UNIVERSITY OF LINCOLN

# Programme Specification

Title:

# Food Engineering

Final Award: **Foundation Degree in Engineering (FdEng)**

With Exit Awards at:
**Certificate of Higher Education (CertHE)**
**Foundation Degree in Science (FdSc)**

To be delivered from: 7 Jan 2019

| Level | Date |
|---|---|
| Level 1 or Certificate of Higher Education (CertHE) | 2019-20 |
| Level 2 or Foundation Degree in Science (FdSc) | 2020-21 |

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# 1. Introduction

This document describes one of the University of Lincoln's programmes using the protocols required by the UK National Qualifications Framework as defined in the publication *QAA guidelines for preparing programme specifications*.

This programme operates under the policy and regulatory frameworks of the University of Lincoln.

# 2. Basic Programme Data

| | |
|---|---|
| **Final Award:** | Foundation Degree in Engineering (FdEng) |
| **Programme Title:** | Food Engineering |
| **Exit Awards and Titles** | Certificate of Higher Education (CertHE)<br>Foundation Degree in Science (FdSc) |
| **Subject(s)** | Engineering<br>Food Science & Technology |
| **Mode(s) of delivery** | Part Time |
| **Is there a Placement or Exchange?** | No |
| **UCAS code** | |
| **Awarding Body** | University of Lincoln |
| **Campus(es)** | Holbeach Campus, Lincoln Campus |
| **School(s)** | National Centre for Food Manufacturing |
| **Programme Leader** | Isabel Campelos (ICampelos) |
| **Relevant Subject Benchmark Statements** | |
| **Professional, Statutory or Regulatory Body Accreditation** | |
| **Programme Start Date** | 2019-20 |

# 3. Programme Description

### 3.1 Overview

Apprenticeships are a key pillar in the Government's strategy to develop a highly skilled and technically capable workforce. Academic knowledge underpins the vocational skills to produce competencies relevant to the workplace. A series of Standards have been developed by Industrial Partnerships to define both the Academic Knowledge and Vocational Skills appropriate for a series of industrial activities. This Programme is designed to meet the Academic Knowledge requirements of the Food and Drink Engineer standard as well as potentially meeting the requirements of further Standards still under development. It provides knowledge crossing traditional trade boundaries to include mechanical, electrical/electronic, automation, production and food concepts, all considered within the food arena and termed food engineering.

A continuing thread of business organisational practices and needs ensures an emphasis on application theory as befits this highly vocational area of employment, making this degree highly relevant, not only to Apprenticeship Standards, but also to the general industry needs.

Focusing strongly on research-informed teaching, we have brought together an international team of staff from a range of disciplines and industry backgrounds to ensure that our students get the most from their course and the best start in their engineering careers. Its integration with the Vocational Skills of the Apprenticeship Scheme help provide some of the most capable graduates with a clearer focus on work-based responsibilities than has hitherto been possible.

### 3.2 Aims and Objectives

The overall aim of this programme is to create numerate and highly motivated graduates who will be in demand by a wide spectrum of organizations. The first two years of study lay the common foundations of mechanical engineering principles. The final year provides an opportunity for students to deepen their education in through a broad range of specialist modules that are integrated within the structured learning environment. The overall aims of this programme are:

• To offer an industrially relevant degree programme that places the student’s learning experience at the centre of every activity and provides students with the partial academic requirements for registration as an Incorporated Engineer (IEng).

• To provide a broad knowledge and understanding of mechanical or electrical engineering within a food context at level 5, all of this being informed by the research activities of the academic staff and drawing on the workplace practices and experiences of a actively engaged series of industrial collaborators within the food and drink arena.

• To produce graduates who can apply fundamental scientific principles and mathematical techniques in order to conceive, realise, create and innovate solutions to real-world engineering problems in a food environment.

• To equip students with an awareness of engineering in the wider social, ethical, sustainable and economic context.

• To give students the opportunity to develop their intellectual curiosity, their powers of creativity and innovation, and to reach their full potential in all aspects of University life.

• To provide opportunities for access and personal and professional development that will inspire a commitment to life-long learning.

• To produce graduates who are prepared for a career in food engineering.

• To produce graduates with industry-relevant experience, having considered the wider implications of industrial activity (i.e. ethics).

• To deliver course content embedded with opportunity for workplace engagement through project work and case studies at all levels and across modules (where appropriate), thus facilitating an evolving course content to reflect changing work environments, varied learners backgrounds and emerging technologies.

### 3.3 Variations to Standard Regulations and Guidance

None

# 4. Programme Outcomes

Programme-level learning outcomes are identified below.

Refer to *Appendix I – Curriculum Map* for details of how outcomes are deployed across the programme.

