



## **Programme Specification**

### **Automotive Engineering {Foundation} [Frenchay]**

Version: 2023-24, v1.1, Validated

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## Section 1: Key Programme Details

### Part A: Programme Information

**Programme title:** Automotive Engineering {Foundation} [Frenchay]

**Highest award:** BEng (Hons) Automotive Engineering

**Interim award:** BEng Automotive Engineering

**Interim award:** DipHE Automotive Engineering

**Interim award:** CertHE Automotive Engineering

**Awarding institution:** UWE Bristol

**Teaching institutions:** UWE Bristol

**Study abroad:** No

**Year abroad:** No

**Sandwich year:** Yes

**Credit recognition:** No

**School responsible for the programme:** CATE School of Engineering, College of Arts, Technology and Environment

**Professional, statutory or regulatory bodies:**

Institution of Mechanical Engineers (IMechE)

**Modes of delivery:** Full-time, Sandwich

**Entry requirements:** For the current entry requirements see the UWE public website.

**For implementation from:** 01 September 2023

**Programme code:** H33H00

## Section 2: Programme Overview, Aims and Learning Outcomes

## Part A: Programme Overview, Aims and Learning Outcomes

**Overview:** The curriculum is designed for students seeking an engineering education closely aligned to engineering practice. Technical knowledge, engineering practice, business awareness and sustainability are integrated through projects and revisited throughout the programme to produce confident graduates able to apply their skills to novel situations and create engineering solutions that benefit society.

Professional development is placed at the heart of the curriculum. From day one, students are taken on a journey from student engineer to graduate engineer, preparing them for life as an engineering professional. Students will identify, develop and demonstrate competencies expected of a professional engineer in the workplace. Projects and activities, embedded throughout the curriculum, are designed to develop the engineering habits of mind such as: Problem-finding, Problem-solving, Visualising, Systems Thinking, Improving, and Adapting. Foundation principles of engineering science, skills and practice are integrated throughout all years of study.

The programme will produce Automotive engineering specialists who will also have a strong mechanical engineering background that will allow employment throughout the engineering sector. Automotive engineering is characterised by the coordination of multidisciplinary teams to produce innovative design solutions and an integrated systems approach to performance improvement and manufacturing. The programme is designed to encourage students to integrate engineering knowledge and skills from across engineering and to work alongside students from other engineering disciplines.

Mechanical engineering analysis, design, structures, stress analysis, dynamics, materials, thermofluids, systems and manufacturing are developed throughout the core and taken to an advanced level in the optional modules. Sufficient electrical and electronic content has been included in the core programme for the study of engineering problems involving electromechanical and mechatronic systems with the option of further studying advanced artefacts.

Automotive specialist core modules are offered at level 6 that include the critically important study of emerging technologies to make possible new engineering designs and create power and fuel systems for automotive products designed for a sustainable future for automotive transport.

The ability to work in multidisciplinary teams on projects that require a broader view of the role of engineering in industry and society is developed through the core programme using project weeks to bring students together in problem finding and solution spaces where students are able to interact with each other, academics and external practitioners.

The integration of knowledge, skills and practice allows the tackling of real engineering challenges and encourage students to engage with the wider role that engineers and specifically engineering habits of mind can play in tackling global challenges. This is an accessible and modern engineering curriculum designed to attract students from diverse backgrounds able to see the future role of engineering in industry and society.

**Features of the programme:** Immersive Project Weeks create student engineer community within curriculum and new building.

Integrated Learning Framework and use of problem-based and project-based learning.

Industry informed curriculum

Engineering Practice modules to scaffold the journey from student engineer to graduate engineer.

Professional and personal development embedded throughout all levels of the programme.

Interdisciplinary projects

Real engineering problems in core curriculum where students can explore industrial, environmental and societal impact of discipline.

Mathematics skills aligned taught in engineering context.

**Educational Aims:** As a result of successful completion of this programme, a student will:

Be able to work as a graduate engineer in the automotive sector and related disciplines. Students will have demonstrated the appropriate level of knowledge and understanding of mechanical engineering so that they will be in a position to secure employment as automotive specialists and in the wider engineering domain.

Have acquired the knowledge and understanding of scientific principles and methods necessary to underpin an education in engineering. The programme will provide insight into, and practical skills in, the creation of complex engineering products, particularly in relation to automotive engineering and will explore the environmental impact of automotive technologies.

Have demonstrated an ability to integrate their knowledge and understanding of core subject material in order to solve a substantial range of engineering problems, including ones of a complex nature either individually or as part of a team.

Have developed and demonstrated understanding of the competencies and social responsibilities required by a professional engineer in the workplace and society. Activities to scaffold this development are embedded throughout the core curriculum to develop the engineering habits of mind. As a consequence, students will be able to critically appraise the value and effectiveness of future engineering innovations in the field in terms of business improvement and environmental sustainability.

