

# REFLEX & REEM

Renewable Energy Flexible Training

Renewable Energy, Enterprise & Management

MSc  
Diploma  
Postgraduate Certificate  
Continuing Professional Development

## Handbook

**2009-10**

*Please note that this handbook has been prepared on the basis of information available at the time of production (Sept 2009). It applies to the – 2009-10 academic year only, and details may be subject to change. Details of any changes will be posted on the web site.*

*The Degree Programme Director, Dr Bryn Jones, would welcome any corrections and any suggestions for improvement and extension.*

## **Preface**

Welcome to the Reflex & REEM programmes.

This Handbook is intended to be the main source of information about the training programmes in Renewable Energy. It includes a wide range of information including details of the programme structure, modules, student assessment and support.

We look forward to working with you during your time with us and wish you all the best in your studies.

Dr Bryn Jones  
Reflex & REEM Programme Director  
September 2009

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## **INTRODUCTION**

### **A.1 About the Handbook**

The purpose of this Handbook is to give you information about the Reflex & REEM programmes.

It will serve as your main reference source for all aspects of the course, and as such, it is essential that you read it carefully and keep it for future reference.

The Handbook was designed to give you a general overview of the programmes and more detailed information about the modules. It will introduce you to the various members of staff involved in the programmes. The staff members will provide students with the necessary level of support, particularly for distance learning material.

If there is anything not included, please contact us for the information you need and let us know if you think it should be included in the next edition of the Handbook.


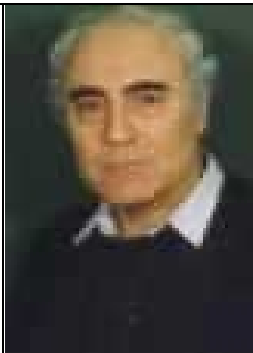
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                                 Newcastle University  
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Website                    <http://www.ncl.ac.uk/sage/postgrad/taught/reflex/>  
                                 <http://www.ncl.ac.uk/sage/postgrad/taught/reem/>






### A.3 Programme Staff

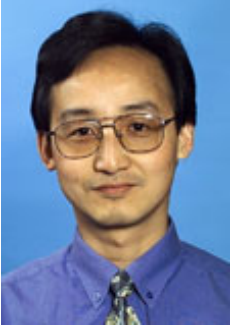



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## OVERVIEW

### B.1 Aims

REFLEX & REEM are innovative postgraduate programmes in renewable energy offered by Newcastle University. REFLEX began in September 2005, and is developing constantly, with an increasing number of engineering students. REEM was offered for the first time in 2008-9, to meet demand from those who are seeking to develop their careers in renewable energy, from a broad range of backgrounds. Both programmes offer MSc, Postgraduate Diploma and Postgraduate Certificate qualifications. In addition, all modules are available as stand alone Continuing Professional Development (CPD) modules. The modules are delivered by a range of Schools within the Faculty of Science Agriculture & Engineering.

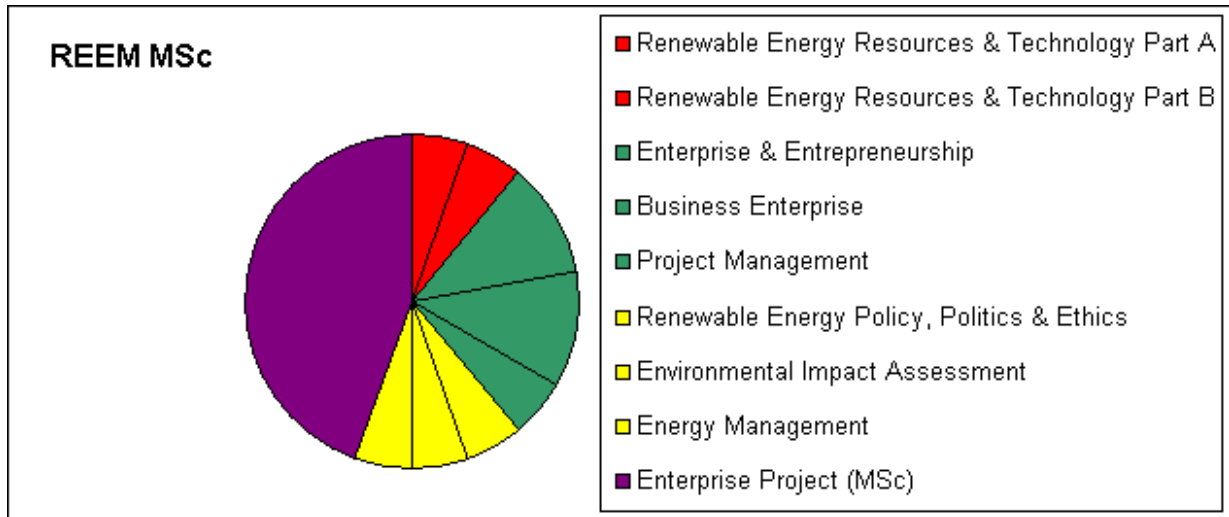
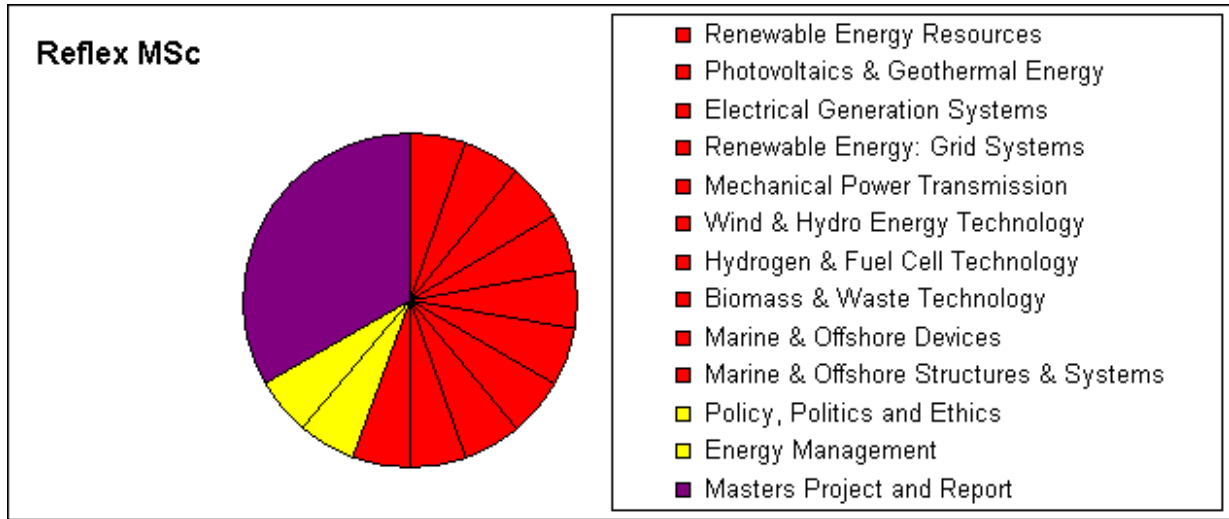
The aim of REFLEX is to provide a fully integrated programme for graduate engineers which includes mechanical, electrical, marine engineering, and also energy policy/economic training applied to the analysis and design of renewable energy systems. This is the more technical of the two programmes, for which the standard entry requirement is a minimum 2:II Honours degree in an engineering related subject, though applicants with prior experience and non-standard qualifications will also be considered.

REEM aims to provide fully integrated renewable energy, enterprise and management training in order to deliver a broad view of the renewable energy industry. While on this programme, students learn business principles and have the opportunity to start and run a business. Students come from a range of backgrounds, usually with a minimum 2:II Honours degree, though applicants with non-standard qualifications and experience will also be considered.

Both programmes are designed to be highly flexible allowing postgraduate students to study renewable energy subjects in either full-time or part-time modes, and to study whilst remaining in full-time employment.

Each module is delivered by a combination of distance learning materials (available on a web-based IT system) and 5-day intensive schools. The programmes involve a wide range of staff across the University and the University of Northumbria teaching in their specialist fields, as well as external academic and industrial experts. In addition to the taught modules, MSc and Postgraduate Diploma students also undertake a project which can be work-based for those in employment.

The pie charts overleaf compare the contents of these programmes.



- Technical Knowledge
- Non-technical & governance related to Renewable Energy.
- Enterprise, Business & Management
- Project

## B.2 Programme Structure & Regulations

### REFLEX PROGRAMME REGULATIONS

#### Degree of Master of Science in Renewable Energy. Code: 5122F/P

- These programme regulations should be read in conjunction with the University's Masters Progress Regulations and Examination Conventions.
- The taught element of the programme is delivered as a combination of distance learning and intensive schools.
- It is highly recommended that students attend an induction session for guidance on the Project.

#### Programme structure

- The programme is available for study in both full-time and part-time modes.
- The period of study for full-time mode shall be 1 year starting at any time. The period of study for part-time mode shall normally be a maximum of 5 years starting at any time.
- The programme comprises modules to a credit value of 180.
- All candidates shall take the following compulsory modules:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8001	Renewable Energy: Resources	10	10			M	Block
SPG8002	Renewable Energy: Photovoltaics & Geothermal Energy	10	10			M	Block
SPG8003	Renewable Energy: Electrical Generation Systems	10	10			M	Block
SPG8004	Renewable Energy: Grid Systems	10	10			M	Block
SPG8005	Renewable Energy: Mechanical Power Transmission	10	10			M	Block
SPG8006	Renewable Energy: Wind & Hydro Energy Technology	10	5	5		M	Block
SPG8007	Renewable Energy: Hydrogen & Fuel Cell Technology	10		10		M	Block
SPG8008	Renewable Energy: Biomass & Waste Technology	10		10		M	Block
SPG8009	Renewable Energy: Policy, Politics & Ethics	10		10		M	Block
SPG8010	Renewable Energy: Marine & Offshore Devices	10		10		M	Block
SPG8011	Renewable Energy: Marine & Offshore Structures & Systems	10		10		M	Block
SPG8012	Renewable Energy: Energy Management	10		10		M	Block
SPG8095	Renewable Energy: Masters Project & Report	60	10	10	40	M	

**Degree of Postgraduate Diploma in Renewable Energy. Code: 3401F/P**

- These programme regulations should be read in conjunction with the University's Masters Progress Regulations and Examination Conventions.
- The taught element of the programme is delivered as a combination of distance learning and intensive schools. It is highly recommended that students attend an induction session for guidance on the Project.

**Programme structure**

- The programme is available for study in both full-time and part-time modes.
- The period of study for full-time mode shall be 1 year starting at any time. The period of study for part-time mode shall normally be a maximum of 5 years starting at any time.
- The programme comprises modules to a credit value of 120.
- All candidates shall take the following compulsory modules:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8001	Renewable Energy: Resources	10	10			M	Block
SPG8096	Renewable Energy: Postgraduate Diploma Project	30	10	10	10	M	

All candidates shall take further optional modules to a value of 80 credits from the following:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8002	Renewable Energy: Photovoltaics & Geothermal Energy	10	10			M	Block
SPG8003	Renewable Energy: Electrical Generation Systems	10	10			M	Block
SPG8004	Renewable Energy: Grid Systems	10	10			M	Block
SPG8005	Renewable Energy: Mechanical Power Transmission	10	10			M	Block
SPG8006	Renewable Energy: Wind & Hydro Energy Technology	10	5	5		M	Block
SPG8007	Renewable Energy: Hydrogen & Fuel Cell Technology	10		10		M	Block
SPG8008	Renewable Energy: Biomass & Waste Technology	10		10		M	Block
SPG8009	Renewable Energy: Policy, Politics & Ethics	10		10		M	Block
SPG8010	Renewable Energy: Marine & Offshore Devices	10		10		M	Block
SPG8011	Renewable Energy: Marine & Offshore Structures & Systems	10		10		M	Block
SPG8012	Renewable Energy: Energy Management	10		10		M	Block

**Degree of Postgraduate Certificate in Renewable Energy. Code: 3034 F/P**

- These programme regulations should be read in conjunction with the University's Masters Progress Regulations and Examination Conventions.
- The taught element of the programme is delivered as a combination of distance learning and intensive schools. It is highly recommended that students attend an induction session.

