UNIVERSITY of BRADFORD

Faculty of Engineering & Informatics

MSc Advanced Chemical and Petroleum Engineering Programme Specification

Academic Year:	2020-2021
Degree Awarding Body:	University of Bradford
Final and interim award(s):	[Framework for Higher Education Qualifications (FHEQ) level 7] MSc Advanced Chemical and Petroleum Engineering MSc Engineering (Chemical) Postgraduate Diploma Advanced Chemical and Petroleum Engineering Postgraduate Certificate Advanced Chemical and Petroleum Engineering
Programme accredited by (if appropriate):	IChemE
Programme duration:	January intake 1 Year
QAA Subject benchmark statement(s):	Engineering
Date last confirmed and/or minor modification approved by Faculty Board	December 2020

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

The impact of Chemical Engineering in the 21st century is set out in the Chemical Engineering Matters (3rd Edition Report) which identifies Water, Energy, Food & Nutrition, Health & Wellbeing, as the four key areas where Chemical Engineering can make a positive impact on the quality of life and help produce a more sustainable future. The MSc Advanced Chemical and Petroleum Engineering curriculum addresses aspects of these four

challenge areas and the related topics of process design, optimisation, safety and risk management.

Chemical Engineers develop and design the processes to make everything the modern society needs: from advanced polymeric materials (packaging, electrical goods, electronics, automotive, aircrafts) to health care products (face creams, shampoo, perfume, drugs) to food (dairy products, cereals, agro-chemicals) and water (desalination for freshwater) to energy (petroleum to nuclear fuels). They do this by efficient use and management of resources including oil and gas, water and energy while controlling health and safety procedures and protecting the environment.

Chemical engineers are concerned with small and large-scale chemical and biochemical processes in which materials undergo change. In practice, this may mean anything from a relatively small batch production of a drug to the massive scale of equipment needed to turn seawater to freshwater, natural gas to agrochemicals etc. by applying advanced reaction and separation processes. The complexity of the oil and gas industry offers a wide variety of opportunities for career development in the petrochemical industries. Further, engineering new materials with advanced properties is at the heart of the new technological drive of this century. Electronic Polymers, Biomaterials, Nanocomposites, and "Smart" Materials are examples of new material developments where the technological applications and impact on society are enormous.

Study at MSc level at Bradford will be a foundation for life aimed at developing a deep understanding of advanced technical principles, analytical tools and competence in their application together with a wide range of management, personal and professional skills. The Programme will provide students with essential tools based on the concept of sustainability and maintaining a low carbon footprint for changing raw materials into useful products in a safe and cost effective way.

This MSc is an industrially relevant programme designed with the aim of producing employable Master's graduates with problem solving skills and the ability to critically apply their knowledge and make informed judgements. The curriculum helps students develop breadth and depth of advanced technical principles, advanced engineering practice whilst taking into consideration the environmental, economic, social, sustainability and ethical issues associated with the operation of industrial processes.

The programme reflects the range of research strengths in chemical engineering at Bradford University, which include Chemical and Petrochemical Engineering, Polymer and Advanced Materials Engineering, Energy, Desalination Technologies, Water Treatment and Pharmaceutical Engineering. It is designed smartly and provides balanced in-depth exposures to help students to find their career in these areas.

Upon completion of the Programme students will have the capacity for meaningful interdisciplinary interaction, leadership roles, and professional growth. The Faculty places emphasis on both teaching and research. We have particular research strengths in chemical and petrochemical engineering, polymers, energy, water, pharmaceutical engineering, coating and materials engineering. We have state of the art research facilities in these areas. We aim to produce MSc graduates who are imaginative, innovative, versatile and competitive. These graduates will be able to progress rapidly to professional positions

of responsibility with minimal additional training and who will be able to provide technical, managerial and entrepreneurial leadership in specialist/interdisciplinary projects.

Having completed the programme, students will be able to work as: (a) Project Engineer (b) Design Engineer (c) Operations Engineer or (d) Research and Development Engineer (R&D) in Chemical/Petroleum/Polymer/Food and Pharmaceutical Industries. Students will have the capacity, potential and opportunity for professional growth to continue the path to Chartered Engineer (CEng) status. The ability of an engineer to think clearly and logically is widely appreciated by many other professions and studies at Bradford may well be a steppingstone to many alternative careers other than Engineering – a real foundation for life and for a lifetime of learning.

The University

The University of Bradford has four key strategic objectives: excellence; internationalisation; equality and diversity; and sustainability. We believe in doing research and teaching to deliver career opportunities for our students as well as for economic development and job creation.

The Faculty of Engineering and Informatics strongly believes that each programme subscribes to these four objectives through the three key streams of the University vision:

- The creation of knowledge through fundamental and applied research.
- The dissemination of knowledge by teaching students from all backgrounds.
- The application of knowledge for the prosperity and wellbeing of people.

