineering Team meetings and reviewed through Glyndŵr University's Academic Programme Sub-committee;
- Issues raised in external examiner reports are referred to Engineering Team meeting for further action, particularly when quality or resource issues are a concern;
- The capture and use of formal and informal student feedback and its interpretation is embedded in the AMRs and discussed;
- External examiners comments are responded to and this response is included in the AMRs for each programme;
- After the Engineering MAR meeting to discuss the AMR they are forwarded to the Standards and Quality Committee;
- A Plenary session is then held for the University to feedback on the overall quality of the AMR's.

### **Programme Monitoring and Review**

Programme monitoring and review is an on-going process involving everyone concerned with each programme. The Programme Leaders and the Programme Team will monitor the day-to-day operation with input as necessary from student representatives. The role of student representatives is detailed further in other sections. In addition, there are two formal mechanisms for dealing with programme issues - the Programme Team and Engineering Team meetings.

### **Staff Student Consultative Committee**

The SSCC is held twice a year to discuss a number of issues. Prior to the meeting an agenda is set and distributed to all participants. The meeting held with the students is minuted and actioned accordingly. Copies of the minutes are given to the class representative to disseminate the information back to the group. The points arising are then discussed at School Board and information is fed back to programme team meetings and issues minuted. If the matter cannot be resolved at this level, issues are referred to other meetings such as Engineering Team meetings or back to the Senate's sub-committees if necessary.

Within the context of the subject areas, individual team members take responsibility for cross programme issues such as Marketing and Recruitment, Admissions, Induction, Retention, Equal Opportunities, Research, Timetabling, relationships with professional bodies and careers advice amongst others.

Part-time staff and colleagues from other Departments are invited to attend the Engineering Team meetings. The contribution of each part-time or sessional team member is overseen by a full-time member of staff who takes responsibility for the management of the module.

### **Module Assessment and Reporting**

Students will have their assessment records (marks) reported to appropriate Module Boards (AUR modules to the Built Environment Module Board, ENG modules to the Engineering Module Board, and SCI modules to the Science Module Board) within the University Institute for Arts, Science, and Technology. This conforms to current practice and the Department has experience of managing programmes with modules taken from a variety of subject areas. In this case it is something of an "in house" rationalisation and therefore all progression and awards will be dealt with at the Department Award and Progression Board.

### **Particular support for learning**

#### **Personal Support:**

The student experience in engineering is extremely demanding as it involves both engagement with academic work and practical investigations in engineering laboratories/workshop, and students are encouraged to engage fully with various personnel who can support them. The Personal Tutor is vitally important in providing this support, and the Programme Team work hard to support students through this process. Each student is allocated a Personal Tutor at the beginning of the programme, has timetabled sessions to engage in this process, and will be supported in both academic and pastoral contexts. This includes the on-going discussions required as part of their personal and professional, and portfolio development.

An induction week takes place prior to the commencement of all programmes where students are given a tour of the site/facilities, industrial visits, field trips, team building exercises, a variety of events to introduce students to the social side of their life at Glyndŵr University and also to help them get to know other students. They are also informed about the programme requirements, the processes in place, such as student handbook, student guide, and Personal Tutor roles. They will also be introduced to their Personal Tutors and Module Leaders, so that expectations can be discussed from both tutor and student perspective. This includes information on the requirements for academic and practical work, for example, module timetables and teaching methods and assessment strategies/types that need to be completed such as health and safety checklists and risk assessments. Students are prepared for theoretical and practical experiences, and action is taken as far as reasonably possible to support and meet the individual needs of students, including introductions to teaching and learning resources that they will be expected to engage with, so that the learning experience can be maximised.

In addition to the pastoral role, the programme team utilise the Student Support Services proactively with students, in conjunction with the student's needs. As necessary, students can have their learning needs assessed, and the Programme Team have developed a very good relationship with the Disability Advice Service and Learning Support Team. Counselling is also available and advised depending on individual circumstance.

It is recognised that each student has different needs and will learn at a different pace. Self-directed time is built into the programme to facilitate individual learning needs, to allow students to work at the pace that suits them.