**Programme structure**

- The programme is available for study in both full-time and part-time modes.
- The period of study for full-time mode shall be minimum 6 months starting in September. The period of study for part-time mode shall normally be a maximum of 3 years starting at any time.
- The programme comprises modules to a credit value of 60.
- All candidates shall take the following compulsory module:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8001	Renewable Energy: Resources	10	10			M	Block

All candidates shall take further optional modules to a value of 50 credits from the following:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8002	Renewable Energy: Photovoltaics & Geothermal Energy	10	10			M	Block
SPG8003	Renewable Energy: Electrical Generation Systems	10	10			M	Block
SPG8004	Renewable Energy: Grid Systems	10	10			M	Block
SPG8005	Renewable Energy: Mechanical Power Transmission	10	10			M	Block
SPG8006	Renewable Energy: Wind & Hydro Energy Technology	10	5	5		M	Block
SPG8007	Renewable Energy: Hydrogen & Fuel Cell Technology	10		10		M	Block
SPG8008	Renewable Energy: Biomass & Waste Technology	10		10		M	Block
SPG8009	Renewable Energy: Policy, Politics & Ethics	10		10		M	Block
SPG8010	Renewable Energy: Marine & Offshore Devices	10		10		M	Block
SPG8011	Renewable Energy: Marine & Offshore Structures & Systems	10		10		M	Block
SG8012	Renewable Energy: Energy Management	10		10		M	Block

Details of the assessment pattern for each module are explained in the module outline.

## PROGRAMME REGULATIONS

### Degree of Master Science in Renewable Energy Enterprise & Management (REEM). Code: 5160F/P

- These programme regulations should be read in conjunction with the University's Masters Progress Regulations and Examination Conventions.
- The taught element of the programme is delivered as a combination of distance learning and intensive schools.
- It is highly recommended that students attend the Induction Session.

#### Programme structure

- The programme is available for study in both full-time and part-time modes.
- The period of study for full-time mode shall be 1 year starting at any time. The period of study for part-time mode shall normally be 5 years starting at any time.
- The programme comprises modules to a credit value of 180
- All candidates shall take the following compulsory modules:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8014	Renewable Energy Resources & Technology Part A	10	10			M	Block
SPG8017	Renewable Energy Resources & Technology Part B	10	10			M	Block
SPG8097	Enterprise Project	80	10	10	60	M	
SPG8016	Business Enterprise	20		20		M	Block
SPG8015	Enterprise & Entrepreneurship	20	10	10		M	Block
SPG8012	Energy Management	10		10		M	Block
SPG8009	Renewable Energy Policy, Politics & Ethics	10		10		M	Block
SPG8013	Environmental Impact Assessment	10		10		M	Block
MST8010	Project Management	10	10			M	Block

## PROGRAMME REGULATIONS

### Degree of Postgraduate Diploma in Renewable Energy Enterprise & Management (REEM)

- These programme regulations should be read in conjunction with the University's Masters Progress Regulations and Examination Conventions.
- The taught element of the programme is delivered as a combination of distance learning and intensive schools.
- It is highly recommended that students attend the Induction Session.

#### Programme structure

- The programme is available for study in both full-time and part-time modes.
- The period of study for full-time mode shall be 1 year starting at any time. The period of study for part-time mode shall normally be a maximum of 5 years starting at any time.
- The programme comprises modules to a credit value of 120.
- All candidates shall take the following compulsory modules:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8014	Renewable Energy Resources & Technology Part A	10	10			M	Block
SPG8017	Renewable Energy Resources & Technology Part B	10	10			M	Block
SPG8098	Enterprise Project (Diploma)	40		10	30	M	
SPG8015	Enterprise & Entrepreneurship	20	10	10		M	Block

All candidates shall take further optional modules to a value of 40 credits from the following:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8016	Business Enterprise	20		20		M	Block
SPG8012	Energy Management	10		10		M	Block
SPG8009	Renewable Energy Policy, Politics & Ethics	10		10		M	Block
SPG8013	Environmental Impact Assessment	10		10		M	Block
MST8010	Project Management	10	10			M	Block

## PROGRAMME REGULATIONS

### Degree of Postgraduate Certificate in Renewable Energy Enterprise & Management (REEM) Code:

- These programme regulations should be read in conjunction with the University's Masters Progress Regulations and Examination Conventions.
- The taught element of the programme is delivered as a combination of distance learning and intensive schools.
- It is highly recommended that students attend the Induction Session.

#### Programme structure

- The programme is available for study in both full-time and part-time modes.
- The period of study for full-time mode shall be 1 year starting at any time. The period of study for part-time mode shall normally be a maximum of 3 years starting at any time.
- The programme comprises modules to a credit value of 60.
- All candidates shall take the following compulsory modules:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8014	Renewable Energy Resources & Technology Part A	10	10			M	Block
SPG8017	Renewable Energy Resources & Technology Part B	10	10			M	Block
SPG8015	Enterprise & Entrepreneurship	20	10	10		M	Block

All candidates shall take further optional modules to a value of 20 credits from the following:

<i>Code</i>	<i>Descriptive title</i>	<i>Total Credits</i>	<i>Credits Sem 1</i>	<i>Credits Sem 2</i>	<i>Credits Sem 3</i>	<i>Level</i>	<i>Type</i>
SPG8016	Business Enterprise	20		20		M	Block
SPG8012	Energy Management	10		10		M	Block
SPG8009	Renewable Energy Policy, Politics & Ethics	10		10		M	Block
SPG8013	Environmental Impact Assessment	10		10		M	Block
MST8010	Project Management	10	10			M	Block

#### Assessment methods

Details of the assessment pattern for each module are explained in the module outline.

### B.3 Learning Outcomes: Reflex

#### 11 Learning Outcomes

Reflex provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the areas listed below. Students on the

MSc will achieve all the outcomes, while students on the Diploma and Certificate courses will achieve a proportion of the outcomes, relevant to the number of credits taken.
<b>Knowledge and Understanding</b>
<p>On completing the programme students should be able to:</p> <p>A1 Demonstrate knowledge and understanding of current worldwide energy usage and its impact on climate.</p> <p>A2 Demonstrate a comprehensive knowledge and understanding of the origins and distribution of different renewable energy sources (solar, wind, hydro, wave, tidal and bioenergy).</p> <p>A3 Demonstrate a comprehensive knowledge and understanding of the storage/conversion and integration of these renewable energy sources into existing systems.</p> <p>A4 Demonstrate knowledge and understanding of the operation and control principles of electrical power distribution networks and a basic knowledge and understanding of the structure of such networks and the roles of different energy sources in the provision of a national electricity supply.</p> <p>A5 Demonstrate a comprehensive knowledge and understanding of a number of key non technical issues including policy, economics, system modelling, environmental issues and energy management.</p>
<b>Intellectual Skills</b>
<p>On completing the programme students should be able to:</p> <p>B1 Evaluate current research and methodologies.</p> <p>B2 Demonstrate originality in identifying and considering problems.</p> <p>B3 Produce and critically appraise engineering solutions.</p> <p>B4 Deal with complex issues both systematically and creatively.</p> <p>B5 Make sound judgments in the absence of complete data.</p> <p>B6 Review options and make decisions while considering a range of issues including technical, financial, environmental and policy.</p> <p>B7 Collate, analyse and evaluate data.</p>
<b>Practical Skills</b>
<p>On completing the programme students should be able to:</p> <p>C1 Demonstrate a critical awareness of theoretical design concepts and their practical implementation within renewable energy systems.</p> <p>C2 Use appropriate software packages and IT skills for modelling and simulation of renewable energy systems.</p> <p>C3 Quantify resource potential and determine the appropriate renewable energy resource at a given site.</p> <p>C4 Analyse the energy capture potential for solar, wind &amp; hydro resources.</p> <p>C5 Demonstrate practical measuring and auditing skills.</p>
<b>Transferable/Key Skills</b>
<p>On completing the programme students should be able to demonstrate:</p> <p>D1 Initiative and personal responsibility.</p> <p>D2 The ability to work independently for continuing professional development.</p> <p>D3 The ability to solve problems.</p>

- D4 The ability to communicate effectively.
- D5 Time and resource planning and management.
- D6 The ability to identify IT needs and to use appropriate IT tools.
- D7 The ability to use the Library and other information sources appropriately.

### Learning Outcomes: REEM

<b>Knowledge &amp; Understanding</b>
<p>On completing the programme students should be able to:</p> <p>A1 Demonstrate knowledge and understanding of current worldwide energy usage and its impact on climate.</p> <p>A2 Demonstrate a comprehensive knowledge and understanding of the storage / conversion and integration of renewable energy sources (solar, wind, hydro, wave, tidal, bioenergy) into existing systems.</p> <p>A3 Demonstrate a knowledge (Cert) comprehensive knowledge (PG Dip) and understanding of a number of key non technical issues including policy, economics, system modelling, environmental issues and energy management as well as the scientific basis that drives innovation in response to environmental regulation); an advanced knowledge and understanding of this issue (MSc).</p> <p>A4 Demonstrate a knowledge of the structure, principles &amp; practice of the EIA process.</p> <p>A5 Identify relationships between research, enterprise &amp; entrepreneurship and understand the entrepreneurial business environment.</p> <p>A6 Evaluate IPR &amp; other legislation relevant to the management of innovation &amp; technology.</p> <p>A7 Identify &amp; research the viability of a business idea. <i>(For the Diploma &amp; Certificate programmes, A4 will depend on module choice)</i></p>
<b>Intellectual Skills</b>
<b>Practical Skills</b>
<p>On completing the programme students should be able to:</p> <p>C1 Analyse the energy capture potential for solar, wind &amp; hydro resources.</p> <p>C2 Demonstrate the ability to critically assess the quality of scientific &amp; engineering data.</p> <p>C3 Demonstrate the ability to interpret, present and summarise such data, and to critically appraise its significance, using appropriate statistical techniques within the context of scientific / engineering innovation.</p> <p>C4 Design, plan and execute an extended project or pilot study involving, where appropriate, a literature review, problem or idea specification, design, implementation and analysis, and the development of a business plan. (MSc &amp; PG Dip only).</p> <p>C5 Develop links and relations with individuals, businesses and agencies that can provide support and advice in the area of knowledge transfer and new venture creation.</p> <p>C6 Develop (some: PgDip) behaviours and actions that are consistent with entrepreneurial activity.</p>

C7 Demonstrate the ability to devise, organise and operate a team-based micro-business over the period of the programme.(For Cert & PG Dip, this is dependent on module selection.)

C8 Understand the importance of Health and Safety and the roles and responsibilities of a professional in the context of legislation and best practice.

C9 Demonstrate the ability to manage time.

C10 Demonstrate the ability to review and report on the work of peers and colleagues.

#### **Transferable/Key Skills**

D1 Communicate by means of well prepared, clear and confident business-focussed presentations and concise and grammatical written documents.

D2 Use library and other information sources skilfully and appropriately.

D3 Use IT resources skilfully and appropriately.

D4 Plan, organise and prioritise work activities in order to meet deadlines.

D5 Work independently, with initiative, and also in teams.

D6 To solve problems.

### **B.4 Teaching Methods**

The teaching methods on the programme include distance learning material (notes, textbook, websites), lectures, seminars and design exercises. The different teaching methods all contribute to the student learning experience.

### **B.5 Assessment Strategies**

The programmes are assessed by both examination and coursework. The form of assessments varies between modules, and is stated in the module outline forms in Appendix 2.

Written examination                      To assess pre-school material and any revision of this during the intensive week. This assessment should not include new material delivered during the intensive school. It will be held during the intensive school.

