Course Handbook

BEng(Hons)/ MEng (Hons) Energy Engineering

2020-21

Course Leader – Dr Matt Stables

School of Engineering

Please read this Handbook in conjunction with the University's Student Handbook.

All course materials, including lecture notes and other additional materials related to your course and provided to you, whether electronically or in hard copy, as part of your study, are the property of (or licensed to) UCLan and MUST not be distributed, sold, published, made available to others or copied other than for your personal study use unless you have gained written permission to do so from the Dean of School. This applies to the materials in their entirety and to any part of the materials.

Contents

1. Welcome to the course

Welcome to Energy Engineering at UCLan. We hope to provide you with an interesting and challenging education, and to develop competences appropriate to Energy Engineering.

Please read the handbook carefully as it is a source of information on the academic, administrative and operational aspects of your course and it is intended to explain what is required of you. Feel free to discuss any aspects with myself or any member of the course team.

1.1 Rationale, aims and learning outcomes of the course

The MEng/BEng(Hons) Energy Engineering course aim is to develop graduates with a broad understanding of current technology and practice covering the relevant aspects of energy generation and energy use as well as additional specialist areas such as sustainability and policy.

The course is three years (BEng) or four years (MEng) in duration, plus an extra year if an industrial placement is included. Satisfactory completion of an industrial placement leads to the award: BEng/MEng (Hons) EnE with Industrial Placement.

To provide students with the opportunity to develop knowledge and understanding in order to maintain and manage applications of current and developing technology, including energy engineering design and development, manufacture, construction and power generation operations. Thereby affording graduates the opportunity to fulfil the educational requirements for Chartered Engineer.

- To meet the requirements for full CEng accreditation of the programme by Engineering Council Institutions.
- To provide an extended, enhanced, and industrially relevant Integrated undergraduate master's programme of study in preparation for professional practice.
- To produce resourceful, competent, clear-thinking professional engineers with a range of skills and experience relevant to contemporary industry.
- To equip graduates of the programme with knowledge, skills, experience, and understanding which underpin a professional career in Engineering.

Specifically, the Energy Engineering courses aim to provide graduates with a broad understanding of current technology and practice with regards to energy, covering the relevant aspects of thermodynamics, technology, sustainability and policy plus additional specialist areas according to the modules studied.

The discipline of engineering encompasses a wide skills base and the emphasis of this course is placed on energy systems, their use and design. By concentrating on the principles fundamental to system level design, the course equips graduates with the knowledge, skills and confidence to thrive in the rapidly evolving field of energy engineering and develop the transferrable skills to find employment in a diverse set of industrial and commercial sectors.

In order to broaden the scope of energy related topics, the third year of both MEng and BEng has optional modules allowing the student to add specialism to their course in the fields of Nuclear fuels, Fossil fuels, Renewable technology and energy use within buildings. For MEng students, the 4th year continues with these options allowing further deepening of the subject matter.

The full program specifications, including learning outcomes, are provided as appendices.

1.2 Course Team

Names and contact details of the key members of the team.

Jonathan Francis
Computing & Technology Building, room CM23
☎ 01772 893229 (ext. 3229), ✉ jfrancis1@uclan.ac.uk

Course Leader for MEng/BEng(Hons) Energy Engineering
Matt Stables
Kirkham Building, room KM001
☎ 01772 893581 (ext. 3581), ✉ mstables1@uclan.ac.uk

Muqi Wulan
Computing & Technology Building, room CM037
☎ 01772 893247 (ext. 3247), ✉ mwulan@uclan.ac.uk

Patrick Ryan
Computing & Technology Building, room CM024
☎ 01772 893273 (ext. 3273), ✉ pryan1@uclan.ac.uk

Joel Allison
Computing & Technology Building, room CM131
☎ 01772 893251 (ext.3251), ✉ jallison@uclan.ac.uk

Phil Tranter
Computing & Technology Building, room CM128
☎ 01772 893260 (ext. 3260), ✉ ptranter@uclan.ac.uk

Javad Yazdani
Computing & Technology Building, room CM138
☎ 01772 892685 (ext. 2685), ✉ jyazdani@uclan.ac.uk

Campus Admin Services is located in the Computer and Technology Building room. Hub contact details are as follows: Telephone: 01772 891994 or 01772 891995, Email: CandThub@uclan.ac.uk

1.3 Expertise of Staff

Staff profiles for members of staff in the School of Engineering can be accessed using the link below:
http://www.uclan.ac.uk/schools/engineering/staff.php

1.4 Academic Advisor

You will be assigned an Academic Advisor who will provide additional academic advice and support during the year. They will be the first point of call for many of the questions that you might have during the year. Your Academic Advisor will be able to help you with personal development, providing insight and direction to enable you to realise your potential. You can use the Starfish system to find out who your Academic Advisor and Teaching Team is.

1.5 Administration details

Campus Admin Services provides academic administration support for students and staff and are located in the following hubs which open from 8.45am until 5.15pm Monday to Thursday and until 4.00pm on Fridays. The hub can provide general assistance and advice regarding specific processes such as extenuating circumstances, extensions and appeals.

Allen Building

Medicine
Dentistry
telephone: 01772 895566
email: AllenHub@uclan.ac.uk

Harris Building

Lancashire Law School
Humanities and the Social Sciences
Centre for Excellence in Learning and Teaching
telephone: 01772 891996/891997
email: HarrisHub@uclan.ac.uk

Foster Building

Forensic and Applied Sciences
Pharmacy and Biomedical Sciences
Psychology
Physical Sciences
telephone: 01772 891990/891991
email: FosterHub@uclan.ac.uk

Computing and Technology Building

Art, Design and Fashion
Computing
Journalism, Media and Performance
Engineering
telephone: 01772 891994/891995
email: CandTHub@uclan.ac.uk

Greenbank Building

Sport and Wellbeing
Management
Business
telephone: 01772 891992/891993
email: GreenbankHub@uclan.ac.uk

Brook Building

Community, Health and Midwifery
Nursing

Health Sciences
Social Work, Care and Community
telephone: 01772 891992/891993
email: BrookHub@uclan.ac.uk

1.6 Communication

The University expects you to use your UCLan email address and check regularly for messages from staff. If you send us email messages from other addresses they risk being filtered out as potential spam and discarded unread.

There is a Blackboard course level space, Engineering@UCLan:

https://portal.uclan.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_21341_1&content_id=_559082_1

There you will find documentation relating to your course – for example student handbooks, support and advice regarding student placements and job hunting, along with other useful information. It is important to keep all your contact details up to date as you may be contacted by post, email, or telephone.

1.7 External Examiner

The University has appointed an External Examiner to your course who helps to ensure that the standards of your course are comparable to those provided at other higher education institutions in the UK. The name of this person, their position and home institution can be found below.

Anthony Johnson, CEng, MIMechE, University of Huddersfield, UK.

Peter Bradbury, CEng, MIET, MRAeS, MIEEE, FHEA, University of Salford, UK.

External Examiner reports for the Engineering courses can be accessed electronically via the Engineering@UCLan Blackboard pages.

2. Structure of the course

2.1 Overall structure

The Energy Engineering courses exist as part of the Modular Credit Accumulation and Transfer Scheme (MODCATS). The award requires that a student pass 360 credits total for BEng(Hons), or 480 credits for MEng(Hons).

Each full-time year of study requires you to pass modules to the value of 120 credits. Most modules on the programmes are standard sized and worth 20 credits, although there are examples of modules worth 10, 30 and 40 credits. Students wishing to follow part time study are counselled by a member of staff and a suitable programme of study developed.

For Years 1 & 2, all modules are compulsory, however, in year 3 and year 4 (for MEng) optional modules are available to tailor the degree towards industry specifics a student may well wish

to pursue as a career. Streams include Renewable Energy, the Nuclear industry, traditional Oil & Gas production and sustainable energy use within buildings.

Specific credit requirements for the target awards:

MEng (Hons) Energy Engineering requires 480 credits with a minimum of 360 at level 5 or above, 200 at level 6 or above, 100 at level 7 and a minimum of 360 credits studied at this University.

MEng (Hons) Energy Engineering with Industrial Placement requires 480 credits with a minimum of 360 at level 5 or above, 200 at level 6 or above, 100 at level 7 and a minimum of 360 credits studied at this University, plus satisfactory completion of the Placement module MP2899.

BEng (Hons) Energy Engineering requires 360 credits including a minimum of 220 at level 5 or above and a minimum of 100 at level 6.

BEng (Hons) Energy Engineering with Industrial Placement requires 360 credits including a minimum of 220 at level 5 or above and a minimum of 100 at level 6, plus satisfactory completion of the Placement module MP2899.

Specific credit requirements for the exit awards:

BEng Energy Engineering requires 320 credits including a minimum of 180 at level 5 or above and a minimum of 40 at level 6.