### 4.1 Knowledge and Understanding

On successful completion of this programme a student will have knowledge and understanding of:

| | |
|---|---|
| 1 | Legislative, regulatory and ethical requirements and their application to food engineering processes; food safety, hazard analysis and critical control points (HACCP), health & safety and environmental considerations |
| 2 | How to apply engineering knowledge in application of technical or practical skills. |
| 3 | Understand the processes of design, development, manufacture, construction, commissioning and operation of products, equipment, processes, systems or services. |
| 4 | Data collection and interpretation methods and applications including digitisation, control and optimisation of the workplace. |
| 5 | Maintenance planning, evaluation and management of risks to facilitate reliability. |
| 28 | The fundamental concepts, theories, principles, and limitations of engineering science, with knowledge of current practice selected areas of engineering and its relation to the food and drink sector at an advanced level. |
| 29 | The mathematical concepts and principles that is relevant to the analysis and solution of food engineering problems. |
| 30 | The principles, processes and methods of design, and how to apply them in the creation of new products and processes. |

### 4.2 Transferable Skills and Attributes

On successful completion of this programme a student will be able to:

| | |
|---|---|
| 6 | Demonstrates ability to work with and mentor others. |
| 7 | Promotes a culture of food safety and safe working practices |
| 8 | Takes responsibility and ownership of decision making for good food practice; is proactive, and demonstrates initiative; plans work: dependable; works autonomously within own sphere of responsibility |
| 9 | Demonstrates a strong work ethic; displays a positive mind set; pays attention to detail; looks for new ways of working that improve outcomes and results |
| 10 | Seeks learning, drives the development of self and others; maintains and enhances own practice through continuing professional development activity |
| 11 | Promotes integrity in process and site standards, respects others, promotes good communication at all levels, adapts personal style to meet work needs |
| 12 | Drives good relationships with others, works collaboratively, contributes ideas and challenges appropriately |

13 Applies appropriate solutions; works to identify and ensure root causes of problems are eliminated, demonstrating a tenacious approach

14 Flexible to changing working environment and demands; resilient under pressure

15 Awareness of relationship between business in relation to wider market and competition, keeps up to date with industry and market advancement, commercially aware

### 4.3 Subject Specific Practical Skills

On successful completion of this programme a student will be able to:

16 Use engineering principles to deliver products/packaged food consistently to specification that meets business, customer, sector and legislative requirements

18 Planning: coordinate labour and engineering materials with operational plans to optimise availability of plant and equipment

19 Influence and communicate with colleagues and others, including engineers, other functions and teams

20 Assess team and individual performance, providing feedback to improve; coach and mentor to grow skills and support the development of professional standards

21 Use continuous improvement techniques to drive continual quality improvement, including ensuring the application of quality management principles, to participate in failure investigations to ensure process effectiveness and to contribute to and implement practical engineering solutions for efficiency and/or profitability

26 Contribute to the construction and commissioning of equipment and machinery used for producing preserved/fresh and safe food and drink products

27 Apply engineering knowledge and specialist techniques e.g. reliability, to prevent or reduce the likelihood or frequency of failures

### 4.4 Subject Specific Intellectual Skills

On successful completion of this programme a student will be able to:

17 Comply with standard operating procedures, company, legal and regulatory requirements and customer/consumer and engineering standards

22 Use IT, digitisation and manual methods to collect and analyse data from systems to support engineering activity within the business

23 Use and develop planned preventative maintenance (PPM) strategies incorporating appropriate proactive maintenance routines i.e. vibration analysis, thermography, to simple visual/part measurement

24 Analyse operational performance, specification and data to minimise system failures to increase equipment reliability and availability

25 Evaluate possible failure modes and identify the most cost-effective strategy for your business e.g. technical risk assessment methods, PPM to RCM techniques

31 Integrate their knowledge and understanding of engineering, food, mathematics, design and business practice to propose solutions to food engineering problems.

32 Acquire, evaluate and understand the context of engineering and/or food information from a

range of sources and apply it in the solution of food engineering problems.

33 Use a systematic approach to define and investigate food engineering problems and display creativity and innovation in establishing engineering solutions.

For details of each module contributing to the programme, please consult the module specification document.

# 5. Learning, Teaching and Assessment Strategies

## 5.1. Learning and Teaching Strategy

The achievement of the learning outcomes is promoted through the following teaching and learning methods:

• Distance learning via the University VLE, utilising a blend of short videos, lecture notes, online interactive tools e-books and other downloadable resources as appropriate to the modules.
• Tutorials online via video-conferencing software linking lecturer to student groups for interactive question time or discussion on new material covered in that week.
• Week blocks on campus (half a week per module) to deliver additional lectures, intensive laboratory session or practical work un-deliverable at a distance.
• Lectures on campus to provide problem sheets, worked examples and/or case studies.
• Students will be directed to suitable resources involving a range of ICT to enable then to develop their understanding of the subject matter during self-directed study.
• Students will be expected to explain and defend their researched contentions to peers, to broaden the breadth of cohort understanding beyond normal lecture delivery.
• Tutorials and Example Classes will draw heavily on the students' workplace experiences. These classes provide an opportunity for students to explore and resolve problems under staff guidance and direction.
• Workshops are used to enable students to work on “open-ended” problems related to real engineering situations. They also provide good opportunities for developing team-working and communication skills as well as individual skills.
• Laboratory Classes are used to introduce experimental techniques and practical methods. They provide an excellent opportunity for students to practice team-working and communication skills.
• Coursework Assignments are used in a number of modules where students are required to seek additional information so that they can develop and demonstrate their understanding of the course material. Students may be required to work independently or in small groups.
• Oral and Poster Presentations are often included as part of coursework assignments. These presentations allow students to develop their communication skills.
• Formative Assessments do not contribute to the final marks achieved for each module, but provide an opportunity for students to develop their critical evaluation skills and to monitor their own academic progress. They also provide a useful opportunity for lecturers to give feedback to the students and to monitor and improve the students learning experience. These assessments will take the form of diagnostic tests, in-class tests and on-line tests during lectures, and evaluation and discussions relating to logbooks and equipment during laboratory classes. Students will have opportunities to develop their oral and presentation skills during tutorials and workshops.

Wherever possible, the Programme will make the maximum use of industry-university links so that graduates will gain practical experience in modern commercial and managerial practices appropriate to the engineering industry. In addition to traditional modes of delivery, workplace experience and industrial exposure is embedded within the program through the workplace vocational delivery.

## 5.2. Assessment Strategy

Assessment Strategy:
Assessment as far as possible will be facilitated digitally. This will not always be possible, hence some assessment will be clustered around campus weeks (i.e. examinations).

Opportunities for the student to demonstrate achievement of the learning outcomes are provided through summative assessment methods, including:

• Written Examinations; typically of 3 hours duration. The content of these exams is previously unseen by the student, and earlier modules may use written exams as the main assessment method. Different modules may use open or closed book, multiple choice, open ended and essay type exams
• Coursework Assignments, Laboratory Reports, Technical Reports, Technical Notes, Portfolios, Oral and Poster Presentations are widely used through out the degree programme to assess higher levels of understanding. They may constitute the only or the major form of assessment in later modules, but most modules will include both coursework and exams as part of the assessment strategy to assess foundation knowledge and deeper understanding within the subject. Coursework assignments increase in size and complexity as student's progress through their degree, and they are designed to give students the opportunity to demonstrate their understanding of the course material (particularly when the student is required to seek additional information). Students are also able to demonstrate their presentation and communication skills. Assignments can be conducted on an individual basis at the beginning of the degree programme, or increasingly as small groups as the student progresses.
• Computer Based Tests and Assessed Simulations are used in modules that involve a substantial computer-based element. These assessments give the students an opportunity to demonstrate their proficiency in a simulated professional situation and levels of analytical and logical problem solving.
• Peer Assessment will be used in modules that involve a substantial team-working element. Normally, students will moderate the final marks for the group project to reflect the contributions of different team members to encourage self assessment and engagement within a team environment.
• Demonstrations of Prototypes and Exhibitions are used to assess practical workshop skills and allow students the opportunity to demonstrate the realisation of a design project.
• Assessments in the programme are developed, published and assessed using a criterion referencing model with clearly defined grading criteria, 'rubriks'. Each module has an individual assessment strategy and this is stated in the module descriptor, where the link between individual module learning outcomes is made against individual assessment tasks.
• The equitability of the student's assessment experience is assured by the University's moderation and or second and double-marking procedures. The University's procedures and regulations regarding external verification of marks will be adhered to. To ensure the equitability of learning, employer mentors will be trained through an induction booklet to ensure that they understand the timescales involved in assessment and the emphasis on work-based learning.
• There will be individual module tutor and personal tutor support throughout the programme. The campus adheres to all equality and diversity policies and Consumer's Right Act 2015 adopted by the University of Lincoln (as seen in the Equality and Diversity Policy and Consumer's Right Act policy).
• Students are encouraged to review all the University's regulations and policies and are also posted on the communities' page on Blackboard via the University's portal. All students will be inducted on the use of the University's electronic resources during the induction. • The selection of the work-based-project title and scope and its execution will have support of the academic body as a part of gateway for this non-integrated programme.
• Support to the learner and employer will be available along the Learner's journey.

# 6. Programme Structure

The total number of credit points required for the achievement of Certificate of Higher Education (CertHE) is 120.
The total number of credit points required for the achievement of Foundation Degree in Science (FdSc) is 240.