Assignments                                      To assess the application knowledge of the subject via an assignment. Submission deadlines will be advised with each module. Post School Assignments will be given to students during the intensive school to provide students with an opportunity to ask questions etc. These are to be submitted within 4 weeks after the intensive school. (See timetable.) They will be marked and returned approximately 4 weeks after the submission date.

Specific details of assessments and exact submission dates will be supplied with the pre-school material for each module.

The final mark is a combination of the two assessments for each module. The breakdown of assignment weightings for each module is given in the module outline forms in Appendix 2.

## Assessment Feedback

Students will receive written feedback on their assessment performance via the marker's report. The marker's report will be completed by the assessor and one report will accompany each assignment when it is returned to the student. This feedback will help students to focus on potential areas of improvements in future assessments. Some modules require a presentation rather than written assignment or examination.

More information about the Projects and Dissertations is given in the Project Handbooks for each programme.

### **B.6 Late Submission of Work Policy**

It is vitally important for your academic career that you adhere to submission deadlines for all of your assessed work. You will be informed of your assessment and submission deadlines well in advance, and should try to plan your work to ensure submission BEFORE the final deadline. However, there may be occasions when you need to ask for an extension due to illness or other unfortunate circumstances. In order to make sure that all students are treated consistently, the University has a policy on the late submission of assessed work.

The key points of the Policy are:

Late submission without good cause or without the granting of an extension will lead to a **maximum mark of 50% for taught postgraduate programmes** for the assessment in question. **Non-submission of work will result in a mark of zero**, as per the relevant University Regulations.

A piece of work is regarded as late if it is not submitted by the published deadline (time and date) for the assessment in question. The period of late submission thereafter will be for a maximum of 7 days if no extension is granted after which the mark awarded for the piece of work will be zero.

Extensions will only normally be granted in the following situations:

- Debilitating personal illness supported by a medical certificate
- Serious illness or death of a close relative
- Participation in a University-approved scheme for which strict guidelines for extensions/extra time will be issued
- In the case of part-time or work-based students, unplanned and unavoidable work commitments

If a student has a legitimate reason that makes them unable to submit a piece of summative assessed work by the published deadline, a University Extension Request Form (together with supporting evidence) must be submitted, in advance of the assessment deadline if at all possible. An extension request form will not be accepted more than 7 days after the original assessment deadline.

The Extension Request Form is available from:

<http://www.ncl.ac.uk/student-progress/studentinfo.HTM>

You must submit your Extension Request Form to the Secretary (lynne.dixon@ncl.ac.uk)

Where an extension request is based upon absence from the University for which the student must self-certificate, the maximum extension granted will be seven calendar days which is the current

limit of self-certification prescribed by the NHS. A revised submission date will not exclude vacations.

The maximum allowable extension for postgraduate programmes will be 3 months after which a concession must be sought. The length of extension granted will vary according to individual circumstances and may be much less than the possible maximum.

The full University Policy on the Late Submission of Work is available from [http://www.ncl.ac.uk/agss/qsh/examinations\\_and\\_assessment/](http://www.ncl.ac.uk/agss/qsh/examinations_and_assessment/)

## **B.7 Professional Accreditation**

The REFLEX MSc has been approved as further learning for Chartered Engineer status by the Energy Institute, IMarEST, IET, IMechE and IChemE.

As REEM is a new programme it has not yet been accredited, but we shall be seeking accreditation with relevant professional bodies in 2009-10.

## **C. STUDENT ASSESSMENT AND PROGRESS**

### **C.1 Attendance**

The University is required to report unauthorised absences of overseas students to the UK Border Agency.

Students unable to attend the residential component of a module will be required to do so at a later date, or will be required to take another module, with the agreement of the Degree Programme Director.

### **C.2 Latecomers**

The decision for permitting a student to begin a module after the official start-date for that module rests with the module leader, and is to be approved by the Programme Director. Each case will be considered individually.

### **C.3 Student Progress**

Students are required to make satisfactory progress in the programme. Progress in all modules shall be reviewed by the Programme Director. In accordance with the University Masters Degree Progress Regulations, failure to make satisfactory progress may be grounds for:

- a) requiring the submission of additional written work or a resit examination;
- b) deferral of the student's first attempt at the whole assessment for the module(s) concerned.
- c) Interruption or termination of the student's programme of study. Termination under this provision requires written warning of unsatisfactory performance to be given. A student may be excluded from this Programme for other than academic reasons in accordance with the provisions of the Rules, Regulations and Ordinances of the University.

#### **C.4 Policy on non-returning students and suspension of studies.**

1. Reflex/REEM students are expected to remain continuously registered on their programme of study from the start date until the date of completion. Students are responsible for registering themselves annually, and will be reminded of this obligation by the University. If registration has not been completed within four weeks following the September registration period, it will be assumed that the student has withdrawn from the programme.
2. The normal period of study for full-time students is 12 months, in which 180 credits should be completed for the MSc, and 120 credits for the Diploma, and 60 credits for the Certificate.
3. Part-time MSc & Diploma students take the same number of credits as their full-time colleagues, but have up to 5 years to complete their studies. Those taking the Certificate, should complete within 36 months.
4. Issues of progress will be dealt with as specified in the University Masters Degree Progress Regulations. Part-time students are normally advised to take at least two modules a year. Long periods of absence are undesirable in this rapidly developing field, as it is important to make connections between module topics to support the coherence of the programme, and modules may change as the programme develops.
5. Only with the approval of the DPD can students transfer from full-time to part-time.
6. Students who have not taken any modules for a period of two years or more shall normally be regarded as having terminated their studies.
7. If a student falls ill or is otherwise unable to study for a long period of time the DPD may grant an interruption of studies. Full-time students may be granted an interruption for up to one year; part-time students for up to two years. Pressure of work will not normally be considered as a reason to interrupt studies, as these are flexible programmes which already benefit from having an extended study period of 5 years.

#### **C.5 Module Rate**

Students will normally be required to undertake a minimum of twenty credits of taught modules per year.

#### **C.6 Assessment and Progress – General Expectations and Requirements**

Academic progress is assessed in a variety of ways. This includes submitted work, formal examinations, dissertations, group presentations and design work.

The student can expect:

- that assessment of whatever kind will be carried out in a fair, efficient and professional manner.
- to receive reasonably prompt feedback from staff on work submitted for assessment and on overall academic progress.
- to receive notification of individual results following the appropriate meeting of the Board of Examiners.
- to receive advice on the possible alternatives in the event of lack of academic progress.

- to receive clear guidance on the right to initiate a review of examination result(s) or their academic consequences.
- to receive clear information about how the elements of the programme will be assessed and an explanation of the criteria used for assessment.

We expect that:

- students will make themselves aware of the information provided about assessment and examinations.
- students will keep a back-up copy of any submitted assignments and projects.
- students will comply with the University's rules and procedures for the conduct of examinations.
- Students will inform their supervisor, module leader or Degree Programme Director of any personal circumstances affecting your academic performance whether it relates to any submitted work or to a formal written examination.
- students will make appropriate re-arrangements to re-take examinations or re-submit work where this has been required.

## C.7 FACULTY OF SCIENCE, AGRICULTURE AND ENGINEERING

### MARKING CRITERIA AND DEGREE CLASS DESCRIPTORS FOR POSTGRADUATE PROGRAMMES

(Revised July 2009)

*The descriptive equivalents are intended as a guideline only and criteria will not necessarily apply equally to all pieces of assessed work (for example, presentational issues are likely to be less important for an answer to an examination question than for a project dissertation). The Faculty expects that examiners will use the whole of the marking scale and to interpret these criteria in the context of the specific aims and objectives of the module or piece of assessed work, as indicated in the Module Outline Form. Where deemed appropriate, other marking criteria may be used and in such cases they should be made available to students in advance of the assignment. It is important to ensure that comments made on assessed work justify the final mark awarded based on these descriptors and clear explanations for any deviations should be given*

Mark Range	Descriptive Equivalent
70% - 100%	<p><b>University Common Scale description: Distinction</b></p> <p>A Distinction performance is distinguished by both breadth and depth of knowledge about the subject material, showing comprehensive awareness, and detailed understanding, interpretation and evaluation. There will be substantial evidence of critical analysis and the ability to apply knowledge to unseen situations. Material will be presented within a clear logical/systematic framework throughout and will demonstrate reading beyond the course material and the ability to employ critical reflection. Assignments such as an individual project report will be well-structured and well-referenced.</p> <p>The deciles within this class may be categorised as</p> <p><b>Professional Standard (90% - 100%)</b></p> <p>It should be rare for a mark to be awarded within this range, but it should certainly be achievable for an individual component of assessment (e.g. a piece of coursework, or an examination question). It should be awarded for work demonstrating outstanding and comprehensive understanding, with critical analysis and evaluation. In an examination situation the student will have presented a complete answer in a fully cogent manner, with no substantive errors or omissions. In individual project work there will be material</p>

	<p>which may be publishable.</p> <p><b>Exceptional: significantly above normal student expectations (80% - 89%)</b> Evidenced by clear indications of comprehensive/detailed understanding and creative thought, and although there will be no substantive errors or omissions, the presentation or arguments will fall short of perfection.</p> <p><b>Excellent (70% - 79%)</b> Evidenced by a comprehensive understanding, well-structured arguments and insight.</p>
60% - 69%	<p><b>University Common Scale description: Pass with Merit</b> A Pass with Merit performance is one that demonstrates a sound/thorough understanding of material presented in the course (and beyond for a mark of 65% and over), with breadth of knowledge but lacking some depth, or vice versa. Critical analysis and the ability to apply knowledge to unfamiliar situations will be present, and work presented will be relevant to the module/topic aims and objectives but not give a full treatment, relying to some extent on course material and likely to contain some errors or omissions. Individual project work will be well presented and structured but with some limitations as to insight and critical evaluation.</p>
50% - 59%	<p><b>University Common Scale description: Pass</b> <b>Acceptable pass: basic understanding</b> A Pass performance is one that demonstrates that a student has achieved the minimum level of performance to indicate that they have broadly achieved the intended learning outcomes, but at a basic level only. It is evidenced by an understanding of material that lacks depth. There may be omission of some relevant material and/or partial use of irrelevant material. It is likely to contain errors of understanding and fact. An individual project will be adequately structured and presented but unbalanced/ with some components poorly constructed, e.g. inadequate/poor referencing.</p>
0% - 49%	<p><b>University Common Scale description: Fail</b> A Fail performance indicates that the student has failed to achieve the intended learning outcomes. This is evidenced by a weak attempt that demonstrates lack of overall knowledge of the subject area, and inability to develop a cogent argument in any aspect. Much of the material presented will be sketchy and/or irrelevant. A failing individual project will be one in which the student has failed to apply themselves to the task in hand and has presented a superficial view of it. A Fail performance may be further classified as</p> <p><b>Borderline (compensatable) fail: limited understanding (40% - 49%)</b> Evidenced by the demonstration of a threshold understanding in some, though not all, areas. There will be many factual errors and omissions. A mark in this range may be awarded where there is evidence that the intended learning outcomes have been achieved but the evidence has been poorly presented, or that there are some omissions in that evidence. A compensatable pass mark for an individual project suggests that the situation is potentially recoverable with some rewriting but little or no additional development.</p> <p><b>Fail: inadequate understanding (25% - 39%)</b> Evidenced by some material of relevance, but generally the approach is shallow and there is a lack of understanding of the basic requirements of the subject area. There are likely to be significant factual errors and omissions. An individual project is likely to be difficult to read and contain serious errors in understanding.</p> <p><b>Clear fail: little or no attempt (0% - 24%)</b> Evidenced by very little material presented to support evidence of having addressed the topic. What material there is is likely to be incomplete and/or confused. An individual project is likely to have very little that is relevant.</p>

## C.8 Examination of Taught Modules

A student's understanding of the subject matter and his/her attainment of the learning outcomes for each module will be assessed from problem solving assignments, a supervised examination and/or an extensive written report. Scheduled submission dates will be clearly stated in the coursework instructions.