Have the requisite academic knowledge, skills and preparation for progression to study for higher degrees in appropriate engineering disciplines.

Be equipped to make an early contribution to the success of an engineering organization having demonstrated strategic management and leadership skills within the context of a significant innovative engineering project requiring technical and business expertise.

**Programme Learning Outcomes:**

On successful completion of this programme graduates will achieve the following learning outcomes.

**Programme Learning Outcomes**

- PO1. Apply established and novel mechanical analysis concepts to solve engineering problems involving design, operations and manufacture that arise within the automotive sector.
- PO2. Use systems incorporating digital hardware, software, communication, processing algorithms, interfacing circuits and parameter sensing and actuating devices.
- PO3. Model automotive engineering systems and be able to specify and assess technical designs
- PO4. Understand the manufacturing, financial and marketing implications of design proposals.
- PO5. Identify the links between design, manufacturing and production management and assess the capabilities of manufacturing systems software used in the design, maintenance and improvement of manufacturing facilities within the automotive specialism.
- PO6. Communicate and operate effectively either as individuals or as members of a team.
- PO7. Pursue independent study, research and investigations to undertake enquiry into novel and unfamiliar concepts and implement change in an engineering environment.
- PO8. Make considered judgements and decisions on complex engineering issues in which not all facts and consequences are accurately known.

**Assessment strategy:** The assessment strategy for the new curriculum is designed to connect topics and levels within the curriculum and to enable students to reflect upon their development. The assessment methods on the programme are aligned to

the requirements of the Institution of Mechanical Engineers who place high importance on the demonstration of authentic and verifiable learning outcomes for each individual student. This consideration can lead to a reliance on written examinations and limit the scope for project or group work activities. We have therefore widened the range of activities within our examinations to include more open book examinations, questions based on pre-seen scenarios, questions that build on practical laboratory-based activities and computer-based examinations where students demonstrate the use of software to solve engineering problems. The assessment strategy is designed to work for large module cohorts, typically associated with this programme (130-300).

The above Factors influence and inform the design of this programme's assessment strategy.

In year 1 the Engineering Practice 1 module develops professional attributes and engineering habits of mind through activities and assessments that encourage reflections through a structured portfolio and presentations. As part of the portfolio we have the concept of a "passport" where students demonstrate key professional skills such as workshop skills, library skills and health and safety awareness. This "replicates" part of the experience of an engineering apprentice but for one who is working in an academic environment.

The assessment strategies of the other core level 4 modules each designed to make sure that the content covered is connected. Solid Mechanics, Materials and Manufacturing and Dynamics Modelling and Simulation are strong examples of the design as students are assessed on key technical material during or at the end of the first semester, then moving to an exercise where the knowledge and skill is assessed in the context of an engineering design problem and then with a controlled assessment at the end of the module. The written examination references and builds upon design activities undertaken during the module and provides an efficient vehicle for integrating the different module elements and assessing individual knowledge. The assessment strategy is programmatic and connects the two immersive project weeks with the task from the first feeding into the second where a more technical treatment is considered bringing the content from these two modules

together.

The level 4 module Thermofluids has an examination where examination questions are based around previously completed laboratory sessions, an activity that should mean that they are fully engaged and aware of how to prepare for that assessment. The assessment at level 4 should create the culture required for students to embrace active learning styles., an activity that should mean that they are fully engaged and aware of how to prepare for that assessment. The assessment at level 4 should create the culture required for students to embrace active learning styles.

At level 5 Structural Mechanics, Dynamics and Applied Thermofluids all provide examples of how content and assessment is developed from level 4 to level 5. The immersive project weeks are used by the project orientated modules Engineering Practice 2 and Engineering Research.

The module Engineering Practice 2 takes over from the level 4 version and is a module that relies on the importance and creation of the team with key roles allocated and the dynamics of the team monitored through a regular peer assessment process. The problem to be tackled and forms the vehicle for the assessment is designed to be motivational and accessible and is assessed through group presentation.

Engineering Research is designed to have a significant impact on our operation. Students work in groups to scope out research ideas. They then work with technical and academic staff to develop a project proposal that will pitched as an individual presentation that will feed forward to an individual written proposal. Students should be able to start their individual level 6 project from the very start of that academic year.

In the final years of the programmes students are able to work on individual and group projects to showcase their understanding and skill as engineering practitioners. The design of the Engineering Research module will strengthen performance, management and consistency of the Engineering Project. Optional modules provide the opportunity to pursue specialist areas and a variety of

assessment approaches are used for these modules.

