Renewable Energy and the Built Environment

This programme is only offered at: **Centre for Alternative Technology, Wales**.

Final award	MSc
Intermediate awards available	• Post Graduate Diploma • Post Graduate Certificate • Post Graduate Associate Cert
UCAS code	N/A
Details of professional body accreditation	N/A
Relevant QAA Benchmark statements	Earth Science, Environmental Sciences and Environmental Studies
Date specification last up-dated	March 2012

Profile

The summary - programme advertising leaflet

Programme content

The programme examines the theory and practice of renewable energy technologies with special reference to the built environment. It ranges from the political, economic and social background of energy issues, including global examination of energy provision and consumption and climate change to local environmental considerations. The theory and practice of renewable energies are examined through both practical work and the lecture programme enabling students to critically analyse the benefits and drawbacks of renewable energy systems.

MSc Renewable Energy and the Built Environment at UEL

This programme, which concentrates on a wide range of current Environmental and Renewable Energy issues, is run by the Centre for Alternative Technology, CAT (Europe's leading Eco centre) in the Graduate School of the Environment and validated for full MSc status by the University of East London, (UEL) with students being registered at UEL for the duration of their studies. The programme offers a unique combination of design, evaluation and practical experience that will equip students with skills that are becoming increasingly sought after in all areas of professional practice. All through the programme students are made aware of the relationship between the supply of renewable energy and the demand made by buildings

The programme runs as a series of 15, 30 or 60 credit modules which all take place at CAT.

Admission requirements

The programme is intended to cater for those with an engineering background. Students are admitted in accordance with the admission requirements in the programme specification (http://www.uel.ac.uk/postgraduate/specs/renewables-msc/) . For acceptance onto the programme the following requirements apply:-

- First degree with an appropriate technical background
- Students who do not possess formal qualifications but who can demonstrate that they have gained appropriate knowledge and skills equivalent to degree standard and that they will benefit from and contribute to the programme, may be accepted. Students may be admitted with advanced standing through the recognition of credit or the accreditation of experiential or certificated learning according to the University of East London Accreditation of (Experiential) Learning (A(E)L) policy.
- A student may gain admission to a programme, with advanced standing, with up to half of the credits associated with the award being achieved through accredited experiential learning, or up two thirds through accredited certificated learning. (Where a combination of experiential and certificated learning is involved up to one half of the credits for the award may be achieved through accredited experiential learning with further credits being achieved through accredited certificated learning up to a maximum of two thirds of the credits for the award).
- The University and CAT are strongly committed to widening participation and equal opportunity for all.
- You must be able to understand and express yourself in both written and spoken English and some evidence e.g. TOEFL at 550 or an IELTS score of 6.0 will be required.

Application to this programme can only be made on line at http://gse.cat.org.uk/msc-renewable-energy-and-the-built-environment-rebe

Programme structure

The programme is delivered by staff from CAT and specialist visitors from the profession, and runs as a series of eleven five-day residential events, which all take place at CAT. This brings the advantage of combining an academic programme with the practical application of research and development that has established CAT as Europe's leading Eco-centre.

The programme comprises of a total of 11 modules. Most modules are 15 credits; some are 30 credits. Each 15 credit module is a five-day residential teaching event which takes place every month except July at CAT; 30 credit modules consist of two of these five day sessions. The thesis is a 60 credit module. There are a number of options available ie modules that run at the same time and students choose which to follow.

After acquiring 120 credits from the available teaching modules and associated coursework, students are eligible for a Postgraduate Diploma; those who wish to obtain an MSc then complete the Thesis Module which is the culmination of the work done on the programme. A formal start to the thesis is made around the sixth module.

Formal tutorials are available at CAT; others by E mail.

Learning environment

Modules consist of lectures, seminars, presentations and practical studies. Learning is delivered through a combination of formal and informal methods. Students benefit from access to in-house computing facilities and web based support at CAT.

In June 2010, WISE (Wales Institute for Sustainable Education) opened. The award winning building was constructed with sustainable, low embodied energy materials, has very high standards of energy efficiency and utilises renewable sources of energy.