**Level 1**

| Title | Credit Rating | Core / Optional |
|---|---|---|
| Food Quality Assurance, HACCP and Hygiene 2019-20 | 15 | Core |
| Electrical and Electronic Technology 2019-20 | 15 | Core |
| Introduction to Robotics 2019-20 | 15 | Core |
| Mathematics for Engineers 2019-20 | 15 | Core |
| Statics and Dynamics 2019-20 | 15 | Core |
| CAD and Technical Drawing 2019-20 | 15 | Core |
| Health & Safety, Energy and The Environment 2019-20 | 15 | Core |
| Food Components and Materials for Food Engineers 2019-20 | 15 | Core |

**Level 2**

| Title | Credit Rating | Core / Optional |
|---|---|---|
| Industrial Continuous Improvement 2020-21 | 15 | Core |
| Digital Systems and Microprocessors 2020-21 | 15 | Optional |
| Analogue Electronics 2020-21 | 15 | Optional |
| Solid Body Mechanics 2020-21 | 15 | Optional |
| Applied Dynamics and Vibrations 2020-21 | 15 | Optional |
| Mechatronics Systems 2020-21 | 15 | Core |
| Applied Thermofluids 2020-21 | 15 | Core |
| Food Process Engineering 2020-21 | 15 | Core |
| Food Factory Design 2020-21 | 15 | Core |
| Food Packaging Systems and Machinery 2020-21 | 15 | Core |

# Appendix I - Curriculum Map

This table indicates which modules assume responsibility for delivering and ordering particular programme learning outcomes.

**Key:** ✓ Delivered and Assessed  Delivered  ✓ Assessed

## Level 1

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAD and Technical Drawing 2019-20 | | ✓ | ✓ | | | ✓ | | ✓ | | ✓ | ✓ | ✓ |
| Electrical and Electronic Technology 2019-20 | | ✓ | ✓ | | | | ✓ | ✓ | | | | ✓ |
| Food Components and Materials for Food Engineers 2019-20 | ✓ | ✓ | ✓ | | | | | ✓ | | ✓ | ✓ | ✓ |
| Food Quality Assurance, HACCP and Hygiene 2019-20 | ✓ | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Health & Safety, Energy and The Environment 2019-20 | ✓ | | | | | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Introduction to Robotics 2019-20 | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | | | ✓ |
| Mathematics for Engineers 2019-20 | | | | ✓ | | | | ✓ | | | | |
| Statics and Dynamics 2019-20 | | ✓ | ✓ | | | | | ✓ | | | | ✓ |

| | PO13 | PO14 | PO15 | PO16 | PO17 | PO18 | PO19 | PO20 | PO21 | PO22 | PO23 | PO24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAD and Technical Drawing 2019-20 | ✓ | | | | | ✓ | ✓ | ✓ | | | | |
| Electrical and Electronic Technology 2019-20 | ✓ | | | | | | | | | | | |
| Food Components and Materials for Food Engineers 2019-20 | ✓ | | ✓ | | | | | | | | | |
| Food Quality Assurance, HACCP and Hygiene 2019-20 | ✓ | | ✓ | ✓ | ✓ | | | | | | | |
| Health & Safety, Energy and The Environment 2019-20 | ✓ | ✓ | | ✓ | ✓ | | | | | | | |
| Introduction to Robotics 2019-20 | ✓ | | | | | ✓ | ✓ | ✓ | | ✓ | | |
| Mathematics for Engineers 2019-20 | ✓ | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Statics and Dynamics 2019-20 | ✓ | | | | | | | | | ✓ | | |

| | PO25 | PO26 | PO27 | PO28 | PO29 | PO30 | PO31 | PO32 | PO33 |
|---|---|---|---|---|---|---|---|---|---|
| CAD and Technical Drawing 2019-20 | | | | ✓ | | ✓ | ✓ | | |
| Electrical and Electronic Technology 2019-20 | | | | ✓ | ✓ | ✓ | | | |
| Food Components and Materials for Food Engineers 2019-20 | | | | ✓ | | ✓ | | | |
| Food Quality Assurance, HACCP and Hygiene 2019-20 | | | | ✓ | | | | | |
| Health & Safety, Energy and The Environment 2019-20 | | | | ✓ | | | | | |
| Introduction to Robotics 2019-20 | | | | ✓ | | ✓ | | | |
| Mathematics for Engineers 2019-20 | | | | ✓ | ✓ | | | | ✓ |
| Statics and Dynamics 2019-20 | | | | ✓ | ✓ | ✓ | | | ✓ |

## Level 2

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analogue Electronics 2020-21 | | ✓ | ✓ | | | | | ✓ | | | | ✓ |
| Applied Dynamics and Vibrations 2020-21 | | ✓ | ✓ | | | | | ✓ | | | | ✓ |
| Applied Thermofluids 2020-21 | | ✓ | ✓ | | | | | ✓ | | | | ✓ |
| Digital Systems and Microprocessors 2020-21 | | ✓ | ✓ | | | | | ✓ | ✓ | | | ✓ |
| Food Factory Design 2020-21 | ✓ | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Food Packaging Systems and Machinery 2020-21 | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Food Process Engineering 2020-21 | | ✓ | ✓ | | | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Industrial Continuous Improvement 2020-21 | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | |
| Mechatronics Systems 2020-21 | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | | ✓ |
| Solid Body Mechanics 2020-21 | | ✓ | ✓ | | | | | ✓ | | | | ✓ |