Diploma of Higher Education in Energy Engineering requires 240 credits including a minimum of 100 at Level 5 or above

Certificate of Higher Education in Energy Engineering requires 120 credits including a minimum of 100 at Level 4 or above.

2.2 Modules available

Each module is a self-contained block of learning with defined aims, learning outcomes and assessment. A standard module is worth 20 credits. It equates to the learning activity expected from one sixth of a full-time undergraduate year. Modules may be developed as half or double modules with credit allocated up to a maximum of 120 credits per module. The modules that you will be studying in your course are detailed in the Programme Specification in Appendix 8.1.

Please note that the above may be subject to minor modifications to reflect improvements/developments in the course or within industry. If this is the case your current year of study will not be affected and you will be notified of the changes.

2.3 Course requirements

In order to progress between levels of your course, minimum pass grades are required. For BEng students, a minimum of 40% is required for each module to pass, for MEng students this is 50%. Unless stated otherwise, all modules are compulsory. Should there be difficulties with a particular

module, special circumstances may allow one module to be compensated for, however, modules marked (c) are deemed to be core modules and therefore MUST be passed.

2.4 Module Registration Options

Discussions about your progression through the course normally take place in February each year. It is an opportunity for you to make plans for your study over the next academic year. The course team will tell you about the various modules / combinations available and you will both agree on the most appropriate (and legal) course of study for you.

The prescribed modules for the first year of the Energy Engineering and Mechanical Engineering undergraduate courses are identical, thereby enabling students to change their course after the first year. Changes would also be possible following the second year, but these would be more restricted and dependent on the particular modules studied.

If you do not feel capable of completing your chosen course of study then advice may be given on alternative routes or exit awards. However, it is not usually prudent to make decisions about this until results are known in June. Most likely you will be advised to finish all your modules to the best of your abilities and to seek advice once results are available.

If you wish to discuss your progression, or discuss a change of programme (e.g. from BEng to MEng) you should speak to your course leader or another member of the course team.

2.5 Study Time

2.5.1 Weekly timetable

A timetable will be available once you have enrolled on the programme, through the student portal.

2.5.2 Expected hours of study

20 credits is a standard module size and equals 200 notional learning hours.

As outlined in the school handbook the normal amount of work involved in achieving a successful outcome to your studies is to study for 10 hours per each credit you need to achieve – this includes attendance at UCLan and time spent in private study.

This translates to a total of 6 hours per 20 credit module per week. We expect that you commit 36 hours study per week (pro-rata for part-time students and/or semester-based modules), inclusive of your contact hours. So for a typical module you may have a 2 hour lecture, and a 1 hour tutorial, leaving you approximately 3 hours for self-directed study (further reading, tutorial questions, assignments, revision). This is thinking time – not coffee and biscuits time! Often you will be working in groups for practical work and you should try and arrange to meet up outside the scheduled class times. You will also need to use equipment such as computer and laboratory facilities for practical work, again sometimes outside the scheduled class times.

2.5.3 Attendance Requirements

You are required to attend all timetabled learning activities for each module. Notification of illness or exceptional requests for leave of absence must be made as follows:

Notification of illness should be made to the Campus Admin Servies:

Exceptional absence requests are made to Jonathan Francis (Academic Lead for Energy, Fire & Nuclear):

☎ +44 1772 893229 | jfrancis1@uclan.ac.uk

You are encouraged to seek the advice of your Academic advisor and/or Course Leader if your personal circumstances make it difficult to meet your study obligations.

3. Approaches to teaching and learning

3.1 Learning and teaching methods

The energy engineering programmes use a number of different assessment techniques that will allow you to demonstrate your understanding of concepts and issues covered. These may be broadly categorised as 'examination' and 'coursework', but several different types are used, e.g. open-book exams, closed-book exams, laboratory reports, practical assessments in the laboratory, computer simulation and analysis, written reports etc.

Evidence of achievement, upon which assessment will be based, will be gained through a programme of practical exercises, assignments and exams. Each week you may be involved in some practical work such as a laboratory exercise, a computer-based assignment, group or individual project work etc. You will often work in groups and make group presentations but you will write up and submit work individually so that you gain credit for your contribution, not that of somebody else.

It should be emphasised that the purpose of assessment is to not only grade you, and provide information to facilitate management of the course, but also to provide feedback to you. In this way you can monitor your own progress, refine your own judgement of your abilities and regulate it accordingly.

You should keep all the returned work in a file and you may have to submit this at the end of the year for the external examiners to assess.

Individual module leaders will distribute information on the methods of assessment used, and their weighting, at the start of each module.

3.2 Study skills

Study Skills - 'Ask Your Librarian'

https://www.uclan.ac.uk/students/support/study/it_library_trainer.php

You can book a one to one session with a subject Librarian via Starfish. These sessions will help with questions such as "My lecturer says I need a wider variety of sources in my references, what do I do?"
"I need to find research articles, where do I start?"
"How do I find the Journal of ...?"
"How do I use RefWorks?"

3.3 Learning resources

3.3.1 Learning Information Services (LIS)

LIS is a centralised service operating from the Library. All queries about computer software and online resources should be made here

Email: LISCustomerSupport@uclan.ac.uk
Phone: 01772 895355

Additionally, the School of Engineering has a dedicated librarian who is available to assist with reading lists, online access and electronic learning resources.

Bob Frost rsfrost@uclan.ac.uk : 01772 892261

3.3.2 Electronic Resources

As well as the resources of the Library, information and resources specific to the course and individual modules are available through the Blackboard portal. Module tutors will use this portal to post lecture notes, workshop material as well as other material suitable for the module.

3.4 Personal Development Planning

Within your course you will develop skills outside of the core technical skills. These include personal development where you will reflect on your performance and actively engage to improve your skills.

3.5 Preparing for your career

Your future is important to us, so to make sure that you achieve your full potential whilst at university and beyond, your course has been designed with employability learning integrated into it. This is not extra to your degree, but an important part of it which will help you to show future employers just how valuable your degree is. These “Employability Essentials” take you on a journey of development that will help you to write your own personal story of your time at university:

- To begin with, you will explore your identity, your likes and dislikes, the things that are important to you and what you want to get out of life.
- Later, you will investigate a range of options including jobs and work experience, postgraduate study and self- employment.

It’s your future: take charge of it!

4. Student Support

Student support is provided throughout all levels of the university. Students may approach their module tutor, course leader or academic advisor, the students union,

Although Academic advisors and Course Leaders will deal with most of the day-to-day questions which arise, the Head of School is always willing to see students and an appointment can be made through the Student Hub the <i> http://www.uclan.ac.uk/students/study/library/the_i.php

Advice relating to administrative issues may also be obtained from the Student Hub.

Information on the support available is at: https://www.uclan.ac.uk/students/

4.1 Academic Advisors

Academic advisors provide help for students with problems and are responsible for overseeing the progress of students, their welfare, academic counselling and guidance. Your Academic advisor is allocated when you enrol. You must see your Academic advisor when requested and meet at least once per semester. Ensure they know you and have your current email address. You can use the Starfish system to find out who your Academic Advisor and Teaching Team is.

Please seek help relating to lecture material and practical classes from the module tutor in the first instance. If necessary make an appointment to seek additional support. Please remember that academic staff are busy people and may not be able to give you instant help.

Although Academic advisors and Course Leaders will deal with most of the day-to-day questions which arise, the Head of School is always willing to see students and an appointment can be made through the Student Hub. Advice relating to administrative issues may be obtained from the Student Hub.

4.2 Students with disabilities

There is a named lead for students with disabilities within your School

Dr Javad Yazadi is the named lead for students with disabilities within the School of Engineering, should you require further advice / support.

jyazadi@uclan.ac.uk

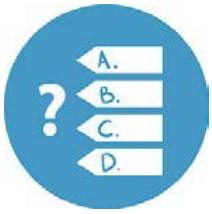
Room CM138

Tel 01772 892685

4.3 Students' Union

The Students' Union offers thousands of volunteering opportunities ranging from representative to other leadership roles. We also advertise paid work and employ student staff on a variety of roles. You can find out more information on our website: http://www.uclansu.co.uk/

5. Assessment



5.1 Assessment Strategy

The assessment strategy for each module will be outlined within the module. The modules will be assessed either as coursework or by a combination of coursework and examinations with the weightings reflecting the course content (theory/practical). Each of the assessments that you complete will assess a series of learning outcomes defined in the modules. Note that within some modules you may complete assessments that do not carry marks, these are termed formative and are an opportunity for you to gain feedback on your progress that will help you in your summative (mark carrying) assessments.

5.2 Notification of assignments and examination arrangements

You will be notified of assessments by your module tutors. They will advise you of the requirements, the marking criteria and of the respective submission dates or exam arrangements, during one or more of the timetabled sessions. In general the examination arrangements are available from the University web site. These arrangements are not generally made by the module tutors.