The written examinations (where appropriate) will be held during the residential week at a place and time to be published prior to the start of the week.

Examinations will be conducted in accordance with the University regulations, and the Taught Postgraduate Masters Degree Examination Conventions will apply.

## C.9 Mitigating Circumstances

Sometimes things happen that are beyond our control – illness, personal problems etc. If things start to affect your course, you need to let someone know. There are processes in place to help you. Use your personal tutor as the starting point – they will be able to advise you about the various University procedures in place. It can be confusing, as there are a few different forms, but they depend on what you need to happen. Some things can be dealt with by your DPD or Faculty, but others will be referred to a central point within the University.

**A PCAP (Personal Circumstances Affecting Performance)** is the most effective way of communicating to the people considering your marks. This form enables you to communicate to the Board of Examiners, and highlight to them any personal or medical problems that might have affected your performance. A PCAP form cannot change a mark – but it may be used as justification for allowing a student to pass a module with a lower mark than normal or it might mean you are considered for a different degree classification.

Students who believe that their performance has been significantly affected by personal extenuating circumstances should submit a **PCAP form** together with supporting documents to the secretary as soon as possible, and before the date of the Exam Board.

**PCAP forms** are available from the website: <http://www.ncl.ac.uk/student-progress/PCAP.doc>

**A Concession** is anything that is not explicitly covered by the University Regulations. Concessions allow exceptions to the regulations, based on a student's personal circumstances. Concessions can, amongst other things, wipe examination attempts away or allow a student to re-do a year, without the regular 'resit' penalty, allow a student to sit an examination at a different time, allow a student to have an unusual split of modules. Concessions are considered by an independent committee and not by individual Schools/Faculty – although the forms should be submitted via the Coordinator for DPD and tutor to sign.

*Some examples:*

*"I was involved in a car accident on the way to my examination and had to be hospitalised. Due to the accident I missed my examination and was only able to contact the school the day after."*

*"I fainted on the morning of my exam. I felt really ill, so I went to the doctors, but it means I have missed my exam and I don't know what to do"*

## **C.10 Retaking an Examination/Assessment**

A student must achieve an overall weighted average of 50 in order to pass a module.

A student who fails no more than 40 credits may be permitted by the Board of Examiners to present himself/herself for re-examination or re-assessment on one occasion only. The maximum mark which will be awarded for a successful re-sit is 50. A student who fails a module can still obtain the MSc, as long as their mark is above 40 and their overall average permits compensation.

## **C.11 Compensation**

A student who fails up to 40 credits of the taught element of the programme may still be awarded a Masters degree provided the following compensation rules are met:

- a) the average mark over all of the assessments for the whole programme, based on simple aggregation (taking into account the credit value of the modules) is at least 50;
- b) no single mark for any module assessed is below 40;
- c) the dissertation has been passed.

A student who satisfies the examiners in the assessment specified for a module may not, unless otherwise required by these regulations, enter again for that assessment.

Subject to these conditions, a student has the right to enter and be assessed as specified for any assessment on up to two occasions only i.e. a first attempt and one reassessment opportunity.

A student who fails the assessment relating to any module shall have the right to be reassessed in those modules without reassessment in any other modules which may have been passed. The form of the reassessment may vary from the original, at the discretion of the Board of Studies. (Note: the Board of Studies may delegate this authority to the Board of Examiners.)

There will be no re-sit fees for students who re-take an examination or re-submit an assignment at the next sitting. However, if a student wants to re-take an examination or re-submit an assignment prior to the next sitting, and this meets with the agreement of the module leader, then a re-sit fee may apply.

Students may continue to undertake modules while awaiting a re-sit opportunity.

## **C.12 Degree Classification**

MSc students who obtain an average mark of 70 or more will be eligible for the award of the Degree of Master of Science with Distinction. Students obtaining a mark between 60 and 69 will be awarded MSc with Merit. Students obtaining a mark between 50 and 59 will be awarded MSc with Pass. For marking criteria, please see [C.7](#).

## **C.13 Individual Modules for Continuing Professional Development**

Students who only undertake individual modules will be sent their provisional mark. Following the Board of Examiners meeting, the student's final mark will be issued, along with a CPD certificate.

## **C.14 Recommendation for Award**

The Board of Examiners will make the final recommendation. Qualifications will be awarded in accordance with the procedures of Newcastle University. No student shall be entitled to an award unless all fees and any other monies due have been paid and any rightful property of the institution returned. The names of those who receive awards will be published in a manner appropriate to the University.

## **C.15 Congregations**

In order to attend a degree ceremony to receive your award, it is necessary to apply in good time to the congregations office. Details can be found at: <http://www.ncl.ac.uk/congregations/>

## **C.16 Student Conduct and Discipline**

A student registered for an award within the programme will be subject to the provisions of the Rules, Regulations, Ordinances and Statutes of Newcastle University.

All students shall be subject to the disciplinary codes of Newcastle University.

If an alleged offence is committed within its precincts, the disciplinary code of Newcastle University shall apply.

## **C.17 Complaints and Appeals**

Any student who wishes to complain about any aspect of the programme shall, contact the Administration Office.

## **C.18 Withdrawal and Termination**

A student who wishes to withdraw permanently before the normal completion of the course shall give notice in writing to the Degree Programme Director, who will be responsible for informing the Board of Studies.

# **D. STUDENT SUPPORT**

## **D.1 Introduction**

For some, these programmes will represent a return to the teaching and learning environment. The time period since last being in education will obviously vary from student to student.

For most students, the programmes may be very different from their previous educational programmes, primarily because:

1. The courses are designed so that they may also be studied whilst working full time.
2. A significant proportion of the courses (approximately 65% of study time) is delivered via distance learning.
3. The taught element is delivered in intensive week-long schools.
4. The programmes will use an IT, web-based method of delivery for the distance learning material and student support.

Whilst many of the skills developed during previous learning experiences are still valid, it is important that students recognise the differences in this type of programme compared to standard

residential taught courses. The information given in this section and the support system established are there to help you make your studies as successful as possible.

## **D.2 Distance Learning Guidelines**

Distance learning is flexible and you can study at your own pace. Guidance is given about the approximate amount of time which should be taken to complete the material, however this will depend on the individual. As distance learning may be new to a number of students, some tips about successful distance learning have been given below:

- Draw up a study timetable for each module and stick to it. An example from 2008-9 is provided in the appendices. Schedule your work so that you use your study time efficiently and effectively.
- Identify a suitable work environment either at home or at work. Spend time making sure that this area is suitable for you. Consider the following: light, temperature, space, possible distractions.
- Make sure you allot an appropriate amount of time to each module and each part of each module.
- Read the material supplied and make notes in whatever way is best for you.
- Understanding is key to learning and remembering. If you do not understand a topic, look it up in a textbook, discuss it with a work colleague, ask for help via the Blackboard system or contact the lecturer or module leader.
- Consider the relevance of the course material to your own work environment, if applicable.
- Use the examples and questions correctly and honestly. These items have been included to help you assess your own progress.
- Complete the material. Understanding of the pre-school material will be assessed during the intensive week. The module leader will expect students to have completed and understood distance learning material on arrival at the school. Post-school material helps the student to consolidate the learning process, and to complete the post course assignments.
- Use the reading references and useful websites recommended in the text.
- Use the Blackboard system to obtain support from your peers. Feel free to start 'a new thread' on the system.
- Use the support system offered by the academic staff if you are having problems understanding the course material.

## **D.3 Intensive School Guidelines**

The intensive school will be a more familiar learning environment for anyone who has completed a residential degree or an intensive course away from work.

The residential school will be an intensive and varied period and may include a combination of seminars, case studies, lectures from industrial tutors, site visits, design exercises and presentations as well as traditional formal lectures.

Students should use the opportunity to get to know the academic and industrial staff, ask questions and ensure they are clear about the course material and assessments.

Students should also use this opportunity to get to know other students on their programme. Peer support for the module and future distance learning material will be very important. Equally, learning about other organisations and meeting those working in different industrial sectors will provide students with a valuable insight into all areas of the renewable energy sector.

#### **D.4 Work Based Learning**

Course material has been specifically developed to be highly relevant and practical to those working in the renewable energy sector. Students should try to reflect on the industrial relevance of the module contents, particularly to their own work environment, if applicable. The application of your studies to your professional life and the needs of your own organisation will add positively to your learning. The post-school assignment is designed to encourage this reflection and application.

#### **D.5 Writing Development Centre**

Location: Level 2, Robinson Library  
Website: <http://www.ncl.ac.uk/students/wdc/>  
E-mail: [wdc@ncl.ac.uk](mailto:wdc@ncl.ac.uk)  
Telephone: 0191 222 5650

The Writing Development Centre offers guidance and tuition for students who wish to improve their writing skills for study or employment purposes. Help is available with the following:

- understanding assignment and examination questions
- planning, structuring and revising assignments
- learning from feedback on previous assignments
- using reading sources without plagiarism
- developing an argument
- writing critically
- using an appropriate authorial voice
- writing different types of assignment (e.g. essays, reports, reviews, reflective pieces)
- writing theses and dissertations
- answering examination questions
- using grammar and punctuation accurately and effectively
- using appropriate vocabulary and style
- writing CVs and cover letters

We run a series of **lectures and workshops** throughout the academic year. Some are open to all students, while others have been developed for specific degree programmes or modules. To find out more about these sessions, please visit the Group Teaching pages of our website: <http://www.ncl.ac.uk/students/wdc/group/>.

We also offer a **one-to-one support service**. You can have an individual consultation with an academic writing tutor to discuss any difficulties you may have with writing, seek feedback on your written work or gain a better understanding of academic writing conventions and the standards expected at University. We recommend that you book a session in advance via our online booking system: <http://www.ncl.ac.uk/students/wdc/support/>. A limited drop-in service is also available. For more information, see **Opening hours** below.

**International students with English as an additional language please note:** You can use the Writing Development Centre one-to-one support service if you meet **one** of the following requirements:

- You have been exempted from language testing
- You have attained a mark of 70 or over in the UELA writing assessment
- You are a continuing student who has attended INTO In-Sessional English classes in previous years

If you are a new international student with a UELA writing score of less than 70, you will be supported by the INTO In-Sessional provision in the first instance.

### **Opening hours**

The Centre is open from 1:00 to 4:30pm Monday to Thursday and from 10:00am to 12:00 noon on Friday. Bookable sessions are available from 1:00 to 4:00pm Monday to Thursday. We also offer a limited drop-in service from 4:00 to 4:30pm Monday to Thursday and 10:00am to 12:00 noon on Friday. In addition, if a bookable slot is free, you may drop in at the appropriate time. A timetable showing free slots will be displayed at the entrance to the Centre.

### **Online resources**

You will find a collection of learning resources for academic writing and general writing skills at <http://www.ncl.ac.uk/students/wdc/learning/>.

## **D.6 Maths Aid**

A free and confidential service to all students who want help practising their numerical & mathematical skills. Robinson Library, 0191 222 6444, email [mathsaid@ncl.ac.uk](mailto:mathsaid@ncl.ac.uk).

## **D.7 Support System**

Although most of the learning process is undertaken independently, the programme has been designed so that students are supported throughout. Support can also be found from other students and your employer (if you have one.) Examples of student support mechanisms are given below:

### Academic Support – Modules

If you are having problems with course material or course assessments, the module leader or their nominated deputy should be contacted. In Appendix 1, a list of module leaders is supplied for all the modules. Contact details are provided in section A of the Handbook. Students can contact the tutor by email, telephone or fax. If a student is unable to contact the tutor or deputy after several days, then they should contact the Degree Programme Director. Contact details will also be made available on the Blackboard system.

## Academic Support – Project

For the project, the student will have a designated academic supervisor and they should be the main contact for any project related issues.

## Peer Support

Peer support will be available via the Forum section of the Blackboard system where questions or problems raised by one student are visible to all students completing the module who are using the Blackboard system.