| | PO13 | PO14 | PO15 | PO16 | PO17 | PO18 | PO19 | PO20 | PO21 | PO22 | PO23 | PO24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analogue Electronics 2020-21 | ✓ | | | | | | | | | | | |
| Applied Dynamics and Vibrations 2020-21 | ✓ | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Applied Thermofluids 2020-21 | ✓ | | | | | | | | | | | |
| Digital Systems and Microprocessors 2020-21 | ✓ | | | | | | | | | ✓ | | |
| Food Factory Design 2020-21 | ✓ | ✓ | | ✓ | ✓ | ✓ | | | | | | |
| Food Packaging Systems and Machinery 2020-21 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | |
| Food Process Engineering 2020-21 | ✓ | | | ✓ | ✓ | | | | | | | |
| Industrial Continuous Improvement 2020-21 | ✓ | | ✓ | | | | | | ✓ | | ✓ | ✓ |
| Mechatronics Systems 2020-21 | ✓ | ✓ | | | | | ✓ | ✓ | | ✓ | | |
| Solid Body Mechanics 2020-21 | ✓ | | | | | | | | | | | |

| | PO25 | PO26 | PO27 | PO28 | PO29 | PO30 | PO31 | PO32 | PO33 |
|---|---|---|---|---|---|---|---|---|---|
| Analogue Electronics 2020-21 | | | | ✓ | ✓ | ✓ | | | |
| Applied Dynamics and Vibrations 2020-21 | | | | ✓ | ✓ | ✓ | | | |
| Applied Thermofluids 2020-21 | | | | ✓ | ✓ | ✓ | ✓ | | |
| Digital Systems and Microprocessors 2020-21 | | | | ✓ | ✓ | ✓ | | | |
| Food Factory Design 2020-21 | | ✓ | | | | | ✓ | ✓ | |
| Food Packaging Systems and Machinery 2020-21 | | ✓ | | ✓ | | ✓ | | | |
| Food Process Engineering 2020-21 | | ✓ | | ✓ | | ✓ | | | |
| Industrial Continuous Improvement 2020-21 | ✓ | | ✓ | | | | | ✓ | |
| Mechatronics Systems 2020-21 | | | | ✓ | ✓ | ✓ | | | ✓ |
| Solid Body Mechanics 2020-21 | | | | ✓ | ✓ | ✓ | | | |

# Appendix II - Assessment Map

This table indicates the spread of assessment activity across the programme. Percentages indicate assessment weighting.

## Level 1

| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAD and Technical Drawing 2019-20 | | | | | | | | | | | | |
| Electrical and Electronic Technology 2019-20 | | | | | | | | | | | | |
| Food Components and Materials for Food Engineers 2019-20 | | | | | | 60 | | | | | 40 | |
| Food Quality Assurance, HACCP and Hygiene 2019-20 | | | | | 50 | | | | | 50 | | |
| Health & Safety, Energy and The Environment 2019-20 | | | | | | | | | | | | |
| Introduction to Robotics 2019-20 | | | | | | | | | | | | |
| Mathematics for Engineers 2019-20 | | | | | 25 | | | | | | | |
| Statics and Dynamics 2019-20 | | | | | | | | | | | | |

| | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAD and Technical Drawing 2019-20 | 100 | | | | | | | | | | | |
| Electrical and Electronic Technology 2019-20 | | | | | | | 100 | | | | | |
| Food Components and Materials for Food Engineers 2019-20 | | | | | | | | | | | | |
| Food Quality Assurance, HACCP and Hygiene 2019-20 | | | | | | | | | | | | |
| Health & Safety, Energy and The Environment 2019-20 | | | | | | | | | | 50 | | |
| Introduction to Robotics 2019-20 | | | | | | | | | | | | |
| Mathematics for Engineers 2019-20 | | | | | | | | | | | | |
| Statics and Dynamics 2019-20 | | | | | | | | | | | | |

| | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAD and Technical Drawing 2019-20 | | | | | | | | | | | | |
| Electrical and Electronic Technology 2019-20 | | | | | | | | | | | | |
| Food Components and Materials for Food Engineers 2019-20 | | | | | | | | | | | | |
| Food Quality Assurance, HACCP and Hygiene 2019-20 | | | | | | | | | | | | |
| Health & Safety, Energy and The Environment 2019-20 | | | 50 | | | | | | | | | |
| Introduction to Robotics 2019-20 | | 100 | | | | | | | | | | |
| Mathematics for Engineers 2019-20 | | | | | | | | | | | | |
| Statics and Dynamics 2019-20 | | | 25 | | | | | | | | | |

| | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAD and Technical Drawing 2019-20 | | | | | | | | | | | | |
| Electrical and Electronic Technology 2019-20 | | | | | | | | | | | | |
| Food Components and Materials for Food Engineers 2019-20 | | | | | | | | | | | | |
| Food Quality Assurance, HACCP and Hygiene 2019-20 | | | | | | | | | | | | |
| Health & Safety, Energy and The Environment 2019-20 | | | | | | | | | | | | |
| Introduction to Robotics 2019-20 | | | | | | | | | | | | |
| Mathematics for Engineers 2019-20 | | | | | | | | | | | | |
| Statics and Dynamics 2019-20 | | | | | | | | | | | | |

| | 49 | 50 | 51 | 52 | EP 1 (Wk 16) | EP 2 (Wks 33, 34, 35) |
|---|---|---|---|---|---|---|
| CAD and Technical Drawing 2019-20 | | | | | | |
| Electrical and Electronic Technology 2019-20 | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Food Components and Materials for Food Engineers 2019-20 | | | | | | | | | | | | |
| Food Quality Assurance, HACCP and Hygiene 2019-20 | | | | | | | | | | | | |
| Health & Safety, Energy and The Environment 2019-20 | | | | | | | | | | | | |
| Introduction to Robotics 2019-20 | | | | | | | | | | | | |
| Mathematics for Engineers 2019-20 | | | | | | | | | | | | 75 |
| Statics and Dynamics 2019-20 | | | | | | | | | | | | 75 |

## Level 2

| | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analogue Electronics 2020-21 | | | | | | | | | | | | |
| Applied Dynamics and Vibrations 2020-21 | | | | | | | | | | | | |
| Applied Thermofluids 2020-21 | | | | | | | | | | | | 50 |
| Digital Systems and Microprocessors 2020-21 | | | | | | | | | | | | |
| Food Factory Design 2020-21 | | | | | | | | | | | | |
| Food Packaging Systems and Machinery 2020-21 | | | | | | | | | | | | |
| Food Process Engineering 2020-21 | | | | | | | | | | | | |
| Industrial Continuous Improvement 2020-21 | | | | | | | | | | | | |
| Mechatronics Systems 2020-21 | | | | | | | | | | | | |
| Solid Body Mechanics 2020-21 | | | | | | | | | | | | |

| | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analogue Electronics 2020-21 | | | | | | | | 25 | | | | |
| Applied Dynamics and Vibrations 2020-21 | | | | | | | 25 | | | | | |
| Applied Thermofluids 2020-21 | | | | | | | | | | | | 50 |
| Digital Systems and Microprocessors 2020-21 | | | | | | | | | | | 50 | |
| Food Factory Design 2020-21 | | | | | | | | | | | 50 | |
| Food Packaging Systems and Machinery | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020-21 | | | | | | | | | | | | |
| Food Process Engineering 2020-21 | | | | | | | | | | | | |
| Industrial Continuous Improvement 2020-21 | | | | | | | | | | | | |
| Mechatronics Systems 2020-21 | | | | | | | | | | | | |
| Solid Body Mechanics 2020-21 | | | | | | | | | | | | |

| | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analogue Electronics 2020-21 | | | | | | | | | | | | |
| Applied Dynamics and Vibrations 2020-21 | | | | | | | | | | | | |
| Applied Thermofluids 2020-21 | | | | | | | | | | | | |
| Digital Systems and Microprocessors 2020-21 | | | | | | | | | | | | |
| Food Factory Design 2020-21 | | | | 50 | | | | | | | | |
| Food Packaging Systems and Machinery 2020-21 | 50 | | | | | | | | | | | |
| Food Process Engineering 2020-21 | | | 60 | | | | | | | | | |
| Industrial Continuous Improvement 2020-21 | 50 | | | | | | | | | | 50 | |
| Mechatronics Systems 2020-21 | | | | 40 | | | | | | | | |
| Solid Body Mechanics 2020-21 | | | 25 | | | | | | | | | |

| | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analogue Electronics 2020-21 | | | | | | | | | | | | |
| Applied Dynamics and Vibrations 2020-21 | | | | | | | | | | | | |
| Applied Thermofluids 2020-21 | | | | | | | | | | | | |
| Digital Systems and Microprocessors 2020-21 | | | | | | | | | | | | |
| Food Factory Design 2020-21 | | | | | | | | | | | | |
| Food Packaging Systems and Machinery 2020-21 | | | | | | | | | | | | |
| Food Process Engineering 2020-21 | | | | | | | | | | | | |
| Industrial Continuous Improvement 2020-21 | | | | | | | | | | | | |
| Mechatronics Systems 2020-21 | | | | | | | | | | | | |
| Solid Body Mechanics 2020-21 | | | | | | | | | | | | |

| | 49 | 50 | 51 | 52 | EP 1 (Wk 16) | EP 2 (Wks 33, 34, 35) |
|---|---|---|---|---|---|---|
| Analogue Electronics 2020-21 | | | | | | 75 |
| Applied Dynamics and Vibrations 2020-21 | | | | | | 75 |
| Applied Thermofluids 2020-21 | | | | | | |
| Digital Systems and Microprocessors 2020-21 | | | | | | 50 |
| Food Factory Design 2020-21 | | | | | | |
| Food Packaging Systems and Machinery 2020-21 | | | | | | 50 |
| Food Process Engineering 2020-21 | | | | | | 40 |
| Industrial Continuous Improvement 2020-21 | | | | | | |
| Mechatronics Systems 2020-21 | | | | | | 60 |
| Solid Body Mechanics 2020-21 | | | | | | 75 |

# Appendix III - Benchmark Analysis

This table maps programme learning outcomes to relevant QAA subject benchmark statements or PSRB guidelines.