Submission of coursework assignments is typically by one of two methods. Paper submissions are made to the assignment boxes located on the ground floor of Computing & Technology Building (in CM007). Each assignment must have a signed 'Assignment Submission Form' attached. Electronic submissions are made through the Blackboard site for the module, using the Turnitin software.

5.3 Referencing

For most of your assignments you will be expected to do some further reading, and you are required to think and produce increasingly original work around the work of others. Do not fall into the 'plagiarism trap' either deliberately or by accident. You need to give suitable credit to those that have produced the work that you are using.

You should reference any information you have referred to in your coursework using the Harvard referencing system (a guide to this system can be found on the Engineering@UCLan course space, accessed through the student portal).

5.4 Cheating, plagiarism, collusion or re-presentation

Please refer to the information included in the University Student Handbook for full definitions. The University uses an online Assessment Tool called Turnitin. A pseudo-Turnitin assignment will be set up using the School space on Blackboard to allow students to check as many drafts as the system allows before their final submission to the 'official' Turnitin assignment. Students are required to self-submit their own assignment on Turnitin and will be given access to the Originality Reports arising from each submission. In operating Turnitin, Schools must take steps to ensure that the University's requirement for all summative assessment to be marked anonymously is not undermined and therefore Turnitin reports should either be anonymised or considered separately from marking. Turnitin may also be used to assist with plagiarism detection and collusion, where there is suspicion about individual piece(s) of work.

5.5 How do I know that my assessed work had been marked fairly?

Assessment is an integral part of the course. Module staff work closely together to design assessments, agree the marking criteria and approve final versions of assessments to ensure that these are appropriate. The criteria for assessment will be communicated to you clearly during the module teaching.

All module staff engage in development and training in assessment, marking and feedback. Once the assessments have been completed the module team will discuss the assessment methods and marking criteria, prior to starting to mark, so that there is a common understanding of what is expected of students. All assessed modules have moderation built into the marking process. Moderation involves sampling students' assessed work to make sure that the learning outcomes and agreed marking criteria have been interpreted and

applied in the same way. This ensures that you and your fellow students are treated equitably and that the academic standards are applied consistently. During the marking process the module leader will co-ordinate moderation to ensure that at least 10% of assessed work (or a minimum of three pieces) has been reviewed by other markers and any concerns about consistency or accuracy addressed with the whole module team. Your work may or may not be part of this sample, but the processes for developing assessments and marking criteria as well as moderation mean that you can be confident that teaching staff are marking assessments to the same criteria. Module teams may then use feedback from moderation to improve clarity about the nature and purpose of future assessment, or to make changes if required.

Modules are also moderated externally. The module leader will arrange for the external examiner to receive a sample of work for review and comment. External examiners cannot change individual grades, but can act as 'critical friends' and confirm that marking standards are in line with other, similar courses in the sector. If, on reviewing the sample, external examiners feel that the marking criteria have not been applied consistently the work of the whole cohort will be reviewed.

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6. Classification of Awards

The University publishes the general principles underpinning the way in which awards and results are decided in Academic Regulations Section H. Decisions about the overall classification of awards are made by Course Assessment Boards through the application of the academic and relevant course regulations.

7. Student Feedback

You can play an important part in the process of improving the quality of this course through the feedback you give.

Students are encouraged to voice their opinions, this can be done with academic advisors, course leaders or module tutors. You will also have an opportunity to feedback your experience with student surveys during the academic year.
Module tutors will periodically seek feedback for particular modules, this is an important opportunity to shape the way a modules is delivered as well as highlight aspects successful enough to be shared with others, improving overall module delivery

7.1 Student Staff Liaison Committee meetings (SSLCs)

Details of the Protocol for the operation of SSLCs is included in section 8.2 of the University Student Handbook. Course representatives will be elected every year either in April or September. We will be requesting volunteers for course representatives within the first few weeks of your study. Alongside receiving recognition, support and respect being a course representative is a great opportunity to enhance your employability skills. If you are interested in becoming a course representative and wish to find out more about the role visit the Students' Union website or by emailing: coursereps@uclan.ac.uk.

8. Appendices

8.1 Programme Specification

UNIVERSITY OF CENTRAL LANCASHIRE

Programme Specification

This Programme Specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided.

Sources of information on the programme can be found in Section 17

1. Awarding Institution / Body	University of Central Lancashire
2. Teaching Institution and Location of Delivery	University of Central Lancashire, Preston Campus
3. University School/Centre	Engineering
4. External Accreditation	EI & IMechE (to be sought)
5. Title of Final Award	BEng (Hons) Energy Engineering
6. Modes of Attendance offered	Full Time, Part Time, Sandwich
7a) UCAS Code	H801 Engineering
7b) JACS and HECOS Code	H221 100175
8. Relevant Subject Benchmarking Group(s)	Engineering Council UK-SPEC
9. Other external influences	Accreditation requirements of IMechE Accreditation requirements of EI
10. Date of production/revision of this form	September 2018

11. Aims of the Programme

- To provide students with the opportunity to develop knowledge and understanding in order to maintain and manage applications of current and developing technology, including energy engineering design and development, manufacture, construction and power generation operations. Thereby affording graduates the opportunity to fulfil the educational requirements for Incorporated Engineer.
- To meet the requirements for partial CEng (IEng) accreditation of the programme by Engineering Council Institutions.
- To provide an extended, enhanced, and industrially relevant Bachelors programme of study in preparation for professional practice.
- To produce resourceful, competent, clear-thinking professional engineers with a range of skills and experience relevant to contemporary industry.
- To equip graduates of the programme with knowledge, skills, experience, and understanding which underpin a technical career in Engineering.

8. Learning Outcomes, Teaching, Learning and Assessment Methods

UK Standard for Professional Engineering Competence (UK-SPEC).
UK-SPEC is the standard for recognition of professional engineers in the UK. The standard is published by the Engineering Council on behalf of the engineering profession. UK-SPEC recommends General Learning Outcomes (GLO) and Specific Learning Outcomes (SLO) for degree courses that are consistent with the learning outcomes existing for UCLan courses. The

following sections A, B, C, and D are written in the UCLan format, referring to the corresponding GLO and SLO in UK-SPEC.

A. Knowledge and Understanding

A1. Utilize a sound theoretical approach to enable the introduction and exploitation of new and advancing technology and other relevant developments, and related underpinning science and mathematics. **(GLO: A1)**.
A2. Compare and contrast the wider multidisciplinary engineering context and underlying principles. **(GLO: A2)**
A3. Describe and discuss the social, environmental, ethical, economic and commercial considerations that affect the exercise of engineering judgement. **(GLO: A3)**.
A4. Learn new theories, concepts, methods etc in unfamiliar situations. **(GLO: A4)**.

Teaching and Learning Methods

Knowledge acquisition occurs initially through tutor-led lectures (teaching) and directed study of textbooks and journal articles. This is followed up by student led learning activity using text (books and e-resources), media (software, video, technical articles) and Active Enquiry research methods.

The understanding of much engineering knowledge (learning) comes by application, use, and observation of effect. This is aided by tutorials, worked examples, analysis, synthesis, and Active Enquiry. Great benefit comes from this occurring in a group environment, where understanding can be developed by support from others. The tutor in these situations takes the role of a Mentor.

The Teaching and Learning strategies employed deliver opportunities for the achievement of the learning outcomes, demonstrate their attainment and recognise the range of student backgrounds. Delivery methods, activities and tasks are aligned with the learning outcomes for this programme, taking account of the learning styles and stage of the student.

Curriculum design is informed by the research, scholarship, and engineering activities of the staff, in line with the established criteria for accredited engineering degree programmes. Industrially relevant applications and examples of the material are essential to student understanding and future use. Delivery methods and curriculum design evolve in response to generic and discipline-specific developments, taking into account educational research, changes in national policy, industrial practice and the needs of employers. The context of the curriculum contains the generic social, legal, environmental and economic factors relevant to engineering, and topical factors (sustainability, and carbon footprint for example).

Assessment methods

Assessment of Knowledge is through examination of key facts using unseen papers. These include formal end of year examinations, or phase-tests focussing on a limited range of material during the year.

Assessment of understanding of the knowledge (and knowledge itself if appropriate) is through assignment or other coursework including group projects as a major aspect of an engineering degree qualification.

Assessment is a measure against the benchmark criteria, and forms an important part of the learning process.