The interdisciplinary Group Design and Integration Project is an exciting new development that brings mechanical, automotive, electronic engineers and roboticists together on projects that are electromechanical in nature. Typical problem fields could involve projects in biomechanics, assistive living, autonomous vehicles, robotics or electric powered vehicles. Projects from these areas would each have the potential to demonstrate modern developments and impact of engineering. The assessment for this module replicates a professional environment with group design review meetings forming part of the assessment.

**Student support:** Espresso Engineering and Espresso Maths drop-in support stations.

Personality and professional strengths finding activity at start of programme.

Mathematics diagnostic testing and follow-up interventions early in year 1.

Development of group work skills and attributes.

Academic mentors to provide continuity of support to SpLD students

Academic personal tutors

Video capture of course content delivery

E-assessments for rapid feedback

## **Part B: Programme Structure**

### **Year 1**

Full time and sandwich students must take 120 credits from the modules in Year 1.

### Year 1 Compulsory Modules (Full Time and Sandwich)

Full time and sandwich students must take 120 credits from the modules in Compulsory Modules (Full Time and Sandwich).

| Module Code  | Module Title                                         | Credit |
|--------------|------------------------------------------------------|--------|
| UFMFEG-30-0  | Engineering Experimentation 2023-24                  | 30     |
| UFMFHG-15-0  | Foundation Group Project 2023-24                     | 15     |
| UFMFBG-30-0  | Foundation Mathematics: Algebra and Calculus 2023-24 | 30     |
| UFMFAG-30-0  | Foundation Mechanics 2023-24                         | 30     |
| UFMFCEG-15-0 | Introduction to Mechatronics 2023-24                 | 15     |

### Year 2

Full time and sandwich students must take 120 credits from the modules in Year 2.

### Year 2 Compulsory Modules (Full Time and Sandwich)

Full time and sandwich students must take 120 credits from the modules in Compulsory Modules (Full Time and Sandwich).

| Module Code | Module Title                                         | Credit |
|-------------|------------------------------------------------------|--------|
| UFMFPS-15-1 | Applied Electrical Technology 2024-25                | 15     |
| UFMFMS-30-1 | Dynamics Modelling and Simulation 2024-25            | 30     |
| UFMFKS-30-1 | Engineering Practice 1 2024-25                       | 30     |
| UFMFLS-30-1 | Solid Mechanics, Materials and Manufacturing 2024-25 | 30     |
| UFMFNS-15-1 | Thermofluids 2024-25                                 | 15     |

### Year 3

Full time and sandwich students must take 120 credits from the modules in Year 3.

**Year 3 Compulsory Modules (Full Time and Sandwich)**

Full time and sandwich students must take 120 credits from the modules in Compulsory Modules (Full Time and Sandwich).

| <b>Module Code</b> | <b>Module Title</b>            | <b>Credit</b> |
|--------------------|--------------------------------|---------------|
| UFMFTS-30-2        | Applied Thermofluids 2025-26   | 30            |
| UFMFL8-15-2        | Dynamics 2025-26               | 15            |
| UFMFQS-15-2        | Engineering Practice 2 2025-26 | 15            |
| UFMFRS-15-2        | Engineering Research 2025-26   | 15            |
| UFMFSS-30-2        | Structural Mechanics 2025-26   | 30            |
| UFMFUS-15-2        | Systems Design 2025-26         | 15            |

**Year 4**

Full time students must take 120 credits from the modules in Year 4.

Sandwich students must take 15 credits from the modules in Year 4.

**Year 4 Compulsory Modules (Full Time)**

Full time students must take 105 credits from the modules in Compulsory Modules (Full Time).

| <b>Module Code</b> | <b>Module Title</b>                          | <b>Credit</b> |
|--------------------|----------------------------------------------|---------------|
| UFMFWS-15-3        | Emerging Automotive Technology 1 2026-27     | 15            |
| UFMFX8-30-3        | Engineering Project 2026-27                  | 30            |
| UFMFV8-15-3        | Group Design and Integration Project 2026-27 | 15            |
| UFMFNQ-15-3        | Professionalism for Engineers 2026-27        | 15            |
| UFMFXS-15-3        | Vehicle Design Fundamentals 2026-27          | 15            |
| UFMFVS-15-3        | Vehicle Dynamics 2026-27                     | 15            |

**Year 4 Compulsory Modules (Sandwich)**

Sandwich students must take 15 credits from the modules in Compulsory Modules (Sandwich).

