UNIVERSITY of BRADFORD

Faculty of Engineering and Digital Technologies

Programme Specification

Programme title: MSc Renewable and Sustainable Energy

Academic Year:	2024-2025
Degree Awarding Body:	University of Bradford
Partner(s), delivery organisation or support provider (if appropriate):	
Final and interim award(s):	[Framework for Higher Education Qualifications (FHEQ) level 7] MSc Renewable and Sustainable Energy Postgraduate Diploma Postgraduate Certificate
Programme accredited by (if appropriate):	
Programme duration:	12 months full-time
QAA Subject benchmark statement(s):	Engineering (QAA 2023)
Date last confirmed and/or minor modification approved by Faculty Board	June 2024

Please note: This programme specification has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but changes may occur given the interval between publishing and commencement of teaching. Any change which impacts the terms and conditions of an applicant's offer will be communicated to them. Upon commencement of the programme, students will receive further detail about their course and any minor changes will be discussed and/or communicated at this point.

Introduction

By 2050, renewable energy will dominate the world's energy generation. To achieve the net-zero target for greenhouse gas emissions and, in accordance with the Paris Agreement, to limit the global temperature rise to 1.5˚C above pre-industrial levels, over 90% of global electricity will come from renewable energy. Particular emphasis lies upon the two energy production technologies of Wind Power and Solar Photovoltaics, in conjunction with required downstream transmission and storage utilities, through the development of multiple battery systems. A "global green deal" requires collaborative measures including labour market interventions, educational and skills development with a strong focus on sustainable energy.

Over the past decade, we have witnessed a gradual shift in the workforce in the energy sector towards renewable energy and clean energy technologies. The total number of people employed in this sector reached 13.7 million in 2022 and this figure is expected to increase significantly to 42 million by 2050 (IRENA, 2023).

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The Programme

The new MSc programme in Renewable and Sustainable Energy will address the global workforce needs for energy transformation and shaping our energy future. It will offer recent graduates from engineering-related disciplines and current engineers who are passionate about renewable and sustainable energy the opportunity to further develop and become future leaders in this fast-growing sector.

The design of this new MSc programme focuses on providing technical knowledge, advanced methods and tools to address energy and sustainability challenges, and on developing professional and interpersonal skills so that graduates can solve real-world problems in the renewable and sustainable energy sector. The context of the future energy sector is embedded in the programme design and topics to be covered, e.g. sustainable energy system design, future energy mix problem, energy industrial big data, sustainability and innovation. Students will also gain experience of interlinked broader themes in innovation, design, manufacturing, operations and maintenance, economics, modelling, optimisation and energy industry big data.

This MSc programme will include a research project with an emphasis on real-world application, experiential learning and high-quality research engagement. This will make a major contribution to the student's skill set, in the skills and attributes for enhanced employability. Our students can also participate in several future-focused extracurricular activities such as employability workshops, career fairs, and focused sessions by the Career and Employability Services to support student's progression to the next stage in their future careers.

The MSc programme is delivered by an interdisciplinary programme team with contributions from external industrial partners who provide research expertise in sustainable energy-related areas, linked to the Engineered Environment research theme at the University with well-known research areas and centres such as Smart Industrial Systems, Sustainable Energy, Centre for Sustainable Environment, and Polymer MNT Centre. Throughout the programme, students will engage with cutting-edge research methodologies in sustainable energy technologies from design, operation and maintenance to decommission and recycling.

The University and Faculty of Engineering and Digital Technologies

The University of Bradford is well known for attracting students from a wide variety of backgrounds, experiences and countries. The University welcomes and celebrates the diverse characteristics and backgrounds of our students and staff. We are committed to an educational experience that is inclusive, one where difference and diverse perspectives are central elements in developing innovative engineering solutions.

This programme actively contributes to the University's commitment to supporting women in Engineering, and the Faculty is instrumental in organising events to celebrate occasions including International Women in Engineering Day (INWED), the UN International Day of Women and Girls in Science, and International Women's Day. We are members of WISE (https://www.wisecampaign.org.uk/) whose long-term vision is for gender balance in STEM, and our staff and students regularly engage with networking events and specific

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upskilling opportunities offered via the organisation. Further information about our commitment to supporting women in engineering is available on our Faculty webpage: https://www.bradford.ac.uk/ei/women-in-engineering/

In addition to engaging with the above organisations, the Faculty contributes to the Bradford Science Festival each year and participates in activities to celebrate National Science Week. The University has held Bronze Athena Swan accreditation since 2015, demonstrating our commitment to striving for gender equality and to advancing women's careers in science, technology, engineering, medicine and mathematics. In May 2021, the Faculty of Engineering and Digital Technologies was also successful in being awarded Bronze Athena Swan Accreditation.