B. Subject-specific skills

B1: Practical Engineering competence acquired in laboratories; workshops; industry; individual & group project work, design work; and development & use of computer software. **(GLO: B1, B2, B3)**.
B2: Application of scientific, mathematical, and associated engineering principles necessary to underpin activities in Energy Engineering. **(SLO: US1, US1m, US2, US2m, US3, US3m, US4m)**.
B3: Creative use of engineering principles in problem solving, design, explanation and diagnosis relevant to Energy Engineering. **(SLO: E1, E1m, E2, E2m, E3, E3m, E4)**.
B4: Create and develop economically viable products, processes and systems to meet defined needs. **(SLO: D1, D1m, D2, D3, D4, D4m, D5, D6)**.
B5: Specify and develop energy engineering activities to promote sustainable development in an economic, social and environmental context. **(SLO: S1, S1m, S2, S2m, S3, S4, S5)**.
B6: Apply competence across professional engineering practice. **(SLO: P1, P1m, P2, P2m, P3, P4, P5, P6, P7, P8, P8m)**.

Teaching and Learning Methods

The development of skills involves some tuition, some practice and considerable experience in using the skills in Engineering situations and relevant to engineering competencies

Skill development relates to areas specific to the Energy Engineering destinations of graduates and includes areas which are generic to engineering (such as workshop practices), those which are expected in an engineering degree (such as advanced simulation of CFD problems), and those which are programme specific (such as entrepreneurial business skills).

Development of team working within the engineering design context is a strong feature of the provision. The Placement activity is a significant aspect of the programme, both for the successful placement student and the culture of the final three years of the degree.

Assessment methods

The assessment methods include report writing, assignments, computational competencies and laboratory demonstrations.

C. Thinking Skills

C1: Apply appropriate quantitative science and engineering tools to the analysis of problems. **(GLO: C1)**.
C2: Demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs. **(GLO: C2)**.
C3**:** Design and deliver engineering solutions with an appropriate level of detail. **(GLO: C3)**.
C4: Develop, monitor and update a plan, to reflect a changing operating environment. **(GLO: C4)**.

Teaching and Learning Methods

The exercise and development of 'Thinking Skills' are achieved through active learning processes. Problem solving is the key to many engineering activities, and progresses in complexity and demand through the course. Staff interests and research often form the background to developments in active learning.

Implementation of this is seen through the use of workshops, drawing/CAD facilities, dedicated software, laboratories, rapid / additive manufacture techniques, bureau manufacturing, student presentations, external visitors, and field/industry based activity. These learning processes compliment the more conventional seminars, tutorials and case study approaches found in HE.

There is extensive group, and later team, working as a natural part of the working (and learning) environment in engineering.

Assessment methods

Assessment of thinking skills is by reports on practical investigations and tests, a 'design and make' project, case studies, formal examinations, workbooks and drawings in early stages of the course provision.

In later stages, formal reports with reflection on practical activities; design and manufacture processes and results; generating and analysing CAD, CIM, and other simulation models; computer software based analysis and calculations; and evaluation of prototypes are included. The independent final Project and group project based assessments demonstrate capability in skills related to individual specialised knowledge, understanding and practical aspects. Unseen examinations are appropriate for assessment of some intellectual skills under time constrained conditions.

Intellectual skills related to practical skills are tested through the experience of the activity in an appropriate context. These include the Engineering workshops and laboratory equipment, practical manufacture of prototypes during modules, the final Project, Creation and Evaluation, and level 7 Innovation in Problem Solving. Workbooks and guidance manuals are used widely in earlier years. The optional Placement provides additional opportunities for the students choosing to take it.

D. Other skills relevant to employability and personal development

D1: Apply transferable skills that will be of value in a wide range of situations, including Problem solving; Communication; and Working with others. **(GLO: D1).**
D2: Effective use of general IT [information technology] facilities and information retrieval skills. **(GLO: D2).**
D3: Plan self-learning and improve performance, as the foundation for lifelong learning/CPD [continuing professional development]. **(GLO: D3)**.
D4: Monitor and adjust a personal programme of work on an ongoing basis, and to learn independently. **(GLO: D4)**.

Teaching and Learning Methods

The Induction for the course starts the Personal Development Planning (PDP) programme, which is seen to continue after graduation as Continuing Professional Development (CPD).

Communication, team working, engineering problem solving and design, reflective use of available software, planning, critical evaluation, verification of results, confidence in outcomes, inter-personal skills, emotional intelligence, and goal setting all feature and are emphasised at various points through the programme. The University Personal Tutor system is a useful vehicle for discussion of these aspects of personal development. However, much is learnt in the day to day interactions with staff, industry visitors, and other students.

Assessment methods

Written communication skills are developed and assessed through the context for the assessment. Examples include the requirements for a formal report, laboratory report, business or technical justification, reflective practice, critical evaluation in a commentary, or statement of confidence in a decision made in complex and unpredictable situations. Group based activity requires reflection on the performance of the individual within that context. Team based activities require an assessment of the team formation and contribution to the outcome.

13. Programme Structures*				14. Awards and Credits*
Level	**Module Code**	**Module Title**	**Credit rating**	
Level 6	MP3999	Project	40	**BEng (Hons) Energy Engineering**
	MP3731	Engineering Design B	20	Requires a minimum of 360 credits at Level 4 or above, 220 at Level 5 or above and 100 at Level 6 or above.
	MP3801	Energy and Power Generation Systems	20	
		Plus Two From:		Students who also successfully complete module MP2899 will receive the award with Industrial Placement
	FV3701	Reservoir Engineering and Well Testing	20	
	SC3106	Nuclear Reactors & Fuel Technology	20	
	NT3036	Systems Design (Building Services)	20	**BEng Energy Engineering**
	ER3800	Renewable Energy Resources and Technologies	20	Requires a minimum of 320 credits with 200 at Level 4 or above, 180 at Level 5 or above and 60 at Level 6 or above.
	EL3102	Control Systems	20	
	SC3007	Advanced Mathematics and Simulation	20	
	MP3732	Operations Management B	20	
	NT3050	Carbon and Energy Management	20	
Level 5	MP2899	Industrial Placement	120 notional credits	
	SC2153	Further engineering mathematics and simulation	20	**Diploma of Higher Education in Energy Engineering**
	EL2104	Instrumentation & control	20	Requires a minimum of 240 credits at Level 4 or above with 120 at Stage 2, and 100 at Level 5 or above.
	EL2711	Electromagnetic systems	20	
	MP2576	Thermofluids with CFD	20	
	MP2721	Operations Management A	20	
	MP2784	Mechanics, Kinematics, and Materials	20	
Level 4	ER1010	Engineering Analysis	30	**Certificate of Higher Education**
	ER1020	Engineering Design	30	Requires a minimum of 120 credits at Level 4 or above.
	ER1030	Engineering Science	30	
	ER1630	Engineering Applications	30	
Levels 3 (FE)	ERC001	Study Skills	20	Students who exit after the Foundation year will receive a transcript of their modules and grades
	ERC002	Basic Mathematics	20	
	ERC003	Information and Communications Technology	20	
	ERC004	Practical Skills	20	
	ERC005	Design Studies	20	
	ERC006	Analytical Studies	20	

15. Personal Development Planning

The course approach to Personal Development Planning (PDP) has been influenced by the LTSN Generic Centre Guide to Curriculum Design: Personal Development Planning. PDP activity is centred on:

- Reflection on learning, performance, and achievement.
- Planning for personal, educational, and career development.

Students are invited to review and reflect on their academic study, extra-curricular activities and career planning. This results in an increased understanding and ownership of learning.

Since learning is a lifelong process the work in PDP is not assessed. There are many similarities to work-based learning, and Continued Professional Development (CPD) - which is required for membership of professional societies. The skills in PDP are key components of employability: – self-

reflection, recording, target setting, action planning and monitoring. Local web based materials relevant to PDP are found at:
Generic: http://www.uclan.ac.uk/information/services/ldu/pdp/generic_PDP_index.php.
Employability and Skills: http://www.uclan.ac.uk/information/services/ldu/employability_and_skills.php
At Induction the student takes part in a session involving a range of self-assessment exercises. This is followed by early in Semester 1 the student being recommended to access the local web based materials, and other materials found by individual need or interest. The results of the activity or exercise are kept together in an A4 folder. A paper based system is suggested, due to concerns about the security, privacy, and long-term accessibility of records.
This activity is reinforced for all first year students by encouraging communication and team working between students, and between students and staff.
Subsequently during group tutorial sessions discussion is directed towards PDP elements. Any topics found difficult, or needing further work are discussed. Alternative approaches are considered and discussed. Opportunities with Wiser (http://www.uclan.ac.uk/information/services/wiser/index.php), eLearn (http://www.uclan.ac.uk/information/services/wiser/elearn.php), offering study skill support, Flying Start for new students (http://www.uclan.ac.uk/information/services/wiser/flying_start_induction_pack.php), and Peer Mentoring (http://www.uclan.ac.uk/information/services/sas/m_and_m/mandm.php) are used.
By the end of their University studies, the student is advised to have completed and reviewed all the activities and exercises.