Lecturers at Bradford are active researchers in their fields of expertise, developing new knowledge, contributing to peer-reviewed journals and books. This research permeates to their teaching practice giving students access to world leading professionals, equipment and ideas within the University's academic themes of Innovative Engineering, Advanced Healthcare and Sustainable Societies. Each year students will engage in enquiry-based projects allowing learning through research. The programmes of study will include research with an emphasis on application, experiential learning and real-world engagement. This will make a major contribution to students skill set, in the skills and attributes for enhanced employability.

We recognise that society benefits from the talents of all, and that the development of creative, collaborative engineers, 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 needs of our businesses and communities.

The Faculty welcomes and celebrates the diverse cultural and national backgrounds of our students. We are committed to an educational experience that is inclusive, one where gender and ethnicity are central elements in developing engineering solutions that address the needs of a diverse society. The University currently holds Bronze Athena Swan accreditation from the Equality Challenge Unit.

Students will have many opportunities to contribute to their Higher Education Achievement Report (HEAR) whilst with us. Students can gain here accreditation for becoming student

representative for their course, by becoming a student ambassador, helping with open days and applicant experience days, or by being a PAL leader. The peer assisted learning scheme or PAL is where experienced students support undergraduate students, especially those in stage 1. The PAL scheme has been very successful, providing guidance on all aspects of being a student of Bradford. PAL leaders become mentors and role models for new students. We support people to become PAL leaders but we also recognise their contribution through the HEAR.

Programme Aims

The aims of the MSc programme are:

- To equip the students with the theoretical knowledge, concepts and skills necessary for original thought and problems analysis related to core chemical/petroleum/water/Food and Pharmaceutical engineering.
- To equip the students with the organisational, practical and computational skills necessary to carry out research in chemical/petroleum/ water/Food and Pharmaceutical engineering fields.
- To enable the student to engage in research by carrying out, under expert supervision, a specific project in chemical/petroleum/ water/Food and Pharmaceutical engineering.
- To provide bridging information to non-specialists enabling them to extend their career opportunities.

Programme Learning Outcomes

To be eligible for the award of Postgraduate Certificate at FHEQ level 7 students will have successfully completed 60 credits.

To be eligible for the award of Postgraduate Diploma at FHEQ level 7, students will have successfully completed 120 credits.

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

LO1 Evidence comprehensive understanding of relevant scientific principles of discipline specialization, applying knowledge (possibly at discipline forefront), understanding, and skills to work with (incomplete or uncertain) information, quantifying the effect of this on the design, and using theory or experiment to mitigate deficiencies.

LO2 Select and apply appropriate advanced modelling and analysis methods and computational tools to critically evaluate complex and multidisciplinary problems in engineering, generate (optimized) solutions, and assess their limitations, robustness, and effects of changes in design parameters.

LO3 Evidence advanced level knowledge and understanding of a wide range of engineering materials and components.

LO4 Critically evaluate current problems and/or new insights informed by the specialization forefront and apply and adapt knowledge and comprehensive understanding of design processes and methodologies in unfamiliar situations.

LO5 Work effectively in a team in order to meet shared objectives.

LO6 Evidence awareness of the need for a high level of professional and ethical conduct in engineering, evidencing business and management practices relevant to engineering and engineers.

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

LO7 Evidence understanding and critical evaluation of concepts relevant to discipline, some from outside engineering, and apply them effectively (including in engineering projects).

LO8 Integrate engineering knowledge and insight to investigate new and emerging technologies, applying professional judgements to balance risks, cost, benefits, safety, reliability and environmental impact.

LO9 Evidence self-direction, independent learning, and originality of thought to generate innovative designs for products, systems, components or processes to fulfil new needs.

LO10 Use software packages in the advanced analysis, design, evaluation, and optimisation of complex engineering systems.

LO11 Apply skills in problem solving, communication, information retrieval, working effectively with general IT facilities to develop, monitor and update a plan for the solution of both technical and personnel contributions to meeting organisational need.

LO12 Plan self-learning to improve performance as a foundation for lifelong learning/CPD, and exercise initiative and personal responsibility in professional practice, which may be as a team member or leader, evidence good negotiation, written and oral communication skills.

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

LO13 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 (e.g., those with uncertain or incomplete data or specification), innovation, and application of relevant skills, reflection, and research methodologies in the production of an advanced technical report.

Curriculum

The curriculum map shows the core (C) and optional (O) units for this programme, which extends over 12 months. It is made up of a taught element of 120 credits and an individual research project element of 60 credits. The taught element is structured in the form of 20 credit modules over the two semesters forming the academic session. The 60 credits MSc research project is carried out over the summer and throughout the year. The curriculum may change, subject to the University's Programme approval, monitoring and review procedures, as improvements are made each year. More detail, including learning outcomes, is available for each unit.