Assessment

Assessment is through coursework, which builds to form the students' academic portfolio, culminating in a thesis. The coursework aims to test that the Learning Outcomes have been met and takes various forms: an essay or report on a subject chosen from the module material and a presentation of the essay or report topic. The essay or report is handed in to fixed deadline dates, the presentation occurs at appropriate times, or by post if not attending before fixed assessment deadlines. There are no closed book examinations.

Relevance to work/profession

The programme is suitable for those students with an interest in developing expertise in an area of renewable energy. The part played by renewable energy in the wider environmental agenda and resource management is rapidly increasing in importance and skill shortages are being reported with increasing specialist knowledge required. There is increasing public concern over the problem of climate change resulting from the continued consumption of fossil fuels. One of the best solutions to this problem is the development of renewable energy technology and in particular how this can be integrated with buildings. The escalating nature of climate change makes need for renewable energy urgent but expertise in this area is not able to meet this need. This programme is being developed to meet the specific demands of the industry in its quest to provide much needed expertise in this important area.

Thesis/Dissertation/project work

The Thesis (of 14,000 words) gives the student an opportunity to apply the discipline and skills of the programme to an individually selected research topic, requiring a measure of original development, providing a vehicle for conducting an in-depth investigation, analysis and critical review of relevant material. The thesis is the culmination of work done on the programme and is considered to be of prime importance. The process of producing the thesis consists of a number of Thesis Workshop day long events which consist of research methods, aspects of structure and organisation etc.
After attendance at the appropriate Thesis Workshop, students are encouraged to attend informal thesis discussions which take place every module. These consist of a number of students and staff with initial ideas for an individual thesis subject being discussed and commented on. At the sixth attended modules students are requested to make a formal presentation of their final thesis proposal. This is registered by the thesis coordinator who then allocates an appropriate supervisor and continues to track the student performance until hand in. All students are encouraged to produce a publishable paper based on the thesis material.
The thesis is read by two members of staff and the external examiner.

Added value

Skills acquired on the programme consist of analysis, design of renewable energy systems, problem solving, fabrication of renewable energy components and systems, communication both written and oral, using IT, creative thinking and self motivation. All are relevant to many areas of life and work and obtaining these skills contributes greatly to the pursuit of life long learning.

Your future career

There is a significant skill shortage in the area of renewable energy, particularly where it relates to the built environment. There are significant employment opportunities in Local Government, Private Industry, Architectural Practices, NGO's associated with the Environment, and in Private Practice. The many skills acquired and areas considered during this programme are excellent preparation for work in any of the above areas.

How we support you

All students studying this programme are allocated to a Seminar Group of about 20 - 25 students and are supported by a personal tutor who is responsible for providing advice and guidance throughout their term of study. All seminars and tutorials take place within seminar groups. Support is also given during specific stages of progression, such as research methods for the thesis. Small group teaching is acknowledged as being beneficial to students as it allows for individual attention and enables peer review and group discussion.

Bonus factors

Residential teaching weeks take place at the Centre for Alternative Technology (CAT) located in North Wales on the edge of Snowdonia National Park. This provides a unique environment for study with access to leading experts in their fields with considerable opportunity for interaction and discussion with programme members and staff.

Outcomes

Programme aims and learning outcomes

What is this programme designed to achieve?

This programme is designed to give you the opportunity to:

- To allow you to undertake advanced study in specialist topics in the area of renewable energy and how this impacts on the built and wider environment.
- To develop your intellectual and imaginative powers, your problem solving skills, your ability to communicate, your ability to see relationships within the subject areas learned and to perceive your field of study in a broader perspective. The teaching programme will stimulate an inquiring, analytical and creative approach, encouraging independent judgement and critical self- awareness.
- To develop your self-confidence and establish your ability to act on your own initiative.

- To apply judgement to complex and unpredictable research and professional issues within the area, through case studies and group working.
- To cultivate your ability to take a senior/management position in academic research or professional practice.