16. Admissions criteria *
(including agreed tariffs for entry with advanced standing)
**Correct as at date of approval. For latest information, please consult the University's website.*

The School of Engineering standard entry requirement is 112 UCAS points from A2 level subjects, including grade C in Mathematics and grade C in either Physics or other STEM subject. Students also require an IELTS score of 6.0 (with no component below 5.5) or grade C GCSE in English (or equivalent). A BTEC extended diploma (D,M,M) is considered equivalent but must include Merits in units 1 & 7.

Other acceptable qualifications that may be accepted at equivalent performance levels include:
- Scottish Certificate of Education Higher Grade
- Irish Leaving Certificate Higher Grade
- International Baccalaureate
- BTEC National Diploma (D,M,M, and including suitable maths units at merit level)
- Cambridge Technicals in Engineering at Level 3 (DMM, including maths unit at merit level)
- Access to HE Diploma

Applications from individuals with non-standard qualifications or relevant work / life experience who can demonstrate the ability to cope with and benefit from degree-level studies are welcome. If you have not studied recently you may need to undertake a Foundation Entry programme first. The School of Engineering offers a common foundation entry course for all BEng Honours degrees.

17. Key sources of information about the programme

http://www.uclan.ac.uk/schools/engineering
http://www.uclan.ac.uk/information/courses/index.php
http://www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/Engineering10.pdf
http://www.engc.org.uk/professional-qualifications/standards/uk-spec
http://www.heacademy.ac.uk/resources/detail/resource_database/id56_guide_to_curriculum_design_pdp

18. Curriculum Skills Map

Please tick in the relevant boxes where individual Programme Learning Outcomes are being assessed

Level	Module Code	Module Title	Core (C), Compulsory (COMP) or Option (O)	Programme Learning Outcomes																	
				Knowledge and understanding				Subject-specific Skills						Thinking Skills				Other skills relevant to employability and personal development			
				A1	A2	A3	A4	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	D1	D2	D3	D4
LEVEL 6	MP3999	Project	COMP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	MP3732	Operations Management B	COMP	✓				✓	✓	✓	✓			✓	✓	✓		✓		✓	✓
	MP3801	Energy & Power Generation Systems	COMP	✓			✓		✓		✓								✓		
	SC3007	Advanced Heat Transfer	COMP	✓			✓	✓	✓			✓	✓	✓			✓	✓			
	NT3036	Systems Design (Building Services)	O	✓	✓		✓		✓	✓				✓	✓						
	EL3102	Control Systems	O	✓		✓	✓	✓			✓	✓									
	FV3701	Reservoir Engineering and Well Testing	O	✓			✓								✓					✓	
	NT3050	Carbon & Energy Management	O		✓	✓	✓					✓	✓				✓	✓	✓		
	SC3106	Nuclear Fuel & Fuel Technology	O	✓			✓			✓				✓		✓					✓
	ER3800	Renewable Energy Resources & Technologies	O	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		
	MP3731	Engineering Design B	COMP	✓					✓	✓	✓	✓		✓	✓	✓				✓	✓
LEVEL 5	MP2899	Industrial Placement	O		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
	EL2104	Instrumentation & Control	COMP	✓			✓											✓	✓		
	EL2711	Electromagnetic Systems	COMP	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		
	MP2756	Thermofluids & CFD	COMP	✓		✓				✓				✓	✓	✓	✓		✓	✓	✓
	MP2721	Operations Management A	COMP		✓	✓	✓	✓		✓	✓			✓	✓	✓		✓	✓	✓	
	MP2784	Mechanics, Kinematics & Materials	COMP	✓				✓	✓	✓	✓		✓	✓							
	SC2153	Further Engineering Mathematics & Simualation	COMP	✓	✓		✓	✓				✓		✓	✓	✓	✓				✓
	ER1010	Engineering Analysis	COMP	✓	✓		✓	✓					✓	✓	✓	✓				✓	

LEVEL 4	ER1020	Engineering Design	COMP					✓		✓	✓					✓				
	ER1030	Engineering Science	COMP	✓			✓	✓					✓	✓	✓			✓		
	ER1063	Engineering Applications	COMP		✓	✓		✓					✓			✓	✓	✓	✓	✓

19. LEARNING OUTCOMES FOR EXIT AWARDS:

BEng Energy Engineering

A1. Utilize a sound theoretical approach to enable the introduction and exploitation of new and advancing technology and other relevant developments, and related underpinning science and mathematics.
A2. Compare and contrast the wider multidisciplinary engineering context and underlying principles.
A3. Describe and discuss the social, environmental, ethical, economic and commercial considerations that affect the exercise of engineering judgement.
A4. Learn new theories, concepts, methods etc in unfamiliar situations.
B1: Practical Engineering competence acquired in laboratories; workshops; industry; individual & group project work, design work; and development & use of computer software.
B2: Application of scientific, mathematical, and associated engineering principles necessary to underpin activities in Energy Engineering.
B3: Creative use of engineering principles in problem solving, design, explanation and diagnosis relevant to Energy Engineering.
B4: Create and develop economically viable products, processes and systems to meet defined needs.
B5: Specify and develop energy engineering activities to promote sustainable development in an economic, social and environmental context.
B6: Apply competence across professional engineering practice.
C1: Apply appropriate quantitative science and engineering tools to the analysis of problems
C2: Demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs.
C3: Design and deliver engineering solutions with an appropriate level of detail.
C4: Develop, monitor and update a plan, to reflect a changing operating environment.
D1: Apply transferable skills that will be of value in a wide range of situations, including Problem solving; Communication; and Working with others.
D2: Effective use of general IT [information technology] facilities and information retrieval skills.
D3: Plan self-learning and improve performance, as the foundation for lifelong learning/CPD [continuing professional development].

Diploma in Higher Education in Energy Engineering

A1: Utilize a sound theoretical approach to the analysis of underpinning science and mathematics.
A2: Compare and contrast the wider multidisciplinary engineering context and underlying principles.
A3: Learn new theories, concepts, methods etc in unfamiliar situations.
B1: Practical Engineering competence acquired in laboratories; workshops; project work, design work; and development & use of computer software.
B2: Application of scientific, mathematical, and associated engineering principles necessary to underpin activities in Energy Engineering.
B3: Creative use of engineering principles in problem solving, design, explanation and diagnosis relevant to Energy Engineering.
B4: Specify and develop energy engineering activities that align with sustainable development.
B5: Apply competence across professional engineering practice.
C1: Apply appropriate quantitative science and engineering tools to the analysis of problems. .
C2: Demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs. .
C3: Design and deliver engineering solutions with an appropriate level of detail. .
D1: Apply transferable skills that will be of value in a wide range of situations, including Problem solving; Communication; and Working with others**.**
D2: Effective use of general IT [information technology] facilities and information retrieval skills. **.**
D3: Plan self-learning and improve performance, as the foundation for lifelong learning/CPD [continuing professional development].

Certificate in Higher Education

The learning outcomes for the Certificate in Higher Education gained through this programme are as follows and the award is based on meeting some of the learning outcomes listed:

A1: Utilize a sound theoretical approach to the analysis of underpinning science and mathematics.
A2: Describe the wider multidisciplinary engineering context and underlying principles.
A3: Learn new theories, concepts, methods etc in unfamiliar situations.
B1: Practical Engineering competence acquired in laboratories; workshops; design work; and use of computer software.
B2: Application of scientific, mathematical, and associated engineering principles necessary to underpin activities in Energy Engineering.
B3: Use of engineering principles in problem solving, design, explanation and diagnosis relevant to Energy Engineering.
B4: Demonstrate a degree of competence across professional engineering practice.
C1: Apply appropriate quantitative science and engineering tools to the analysis of problems. .
C2: Sythesize learning to develop solutions and/or formulate designs. .
C3: Design and deliver engineering solutions with an appropriate level of detail. .
D1: Apply transferable skills that will be of value in a wide range of situations, including Problem solving; Communication; and Working with others**.**
D2: Effective use of general IT [information technology] facilities and information retrieval skills. **.**
D3: Plan self-learning and improve performance, as the foundation for lifelong learning/CPD [continuing professional development].

UNIVERSITY OF CENTRAL LANCASHIRE

Programme Specification

This Programme Specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided.

Sources of information on the programme can be found in Section 17

1. **Awarding Institution / Body**	University of Central Lancashire.
2. **Teaching Institution and Location of Delivery**	University of Central Lancashire, Preston campus
3. **University School/Centre**	School of Engineering
4. **External Accreditation**	EI & IMechE to be sought
5. **Title of Final Award**	MEng (Hons) Energy Engineering.
6. **Modes of Attendance offered**	Full Time; Part Time; Sandwich.
7. **UCAS Code (JACS / HECOS)**	H800 Energy Engineering. (H221 /100175)
8. **Relevant Subject Benchmarking Group(s)**	Engineering Council UK-SPEC. BEng and extended to include MEng.
9. **Other external influences**	Accreditation requirements of IMechE. Accreditation requirements of EI. QAA Academic Infrastructure Codes of Practice. Science, Technology, Engineering & Mathematics (STEM) government initiatives.
10. **Date of production/revision of this form**	September 2018

11. Aims of the Programme

To provide students with the opportunity to develop knowledge and understanding in order to maintain and manage applications of current and developing technology, including energy engineering design and development, manufacture, construction and power generation operations. Thereby affording graduates the opportunity to fulfil the educational requirements for Chartered Engineer.