### **Resit/Re-assessment Summer Support Project**

The Summer Support Project plays a major role in the University's retention strategy by ensuring students receive the guidance and support they need to progress to the next level of study through academic cover rotas. The project has made a positive impact for the past four years, and is important in improving student progression and continuation rates.

The project targets undergraduate and postgraduate students who, following the June assessment boards, must either re-sit exams or resubmit assignments over the summer period and / or repeat a year of study.

Students are normally directed to a Summer Support webpage via Moodle where they can:

- Access resources and information pertaining to general study skills;
- Make contact with the Academic Study Skills team;
- Retrieve assignment briefs provided to the SPC (Student Programme Centre) by Programme Teams.

To assist Programme Teams in reaching students in need of support, a Student Data Services report identifying every student facing reassessment or a repeat year are made available to them. It contains student contact details, the assessment board outcome (i.e. re-sit or repeat) and list the module(s) reassessment students must revisit.

### **Maths Support Centre for Engineering and Science**

Glyndŵr University has been highly successful in supporting widening participation and has been effective over many years in attracting students from low income families besides part time students. As it has done so, the University has continued to face the challenge of providing a sufficiently high level

of student Widening participation agenda – To recruit non-standard students support in order to achieve a strong level of student progression.

By getting an HE STEM Wales grant of £10,000, a Maths Support Centre for Engineering and Science students has been set up. Topics offered to Engineering and Science students were in-line with Level 4 and 5 syllabi. It is anticipated that the Departments will carry on delivering the Maths support and more general support using Experiential and Negotiated Learning modules, which are designed to help students in their studies but will be outside of the programmes.

The set-up of the Maths Support Centre for Engineering and Science improved student retention especially at Level 4 (None of Level 4 students withdrew from Engineering or Science programmes for Academic reasons), the performance of the less well-prepared students, and student confidence by creating an environment where students will feel that “no question is a stupid question”. It also succeeded to reach the students who need this support most.

**Learning resources available:**

When students commence their studies with engineering, they are introduced to the purpose built library and computer resource within Glyndŵr University, and informed of the services available to them. Whilst containing two floors of resources, it is also an effective environment for small group and individual working.

Library and computing facilities provide the books, journals, electronic resources and up-to-date computing facilities that will support students study and research. Students have access to over 150,000 books and 300 journals and a high-speed computer network supplying a wide range of information resources and applications software, and students are increasingly being encouraged to access these resources. This academic year, The University library received £100K for non-recurrent purchases. The students and Programme Team have a direct link to the Academic Liaison Co-ordinator, which provides a dynamic forum to ensure that issues regarding educational resources are discussed and acted upon to enhance the students’ experience.

The library holds books, journals, videos, DVD’s and other printed materials as well as networked computers. Students can access validated, reliable and useful websites via the Glyndŵr University web page. There are approximately 200 PCs in the centre, plus IT helpdesk and wireless application is available throughout the library. The University provides a wide range of software including word processing, spreadsheet, database and presentation packages. In addition, there are printed and web-based guides available to students. Students are also able to attend workshops and seminars enabling them to make effective use of the resources available. Students are given a username and password to use the networked computers in the University. This allows for easy access to the internet and electronic mail as well as electronic information resources.

The library uses a web-based library catalogue which integrates the printed and digital library collections into a single resource. It can be accessed from any computer connected to the University network and over the web. Students are able to search for books and journals and link to a wide variety of electronic resources including databases and full text journals. Students can check their library borrowings, renew the periods of loan and reserve items which are not immediately available.

The library provides multiple copies of recommended text books which are on reading lists and in heavy demand. Books are usually for a three-week loan period. However, titles that are likely to have a high demand can be made available for one week, 24-hour and 4-hour loan periods.

The centre has a joint catalogue with the University of Wales, Bangor. The library can request books on students' behalf from the Bangor library and an inter-library loan service is also available when items are not held at either Glyndŵr University or Bangor. A charge is made for this service.

Since this academic year, staff and students can simultaneously search IEEE Xplore alongside electronic resources including:

- EBSCO ebook collection;
- Emerald;
- News Bank (for UK newspapers);
- SAGE Journals online;
- ScienceDirect;
- Web of Science.