Direct peer support could be obtained from individuals you have met during the intensive week school and from other people within your organisation who are also involved in the programme. It is therefore very important to take the opportunity of getting to know other students during the school. An informal voluntary 'Buddy System' will be available to put new students in touch with existing students.

## Welfare Support

Welfare issues should be raised with your personal tutor or module leader who may wish to discuss the matter with the Degree Programme Director. If you have any problems which you feel may affect your ability to meet deadlines, academic progress or commitment to the programme, then it is very important that they are raised as soon as possible. The staff members are very experienced academic tutors who will be aware of the support mechanisms available (e.g. counselling, disability, and financial support services.) The University provides a welfare service that offers a range of services which aim to support you during your time here in order to ensure successful completion of your studies. Welfare services are available throughout the year and are completely free and confidential.

<http://www.ncl.ac.uk/welfare-service/>

<http://www.ncl.ac.uk/subjects/services/support.html>

<http://www.ncl.ac.uk/student-support/counselling.htm>

<http://www.unionsociety.co.uk/sac.htm>

## **E. DELIVERY OF DISTANCE LEARNING MATERIAL AND IT SYSTEMS**

The distance learning material will be made available via the Blackboard system, on the website as password protected documents or in a paper format, depending on the student's access to a suitable PC and web browser.

### **E.1 Blackboard System**

The Blackboard system is designed to be user friendly and it is anticipated that students will quickly learn how to use the system.

When a student is registered for a module or award, the student shall be given access to the modules they will undertake initially. Blackboard access will be extended as a student works through the programme and selects modules.

Any students who experience difficulties using the Blackboard system should contact the support staff during office hours (see section A for contact details) in order for queries and problems to be addressed.

Students may find that distance learning material for a particular module is made available on Blackboard in separate sections. Students will be informed of the date of the next batch of material via the Announcements.

Students can make use of the 'Discussion Boards' within Blackboard and all students registered on a particular module are able to see and reply to any questions or points raised.

## **E.2 Reading Lists**

Reading lists may be issued with the distance learning material. Usually there will be other texts on the list. Students can then review the list and identify any additional texts which may be of interest to them or particularly relevant to their work/career.

Students may also be directed to other documents such as papers or web sites as part of the distance learning material. Anyone who has problems accessing this information should contact the Module Leader.

## **F. STUDENT/INDUSTRIAL FEEDBACK AND PARTICIPATION**

### **F.1 Introduction**

Feedback from students is vital to the success of the programme and the implementation of a continuous improvement process. In particular, students and their supporting organisations, where applicable, will be able to provide valuable input about the industrial relevance of the programme content.

### **F.2 Module Evaluation**

Students will be asked to complete evaluation questionnaires following completion of a module. One section of the questionnaire relates to the delivery of the intensive school and the other to the module in general. All questionnaires will be anonymous. Students will be asked to comment on all aspects of the module including quality of teaching, course content and course notes, distance learning material, support systems, the match between expectations and learning outcomes and general organisation. These comments will be passed to the module leader and will be reviewed and discussed at the next Board of Studies meeting along with the module leader's proposed actions.

### **F.3 Project / Programme Evaluation**

On completion of the project and the full programme, feedback will be sought from both student and the industrial supervisor (where applicable) and will include subjects such as academic supervision and support during the project, relevance of the project etc. All questionnaires will be anonymous. The comments will be passed to the academic project supervisor and the Degree Programme Director. Comments will also be sought about the programme as a whole. These comments will be reviewed and discussed at the next Board of Studies meeting.

### **F.4 Board of Studies**

Students are encouraged to participate in the Board of Studies meetings. Student representatives are chosen by their peers to sit on this committee. The Board meets approximately four times per annum.

The Board of Studies addresses the following:

- Development, maintenance and enhancement of academic standards and quality assurance of the programme.
- Formulation, monitoring and evaluation of academic policy relating to the programme.
- Gathering and evaluating feedback from students.
- Gathering and evaluating feedback from industrial supervisors.

#### **F.5 Staff/Student Forum,**

In addition to the above, The Degree Programme Director and support staff will meet with students on an informal basis for an hour or so during an intensive school. This will provide students with the opportunity to raise any issues they may have regarding the programmes.

### **G. GENERAL INFORMATION**

#### **G.1 Equal Opportunities**

Reflex & REEM aim to ensure equality of opportunity for applicants and for all students in teaching, learning and assessment, and in the provision of services. Both programmes aim to create conditions whereby students are treated solely on the basis of their merits, abilities and potential, regardless of age, socio-economic background, religious belief, ethnic origin, gender, marital or family status, sexual orientation or disability.

<http://www.ncl.ac.uk/disability.services/>

#### **G.2 Health and Safety**

The University of Newcastle upon Tyne accepts its statutory duty to ensure, as far as is reasonably practicable, the health, safety and welfare at work of all its employees and students. It has a health and safety policy to which all staff and students must adhere.

<http://www.ncl.ac.uk/internal/safety/>

Individual School health and safety requirements must also be observed when you are working in those Schools.

#### **G.3 Use of Facilities**

Students will have access to, or be eligible to join, the facilities throughout their programme.

#### **G.4 Careers Service**

2nd Floor, Armstrong Building  
Tel: 0191 222 7748  
[www.careers.ncl.ac.uk](http://www.careers.ncl.ac.uk)

Opening Times (including vacations)  
Monday - Thursday 10:00am to 5:00pm  
Friday 10:00am to 4:30pm

#### **Thinking ahead?**

The intensity and demands of postgraduate study mean that it can be easy to neglect your personal priorities and difficult to find time to think about and plan your next steps. Adopting a proactive approach to your personal and career development from the start will help to ensure that you make the most of what Newcastle University can offer, and improve your chances of securing work that meets, or even exceeds, your expectations. Whatever your motivation for embarking on

a postgraduate degree and your current thinking, the Careers Service provides independent information and guidance through a range of different approaches and services. We are here to develop enterprising graduates who can effectively apply their knowledge and skills in a global context.

### **Information**

We hold an extensive range of paper and web based materials for postgraduate students covering career choice, occupations, employers, finding and applying for jobs worldwide and working for yourself. Our website has pages tailored to the needs of postgraduates including details of events and links to relevant career-related sites. Members of staff are available during working hours to help you find and make the most of these resources.

### **Individual advice & guidance**

Careers advisers are available without an appointment for short consultations 11am – 4.30pm, Monday to Friday. In some cases, a longer guidance interview may be recommended. We offer advice and guidance on all aspects of your career, from recognising what you can offer, to researching and assessing your options, applying for jobs and preparing for interviews. Experts are also available to advise on individual business ideas.

We offer a number of opportunities to access information and advice from experienced graduates, including 'Graduate Connections' our database of career profiles on a range of different jobs, sectors and organisations.

### **Developing Skills & Experience**

The Careers Service offers a variety of work related opportunities to broaden your practical experience whatever your career intentions. During the academic year, we also deliver sessions on marketing your skills and finding and applying for opportunities. Sessions include writing CVs and application forms, preparing for interviews and assessment centres and advice on working in the UK for international students. These are open to all students. For full details, collect a copy of our wallplanner from the Careers Service or see [www.careers.ncl.ac.uk](http://www.careers.ncl.ac.uk). You will also receive email notification of specific school based sessions taking place during the year.

### **Access to employers & help finding a job**

We work closely with a wide range of regional, national and international organisations that target Newcastle University graduates. During the year, we provide an extensive programme of recruitment and information events for employers to visit Newcastle to promote their graduate opportunities and support your career planning. These events offer an opportunity for you to talk informally to employers and recent graduates working in a variety of functions and gain a real insight into their work, sector and the application process.

Over 100 new opportunities are added weekly to 'Vacancies Online' our database of graduate job vacancies, work experience and voluntary positions with organisations that target Newcastle graduates. You can search for opportunities at any time and register to receive email alerts of relevant opportunities and events on and off campus at [www.careers.ncl.ac.uk](http://www.careers.ncl.ac.uk).

Our website provides comprehensive links to further sources of vacancies including specialist directories, newspapers and journals. Your academic and professional contacts may also be a useful source of information and advice.

### **Starting your own business**

The Careers Service Business Start-up Team focuses on developing and applying enterprise skills and facilitates new business creation. If you are considering starting a business using the knowledge and skills developed through your studies or other ideas you have, they can provide advice and link you to various business support services. Further support is available in our

business hatchery facility. For more information, see [www.careers.ncl.ac.uk](http://www.careers.ncl.ac.uk).

### **Using our services**

Please let us know if you need any materials in alternative formats or require any other reasonable adjustments to access our events or resources.

### **G5 Data Protection Act**

The University is registered as a data user with the Office of the Data Protection Commissioner. Initial inquiries should be made to the Coordinator. The University will hold data relating to its students for a variety of purposes. These are:

- maintenance of student records (including personal and academic details)
- management of the academic processes (for example academic audits, examination boards and awarding of degrees)
- alumni operations and programme marketing
- provision of advice and support to students (via, amongst others, the university registry departments and counselling services)

The University will disclose student information to a variety of recipients, notably:

- employees and agents of the University (on a need to know basis only)
- students' sponsors (including companies, EPSRC)
- relevant government departments to whom we have a statutory obligation to release information
- current or potential employers of our students
- current or potential providers of education to our students.

N.B. Disclosure to persons or institutions not listed above will be made only with your permission, unless exceptional circumstances apply, as provided by law.

The University undertakes to maintain student data in secure conditions and to process and disclose data only within the terms of their Data Protection notifications. The details above are not exhaustive – for further information please contact the Programme Administrator in the first instance. Please note that we are reliant on you for much of the data we hold: please help us keep your record up-to-date by notifying us of any alterations to your address, personal details etc.

Under the Data Protection Act 1988 you have a right to a copy of the current personal information held on you by the institutions and a right to object to data processing that causes damage or distress.

### **G.6**

For queries regarding visas, the generic e-mail address is: [visa@ncl.ac.uk](mailto:visa@ncl.ac.uk)  
The web pages can be found at: <http://www.ncl.ac.uk/student-progress/visas/>

## **H. UNIVERSITY INFORMATION**

More information about the Universities can be found at <http://www.ncl.ac.uk> and <http://www.unn.ac.uk>

## **University of Newcastle upon Tyne**

The University developed from a School of Medicine and Surgery, established in Newcastle in 1834, to become one of Britain's largest civic universities and one of its leading research institutions. It was voted The Times University of the Year in 2000. The Reflex & REEM programmes are delivered by several schools within the Faculty of Science, Agriculture and Engineering:-

### **H.1 Marine Science and Technology (MAST)**

<http://www.ncl.ac.uk/marine/>

MAST is the largest and broadest-based marine school in the UK, covering the fields of marine engineering, marine science, naval architecture, offshore engineering, coastal management and small craft technology, and enjoys a substantial international reputation. The School is formed on excellent foundations established by the prior departments of Marine Technology with its 5\* research rating, and Marine Sciences and Coastal Management.

### **H.2 Electrical, Electronic & Computer Engineering**

<http://www.ncl.ac.uk/eece/>

The School of Electrical, Electronic & Computer Engineering offers a wide range of excellent undergraduate and postgraduate degrees, covering topics from communications to microelectronics, power electronics and electrical machines. They also have a dynamic research environment and the school has been awarded a 5A for research in the most recent RAE.

### **H.3 Mechanical and Systems Engineering**

<http://www.ncl.ac.uk/mech/>

An exciting multidisciplinary school offering a wide range of excellent degrees, covering topics from many facets of mechanical engineering. Research within the school is far ranging and encompasses the fields of robotics, bioengineering, engineering mathematics, MEMS, smart materials, manufacturing plus power and transmission systems. Engineering has been taught at Newcastle since 1871 and the school has strong links with both the principal engineering institutions and the engineering industry throughout the world.

### **H.4 Chemical Engineering and Advanced Materials**

<http://www.ncl.ac.uk/ceam/>

Since its institution in 1954, Chemical Engineering at Newcastle has undergone many cycles of change. The formation of the School of Chemical Engineering and Advanced Materials in August 2002 reflects the evolution in the field, consolidating Newcastle's status as the regional centre for education and research in the discipline.