Students on the sandwich route take a placement year and study UFMF89-15-3 Industrial Placement.

| Module Code | Module Title                 | Credit |
|-------------|------------------------------|--------|
| UFMF89-15-3 | Industrial Placement 2026-27 | 15     |

**Year 4 Optional Modules (Full Time)**

Full time students must take 15 credits from the modules in Optional Modules (Full Time).

| Module Code | Module Title                                              | Credit |
|-------------|-----------------------------------------------------------|--------|
| UFMF7T-15-3 | Advanced Heat Transfer 2026-27                            | 15     |
| UFMFYS-15-3 | Advanced Manufacturing Technology 2026-27                 | 15     |
| UFMFU6-15-3 | Composite Engineering 2026-27                             | 15     |
| UFMFYJ-15-3 | Control Engineering 2026-27                               | 15     |
| UFMFCL-15-3 | Engineering and Society 2026-27                           | 15     |
| UFMFSL-15-3 | Integrated Electro-Mechanical Systems 2026-27             | 15     |
| UFMF7K-15-3 | Materials and Structures for Special Applications 2026-27 | 15     |

**Year 5**

Sandwich students must take 105 credits from the modules in Year 5.

**Year 5 Compulsory Modules (Sandwich)**

Sandwich students must take 90 credits from the modules in Compulsory Modules (Sandwich).

| Module Code | Module Title | Credit |
|-------------|--------------|--------|
|-------------|--------------|--------|

|             |                                              |    |
|-------------|----------------------------------------------|----|
| UFMFWS-15-3 | Emerging Automotive Technology 1 2027-28     | 15 |
| UFMFX8-30-3 | Engineering Project 2027-28                  | 30 |
| UFMFV8-15-3 | Group Design and Integration Project 2027-28 | 15 |
| UFMFXS-15-3 | Vehicle Design Fundamentals 2027-28          | 15 |
| UFMFVS-15-3 | Vehicle Dynamics 2027-28                     | 15 |

### Year 5 Optional Modules (Sandwich)

Sandwich students must take 15 credits from the modules in Optional Modules (Sandwich).

| Module Code | Module Title                                              | Credit |
|-------------|-----------------------------------------------------------|--------|
| UFMF7T-15-3 | Advanced Heat Transfer 2027-28                            | 15     |
| UFMFYS-15-3 | Advanced Manufacturing Technology 2027-28                 | 15     |
| UFMFU6-15-3 | Composite Engineering 2027-28                             | 15     |
| UFMFYJ-15-3 | Control Engineering 2027-28                               | 15     |
| UFMFCL-15-3 | Engineering and Society 2027-28                           | 15     |
| UFMFSL-15-3 | Integrated Electro-Mechanical Systems 2027-28             | 15     |
| UFMF7K-15-3 | Materials and Structures for Special Applications 2027-28 | 15     |

### Part C: Higher Education Achievement Record (HEAR) Synopsis

Graduates of this programme will be equipped with a broad understanding of mechanical and automotive analysis and design, combined with knowledge of engineering practice, information technology and project management.

The programme produces graduates with a broad-based 'systems' approach to engineering problem solving. Graduates from this programme will be equipped to work in multi-disciplinary teams, able to critically appraise existing ideas and practice and produce creative solutions to engineering problems.

#### **Part D: External Reference Points and Benchmarks**

QAA UK Quality Code for HE

Framework for higher education qualifications (FHEQ)

Subject benchmark statement for Higher Education qualifications in engineering (Feb 2015)

Strategy 2030

University policies

Staff research projects

Relevant PSRB requirements: AHEP3

Industrial Advisory Board

#### **Part E: Regulations**

B: Approved variant to University Academic Regulations and Procedures

The following variant regulations have been approved by the University Regulations to comply with conditions set out by Engineering Council UK.

The degree classification for the 360 credit honours degree BEng (Hons) Automotive Engineering (or 480 credit honours degree with an integrated foundation year) is based upon the best marks for 100 credits at level 6 and the best marks achieved for the next 100 credits at level 5 or above.

Marks achieved for the 100 level 6 credits are weighted three times the value of the marks for the 100 credits at level 5 or above.

The calculation at level 6 must always use the full credit and mark for the level 6 project module UFMFX8-30-3 followed by the best marks associated with the remaining level 6 credits.

Where the credit size of the best marks associated with the remaining level 6 modules would give a credit total greater than 100, only the relevant portion of credit is counted. The unused credit may be counted towards the set of best marks at level 5 or above.

The classification method for direct entrants to the BEng in Automotive Engineering will include the marks and whole credit for the project.

Approved to University Regulations and Procedures.

The PSRB requirements below are permitted within the regulations.

The following requirements apply to awards which have been accredited by a PSRB that comes under the auspices of the Engineering Council UK:

- The permitted maximum compensated credit is 30 credits for a Bachelors or Integrated Masters degree, and a maximum of 20 credits in a Masters degree.
- The awarding of compensated credit may be considered for an overall module mark in the range of 30% to 39% for Levels 4-6 and 40%-49% for Level 7.
- Major individual and group-based project modules must not be compensated.
  
- This requirement applies to Award Boards from (for learners at all levels) 2023/24 onwards.