- To meet the requirements for full CEng accreditation of the programme by Engineering Council Institutions.
- To provide an extended, enhanced, and industrially relevant Integrated undergraduate master's programme of study in preparation for professional practice.
- To produce resourceful, competent, clear-thinking professional engineers with a range of skills and experience relevant to contemporary industry.
- To equip graduates of the programme with knowledge, skills, experience, and understanding which underpin a professional career in Engineering.

12. **Learning Outcomes, Teaching, Learning and Assessment Methods**

UK Standard for Professional Engineering Competence (UK-SPEC).

UK-SPEC is the standard for recognition of professional engineers in the UK. The standard is published by the Engineering Council on behalf of the engineering profession. UK-SPEC recommends General Learning Outcomes (GLO) and Specific Learning Outcomes (SLO) for degree courses that are consistent with the learning outcomes existing for UCLan courses. The following sections A, B, C, and D are written in the UCLan format, referring to the corresponding GLO and SLO in UK-SPEC.

A. Knowledge and Understanding

A1: Describe the key principles of all relevant scientific and engineering aspects related to energy engineering and their applications to the study of engineering for the built environment using simulated scenarios and actual case studies. **(GLO: A1).**

A2: Explain the design, operation and performance of technological design solutions for a wider multidisciplinary engineering context and its underlying principles.. **(GLO: A2).**

A3: Identify aspects of social, environmental, ethical, economic and commercial considerations affecting the exercise of engineering judgement. **(GLO: A3).**

A4: Comprehensively explore theories, concepts, principles and methodologies in unfamiliar situations. **(GLO: A4).**

Teaching and Learning Methods

Knowledge acquisition occurs initially through tutor-led lectures (teaching) and directed study of textbooks and journal articles. This is followed up by student led learning activity using text (books and e-resources), media (software, video, technical articles) and active enquiry research methods.

The understanding of much engineering knowledge (learning) comes by application, use, and observation of effect. This is aided by tutorials, worked examples, analysis, synthesis, and Active Enquiry. Great benefit comes from this occurring in a group environment, where understanding can be developed by support from others. The tutor in these situations takes the role of a Mentor.

The Teaching and Learning strategies employed deliver opportunities for the achievement of the learning outcomes, demonstrate their attainment and recognise the range of student backgrounds. Delivery methods, activities and tasks are aligned with the learning outcomes for this programme, taking account of the learning styles and stage of the student.

Curriculum design is informed by the research, scholarship, and engineering activities of the staff, in line with the established criteria for accredited engineering degree programmes. Industrially relevant applications and examples of the material are essential to student understanding and future use. Delivery methods and curriculum design evolve in response to generic and discipline-specific developments, taking into account educational research, changes in national policy, industrial practice and the needs of employers. The context of the curriculum contains the generic social, legal,

environmental and economic factors relevant to engineering, and topical factors (sustainability, and carbon footprint for example).

Assessment methods

Assessment of Knowledge is through examination of key facts using unseen papers. These include formal end of year examinations, or *phase-tests* focussing on a limited range of material during the year.

Assessment of understanding of the knowledge (and knowledge itself if appropriate) is through assignment or other coursework including group projects as a major aspect of an engineering degree qualification.

Assessment is a measure against the benchmark criteria, and forms an important part of the learning process.

The assessment of the Module Learning Outcomes through assignments and examinations are mapped to the Programme Learning Outcomes (in this section), which are directly linked to the Aims of the Programme, which in turn are in line with Accreditation, subject and other academic requirements.

B. Subject-specific skills

B1: Practical Engineering competence acquired in laboratories; workshops; industry; individual & group project work, design work; and development & use of computer software. **(GLO: B1, B2, B3).**

B2: Knowledge and understanding of scientific, mathematical, and associated engineering principles necessary to underpin activities in Energy Engineering. **(SLO: US1, US1m, US2, US2m, US3, US3m, US4m)**.

B3: Creative use of engineering principles in problem solving, design, explanation and diagnosis. **(SLO: E1, E1m, E2, E2m, E3, E3m, E4)**.

B4: Create and develop economically viable products, processes and systems to meet defined needs. **(SLO: D1, D1m, D2, D3, D4, D4m, D5, D6)**.

B5: Comprehensively, Identify and apply engineering principles and activities to promote sustainable development in an economic, social and environmental context. **(SLO: S1, S1m, S2, S2m, S3, S4, S5).**

B6: Practical application of competence in professional engineering practice. **(SLO: P1, P1m, P2, P2m, P3, P4, P5, P6, P7, P8, P8m)**.

Teaching and Learning Methods

The development of skills involves some tuition, some practice and considerable experience in using the skills in Engineering situations and relevant to engineering competencies

Skill development relates to areas specific to the Energy Engineering destinations of graduates and includes areas which are generic to engineering (such as workshop practices), those which are expected in an engineering degree (such as advanced simulation of CFD problems), and those which are programme specific (such as entrepreneurial business skills).

The course provides significant exposure to hands-on laboratory work and substantial individual project work, both at final year and developing through the course. Both design and Active Enquiry (research-led) projects are used, which develop both independence of thought and the ability to work effectively in a team.

Development of team working within the engineering design context is a strong feature of the provision. This enthuses students in their study, and creates graduates able to contribute immediately to their employment. The Placement activity is a significant aspect of the programme, both for the successful placement student and the culture of the final three years of the degree.

Assessment methods

The assessment methods include report writing, assignments, computational competencies and laboratory demonstrations.

The assessment of the Module Learning Outcomes through assignments and examinations are mapped to the Programme Learning Outcomes (in this section), which are directly linked to the Aims of the Programme, which in turn are in line with Accreditation, subject and other academic requirements.

C. Thinking Skills

C1: Apply appropriate quantitative science and engineering tools to the analysis of problems. **(GLO: C1)**.
C2: Employ problem solution skills, as appropriate, in the processes of analysis, synthesis, evaluation and summarisation of ideas, information and the proposal of solutions.**(GLO: C2)**.
C3: Debate, in a rational manner, future strategies and proposals for the resolution of energy related design and project management solutions in a changing social environment. **(GLO: C3)**.

C4: Develop, monitor and update a plan, to reflect a changing operating environment. **(GLO: C4)**.

Teaching and Learning Methods

The exercise and development of *thinking skills* are achieved through active learning processes. Problem solving is the key to many engineering activities, and progresses in complexity and demand through the course. Staff interests and research often form the background to developments in active learning.

Implementation of this is seen through the use of workshops, drawing/CAD facilities, dedicated software, laboratories, rapid/additive manufacture techniques, bureau manufacturing, student presentations, external visitors, and field/industry based activity. These learning processes compliment the more conventional seminars, tutorials and case study approaches found in HE.

There is extensive group, and later team, working as a natural part of the working (and learning) environment in engineering.

Assessment methods

Assessment of thinking skills is by reports on practical investigations and tests, a ‘design and make’ project, case studies, formal examinations, workbooks and drawings in early stages of the course provision.

In later stages, formal reports with reflection on practical activities; design and manufacture processes and results; generating and analysing CAD, CIM, and other simulation models; computer software based analysis and calculations; and evaluation of prototypes are included. The independent final Project and group project based assessments demonstrate capability in skills related to individual specialised knowledge, understanding and practical aspects. Unseen examinations are appropriate for assessment of some intellectual skills under time constrained conditions.

Intellectual skills related to practical activity are developed through the experience of the activity in an appropriate context. These include the Engineering workshops and laboratory equipment, practical manufacture of prototypes during modules, the final Project, Creation and Evaluation, and level 7 Innovation in Problem Solving. Workbooks and guidance manuals are used widely in earlier years. The optional Placement provides additional opportunities for the students choosing to take it.

D. Other skills relevant to employability and personal development

D1: Developed transferable skills that will be of value in a wide range of situations, including Problem solving; Communication; and Working with others. **(GLO: D1).**
D2: Effective use of general IT [information technology] facilities and information retrieval skills. **(GLO: D2).**
D3: Planning self-learning and improving performance, as the foundation for lifelong learning/CPD [continuing professional development]. **(GLO: D3)**.
D4: Monitor and adjust a personal programme of work on an ongoing basis, and to learn independently. **(GLO: D4)**.