We recognise that society benefits from the talents of all and that the development of creative, collaborative professionals, skilled in communication and teamwork is vital. Diverse engineering teams are known to be more innovative. We help students to contribute to and learn from the varied perspectives of their tutors and peers. We want to equip our graduates with the knowledge and skills to respond to the many different and ever-changing needs of our societies and businesses. We create opportunities, spaces and resources to promote proactive dialogue among staff and students to integrate all cultures and enhance the curriculum.

Programme Aims

The programme is intended to:

A1. Train the next generation of engineers to drive the global energy transformation to a sustainable future.

A2. Provide advanced theoretical knowledge and critical and innovative thinking skills in renewable energy technologies and sustainability.

A3. Offer technical advances, recent methods and tools to address the global sustainability challenges in relation to energy.

A4. Equip students with interpersonal and professional skills to adapt to the changing needs of the energy industry and society.

A5. Enable students to carry out, independently and collaboratively, projects related to sustainable energy.

Programme Learning Outcomes

To be eligible for the award of Postgraduate Certificate at FHEQ level 7, students will be able to:

1. Demonstrate comprehensive knowledge at the forefront of renewable and sustainable energy.

2. Critically evaluate technical literature and be aware of current problems and new insights in the field of renewable energy and sustainability.

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3. Apply fundamental mathematics, statistics, natural science and engineering principles to model and formulate complex sustainable energy-related problems.

4. Apply analytical and computational techniques to solve complex problems in renewable and sustainable energy.

5. Work effectively in a team to meet shared objectives.

Additionally, to be eligible for the award of Postgraduate Diploma at FHEQ level 7, students will be able to:

6. Design and develop solutions for complex engineering problems that meet the requirements of the users and businesses in the energy sector.

7. Apply problem-solving skills and advanced data analysis techniques and use IT facilities and specialised software packages to formulate and solve energy and sustainability-related problems.

8. Deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data and uncertainty and communicate their analyses and conclusions clearly to specialist and non-specialist audiences.

9. Evaluate the environmental and societal impact of solutions to complex problems (to include the entire lifecycle of a product or process) and minimise adverse impacts.

Additionally, to be eligible for the award of Degree of Master at FHEQ level 7, students will be able to:

10. Plan, implement, monitor and adjust on an on-going basis, a self-directed individual research programme of work, evidencing collection and critical analysis of research data, use or adaptation of appropriate analysis tools to tackle unfamiliar problems, innovation, and application of relevant skills, reflection, and research methodologies in the production of an advanced dissertation.

Curriculum

The curriculum is designed with a total of 180 credits. Students study a total of 60 credits each in Semesters 1 and 2, plus 60 credits for the MSc Project module across the whole year. The curriculum may change, subject to the University's programme approval, monitoring and review procedures.

The programme has two entry points: September and January. The programme will provide flexibility with a balanced approach and optional modules in both semesters and intakes. Each student will take two core modules plus one optional module per September/January semester. Students who enter via the September intake will carry out their studies via the usual semester sequence (1,2,3), whilst those students who enter the course in January will study semesters in sequence 2,3,1.

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September Intake:

September to January

Module Code	Module Title	Core/ Option	Credits	FHEQ Level	Study Period
ENM7005-B	Modelling and Optimisation	Core	20	7	1
ENG7014-B	Advanced Sustainable Energy	Core	20	7	1
COS7049-B	Statistical Applications of Industrial Big Data*	Option	20	7	1
CSE7016-B	Sustainability in the Built Environment	Option	20	7	1

January to May

Module Code	Module Title	Core/ Option	Credits	FHEQ Level	Study Period
ENG7015-B	Wind and Solar Energy Systems	Core	20	7	2
ENG7016-B	Low-carbon Industry Energy and Materials	Core	20	7	2
ENB7011-B	Sustainability and Innovation for Engineers	Option	20	7	2
COS7050-B	Industrial Big Data Analysis and Mining*	Option	20	7	2

September to September

Module Code	Module Title	Core/ Option	Credits	FHEQ Level	Study Period
ENG7002-E	MSc Project	Core	60	7	1, 2, 3

***: Students can choose only one Big Data module in their study**

January Intake:

January to May

Module Code	Module Title	Core/ Option	Credits	FHEQ Level	Study Period
ENG7015-B	Wind and Solar Energy Systems	Core	20	7	2
ENG7016-B	Low-carbon Industry Energy and Materials	Core	20	7	2
ENB7011-B	Sustainability and Innovation for Engineers	Option	20	7	2
COS7050-B	Industrial Big Data Analysis and Mining*	Option	20	7	2

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September to January

Module Code	Module Title	Core/ Option	Credits	FHEQ Level	Study Period
ENM7005-B	Modelling and Optimisation	Core	20	7	1
ENG7014-B	Advanced Sustainable Energy	Core	20	7	1
COS7049-B	Statistical Applications of Industrial Big Data*	Option	20	7	1
CSE7016-B	Sustainability in the Built Environment	Option	20	7	1

January to January

Module Code	Module Title	Core/ Option	Credits	FHEQ Level	Study Period
ENG7002-E	MSc Project	Core	60	7	1, 2, 3

***: Students can choose only one Big Data module in their study**

Postgraduate Certificate

Students will be eligible to exit with the award of a Postgraduate Certificate if they have successfully completed 60 credits and achieved the award learning outcomes.