## Knowledge and Understanding

| | Engin01 | Engin02 | Engin03 | Engin04 | Engin05 | Engin06 | Engin07 | Engin08 | Engin09 |
|---|---|---|---|---|---|---|---|---|---|
| PO1 | | | | | | | | ✓ | |
| PO2 | | | | | | | ✓ | | |
| PO3 | | | | ✓ | | | | | |
| PO4 | | | | | ✓ | ✓ | | | |
| PO5 | | | | | | | | | |
| PO28 | ✓ | | | | | | | | |
| PO29 | | ✓ | | | | | | | |
| PO30 | ✓ | | ✓ | | | | | | |

| | Engin10 | Engin11 | Engin12 | Engin13 | Engin14 | Engin15 | Engin16 | Engin17 | Engin18 |
|---|---|---|---|---|---|---|---|---|---|
| PO1 | | | | | | | | ✓ | |
| PO2 | | | | | | | | | |
| PO3 | | | | | | | | | |
| PO4 | | | | | | | | | |
| PO5 | | | | | | | | | |
| PO28 | | | | | | | | | |
| PO29 | | | | | | | | | |
| PO30 | | | | | | | | | |

| | Engin19 | Engin20 | Engin21 | Engin22 | Engin23 | Engin24 | Engin25 | Engin26 |
|---|---|---|---|---|---|---|---|---|
| PO1 | | | | | | | | |
| PO2 | | | | | | | | |
| PO3 | ✓ | | | | | | | |
| PO4 | | | | | | | | |
| PO5 | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PO28 | | | | | | | | |
| PO29 | | | | | | | | |
| PO30 | | ✓ | | | | | | |

## Subject Specific Intellectual Skills

| | Engin01 | Engin02 | Engin03 | Engin04 | Engin05 | Engin06 | Engin07 | Engin08 | Engin09 |
|---|---|---|---|---|---|---|---|---|---|
| PO17 | | | | | | | | | |
| PO22 | | | | | ✓ | | | | |
| PO23 | | | | | | | | | |
| PO24 | | | | | | | | | |
| PO25 | | | | | | ✓ | | | |
| PO31 | | | ✓ | | | | | | |
| PO32 | | | | | ✓ | ✓ | ✓ | ✓ | |
| PO33 | | | | | | | | ✓ | |

| | Engin10 | Engin11 | Engin12 | Engin13 | Engin14 | Engin15 | Engin16 | Engin17 | Engin18 |
|---|---|---|---|---|---|---|---|---|---|
| PO17 | | | | | | | | ✓ | |
| PO22 | | | | ✓ | | | | | |
| PO23 | | | ✓ | | | | | | |
| PO24 | | | ✓ | | | | | | |
| PO25 | ✓ | | | | | | | | |
| PO31 | | | | | | | | | |
| PO32 | | | | | | | | | |
| PO33 | | ✓ | | | | | | | |

| | Engin19 | Engin20 | Engin21 | Engin22 | Engin23 | Engin24 | Engin25 | Engin26 |
|---|---|---|---|---|---|---|---|---|
| PO17 | | | | | | | | |
| PO22 | ✓ | | | | | | | |
| PO23 | ✓ | | | | | | | |
| PO24 | ✓ | | | | | | | |
| | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PO25 | | | | | | | | |
| PO31 | | | | | | | | |
| PO32 | | | | | | | | |
| PO33 | | | | | | | | |

## Subject Specific Practical Skills

| | Engin01 | Engin02 | Engin03 | Engin04 | Engin05 | Engin06 | Engin07 | Engin08 | Engin09 |
|---|---|---|---|---|---|---|---|---|---|
| PO16 | | | | | | | | | ✓ |
| PO18 | | | | | | | | | |
| PO19 | | | | | | | | | |
| PO20 | | | | | | | | | |
| PO21 | | | | | | | | | |
| PO26 | | | | | | | | | |
| PO27 | | | ✓ | | | | | | |

| | Engin10 | Engin11 | Engin12 | Engin13 | Engin14 | Engin15 | Engin16 | Engin17 | Engin18 |
|---|---|---|---|---|---|---|---|---|---|
| PO16 | | | | | ✓ | | | | |
| PO18 | | | | | | ✓ | | | |
| PO19 | | | | | ✓ | | | | |
| PO20 | | | | | | | | | ✓ |
| PO21 | | | ✓ | ✓ | | | | | |
| PO26 | | | | | | | | | |
| PO27 | | | | | | | | | |