Teaching and Learning Methods
The Induction for the course starts the Personal Development Planning (PDP) programme, which is seen to continue after graduation as Continuing Professional Development (CPD). Communication, team working, engineering problem solving and design, reflective use of available software, planning, critical evaluation, verification of results, confidence in outcomes, inter-personal skills, emotional intelligence, and goal setting all feature and are emphasised at various points through the programme. The University Personal Tutor system is a useful vehicle for discussion of these aspects of personal development. However, much is learnt in the day to day interactions with staff, industry visitors, and other students.
Assessment methods
Written communication skills are developed and assessed through the context for the assessment. Examples include the requirements for a formal report, laboratory report, business or technical justification, reflective practice, critical evaluation in a commentary, or statement of confidence in a decision made in complex and unpredictable situations. Group based activity requires reflection on the performance of the individual within that context. Team based activities require an assessment of the team formation and contribution to the outcome. Effective use of the internet and web based infrastructure, including remote working are essential to engineers. These skills develop naturally out of the learning environment, which is facilitated by engineers with ongoing extensive industry experience. The easy transition of engineering graduates from related areas of study into key professional engineering positions and careers is attributed to the emphasis on the *real engineering* context.

13. Programme Structures				**14. Awards and Credits**
Lvl	**Module code**	**Module Title**	**Credit Rating**	
7	MP4580 (C)	Engineer and society	20	**A minimum of 480 credits must be studied at this University on this programme.** **MEng (Hons) Energy Engineering** Requires a minimum of 480 credits at Level 4 or above, 360 at Level 5 or above, 220 at Level 6 or above and 120 at Level 7 or above. **students who also successfully complete** module MP 2899 will receive the award with Industrial Placement.
	ER4587(C)	Group (project energy)	20	
	ER4995(C)	Project	20	
	MP4801(C)	Advanced energy systems design	20	
		Plus Two From:		
	MP4710(O)	Design & Analysis of Renewable energy systems	20	
	MP4713(O)	Wind power generation & control	20	
	MP4712(O)	Wind Energy Systems Design & Analysis	20	
	FV4701 (O)	Geotechnology: Oil & Gas Engineering	20	
	SC4101(O)	Nuclear Energy & The Nuclear Fuel Cycle	20	
	NT 4038(O)	Carbon & Energy Management *"NT4038" excluded if previously chosen NT3050*	20	
	NT 4009(O)	Waste Treatment & Low Carbon Technologies	20	
6	MP3999(C)	Project	40	**BEng (Hons) Energy Engineering** Requires a minimum of 360 credits at Level 4 or above, 220 at Level 5 or above and 100 at Level 6 or above including MP3999. Students who also successfully complete module MP2899 will have the placement module listed on their award transcript. **BEng Energy Engineering** Requires a minimum of 320 credits at Level 4 or above, 180 at Level 5 or above and 60 at Level 6 or above.
	MP3732 (C)	Operations Management B	20	
	MP3801(C)	Energy & Power generation systems	20	
	SC3007(C)	Advanced Mathematics & Simulation	20	
		Plus ONE From:		
	FV3701(O)	Reservoir Engineering and Well Testing	20	
	SC3106(O)	Nuclear Reactors & Fuel Technology	20	
	EL3102 (O)	Control Systems	20	
	NT 3050 (O)	Carbon and Energy Management	20	
	ER3800(O)	Renewable Energy resources & technologies	20	

5	MP2899(O)	Industrial Placement	120	

5	SC2153(C) EL2104 (C) EL2711 (C) MP2576(C) MP2721(C) MP2784(C)	Further engineering mathematics and simulation Instrumentation & control Electromagnetic systems Thermo-fluids with CFD Operations Management A Mechanics, Kinematics, and Materials	20 20 20 20 20 20	**Diploma of Higher Education in Energy Engineering** Requires a minimum of 240 credits at Level 4 or above with 120 at Stage 2, and 100 at Level 5 or above.
4	ER1010(C) ER1020(C) ER1030(C) ER1630(C)	Engineering Analysis Engineering Design Engineering Science Engineering Applications	30 30 30 30	**Certificate of Higher Education** Requires a minimum of 120 credits at Level 4 or above.

Modules marked (C) are Compulsory; and (O) are Optional.

15. Personal Development Planning

The course approach to Personal Development Planning (PDP) has been influenced by the LTSN Generic Centre Guide to Curriculum Design: Personal Development Planning. PDP activity is centred on:

- Reflection on learning, performance, and achievement.
- Planning for personal, educational, and career development.

Students are invited to review and reflect on their academic study, extra-curricular activities and career planning. This results in an increased understanding and ownership of learning.

Since learning is a lifelong process the work in PDP is not assessed. There are many similarities to work-based learning, and Continued Professional Development (CPD) - which is required for membership of professional societies. The skills in PDP are key components of employability: – self-reflection, recording, target setting, action planning and monitoring. Local web based materials relevant to PDP are found at:

Generic: http://www.uclan.ac.uk/information/services/ldu/pdp/generic_PDP_index.php.

Employability and Skills: http://www.uclan.ac.uk/information/services/ldu/employability_and_skills.php

At Induction the student takes part in a session involving a range of self-assessment exercises. This is followed by early in Semester 1 the student being recommended to access the local web based materials, and other materials found by individual need or interest. The results of the activity or exercise are kept together in an A4 folder. A paper based system is suggested, due to concerns about the security, privacy, and long-term accessibility of records.

This activity is reinforced for all first year students by encouraging communication and team working between students, and between students and staff.

Subsequently during group tutorial sessions discussion is directed towards PDP elements. Any topics found difficult, or needing further work are discussed. Alternative approaches are considered and discussed. Opportunities with Wiser (http://www.uclan.ac.uk/information/services/wiser/index.php), eLearn (http://www.uclan.ac.uk/information/services/wiser/elearn.php), offering study skill support, Flying Start for new students (http://www.uclan.ac.uk/information/services/wiser/flying_start_induction_pack.php), and Peer Mentoring (http://www.uclan.ac.uk/information/services/sas/m_and_m/mandm.php) are used.

By the end of their University studies, the student is advised to have completed and reviewed all the activities and exercises.

16. Admissions Criteria

Programme Specifications include minimum entry requirements, including academic qualifications, together with appropriate experience and skills required for entry to study. These criteria may be expressed as a range rather than a specific grade. Amendments to entry requirements may have been made after these documents were published and you should consult the University's website for the most up to date information.
Students will be informed of their personal minimum entry criteria in their offer letter.

The School of Engineering standard entry requirement is 112 UCAS points from A2 level subjects, including grade C in Mathematics and grade C in either Physics or other STEM subject. Students also require an IELTS score of 6.0 (with no component below 5.5) or grade C GCSE in English (or equivalent). A BTEC extended diploma (D,M,M) is considered equivalent but must include Merits in units 1 & 7.

Other acceptable qualifications that may be accepted at equivalent performance levels include:

- Scottish Certificate of Education Higher Grade
- Irish Leaving Certificate Higher Grade
- International Baccalaureate
- BTEC National Diploma (D,M,M, and including suitable maths units at merit level)
- Cambridge Technicals in Engineering at Level 3 (DMM, including maths unit at merit level)

Access to HE Diploma

Applications from individuals with non-standard qualifications or relevant work / life experience who can demonstrate the ability to cope with and benefit from degree-level studies are welcome. If you have not studied recently you may need to undertake a Foundation Entry programme first. The School of Engineering offers a common foundation entry course for all BEng Honours degrees.

17. Sources Of Information

http://www.uclan.ac.uk/schools/engineering
http://www.uclan.ac.uk/information/courses/index.php
http://www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/Engineering10.pdf
http://www.engc.org.uk/professional-qualifications/standards/uk-spec
http://www.heacademy.ac.uk/resources/detail/resource_database/id56_guide_to_curriculum_design_pdp

18. Curriculum Skills Map

Please tick in the relevant boxes where individual Programme Learning Outcomes are being assessed

Level	Module Code	Module Title	Core (C), Compulsory (COMP) or Option (O)	Programme Learning Outcomes																	
				Knowledge and understanding				Subject-specific Skills						Thinking Skills				Other skills relevant to employability and personal development			
				A1	A2	A3	A4	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	D1	D2	D3	D4
LEVEL 7	MP4580	Engineer and society	COMP			X	X			X		X	X	X	X		X	X	X	X	X
	ER4587	Group (project energy)	COMP	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	ER4995	Project	COMP	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X
	MP4801	Advanced energy systems design	COMP	X	X	X	X	X	X	X	X			X	X	X	X	X	X		X
	MP4710	Design & Analysis of Renewable energy systems	O	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	
	MP4713	Wind power generation and control	O	X	X		X	X	X					X						X	
	MP4712	Wind energy systems design and analysis	O	X			X	X	X	X	X	X	X	X	X	X	X	X	X		X
	FV4701	Geotechnology: oil & gas engineering	O	X			X		X						X					X	
	SC4101	Nuclear Energy & The Nuclear Fuel Cycle	O	X	X	X	X									X		X			
	NT4038	Carbon & Energy Management	O		X	X	X					X	X	X				X	X	X	
	NT4009	Waste treatment and low carbon technologies	O		X	X	X					X	X					X	X	X	
LEVEL 6	MP3999	Project	COMP	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	MP3732	Operations Management B	COMP	X				X	X	X	X			X	X	X		X		X	X
	MP3801	Energy & power generation systems	COMP	X			X		X		X						X				
	SC3007	Advanced Mathematics & Simulation	COMP	X		X	X	X			X	X	X			X	X				
	FV3701	Reservoir Engineering and Well Testing	O	X			X								X					X	