### **H.5 Agriculture, Food and Rural Development**

<http://www.ncl.ac.uk/afrd/>

This is the leading school of Agriculture, Food and Rural Development in the UK and the largest centre for teaching and research in these subjects. Cutting edge research covers the whole of the spectrum of food science and human health, production agriculture, rural economics and development, marketing and ecology and the environment, both in Britain and internationally. The School houses two internationally renowned research centres, the Centre for Rural Economy and the Centre for Organic Agriculture and DEFRA's Farm Business Survey.

## **H.6 Sir Joseph Swan Institute for Energy Research**

<http://www.ncl.ac.uk/energy>

The mission of The Sir Joseph Swan Institute is to provide an intellectual lead in the pursuit of the low-carbon economy of the future, by developing new technologies which reconcile human needs for energy conversion and use with social and ecological needs.

The Sir Joseph Swan Institute is an interdisciplinary research institute within Newcastle University. It provides the focus for energy related research across the University and incorporates researchers specialising in natural science, social science and engineering from 11 academic schools.

The researchers involved with the Institute already have extensive industrial collaborations and the close integration of the research team enhances the industrial offering.

The Sir Joseph Swan Institute provides the vehicle for inter-institution collaboration and bridges academia, other centres such as NaREC and CPI, the regional development agency and industry.

The Institute research activity is aligned with strategic national and regional drivers including the Government's declared strategies in the Energy White Paper and with initiatives such as the national Energy Technologies Institute. The goal of the Institute thus positions itself alongside the Newcastle Science City agenda as well as existing centres and research institutes both within the University and externally and within the supporting mechanisms of One NorthEast.

## **H.7 Business School**

<http://www.ncl.ac.uk/nubs>

If you plan to build a successful future in business, management, finance or economics then we believe that starting your career journey at Newcastle University Business School will give you both an unrivalled start and, a student experience to remember for life. All our students benefit from our passionate commitment to learning and research. We are dedicated to providing the best opportunities for our students and have developed many links with business and the professions to further help maximise your potential.

## **H.8 Careers Service Business Start-up**

<http://www.ncl.ac.uk/careers/makeitfly/startup/>

A dedicated team of business advisers and business support staff can offer you specialist one-to-one advice and practical tips on running a business. The Hatchery can offer you space to think and develop your idea. Need some inspiration? Why not read our success stories. Whatever your needs, the business start-up team is here to support you every step of the way.

## **H.9 University of NORTHUMBRIA**

Specialist expertise in the field of photovoltaics is made use of in this programme. The Northumbria Photovoltaics Applications Centre (NPAC) undertakes research and development on many aspects of photovoltaics, including: the development of new solar cell structures and materials; testing and characterisation of solar cells; photovoltaic system design; performance monitoring and assessment for building integrated photovoltaic (BIPV) systems; environmental impact analysis for production and operation of photovoltaic systems.

## **I. PROGRAMME MANAGEMENT AND QUALITY ASSURANCE**

### **I.1 Programme Management**

The Reflex & REEM programmes are managed via a Steering Committee, consisting of academic and industrial members. The Steering Committee is responsible for the overall policy and strategy of the programme including review and implementation of plans of action identified by the Board of Studies.

The Board of Studies includes representatives from the Schools involved in module development and delivery, and student representatives. The Board of Studies is responsible for the delivery, maintenance and enhancement of academic standards. The Board monitors a significant amount of data relating to the programme including student feedback and External Examiners reports. The Board of Studies also undertakes an annual review of the programme and will include issues such as progress and assessment of students, feedback, academic issues, aims and learning outcomes. More information about student representation on the Board of Studies is given in section F.4.

The Board of Examiners includes module leaders, and the External Examiner. The External Examiner is nominated by the Board of Studies to act as moderator. The Board of Examiners is given the opportunity to see all examinations, assignments and dissertations. The Board of Examiners reports to the University and the Board of Studies.

For further information about the management structure, please contact the Coordinator.

### **I.2 Quality Assurance**

The programmes are subject to the academic quality assurance policies of the partner institutions. The implementation of appropriate procedures will be the responsibility of the Board of Studies.

As part of the quality assurance, feedback will be sought from students, their supporting organisations, module leaders and external examiners as part of the continuous improvement process. This information will be reviewed by the Board of Studies, as described above in section I.1.

University quality assurance is monitored by the QAA – the Quality Assurance Agency for Higher Education. The QAA was established in 1997 to provide an integrated quality assurance service for UK higher education institutions. The Agency is an independent body funded by subscriptions from universities and colleges of higher education, and through contracts with the main funding bodies.

The Agency's core business is to review the quality and standards of higher education in universities and colleges. It does this by auditing institutional arrangements for managing quality and standards and by assessing the quality and standards of teaching and learning at subject level. The programmes are required to meet a number of QAA codes of practice including distance learning.

Academic institutions also undertake internal quality assurance checks through internal reviews, availability of guidance documents and specialist staff.

## **J. Project & Dissertation**

**See separate Project Handbooks**

### **J.1 Planning**

An Induction Session is held in September. At this session students will receive guidance on project selection, research methods and dissertation presentation. A brief induction session will also be held in January/February for students who start later in the year.

## Appendix Reflex & REEM Taught Modules 2008-9

Code	REFLEX MODULES	CREDITS	MODULE LEADER
SPG8001	Renewable Energy: Resources	10	Prof A Roskilly
SPG8002	Renewable Energy: Photovoltaics & Geothermal Energy	10	Dr Catherine Gandy
SPG8003	Renewable Energy: Electrical Generation Systems	10	Dr R Norman
SPG8004	Renewable Energy: Grid Systems	10	Dr B Zahawi
SPG8005	Renewable Energy: Mechanical Power Transmission	10	Mr R Davidson
SPG8006	Renewable Energy: Wind & Hydro Energy Technology	10	Dr A Anderson
SPG8007	Renewable Energy: Hydrogen & Fuel Cell Technology	10	Prof K Scott
SPG8008	Renewable Energy: Biomass & Waste Technology	10	Dr P Bilsborrow
SPG8009	<i>*Renewable Energy: Policy, Politics and Ethics</i>	10	Euring I Arbon
SPG8010	Renewable Energy: Marine & Offshore Devices	10	Prof M Downie, Mr G Mackie
SPG8011	Renewable Energy Marine & Offshore Structures & Systems	10	Prof M Downie
SPG8012	<i>*Renewable Energy: Energy Management</i>	10	Ms S Joyce
SPG8095	Renewable Energy: Masters Project and Report	60	Prof A Roskilly
SPG8096	Renewable Energy Postgraduate Diploma Project and Report	30	Prof A Roskilly
<b>REEM MODULES</b>			
MST8010	Project Management	10	Dr C Fitzsimmons
SPG8013	Environmental Impact Assessment	10	Dr J Bythell
SPG8014	Renewable Energy Resources & Technology Part A	10	Dr A Anderson/Dr R Norman
SPG8015	Enterprise & Entrepreneurship	20	Ms Katie Wray
SPG8016	Business Enterprise	20	Ms Katie Wray
SPG8017	Renewable Energy Resources & Technology Part B	10	Dr P Bilsborrow
SPG8097	Renewable Energy: Masters Project and Report	80	Prof D Roddy
SPG8098	Renewable Energy Postgraduate Diploma Project and Report	40	Prof D Roddy

*\* Module is on both REFLEX & REEM*

## Appendix 2 Reflex Module Outline Forms 2009-10 Summarised

### Renewable Energy Resources SPG8001 Prof Roskilly, Dr Yao Dong Wang

#### Aims:

This module aims to provide an introduction to

- Energy sources and their use.
- Long-term problems and socio-economic and political issues surrounding energy supplies.
- The major renewable energy resources, their origins, potential and the measurement techniques used to quantify them.

#### Outline of Syllabus

Energy sources in terms of current worldwide usage; climate change and political, social, environmental and economic issues surrounding energy use; origins, potential and resource assessment for the major renewable energy resources (solar, wind, hydro, wave, tidal and biomass); introduction to energy conversion devices.

#### Intended knowledge outcomes:

After completing this module a student should be able to:

1. Describe the current worldwide energy usage and its impact on climate
2. Explain at a basic level the structure of electricity networks and the roles of different energy sources in the provision of a national electricity supply
3. Discuss each of the main renewable energy resources (solar, wind, hydro, wave, tidal and bioenergy), their origins and distribution
4. Discuss the measurement and estimation of the appropriate renewable energy resource at a given site.
5. Quantify resource potential and variation at a given site (for solar, wind, hydro, wave and tidal resources)

#### Intended skills outcomes:

After completing this module a student should:

1. Be able to analyse the energy capture potential for solar, wind and hydro resources
2. Be able to comment critically on technical papers regarding renewable resource availability
3. Have practised problem solving skills
4. Have practised skills in information literacy

#### Useful, but not essential, background reading:

Renewable Energy: Power for a Sustainable Future, Oxford University Press. (2004) Boyle, G. (Ed) 0199261784

Energy, Society and Environment, 2nd Edition, Routledge. (2003) Elliott, D. 0415304865

Renewable Energy Resources, 2nd Edition, Taylor and Francis. (2005) Twidell, J. Weir, A. 0419253300

#### Assessment weightings:

Written Examination	50%
Post-school coursework	50%

## **Appendix 2 Reflex Module Outline Forms 2009-10 Summarised**

### **Photovoltaics & Geothermal Energy SPG8002, Dr Catherine Gandy**

#### **Aims:**

The aim of the module is to introduce students to the generation and conversion of energy from renewable sources, in particular Photovoltaics and Geothermal Energy. Students will also learn about the fundamental technology associated with photovoltaic systems including semi-conductor physics, cells and modules.

#### **Outline of syllabus**

Generation and conversion systems associated with the following renewable energy systems:

1. Photovoltaics
2. Geothermal Energy

Introduction to the technology associated with photovoltaic systems covering:

Enabling technology of semi conductors (theory, device operation, processing and fabrication techniques)

Cells (design, manufacture and performance)

Modules (design manufacture and performance)

Introduction to the technology associated with geothermal energy systems covering:

Deep geothermal energy (theory, site selection, power plant type)

Ground source heat (heat pumps, drilling, design, site selection, licensing.)

#### **Intended knowledge outcomes:**

It is anticipated that students who successfully complete this module will be able to demonstrate knowledge and understanding of the generation and conversion of energy from these renewable energy sources.

#### **Intended skills outcomes:**

Subject specific skills:

Illustrate an understanding of technology associated with photovoltaic systems.

Cognitive skills:

Identify and utilise data associated with generation and conversion of energy sources.

#### **Key Skills:**

Employment of communication skills through assessed work and class discussions.

Plan and manage study time particularly in pre and post school periods.

Use of a variety of IT skills.

#### **Assessment weightings**

Written Examination            50%;

Post School Assignment       50%

## **Appendix 2 Reflex Module Outline Forms 2009-10 Summarised**

### **Electrical Generation Systems SPG8003 Dr Rose Norman**

#### **Aims:**

The aims of this module are to develop knowledge and understanding of:

1. Electrical generators used within renewable energy conversion systems
2. Photovoltaic (PV) systems both for stand-alone and grid-connected applications
3. Basic power electronic converters used in renewable energy applications

#### **Module Summary**

The module considers aspects of electrical engineering within the renewable energy sector. In particular, the issues of photovoltaic systems and micro-grid systems are addressed along with those of electrical generators and power electronic conversion.