Postgraduate Certificate

FHEQ Level	Module Title	Type Core/ option/ elective	Credits	Semester (s) (January 2021)	Module Code
7	Upstream Production and Refinery Operations	C	20	2	CPE7007-B
7	Food and Pharmaceutical Processes Engineering	C	20	2	CPE7004-B
7	Polymer and Materials Engineering	O	20	2	CPE7012-B
7	Risk Assessment and Management	O	20	2	ENB7007-B
7	Water and Waste Water Treatment	O	20	2	CSE7013-B
7	Oil and Gas Management	O	20	2	CPE7013-B

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

Postgraduate Diploma

FHEQ Level	Module Title	Type Core/ option/ elective	Credits	Semester (s) (Sep 2021)	Module Code
7	Desalination Technology	C	20	1	CPE7002-B
7	Transport Phenomena	C	20	1	CPE7011-B
7	Big Data Systems and Analytics	O	20	1	COS7006-B
7	Supply Chain Management and Production	O	20	1	ENB7008-B

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

Degree of Master

FHEQ Level	Module Title	Type Core/ option/ elective	Credits	Semester (s)	Module Code
7	MSc Project	C	60	2,3	ENG7002-E

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.

The curriculum may change, subject to the University's programme approval, monitoring and review procedures.

Learning and Teaching Strategy

The 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, great team-workers with an inquisitive and curious mind. This should mean that by the end of their study with us they can move seamlessly into the world of work, academic research or become an entrepreneur.

The teaching and learning methods have been selected to engage students in developing their knowledge and understanding of engineering fundamentals, chemical engineering through formal learning opportunities such as lectures and tutorials, experiential learning through practical classes and lab sessions and informal and social learning through team-working in projects and competitions.

Study with us will include formal lectures (including those from visiting lecturers and invited speakers), but these will always be interactive and two way. We want to develop students understanding of the vast array of opportunities open to today’s professional engineer and therefore we look to incorporate aspects of real-world engineering problems and solutions where possible. To this end we make use of case studies, practical demonstrations, and provide lots of opportunities for students to design their own solutions.

As part of our focus on building a learning experience which will prepare students for the world of work our curriculum has been developed using the CDIO framework. This means that our learning strategy will be to encourage students to work in teams to Conceive potential solutions, Design new products processes or services, implement (or model) and test those designs, and Operate the product or solution. In line with the CDIO philosophy students will have numerous opportunities to be an active learner, to work as an engineer on real-world projects. Students will operate analytical instruments, under supervision, during the initial phase of their research project.

The University of Bradford is well known for attracting students from a wide variety of backgrounds, experiences and countries. The University of Bradford encourages and

supports women in engineering. Female staff and students are an integral part to the University of Bradford's Faculty of Engineering and Informatics The University of Bradford's modus operandi, Making Knowledge Work, is embedded in the philosophy of this programme.

Assessment Strategy

In the same way that our teaching and learning strategy is designed to prepare students for the world of work, academic research or entrepreneurship, our assessment methods incorporate a wide range of different methods designed to meet the needs of industry, the accrediting bodies as well as prepare students for a potential academic research career.

Assessment is a key part of the learning process, it is only through challenging themselves to express what they have learned or put it to practical use, can they complete the learning journey and assess for themselves if they have understood what they have been taught and are able to apply and use that skills and knowledge. There are two forms of assessment; formative and summative. Formative assessment provides an opportunity for our staff to give students feedback during their learning. This feedback is designed to help and guide students learning. All the modules will have some formative assessment, and this may be in various forms including discussions or questioning from their supervisor, tests, practical activities, et cetera. These formative activities are crucial if students are to make 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 their grade will be determined.

A main method of assessment (as is common on all professional engineering degree programmes) is by formal written examinations. Nevertheless, many of the assessments will be tailored to the most efficient ways the learning outcomes. Therefore, project work will often be assessed on the basis of the quality of the product produced as part of the project, we use practical tests to assess practical skills and written reports to show the depth of understanding of concepts and ideas. 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 in the structure of the examinations, case studies, laboratory demonstrations and project work.

Assessment Regulations

This Programme conforms to the standard University Taught Postgraduate Regulations, which are available at the link https://www.bradford.ac.uk/regulations/

However, there is one exception to these regulations as listed below:

To gain an accredited MSc award, students must achieve 180 credits in total, comprising 160 credits at 50% or above and 20 credits at 40% or above.

Students who achieve a mark between 40%-49% in up to 60 credits worth of modules will be permitted one supplementary assessment attempt to support them to remain on the accredited MSc with no more than 2 attempts in any module.

If the above requirement is not met, but the University's taught postgraduate regulations are complied with, then a non-accredited MSc will be awarded, MSc Engineering (Chemical).

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:

In addition to satisfying the general admissions requirements of the University of Bradford, the candidates must have:

2.2 equivalent Bachelor's degree in Chemical Engineering.

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	New curriculum	
2	Updated January intake	December 2020
3	Specification reformatted and made accessible	February 2021