What will you learn? Learning Outcomes, (LO's)

Knowledge

1. demonstrate a critical understanding of and ability in the principles and techniques of the analysis in the area of environment and energy
2. demonstrate a critical understanding of and ability in the principles and techniques used in the development of practical applications in the area of environment and energy

Thinking skills

3. demonstrate an understanding of principles and practices derived from each of the Modules studied and integrate and apply the knowledge and skills gained, in a new area or form
4. demonstrate a critical understanding of the theory and practice of environment and energy issues in the context of society as a whole

Subject-Based Practical skills

5. demonstrate a critical understanding of current theories and techniques for appraising user interfaces and practical design skills for effective user interactions
6. demonstrate a critical understanding of and ability in the tools, techniques and equipment used in the development of practical applications in the area of environment and energy

Skills for life and work (general skills)

7. analyse a problem and systematically design and implement an effective solution drawing on creativity and judgement; either as an individual or in cooperation with others involved in an enterprise
8. clarity of expression in spoken and written words, as well as in other visual media including use of computers
9. demonstrate fundamental management skills and techniques relating to the leadership of project

Structure

The programme structure

Introduction

All programmes are credit-rated to help you to understand the amount and level of study that is needed.

One credit is equal to 10 hours of directed study time (this includes everything you do e.g. lecture, seminar and private study).

Credits are assigned to one of 5 levels:

- 0 - equivalent in standard to GCE 'A' level and is intended to prepare students for year one of an undergraduate degree programme
- 1 - equivalent in standard to the first year of a full-time undergraduate degree programme
- 2 - equivalent in standard to the second year of a full-time undergraduate degree programme
- 3 - equivalent in standard to the third year of a full-time undergraduate degree programme
- M - equivalent in standard to a Masters degree

Credit rating

The overall credit-rating of this programme is 180 for a Master Degree, 120 for Post Graduate Diploma, 60 for Post Graduate Certificate and 30 for a Post Graduate Associate Certificate. Any module may be counted for the above.

Typical duration

The typical duration of this programme is one year full-time and two years part time. It is possible to move from full-time to part-time mode and vice-versa to accommodate any external factors such as financial constraints or domestic commitments. Many of our students make use of this flexibility; this may impact on the overall duration of their study period.

How the teaching year is divided

The teaching year is divided into two semesters of roughly equal length. A typical full-time student may study four 15 credit modules per semester and a typical part-time student will study two modules per semester. However the student may choose how many Modules to attend and when within the limits of the time (one year or two) chosen by the student.

What you will study when

The programme runs as a sequence of 15, 30 and 60 credit modules over one year or two years starting in September and finishing in August. All modules are at Level M. There are four practical modules each equivalent to 30 credits. Those students who wish to follow the programme with less practical activity can choose other modules which cover the same topic but run at different times, as shown in the table below:-

Topic	**Practical Module**	**Minimal Practical Module**
Biomass	Module 4 (30 credits)	Module 6 (15 credits)
Windpower	Module 5 (30 credits)	Module 7 (15 credits)
Solar Thermal	Module 10 (30 credits)	Module 8 (15 credits)
Solar Photovoltaic	Module 11 (30 credits)	Module 9 (15 credits)

However, all students must complete at least one 30 credit practical module. It is strongly recommended that students complete Module 1 (CEM121) and for the award of an MSc, the Thesis module is a core module.
Details of the content, dates and credits of each module are given below.

Programme Diagram

Semester	Module Code	CONTENT	ACTIVITY	CREDITS	HOURS	CORE / OPTION	Programme LO's
Sept	**CEM121**	**Introduction** Environment and energy in world context; Energy markets and regulation: Energy Conservation - inc. CHP and storage. Electrical Theory and grid connection	Lectures Seminar Presentations Tutorials Practicals	15	150	Core	Numbers 1- 6
October	**CEM129**	**Buildings Related** Heating and cooling strategies for buildings, Building heat loss, heating system design: Ventilation and infiltration. The Passive house Modelling building energy performance: Introduction to heat pumps.	Lectures Seminar Presentations Tutorials Practicals	15	150	Option	Numbers 1- 7
November	**CEM123**	**Hydroelectricity** Hydro electric site assessment, turbines water wheels and civil engineering. Hydro electric generators, electric controls and grid connection	Lectures Seminar Presentations Tutorials Practicals	15	150	Option	Numbers 1- 6