	SC3106	Nuclear reactors & fuel technology	O	X			X			X				X		X					X
	EL3102	Control Systems	O	X		X	X	X			X	X									
	NT3050	Carbon & Energy Management	O		X	X	X					X	X				X	X	X		
	ER3800	Renewable energy resources & technologies	O	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X		
LEVEL 5	MP2899	Industrial Placement	O		X	X		X		X	X	X	X	X	X	X		X	X	X	X
	SC2153	Further engineering mathematics and simulation	COMP	X	X		X	X				X		X	X	X	X				X
	EL2104	Instrumentation & control	COMP	X			X														
	EL2711	Electromagnetic systems	COMP	X			X		X			X	X	X			X	X			
	MP2576	Themo-fluids with CFD	COMP	X		X				X				X	X	X	X		X	X	X
	MP2721	Operations Management A	COMP		X	X	X	X		X	X			X	X	X		X	X	X	
	MP2784	Mechanics, Kinematics and Materials	COMP	X				X	X	X	X		X	X							
LEVEL 4	ER1010	Engineering Analysis	COMP	X	X		X	X					X	X	X	X				X	
	ER1020	Engineering Design	COMP					X		X	X					X					
	ER1030	Engineering Science	COMP	X			X	X					X	X	X			X			
	ER1630	Engineering Applications	COMP		X	X		X					X			X	X	X	X	X	

Note: *Mapping to other external frameworks, e.g. professional/statutory bodies, will be included within Student Course Handbooks*

19. LEARNING OUTCOMES FOR EXIT AWARDS:

BEng (Hons) Energy Engineering

The award of BEng(Hons) Energy Engineering is based on meeting the following learning outcomes (UK Spec outcomes in bold parentheses):

A1: Describe the key principles of all relevant scientific and engineering aspects related to energy engineering and their applications to the study of engineering for the built environment using simulated scenarios and actual case studies.

A2: Explain the design, operation and performance of technological design solutions for a wider multidisciplinary engineering context and its underlying principles.

A3: Identify aspects of social, environmental, ethical, economic and commercial considerations affecting the exercise of engineering judgement.

A4: Comprehensively explore theories, concepts, principles and methodologies in unfamiliar situations.

B1: Practical Engineering competence acquired in laboratories; workshops; industry; individual & group project work, design work; and development & use of computer software.

B2: Knowledge and understanding of scientific, mathematical, and associated engineering principles necessary to underpin activities in Energy Engineering.

B3: Creative use of engineering principles in problem solving, design, explanation and diagnosis.

B4: Create and develop economically viable products, processes and systems to meet defined needs.

B5: Comprehensively, Identify and apply engineering principles and activities to promote sustainable development in an economic, social and environmental context.

B6: Practical application of competence in professional engineering practice.

C1: Apply appropriate quantitative science and engineering tools to the analysis of problems.

C2: Employ problem solution skills, as appropriate, in the processes of analysis, synthesis, evaluation and summarisation of ideas, information and the proposal of solutions.

C3: Debate, in a rational manner, future strategies and proposals for the resolution of energy related design and project management solutions in a changing social environment.

C4: Develop, monitor and update a plan, to reflect a changing operating environment.

D1: Developed transferable skills that will be of value in a wide range of situations, including Problem solving; Communication; and Working with others.

D2: Effective use of general IT [information technology] facilities and information retrieval skills.

D3: Planning self-learning and improving performance, as the foundation for lifelong learning/CPD [continuing professional development].

D4: Monitor and adjust a personal programme of work on an ongoing basis, and to learn independently.

BEng Energy Engineering

A1: Describe the key principles of all relevant scientific and engineering aspects related to energy engineering and their applications to the study of engineering for the built environment using simulated scenarios and actual case studies.

A2: Explain the design, operation and performance of technological design solutions for a wider multidisciplinary engineering context and its underlying principles.

A3: Identify aspects of social, environmental, ethical, economic and commercial considerations affecting the exercise of engineering judgement.

A4: Comprehensively explore theories, concepts, principles and methodologies in unfamiliar situations.

B1: Practical Engineering competence acquired in laboratories; workshops; industry; individual & group project work, design work; and development & use of computer software.

B2: Knowledge and understanding of scientific, mathematical, and associated engineering principles necessary to underpin activities in Energy Engineering.

B3: Creative use of engineering principles in problem solving, design, explanation and diagnosis.

B4: Create and develop economically viable products, processes and systems to meet defined needs.

B5: Comprehensively, Identify and apply engineering principles and activities to promote sustainable development in an economic, social and environmental context.
B6: Practical application of competence in professional engineering practice.

C1: Apply appropriate quantitative science and engineering tools to the analysis of problems.
C2: Employ problem solution skills, as appropriate, in the processes of analysis, synthesis, evaluation and summarisation of ideas, information and the proposal of solutions.
C3: Debate, in a rational manner, future strategies and proposals for the resolution of energy related design and project management solutions in a changing social environment.
C4: Develop, monitor and update a plan, to reflect a changing operating environment.
D1: Developed transferable skills that will be of value in a wide range of situations, including Problem solving; Communication; and Working with others.
D2: Effective use of general IT [information technology] facilities and information retrieval skills.
D3: Planning self-learning and improving performance, as the foundation for lifelong learning/CPD [continuing professional development].

Industrial Placement

The learning outcomes for an award of MEng (Hons) Energy Engineering with industrial placement are the same as for MEng (Hons) Energy Engineering but in addition the module MP2899 must be passed. The learning outcomes for an award of BEng (Hons) Energy Engineering with industrial placement are the same as for BEng (Hons) Energy Engineering but in addition the module MP2899 must be passed. The learning outcomes for an award of BEng Energy Engineering with industrial placement are the same as for BEng Energy Engineering but in addition the module MP2899 must be passed.

Diploma in Higher Education

A1*: Utilize a sound theoretical approach to the analysis of underpinning science and mathematics.
A2*: Compare and contrast the wider multidisciplinary engineering context and underlying principles.
A3*: Learn new theories, concepts, methods etc in unfamiliar situations.
B1*: Practical Engineering competence acquired in laboratories; workshops; project work, design work; and development & use of computer software.
B2*: Application of scientific, mathematical, and associated engineering principles necessary to underpin activities in Energy Engineering.
B3*: Creative use of engineering principles in problem solving, design, explanation and diagnosis relevant to Energy Engineering.
B4*: Specify and develop energy engineering activities that align with sustainable development.
B5*: Apply competence across professional engineering practice.
C1*: Apply appropriate quantitative science and engineering tools to the analysis of problems. .
C2*: Demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs. .
C3*: Design and deliver engineering solutions with an appropriate level of detail. .
D1*: Apply transferable skills that will be of value in a wide range of situations, including Problem solving; Communication; and Working with others**.**
D2*: Effective use of general IT [information technology] facilities and information retrieval skills. **.**
D3*: Plan self-learning and improve performance, as the foundation for lifelong learning/CPD [continuing professional development].

Certificate in Higher Education

A1*: Utilize a sound theoretical approach to the analysis of underpinning science and mathematics.
A2*: Describe the wider multidisciplinary engineering context and underlying principles.
A3*: Learn new theories, concepts, methods etc in unfamiliar situations.
B1*: Practical Engineering competence acquired in laboratories; workshops; design work; and use of computer software.

B2*: Application of scientific, mathematical, and associated engineering principles necessary to underpin activities in Energy Engineering.
B3*: Use of engineering principles in problem solving, design, explanation and diagnosis relevant to Energy Engineering.
B4:** Demonstrate a degree of competence across professional engineering practice.
C1*: Apply appropriate quantitative science and engineering tools to the analysis of problems. .
C2*: Sythesize learning to develop solutions and/or formulate designs. .
C3*: Design and deliver engineering solutions with an appropriate level of detail. .
D1*: Apply transferable skills that will be of value in a wide range of situations, including Problem solving; Communication; and Working with others**.**
D2*: Effective use of general IT [information technology] facilities and information retrieval skills. **.**
D3*: Plan self-learning and improve performance, as the foundation for lifelong learning/CPD [continuing professional development].