| | Engin19 | Engin20 | Engin21 | Engin22 | Engin23 | Engin24 | Engin25 | Engin26 |
|---|---|---|---|---|---|---|---|---|
| PO16 | | | | | | ✓ | ✓ | |
| PO18 | | | | ✓ | | | | |
| PO19 | | | ✓ | ✓ | | | | |
| PO20 | | | | | | | | |
| PO21 | | | | | | | | |
| | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PO26 | | ✓ | | ✓ | | | | |
| PO27 | | | | | | | | |

## Transferable Skills and Attributes

| | Engin01 | Engin02 | Engin03 | Engin04 | Engin05 | Engin06 | Engin07 | Engin08 | Engin09 |
|---|---|---|---|---|---|---|---|---|---|
| PO6 | | | | | | | | | |
| PO7 | | | | | | | | | |
| PO8 | | | | | | | | | |
| PO9 | | | | | | | | | |
| PO10 | | | | | | | | | |
| PO11 | | | | | | | | | |
| PO12 | | | | | | | | | |
| PO13 | | | | | | | | | |
| PO14 | | | | | | | | | |
| PO15 | | | | | | | | | |

| | Engin10 | Engin11 | Engin12 | Engin13 | Engin14 | Engin15 | Engin16 | Engin17 | Engin18 |
|---|---|---|---|---|---|---|---|---|---|
| PO6 | | | | | | | | | ✓ |
| PO7 | | | | | | | | ✓ | |
| PO8 | | ✓ | | | | | | | |
| PO9 | | | | | | | | | |
| PO10 | | | | | | | | | ✓ |
| PO11 | | | | | | | | | ✓ |
| PO12 | | | | | | ✓ | | | |
| PO13 | | ✓ | | | | | | | |
| PO14 | | | | | | | | | |
| PO15 | | | | | | | | | |

| | Engin19 | Engin20 | Engin21 | Engin22 | Engin23 | Engin24 | Engin25 | Engin26 |
|---|---|---|---|---|---|---|---|---|
| PO6 | | | | | | | | |
| | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PO7 | | | | | | ✓ | | |
| PO8 | | | | | | | | |
| PO9 | | | | | | | | ✓ |
| PO10 | | | | | | | | |
| PO11 | | | | ✓ | | | | |
| PO12 | | | | | | | | |
| PO13 | | | | | | | | |
| PO14 | | | | | | | | ✓ |
| PO15 | | | ✓ | | ✓ | | | |

# Appendix IV:
# Benchmark Benchmark Statement(s)

**Engin01** - *Knowledge and understanding of scientific principles and methodology necessary to underpin their education in mechanical and related engineering disciplines, to enable appreciation of its scientific and engineering context and to support their...*

**Engin02** - *Knowledge and understanding of mathematical principles necessary to underpin their education in mechanical and related engineering disciplines and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and...*

**Engin03** - *Ability to apply and integrate knowledge and understanding of other engineering disciplines to support the study of mechanical and related engineering disciplines.*

**Engin04** - *Understanding of engineering principles and the ability to apply them to analyse key engineering processes.*

**Engin05** - *Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques.*

**Engin06** - *Ability to apply quantitative methods and computer software relevant to mechanical and related engineering disciplines, to solve engineering problems.*

**Engin07** - *Understanding of and ability to apply a systems approach to engineering problems.*

**Engin08** - *Investigate and define a problem and identify constrains including environmental and sustainability limitations, health and safety and risk assessment issues.*

**Engin09** - *Understand customer and user needs and the importance of considerations such as aesthetics.*

**Engin10** - *Identify and manage cost drivers.*

**Engin11** - *Use creativity to establish innovative solutions.*

**Engin12** - *Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal.*

**Engin13** - *Manage the design process and evaluate outcomes.*

**Engin14** - *Knowledge and understanding of commercial and economic context of engineering processes.*

**Engin15** - *Knowledge of management techniques which may be used to achieve engineering objectives within that context.*

**Engin16** - *Understanding of the requirement for engineering activities to promote sustainable development.*

**Engin17** - *Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues.*

**Engin18** - *Understanding of the need for a high level of professional and ethical conduct in engineering.*

**Engin19** - *Knowledge of characteristics of particular equipment, processes or products.*

**Engin20** - *Engineering workshop and laboratory skills.*

**Engin21** - *Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology, development, etc)*

**Engin22** - *Understanding use of technical literature and other information sources.*

**Engin23** - *Awareness of nature of intellectual property and contractual issues.*

**Engin24** - *Understanding of appropriate codes of practice and industry standards.*

**Engin25** - *Awareness of quality issues.*

**Engin26** - *Ability to work with technical uncertainty.*