#### **Outline of syllabus**

Review of electromagnetics; transformers; synchronous and induction generators; power electronic devices; power electronic converter circuits; heat sinking and drive circuits for power electronics; stand-alone PV systems including energy storage; grid-connected PV systems; variable-speed generator operation

#### **Intended knowledge outcomes**

After completing this module a student should be able to:

1. Explain the operation of AC generators and transformers
2. Discuss the basic properties of power electronic devices
3. Explain the operation of power electronic converter circuits
4. Discuss the specific design requirements of stand-alone and grid-connected PV systems
5. Explain the operation of variable-speed generators used in wind turbine applications

#### **Intended skills outcomes:**

After completing this module a student should:

1. Analyse the operation of power electronic converters
2. Analyse the performance of AC generators
3. Carry out design calculations for stand-alone and grid-connected PV systems
4. Students will also have the opportunity to practise report-writing skills

#### **Assessment Weightings:**

Written Examination	50%
Post-school coursework	50%

## **Appendix 2 Reflex Module Outline Forms 2009-10 Summarised**

### **Grid Systems SPG8004 Dr Bashar Zahawi**

#### **Aim**

The aim of the module is to provide students with an advanced level of understanding of grid systems in relation to the renewable energy sector.

#### **Module Summary**

This module is designed to be of value to engineers whose task is the planning and operation of renewable energy generation connected to the electricity distribution system. Starting with the fundamental principles of a three-phase electric power system, the module considers such matters as power and reactive power flows, load flow calculations, symmetrical and unsymmetrical fault conditions and network harmonics and the impact of embedded generation on the local distribution network.

#### **Outline of syllabus**

Three-phase electric power systems, transmission lines and cables, power and reactive power flows, relationship between line network voltages and reactive power flows, the per unit system of calculation, fault level calculations, load flow calculations, system steady-state stability, transient stability, control of system frequency and voltage, unsymmetrical fault calculations, supply harmonics, protection, high voltage dc transmission, impact of embedded generation.

#### **Intended knowledge outcomes:**

On successful completion of the course the students will:

Understand the principles of operation and control of electrical power distribution networks.

Perform calculations indicating the distribution of power and the flow of current in a power distribution network under normal and fault conditions.

Understand the principles of operation of synchronous and asynchronous generators and perform system stability calculations.

Understand how harmonics are generated together with methods of their elimination.

Understand the technical issues concerned with the operation of power distribution networks with embedded generation, with reference to both renewable energy sources and other types of generation such as combined heat and power (CHP).

#### **Intended skills outcomes include:**

Illustrate an understanding of theoretical concepts and practical implementation of grid system issues in renewable energy systems.

Collation, analysis and evaluation of data associated with grid systems.

Identification of problem, production and appraisal of solutions to grid system issues of renewable energy systems.

#### **Background, but not essential, reading:**

AE Guile and WD Paterson 'Electrical power systems Volumes 1 and 2', Pergamon.

BM Weedy and BJ Cory, 'Electric Power Systems', Wiley.

#### **Assessment Weightings:**

Written Examination	67%
Pre-School Assignment	33%

## Appendix 2 Reflex Module Outline Forms 2009-10 Summarised

### Mechanical Power Transmission SPG8005 Mr Rob Davidson

#### Aim

The aim of the module is to provide students with an appreciation of mechanical power transmission systems and equipment, especially rotary drive systems, and to enable them to select and specify drive systems to link a variety of prime movers to a wide variety of driven loads to satisfy given performance specifications.

#### Module Summary

Drive systems, drive systems components, torque, performance and selection.

#### Outline of syllabus

- Introduction to drive systems and components.
- Principles of drive systems and component specification/selection.
- Features of power transmission shaft/bearing/housing assemblies for ease of manufacture and maintenance.
- Gear drives, gear types, main characteristics, geometry, materials and manufacturing routes.

#### Skills

It is anticipated that students who successfully complete this module will be able to:

- Identify drive system components and their capabilities and limitations.
- Specify selected drive system equipment for a specific requirement.

Evaluate conventional drive system designs.

Illustrate an understanding of theoretical concepts and practical implementation of mechanical power transmission systems and equipment in renewable energy systems.

Collation, analysis and evaluation of data associated with mechanical power transmission systems and their operational requirements.

Identification of problem, production and appraisal of solutions associated with mechanical power transmission systems.

Employment of communication skills through assessed work and class discussions.

Plan and manage study time particularly in pre and post school periods.

Use of a variety of IT skills.

#### Assessment Weightings

Written Examination	50%
Post-school assignment	50%

## **Appendix 2 Reflex Module Outline Forms 2009-10 Summarised**

### **Wind & Hydro Energy Technology SPG8006 Dr Sandy Anderson**

#### **Aim**

The aim of the module is to provide students with an appreciation of wind and hydro power and pumped energy storage technologies, their capabilities and the key issues in their specification and design.

#### **Outline of syllabus**

Energy Supply issues and the capabilities & roles of wind and water power to meet these.

Basic project economic appraisal methods.

Review of relevant fluid mechanical and scale modeling principles.

Wind turbine installation design. Water power installation design. Pumped water energy storage.

#### **Intended knowledge outcomes**

It is anticipated that student who successfully complete this module will be able to:

- Identify the technical issues to be addressed in assessing any potential wind or hydro power or pumped energy storage site.
- Specify appropriate technology for power generation or pumped storage for a given site.
- Evaluate the technical feasibility of proposed wind or hydro power or pumped storage installations.

#### **Intended skills outcomes**

Illustrate an understanding of theoretical concepts and practical implementation of wind and hydro energy technology in renewable energy systems.

Collation, analysis and evaluation of data associated with wind and hydro energy technology.

Identification of problem, production and appraisal of solutions associated with wind and hydro energy technology.

#### **Key Skills**

Employment of communication skills through assessed work and class discussions.

Plan and manage study time particularly in pre and post school periods.

Use of a variety of IT skills.

#### **Assessment Weightings**

Oral presentation	40%
Written Examination	60%

## Appendix 2 Reflex Module Outline Forms 2009-10 Summarised

### Hydrogen & Fuel Cell Technology SPG8007 Prof Keith Scott

#### Aim

The aim of the module is to provide students with an advanced knowledge of the use of hydrogen and fuel cells in the energy sector. In particular, the module will focus on the opportunities for using hydrogen, how it is produced, and fuel cell technology.

#### Module Summary

Provides essential material for the hydrogen economy and Fuel Cell Technology, in particular the opportunities for using hydrogen; the use of hydrogen in a hydrogen economy; hydrogen production / generation; storage and distribution. Also basic thermodynamic & kinetic principles or electrochemical power sources & fuel cells and current fuel cell technologies available.

#### Outline of syllabus

Introduction to physical chemistry: units, thermodynamics, kinetics and basic electrochemistry.  
Reactor engineering (Introduction to chemical engineering, material and energy balances, heat transfer separation processes and process design)  
Hydrogen production  
Hydrogen economy  
Fuel Cell Technology  
Battery technology  
Supercapacitor technology.

#### Intended knowledge outcomes

It is anticipated that students who successfully complete this module will be able to:

Demonstrate knowledge and understanding of hydrogen and the use of fuel cells.  
Be able to develop and design appropriate systems for use in a fuel cell system.

#### Intended skills outcomes

Illustrate an understanding of theoretical concepts and practical implementation associated with hydrogen and fuel cells in energy systems.  
Collation, analysis and evaluation of data associated with the selection and design of fuel cell systems.  
Identification of problem, production and appraisal of solutions for fuel cell systems in renewable energy systems.  
Employment of communication skills through assessed work and class discussions.  
Plan and manage study time particularly in pre and post school periods.  
Use of a variety of IT skills.

#### Recommended Reading

Fuel Cell Systems Explained, J Wiley and Sons England, L Larmanie and A Dicks, 0470 848857

#### Assessment Weightings

Pre school assignment	50%
Written Examination	50%

## Appendix 2 Reflex Module Outline Forms 2009-10 Summarised

### Biomass and Waste Technology SPG8008 Dr Paul Billsborrow

#### Aim

The aim of the module is to provide students with an advanced knowledge of the sources of biomass and the range of technologies available for conversion into energy. The module will focus on the opportunities and potential for biomass to contribute to the production of renewable heat, electricity and transport fuel together with the potential for reducing carbon dioxide emissions.

#### Module Summary

The module examines biomass resources and technologies available for conversion to energy. The module looks at technologies for the production of heat, electricity and transport fuel, the economics of production and the potential for reducing carbon dioxide emissions. The potential for reducing costs of the different technologies are considered via research and development, improved efficiencies etc.

#### Outline of syllabus

- 1 Biomass resources, policy and potential contribution to EU and UK targets
- 2 Biomass heat
- 3 Gasification
- 4 Anaerobic digestion
- 5 Biofuel technologies
- 6 Environmental performance/issues/integration
- 7 Economics/costs

#### On successful completion of this module students will be able to:

- Appreciate the potential of biomass to contribute to renewable energy production and reductions in CO<sub>2</sub>.
- Identify the policy drivers at an International, National and Regional level relating to renewable energy and biomass.
- Evaluate the barriers to uptake of biomass as a renewable energy source.
- Identify the range of biomass resources available for energy production.
- Evaluate a range of technologies available for energy production from biomass and appreciate the potential for future reduction in costs through technological development.
- Analyse the economics of energy production from biomass when compared with fossil fuels and other sources of renewable energy.
- Illustrate an understanding of theoretical concepts and practical implementation associated with chemical engineering systems and processes in renewable energy systems.
- Collate, analyse and evaluate data associated with the selection and design of energy recovery systems.
- Identify problems, produce and appraise solutions for biomass engineering systems.

#### Assessment Weightings

Written Examination	67%
Post-school assignment	33%

## **Appendix 2 Reflex Module Outline Forms 2009-10 Summarised**

### **Policy, Politics & Ethics SPG8009 Euring Ian Arbon**

#### **Aim**

The aim of the module is to provide students with an appreciation of the political and ethical context of renewable energy at an international, national and local level.

#### **Outline Syllabus**

- Sustainability and Renewable Energy:
- International politics and ethics of renewable energy:
- National politics of renewable energy:
- Local politics of renewable energy:
- Environmental Impact issues:

#### **Intended Learning Outcomes**

It is anticipated that students who successfully complete this module will be able to:

- Identify the key political and ethical issues associated with renewable energy projects.
- Describe the policies which influence the development of renewable energy at international, EU, UK and local level.
- Have an appreciation of the public's attitude to and involvement in decisions associated with renewable energy projects and the potential need for education.
- Have an appreciation of environmental impact issues including EIA and regulations and be able to weigh the importance of these against the need to tackle global climate change.

#### **Subject specific skills**

Illustrate an understanding of the relevance of sustainability issues (Economic, Environmental, Societal) to renewable energy projects.

#### **Cognitive skills**

Decision making skills whilst considering a range of issues including politics and ethics.

#### **Key Skills**

Employment of communication skills through assessed work and class discussions.

Plan and manage study time particularly in pre- and post-school periods.

Ability to work in a team or alone.

Use of a variety of IT skills.

#### **Essential Reading References**

Renewable Energy Policy and Politics – Karl Mallon, Earthscan (2006)

#### **Assessment Weightings**

Pre school assignment	50%
Post school assignment	50%

## **Appendix 2 Reflex Module Outline Forms 2009-10 Summarised**

### **Marine & Offshore Devices SPG8010 Prof Martin Downie / Mr Graeme Mackie**

#### **Aim**

The aim of the module is to provide students with an advanced knowledge of marine and offshore engineering within the renewable energy sector. In particular, the module will focus on the choice and design of devices for marine based renewable energy systems.

#### **Module Summary**

The aim of the module is to provide students with an advanced knowledge of marine and offshore engineering within the renewable energy sector. In particular, the module will focus on the choice and design of devices for marine based renewable energy systems.

#### **Outline of syllabus**

Marine and offshore engineering associated with renewable energy systems. The module will largely focus on the subject of the design of marine/offshore devices and will include:

Principles of design

Choice and design of a range of devices including:

Wave power devices

Tidal/current power devices

Offshore wind power devices

Life cycle analysis

#### **Students who successfully complete this module will be able to:**

demonstrate knowledge and understanding of the different types of marine/offshore based devices for generating renewable energy and their design;

develop and design appropriate marine/offshore based devices for use in a renewable energy system.