December and February	**CEM124**	**Practical: Biomass wood heating** A mixture of practical and theoretical sessions evaluating performance over two months. Site visits to larger scale wood chip boiler systems.	Lectures Seminars Presentations Tutorials Practicals Groupwork	30	300	Option	Numbers 1- 9
December and February	**CEM125**	**Practical: Windpower** Feasibility and impact assessment of a wind farm development Wind monitoring and data used to evaluate the performance of an existing wind turbine. Wind data gathered in December analysed and cross referenced against known site. Standalone and Grid connection assessed.	Lectures Seminars Presentations Tutorials Practicals Groupwork	30	300	Option	Numbers 1- 9

		CONTENT	**ACTIVITY**	**CREDITS**	**HOURS**	**CORE / OPTION**	**Programme LO's**
JANUARY	**CEM126**	**Biomass: Space Heating Systems** Wood fuel types, characteristics and combustion. Fuel supply storage and delivery. Regulations and flues. Hydraulic	Lectures Seminar Presentations Tutorials Practicals	15	150	Option	Numbers 1- 6

		systems. Combined Heat and Power, overview. Gasification					
MARCH	**CEM127**	**Windpower** Standalone and Grid connected wind system. Wind analysis and turbine siting. Generators. Rotor design and speed control	Lectures Seminar Presentations Tutorials Practicals	15	150	Option	Numbers 1- 6
APRIL	**CEM128**	**Solar Thermal** Solar resource, geometry and theory. Collectors and systems. Large scale systems. System modelling Design standards and regulations Roofs, Mounting and Installation Using heat pumps with solar	Lectures Seminar Presentations Tutorials Practicals	15	150	Option	Numbers 1- 6
MAY	**CEM122**	**Photovoltaics** Solar geometry and resource. Photovoltaic technologies, types and characteristics. Standalone and grid linked systems. Mounting systems. Modelling. Building integration.	Lectures Seminar Presentations Tutorials Practicals	15	150	Option	Numbers 1- 6
JUNE and AUGUST	**CEM130**	**Practical: Solar Thermal** Design, build and model the performance of a solar thermal	Lectures Seminars Presentations Tutorials Practicals Groupwork	30	300	Option	Numbers 1- 9

		subsystem. Systems are constructed and left in operational state with monitoring systems running. Analysis the data gathered over the previous two months and the effectiveness of the models examined determined.					
JUNE and AUGUST	**CEM131**	**Practical: Photovoltaic** Design, build and model the performance of a PV system. Design parameters considered are different inverter sizes, the benefits of different cooling strategies or novel PV applications. System is constructed and monitored using a system designed by the students. The evaluation of data collected from test rigs constructed in June. Extensive use of PV modelling packages is involved	Lectures Seminars Presentations Tutorials Practicals Groupwork	30	300	Option	Numbers 1- 9
	CEM135	**THESIS**	Independent research, tutorials	60	600	Core	Numbers 1- 9

Description of Module activities

- **Module:** Students choose teaching Modules making a total of 120 credits and a Thesis module of 60 credits
- **Module Lectures:** Lectures associated with the Module
- **Seminars:** Event following lectures or other Module activity, in which students discuss lecture content
- **Presentations:** Students present their essay topic
- **Tutorials:** One to one contact with tutor (also by E mail as required)
- **Practicals:** Practical activity related to Module content

Requirements for gaining an award

In order to gain a Postgraduate Associate Certificate, you will need to obtain 30 credits at Level M.

In order to gain a Postgraduate Certificate, you will need to obtain 60 credits at Level M.

In order to gain a Postgraduate Diploma, you will need to obtain 120 credits at Level M.

In order to gain an MSc, you will need to obtain 180 credits at Level M which must include the thesis module.

