

**College of Engineering 2023-2024  
BEng (Hons) Mechanical Engineering – Dual Award  
Module Descriptors**

<b>Module Title &amp; Code</b>	<b>Mathematics 1 ASU_S_MA1</b>
<b>Description</b>	The module is designed to provide students with the mathematical knowledge and skills to support the study of engineering and to provide the requirement for entry into the BEng programmes at ASU. Therefore, it is a preparatory or foundation module building on the knowledge obtained at school.

<b>Module Title &amp; Code</b>	<b>Mathematics 2 ASU_S_MA2</b>
<b>Description</b>	The module is designed to provide students with the mathematical knowledge and skills necessary for transition to Level 4 study of engineering subjects. Students will attend lectures and tutorials where mathematical exercises are undertaken. Where possible, the statistical content will introduce the use of statistical packages and the presentation of real-life data sets. All students will keep a logbook of the problems tackled. Besides the 36 contact hours, students are encouraged to spend some time on their own to practice the mathematical concepts they learn during the lectures and solve extra problems.

<b>Module Title &amp; Code</b>	<b>Engineering Science 1 ASU_S_ES1</b>
<b>Description</b>	This module covers scientific principles of physics and chemistry at a level between secondary school level and Advanced Level. It serves as a preparatory module for students intending to undertake engineering undergraduate degree programmes at the University and introduces students to a range of skills required for the study of engineering.

<b>Module Title &amp; Code</b>	<b>Engineering Science 2 ASU_S_ES2</b>
<b>Description</b>	This module is aimed at extending the engineering students' science knowledge in preparation for continuing their respective engineering degrees. It covers general applied physical principles, including dynamics, statics, fluids, heat and energy.

<b>Module Title &amp; Code</b>	<b>Intermediate English ASU_S_IEN</b>
<b>Description</b>	A 10 CAT module which runs for one semester of 15 weeks for three hours per week. It is the first credit English module that ASU undergraduate students are required to take. The module provides intensive practice in upper-intermediate reading, oral presentations, writing, and note-taking. Academic and study skills are embedded in

	the module. The module develops students' English language and analytical skills to pursue a more advanced ASU academic English module and cope with the literacy demands of specialised modules taught in English.
<b>Module Title &amp; Code</b>	<b>Advanced English ASU_S_AEN</b>
<b>Description</b>	A 10 CAT module, which runs for one semester of 15 weeks for three hours per week. It is the second credit English module that ASU undergraduate students are required to take. The module provides intensive practice in advanced level reading, oral presentations, writing, and listening. Academic and study skills are embedded in the module. This module aims to enhance students' English and analytical skills as a prerequisite for academic and professional success.
<b>Module Title &amp; Code</b>	<b>Engineering Design and Modelling ASU_S_EDM</b>
<b>Description</b>	This module provides an introduction to engineering design, including the basics of the design process, machining and fabrication and hand and computer engineering drawings. The module will also highlight the role of engineering design within the engineering industry. The module will be taught in a mechanical workshop where students are expected to use model-making tools.
<b>Module Title &amp; Code</b>	<b>Scientific Principles of Engineering ASU_S_SPE</b>
<b>Description</b>	This module develops the students' understanding of essential physics and chemistry principles for the study of engineering. It is designed to be accessible to students with a wide range of prior science specialisations. The module introduces the fundamentals of statics, dynamics and the electrical and mechanical properties of materials.
<b>Module Title &amp; Code</b>	<b>Study Skills and Professional Practice ASU_S_SSP</b>
<b>Description</b>	This module provides an introduction to both study and professional skills and practice. The module introduces study skills considering both individual and team-working skills; it covers exam preparation, revision and question answering techniques. It introduces students to their own Personal Development Planning processes. It also enables students to develop and use appropriate safe working practices as expected in an engineering and industrial environment.

<b>Module Title &amp; Code</b>	<b>Laboratory and Workshop Skills ASU_S_LWS</b>
<b>Description</b>	This module is a mixture of workshop exercises and practical experiments and projects. Students work in small groups of 2-5 people, depending on the task. The module also provides students with an introduction to design skills and basic engineering drawing.

<b>Module Title &amp; Code</b>	<b>Computer Programming for Engineering ASU_S_CPE</b>
<b>Description</b>	This module introduces students to concepts of programming. This includes conditional, iterations and block structure. Structure programming and data-types will also be introduced and illustrated on typical and simple engineering problems.

<b>Module Title &amp; Code</b>	<b>Human Rights ASU_S_HUR</b>
<b>Description</b>	<p>This module deals with the basic principles of human rights in terms of the definition of human rights and its scope and source, focusing on the provisions of the international law of human rights, which include the following international documents:</p> <ol style="list-style-type: none"> <li>a. Charter of the United Nations</li> <li>b. The Universal Declaration of Human Rights</li> <li>c. The International Covenant on Civil and Political Rights</li> <li>d. The International Covenant on Economic, Social and Cultural Rights</li> <li>e. Convention against Torture and Cruel, Inhumane Punishments.</li> <li>f. Protection Mechanisms and Constitutional Organisation of Public Rights and</li> <li>g. Freedom in the Kingdom of Bahrain</li> </ol>

<b>Module Title &amp; Code</b>	<b>Bahrain Civilisation and History ASU_S_BCH</b>
<b>Description</b>	The aim of the module is to highlight the role of the Kingdom of Bahrain in its local, regional and international levels through various historical eras, beginning with the Old Ages through the Islamic era to the modern era. The module demonstrates the Arab and Islamic identity of the Kingdom of Bahrain and the vital role they play politically and culturally.