#### **Intended skills outcomes**

Illustrate an understanding of theoretical concepts and practical implementation associated with marine and offshore engineering devices in renewable energy systems.

Collation, analysis and evaluation of data associated with marine and offshore engineering device choice and design.

Identification of problem, production and appraisal of solutions for marine and offshore engineering device design in renewable energy systems.

Employment of communication skills through assessed work and class discussions.

Plan and manage study time particularly in pre and post school periods.

Use of a variety of IT skills.

#### **Assessment Weightings:**

Oral presentation	50%
Post School Assignment	50%

## **Appendix 2 Reflex Module Outline Forms 2009-10: Summarised**

### **Marine & Offshore Structures & Systems SPG8011 Prof Martin Downie**

#### **Aim**

The aim of the module is to provide students with an advanced knowledge of marine and offshore engineering within the renewable energy sector. In particular, the module will focus on the principles associated with the design and installation of marine systems and structures for renewable projects.

#### **Outline Syllabus**

Marine and offshore engineering associated with renewable energy systems. The module will largely focus on the subject of marine structures and will include:

- Hydrodynamics
- Marine structures and corrosion
- Foundations and moorings
- Sub sea cabling
- Installation and maintenance
- Sub-sea cabling and mooring
- Marine structures and foundations
- Marine hydrodynamics
- Corrosion and maintenance

#### **Students who successfully complete this module will be able to**

Demonstrate knowledge and understanding of marine and offshore structures associated with renewable energy systems. This knowledge and understanding will include hydrodynamic principles, design issues, installation and maintenance.

Illustrate an understanding of theoretical concepts and practical implementation of marine and offshore engineering solutions in renewable energy systems.

Collate, analyse and evaluate data associated with marine and offshore engineering systems.

Identify problems, produce and appraise solutions to the marine and offshore engineering element of renewable energy systems.

#### **Key Skills**

Employment of communication skills through assessed work and class discussions.

Plan and manage study time particularly in pre and post school periods.

Use of a variety of IT skills.

#### **Assessment Weightings**

Written Examination	50%
Post school assignment	50%

## Appendix 2 Reflex Module Outline Forms 2009-10 Summarised

### Energy Management SPG8012 Ms Sharon Joyce

#### Aim

To give students an appreciation of the drivers, technologies and techniques behind the management of energy. In addition to give practical experience in energy auditing, including monitoring and targeting, enabling them to identify energy efficiency opportunities.

#### Outline Syllabus

Demand side management  
Policy, regulations and fiscal drivers  
Monitoring and targeting  
Energy efficient techniques and technologies  
Human factors  
Practical energy auditing

#### Intended Learning Outcomes

The students should be able to;  
Describe the political, regulatory and fiscal drivers for energy management;  
Be aware of energy efficiency technologies and techniques;  
Understand and identify what data they require, know where to find it, how to organise, present and use it to monitor and target energy efficiency initiatives. This will include metering, degree day calculation, correlation between productivity and energy usage.

#### Subject specific skills

Illustrate an understanding of the relevance of Government policy, regulations and fiscal drivers;  
Demonstrate practical auditing skills and the ability to apply the above knowledge to real life situations. To measure and analyse data, audit facilities, write energy audit reports and recommend improvements.

#### Cognitive skills

Collation, analysis and evaluation of data associated with energy efficiency and energy auditing activities.

#### Key skills

Communication skills through group work, discussions, presentation and report writing.  
Time management skills.

#### Assessment Weightings

Pre School Assignment	50%
Post School assignment	50%

## **Appendix 2 Module Outline Forms 2009-10 Summarised**

### **Environmental Impact Assessment SPG8013 Dr John Bythell**

#### **Aim**

To provide a background outlining the principles and practice of the EIA process

To provide training in undertaking EIA projects, including the communication of outcomes via final written report

To promote development of a wide range of transferable skills that are an integral part of the specialist ability to contribute to the EIA process.

#### **Summary**

The Environmental Impact Assessment (EIA) process should inform decision makers about the likely effects of a proposed development on the natural and man-made environment. It is a consultative and participatory process between scientists, environmental managers, developers, public bodies and government authorities which requires a wide range of skills and expertise to complete successfully. Its aim is to identify likely effects and possible mitigation measures at an early stage and thus improve the quality of both project planning and decision-making. This course will provide a background to the principles and practice of the EIA process and hands-on experience and skills training with realistic environmental impact scenarios. Although the course is designed for international applications, much of the documentation and procedures are based on EU EIA frameworks and is particularly suited to work within the EU countries.

#### **Syllabus**

1. Introduction. What is EIA and how does it work? Objectives of the module; preparation and presentation of EIA reports; evaluating and reviewing EIA statements and reports; sourcing information; introduction to the EIA projects and case studies.

2. Issues and trends in EIA. Types of EIA; integration into a sustainable development framework; approaches to developing effective EIA procedures; strategic EIA (SEA); trans-boundary issues.

3. Stages in the project cycle. Project screening; initial environmental evaluation; scoping studies; baseline studies; impact prediction and significance; mitigating measures; monitoring requirements.

4. Techniques used in the EIA process. Checklists; matrices; mapping techniques; assessing social, fiscal and human health impacts; risk analysis.

5. Success of EIA. Historical and regional overview of EIA practices; case studies and cost-benefit analysis; where and why has EIA failed to be effective?

#### **Knowledge Outcomes**

On completion of the module students should:

- understand the structure, principles and practice the EIA process in tropical areas
- have experience in undertaking EIA projects
- have experience in communicating the outcomes of an EIA process in an appropriate formal written report.

#### **Assessment weightings**

In session report	50%
Post-School report	50%

## **Appendix 2 Module Outline Forms 2009-10: Summarised**

### **SPG8014 Renewable Energy Resources & Technology Part A: Dr Sandy Anderson, Dr Ian Potts & Dr Rose Norman**

#### **Aim**

To introduce students to a range of renewable energy technologies available and provide students with an awareness of the technological, economic, environmental and resource aspects of a range of renewable energy technologies. This module will focus on basic energy principles, hydro, wind, wave and tidal energy.

#### **Summary**

The module will focus on the technical issues involved in renewable energy exploitation, starting with general issues and resources then outlining technologies for water, wind, tidal and wave power.

#### **Syllabus**

Energy and power - what they are, what we do with them (and why), where and how we can access them, what problems that process causes (resource depletion, CO2 and climate)

Energy exploitation issues - matching supply to demand (temporal, geographic), energy distribution and storage.

Renewable Energy Resources - what, where and their characteristics.

Renewable Energy technologies -

-water and wind

-wave and tidal

#### **Knowledge Outcomes**

On successful completion of this module students will have an understanding of:

what energy and power are and what uses are made of them;

the basic principles underlying energy extraction and application;

the underlying causes of climate change and the role of energy in them;

the technical and other issues in matching energy supply to demand through distribution and storage;

renewable energy resources and their characteristics;

renewable energy technologies for water, wind, wave and tidal power.

#### **Recommended reading:**

Sustainable Energy without the Hot Air, by David Mackay

#### **Assessment Weightings**

Presentation 40%

Written Examination 60%

## **Appendix 2 Module Outline Forms 2009-10: Summarised**

### **SPG 8015 Enterprise & Entrepreneurship : Ms Katie Wray**

#### **Aim**

This module provides an introduction to enterprise and entrepreneurship within science and / or engineering by:

- 1) Developing students' knowledge, understanding, and practical experience of enterprise and entrepreneurship within science and/or engineering.
- 2) Enabling students to consider enterprise and entrepreneurship activity within their wider economic, social and political contexts.
- 3) Developing students' knowledge and understanding of the role of innovation in enterprise development

#### **Summary**

This module has been designed to improve employability of science and engineering students and to widen their career choices. The module develops business skills and awareness of entrepreneurial ability through a variety of business case studies (student-generated or university-generated) which are unpacked to allow students to better understand the deployment of these skills in a small business through to a corporate setting. This includes accessing finance, developing networks, protecting business expertise and understanding entrepreneurial traits and their contribution to employability.

#### **Syllabus**

This module will include:

Introduction to enterprise and entrepreneurship

The role of the entrepreneur - teamworking, learning styles and leadership

The wider business environment and entrepreneurship in a small business context

Business support and the development of business mentoring and networks

The role of innovation in technology-based businesses

A critical analysis of intellectual property rights within science and engineering

Business development and integration in the future Science and Engineering environment

**Analysis of small business development (via placement/case study.)**

#### **Knowledge Outcomes**

Students will be able to:

Identify relationships between research, enterprise and entrepreneurship.

Undertake a skills audit and identify the skills they bring and the areas for development.

Evaluate IPR and other legislation and regulations relevant to the management of innovation and technology

Understand the entrepreneurial business environment

#### **Assessment Weightings**

Written Examination:	35%
Presentation:	25%
2000 word reflective report:	40%

## **Appendix 2 Module Outline Forms 2009-10: Summarised**

### **SPG8016 Business Enterprise in Science & Engineering: Ms Katie Wray**

#### **Aim**

To provide students with knowledge and experience of business development, planning and enterprise within the science and engineering sector. In particular the module will focus on generating ideas, constructing and presenting a business proposition, trading (where possible) and liquidating a business.

#### **Summary**

This module has been designed to improve employability of science & engineering students and to widen their career choices. The module develops business skills and awareness of entrepreneurial ability through the provision of opportunities to create, trade and liquidate a real business.

#### **Syllabus**

The module will include:

The characteristics of successful science and engineering business

Business planning

Team working

Ideas generation

Financing an engineering business

The Market

Presenting and selling

Legal (IP) & environmental analysis

Operations & network management and development

Liquidation and lifelong enterprise

#### **Knowledge Outcomes**

Students will be able to:

Identify and research the viability of a range of business ideas

Demonstrate knowledge of the transition from knowledge to idea to business

Understand functions relevant to the creation of a small enterprise

Evaluate theories of organisation and business management

#### **Assessment Weightings**

Written Examination: 25%

Presentation: 25%

Business Plan post school assignment based on 2000 words per group member: 50%

## Appendix 2 Module Outline Forms 2009-10: Summarised

### SPG8017 Renewable Energy Resources & Technology Part B: Dr Paul Bilsborrow; Prof Nicola Pearsall

#### Aim

To introduce students to a range of renewable energy technologies available and to provide students with an awareness of technological, economic, environmental and resource aspects of a range of renewable energy technologies.

#### Summary

This module will focus on sources of biomass and the range of technologies available for conversion into energy in the form of heat, power and transport fuel. Students will also learn about the photovoltaic technology, including cell and system operation, the range of applications currently addressed and implementation aspects both technical and non-technical.

#### Syllabus

1. Biomass and biofuel resources, policy and potential contribution to EU & UK targets (PEB)
2. Biomass heat and CHP - technologies, economics and environmental benefits (PEB)
3. Biofuels - 1st & 2nd generation technologies, economics and environmental benefits (PEB & DR)
4. Solar Resources (NP)
5. PV cell, module and system design, manufacture and performance (NP)
6. PV applications and implementation, economics and environmental benefits (NP)

#### Knowledge Outcomes

On successful completion of this module students will be able to:

Appreciate the potential of biomass and pv to contribute to renewable energy production and reductions in CO<sub>2</sub>.

Identify the policy drivers at an international, national and regional level relating to renewable energy especially biomass and photovoltaics.

Evaluate the barriers to uptake of biomass and pv as renewable energy sources.

Identify the range of biomass resources available for energy production.

Understand the solar resources available for energy production.

Evaluate a range of technologies available for energy production from biomass and appreciate the potential for future reduction in costs through technological development.

Evaluate a range of applications of photovoltaics and appreciate the potential for future reduction in costs of pv systems through technological development.

Analyse the economics of energy production from biomass and pv when compared with fossil fuels and other sources of renewable energy.

#### Assessment Weightings

Written Examination	67%
2000 word post school assignment	33%