Award Classification

Where a student is eligible for the award of MSc then the award classification is determined by calculating the arithmetic mean of all marks and applying the mark obtained as a percentage, with all decimals points rounded up to the nearest whole number, to the following classification

70% - 100%	Distinction
60% - 69%	Merit
50% - 59%	Pass
0% - 49%	Not Passed

Assessment

Teaching, learning and assessment

Teaching and learning

Knowledge is developed through:

- Primary and secondary research, e.g. using the Internet or Learning Resource Centre
- course work including directed and general reading and essay writing
- participation in lectures, seminars, tutorials and workshops

Thinking skills are developed through:

- self appraisal and self evaluation

- successful completion of set assessment tasks and course work
- critical evaluation of concepts, assumptions, arguments and data

Practical skills are developed through:

- design and construction based projects
- practical activity including use of specialist pieces of equipment and IT applications

Skills for life are developed through:

- group project work, including presentations
- working to deadlines, self-directed study and peer assessment

Assessment

Knowledge is assessed by:

- its manifestation in course work; practical work, presentations, essays and design activity

Thinking skills are assessed by:

- their manifestation in course work particularly those items requiring critical evaluation
- use of appropriate problem solving skills

Practical skills are assessed by:

- their manifestation in course work such as the writing up of the work done together with a critical evaluation of the results obtained within the context of the subject as a whole
- assessment tasks requiring the use of general and specialised applications
- use of specialist equipment during practicals

Skills for life are assessed by:

- individuals ability to explain their own work verbally
- evidence of group and team working
- ability to produce time constrained work

Quality

How we assure the quality of this programme

Before this programme started, the following was checked:

- there would be enough qualified staff to teach the programme;
- adequate resources would be in place;
- the overall aims and objectives were appropriate;

- the content of the programme met national benchmark requirements;
- the proposal met other internal quality criteria covering a range of issues such as admissions policy, teaching, learning and assessment strategy and student support mechanisms.

This is done through a process of programme approval which involves consulting academic experts including some subject specialists from other institutions.

How we monitor the quality of this programme

The quality of this programme is monitored each year through evaluating:

- external examiner reports (considering quality and standards);
- statistical information (considering issues such as the pass rate);
- student feedback

Drawing on this and other information, programme teams undertake the annual Review and Enhancement Process which is co-ordinated at School level and includes student participation. The process is monitored by the University's Quality and Standards Committee.

Once every six years the University undertakes an in-depth review of the whole field. This is undertaken by a panel that includes at least two external subject specialists. The panel considers documents, looks at student work, speaks to current and former students and speaks to staff before drawing its conclusions. The result is a report highlighting good practice and identifying areas where action is needed.

The role of the programme committee

This programme has a programme committee comprising all relevant teaching staff, student representatives and others who make a contribution towards the effective operation of the programme (e.g. technician staff). The committee has responsibilities for the quality of the programme. It provides input into the operation of the Review and Enhancement Process and proposes changes to improve quality. The programme committee plays a critical role in the University's quality assurance procedures.

The role of external examiners

The standard of this programme is monitored by at least one external examiner. External examiners have two primary responsibilities:

- To ensure the standard of the programme;
- To ensure that justice is done to individual students

External examiners fulfil these responsibilities in a variety of ways including:

- Approving exam papers/assignments;
- Attending assessment boards;
- Reviewing samples of student work and moderating marks;
- Ensuring that regulations are followed;

- Providing feedback to the University through an annual report that enables us to make improvements for the future.

Listening to the views of students

The following methods for gaining student feedback are used on this programme:

- Module and component evaluation and feedback questionnaires at end of every module and/or component
- Student representation on programme committees (once per semester)
- Student/Staff consultative committee (meeting 11 times a year)
- Group seminars and tutorials

Students are notified of the action taken through:

- circulating the minutes of the programme and consultative committee meetings
- comments from feedback questionnaires published for every module/component
- providing details on the programme notice board/dedicated web site

Listening to the views of others

The following methods are used for gaining the views of other interested parties:

- the relevance of the education is tested by inviting leading professionals to evaluate student work
- information/feedback provided by the Centre for Alternative Technology
- communication with prospective students applying to the course

Further Information

Where you can find further information

Further information about this programme is available from:

- **The CAT web site http://www.cat.org.uk/graduateschool**
- The UEL web site http://www.uel.ac.uk
- The student handbook at http://www.cat.org.uk/graduateschool
- UEL Manual of General Regulations and Policies http://www.uel.ac.uk/qa/
- UEL Quality Manual http://www.uel.ac.uk/qa/
- School of Architecture, Computing and Engineering http://www.uel.ac.uk/ace/