Postgraduate Diploma

Students will be eligible to exit with the award of a Postgraduate Diploma if they have successfully completed at least 120 credits and achieved the award learning outcomes.

Degree of Master

Students will be eligible for the award of Degree of Master if they have successfully completed at least 180 credits and achieved the award learning outcomes.

Learning and Teaching Strategy

The programme's teaching and learning strategy takes into consideration the learning outcomes, the nature of the subject and the student intake, and the need for students to take greater responsibility for their own learning as they progress through the programme.

Our strategy begins with the end in mind. We want students to become great engineers; that means great problem solvers and great team workers with inquisitive and curious minds. This should mean that by the end of their study with us, they can move seamlessly into the world of work, academic research, or other occupation such as an entrepreneurial/start-up venture.

The teaching and learning methods have been selected to engage students in developing their knowledge and understanding of fundamentals in the area of renewable and sustainable energy through formal learning opportunities such as lectures and tutorials,

experiential learning through practical classes and lab sessions, industrial site visits and informal and social learning through team-working in projects and competitions. Studying with us will include interactive lectures, as well as smaller seminars and open discussions, and students will be encouraged to present their ideas to their cohort at multiple stages, encouraging dissemination and increasing confidence in communicating ideas, while also allowing differing points of view to be explored.

We want to develop student's understanding of the vast array of opportunities open to today's professional engineers and therefore we look to incorporate aspects of real-world engineering problems and solutions wherever possible. To this end, we also include external speakers from industry and research institutes and make use of real-world case studies, practical demonstrations, and provide lots of opportunities for students to design their own solutions. The programme is developed and delivered by a strong academic team with research focused on renewable and sustainable energy. Invited lectures and cutting-edge research are incorporated. We provide opportunities for high-quality MSc projects to be submitted to academic journals and conferences and inspire students to achieve the highest research quality.

Assessment Strategy

Our assessment strategy incorporates a wide range of different methods designed to meet the needs and expectations of industry as well as to prepare students for a potential academic research career.

In this programme, assessments aim to solve real-life energy and sustainability challenges, the tasks will be interactive and authentic, to allow the students to apply their knowledge to current problems the field faces. Assessment is a key part of the learning process and students on this programme will undertake a variety of assessments to evaluate their knowledge, practical and interpersonal skills development throughout the course. Tutors will play an active role in providing regular and constructive feedback to support and reinforce student learning.

There are two forms of assessment. Formative assessment provides an opportunity for our staff to give students feedback during their learning. This feedback is designed to help and guide learning. All the modules will have some formative assessment, and this may be in various forms including discussions or questioning from the supervisor, self-paced tutorials, online Canvas quizzes, practical activities, etc. These formative activities are crucial if students are to make the best use of their learning experience and they are designed to prepare students for their summative assessment. Summative assessment is how we grade the work on a module and the details of this assessment will be available from the beginning of the module so that students understand how the grade will be determined.

Each assessment on the programme is tailored to the specific module learning outcomes and is structured to ensure that the learning is embedded by the application of knowledge to real-world examples. Practical skills are often assessed via individual and group technical reports with the laboratory work linked with the taught modules. The methods of assessment of transferable skills are built into the structure of the examinations, case studies, laboratory demonstrations and project work.

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Assessment Regulations

This Programme conforms to the standard University Regulations (for Postgraduate Taught Programmes) which are available at the following link:

https://www.bradford.ac.uk/regulations/

Admission Requirements

The University welcomes applications from all potential students and most important in the decision to offer a place is our assessment of a candidate's potential to benefit from their studies and of their ability to succeed on this particular programme. Consideration of applications will be based on a combination of formal academic qualifications and other relevant experience.

The standard entry requirements for the programme are as follows:

A second-class Honours degree or equivalent in an engineering discipline (e.g. mechanical, manufacturing, industrial, chemical, electrical, electronics, computer, biomedical, civil, etc.).

Candidates who do not fulfil the normal entry requirements but have extensive industrial experience (minimum two years) in an engineering area/position are considered on an individual basis.

English language requirements:

IELTS at 6.0 or the equivalent, with no less than 5.5 in any band.

Recognition of Prior Learning

If applicants have prior certificated learning or professional experience which may be equivalent to parts of this programme, the University has procedures to evaluate and recognise this learning in order to provide applicants with exemptions from specified modules or parts of the programme.

Minor Modification Schedule

Version Number	Brief description of Modification	Date of Approval (Faculty Board)
1	First draft of the Programme Spec.	June 2024