Laboratories and Equipment (Located in C Block, E Block, and Library):

The 10 programmes are each a continuation of an existing programme so that all essential resources are already in place: rooms, laboratories, staff and equipment. There are 16 laboratory areas used by these programmes:

L100	General Computer suite.
E1	Computer/CAD/ECAD Lab (approx 16 seats total).
E1Proj	Embedded Systems Lab.
E12	Control and PLCs Lab.
E13	Electronics Workshop.
E15	Dedicated computer-automated testing (ATE) Lab.
E2e	Main electronics and electrical Lab (approx 40 seats). Plus computing (ECAD) facilities
E2p	Electrical and Electronic Lab.
E2m	Electrical machines and Power Lab.
E*	PCB etching and preparation areas.
E5	Mechanical and Thermofluid Lab.
E6	Motor vehicle workshop.
E7	Mechanical workshop.
Hangar	Aircraft Hangar.
Aero Lab	Six-axis flight simulator, Wind Tunnel, Smoke Tunnel Lab.
C36	Audio, TV, and Radio Lab.

There is a wide range of equipment from the basic to the sophisticated. This does not mean that the team members do not seek improvements. With the large student cohorts being handled, additional resources are always sought and, considering the modern technology involved in the programmes, updating is a continual pressure.

A major boost to the programmes and to the Programme Team is the recent capital investment in excess of £300K being spent in the Engineering laboratories and workshops.

### Virtual Learning Environment

Extensive use is made of Glyndŵr University's VLE, Moodle™, to enhance the students' learning experience.

Moodle is used by most staff to provide information about the programmes and individual modules, and also as a repository of lecture notes, tutorial and lab sheets, videos and links to other sources of information (e.g.: professional body websites, online magazines/books).

Moodle can also be used for conducting on-line assessments and to communicate with individual students or groups. For example, we have developed several on-line quizzes, which are used for formative assessment during module delivery, as practice for formal in-course tests, and also in some cases for summative assessments, replacing traditional paper-based examinations. These are used where appropriate to supplement the more traditional forms of assessment.

Whilst emails are utilised within the programmes, the 'Moodle' site has provided an additional efficient communication method and a valuable learning resource for the students in all cohorts. Providing a variety of learning resources facilitates maximum student potential by catering for individual learning styles. Feedback from our current students suggests that they find Moodle very useful as a learning aid and the quizzes help maintain motivation during the programme and for revision, etc.

This is particularly useful with part-time students, who only have limited access to PC's and the intranet during their attendance because of the intensive nature of their contact hours. Moodle is available virtually 24/7 from any internet enabled PC, so this allows them to preview material before attending, and review lecture and supplementary notes afterwards, as well as being able to submit work and receive feedback outside of their day-release attendance.

Use of Moodle also replaces traditional paper 'hand-outs' (in a lot of cases), meaning students cannot lose them, and are able to access them on-demand from a laptop/ipad, etc. This allows them to revisit course materials, follow up internal and external links, tutorial examples and revision notes, etc. Several e-books are available via Moodle, and there is access to a large resource of video and other materials particularly to support Mathematics and related subjects.

Year Tutors and Programme Leaders also use Moodle to disseminate support materials, such as student handbooks, notices relating to the programmes, assignments, examination information and past papers, revision material, information relating to Professional Bodies, visiting lecturers, out of hours or special events, etc.

### **English Language Support for Non-Native English Speaker:**

A Second Language Learning Centre was established in 2007. A team of English Tutors along with a Second Language Learning Manager are responsible for the delivery of general and technical English tuition across the University. The team is liaising with academic staff for the English subject specific provision.

### **Equality and Diversity**

The admissions process adheres to Glyndŵr University's published policies on Equal Opportunities and Student Disabilities.

Ensuring all areas of the programme (including assessments) are accessible to students on the programme supports equality and inclusion. Recognising the requirements of current regulations and legislation in relation to the Equality Act 2010 all information that is produced for students will use plain language that is free from bias.

Students who present with a specific learning requirement are referred to Student Services where they can be formally assessed and the appropriate support can be implemented. The range of support that is available to individuals range from one-to-one tutor support to specialist equipment and software.