<b>Module Title &amp; Code</b>	<b>Arabic Language ASU_S_ALA</b>
<b>Description</b>	This module of 10 CAT's runs for one semester of 7 weeks (Summer Semester). The module provides intensive practice in reading, oral presentations, writing, and note-taking.

<b>Module Title &amp; Code</b>	<b>Arabic Language for Non-Arabic Speakers ASU_S_ALN</b>
<b>Description</b>	This module of 10 CAT's runs for one semester of 7 weeks (Summer Semester). This Arabic module is required to be taken by non-Arabic speaking students in ASU undergraduate Engineering programmes. The module provides intensive practice for beginners in reading, oral presentations, writing, and note-taking.

<b>Module Title &amp; Code</b>	<b>Design and Practice ASU_4_DAP</b>
<b>Description</b>	This module provides an introduction to engineering practice and design, including hand and computer-aided drawings, design activities, sustainable design principles, project management, group work and health and safety issues. The module will have a lab component where students will apply the theoretical concepts.

<b>Module Title &amp; Code</b>	<b>Engineering Mathematics and Modelling ASU_4_EMM</b>
<b>Description</b>	This module consolidates the mathematical skills that underpin the BEng engineering degrees. The module contents include Differentiation and Integration Complex Numbers, Linear Algebra, Statistics, Elementary Probability, and Probability Distributions with Applications to Engineering Problems. The module includes a practical component where students use mathematical software packages (Matlab and Excel) to apply the theoretical concepts learnt in class.

<b>Module Title &amp; Code</b>	<b>Introduction to Mechanical Engineering ASU_4_IME</b>
<b>Description</b>	This module provides an introduction to the concepts of mechanical engineering, which include the properties and limitations of engineering materials, engineering mechanics such as statics, strength of the material, dynamics and material science. The module will include a practical component where students will conduct appropriate practical laboratory experiments to equip students with practical skills related to the mechanical engineering profession.

<b>Module Title &amp; Code</b>	<b>Engineering Computing ASU_4_ENC</b>
<b>Description</b>	This is an introductory module to Object-Oriented Programming (OOP) using Python programming language, which will address programming knowledge and skills. It will enable students to acquire computer programming skills needed for developing software used in engineering design and simulation.

<b>Module Title &amp; Code</b>	<b>Thermofluids and Dynamics ASU_4_TAD</b>
<b>Description</b>	This module provides an introductory study of Thermofluids, including heat transfer, fluid mechanics and thermodynamics, which enable students to analyse simple engineering systems and processes. The module will include a practical component where students acquire practical skills through conducting experiments on thermodynamics and fluid mechanics in the Thermofluids lab.

<b>Module Title &amp; Code</b>	<b>Introduction to Electrical and Electronic Engineering ASU_4_IEE</b>
<b>Description</b>	This module covers the fundamentals of both electrical and electronic engineering. The module starts with the basic concepts of Voltage, Current, Power and Energy and the basic laws that govern electrical circuits, such as Ohm's Law and Kirchhoff's Law and more advanced circuit analysis techniques, such as Node Voltage and Mesh Current methods, DC responses of RC, RL RLC circuits, and AC sinusoidal circuit theory. Then, the module will cover the basics of semiconductors (Diodes, BJTs and Op-Amps). The module includes a practical component where students perform experiments to apply the theoretical concepts and gain practical skills in circuits and electronics.

<b>Module Title &amp; Code</b>	<b>Advanced Engineering Mathematics and Modelling ASU_5_AMM</b>
<b>Description</b>	This module covers advanced engineering mathematical techniques used for solving engineering problems, including Computational Techniques in Engineering, Vectors, Differential equations, Selected Numerical and Computational methods, Advanced Matrix computation techniques, Advanced Computational Optimisation, and advanced statistical techniques, including Permutations and combinations. Binomial, Poisson and normal distributions.

<b>Module Title &amp; Code</b>	<b>Solid Mechanics and Finite Element Analysis (FEA) ASU_5_FEA</b>
<b>Description</b>	This module discusses concepts in the deformation of materials building based on knowledge gained in L3 and L4 modules, where the fundamental principles of solid mechanics are applied to more complex systems. The module will provide basic principles of the finite element analysis (FEA) techniques and their application in structural and stress analysis. The module involves a practical component where students use FEA software to implement the theoretical concepts.

<b>Module Title &amp; Code</b>	<b>Machine Drives and Mechatronics ASU_5_MDM</b>
<b>Description</b>	This module provides the fundamentals of mechanical drives, power transmission systems, microcontrollers and electrical actuation systems. The module has a lab component where students will conduct experiments on mechanical and mechatronic control systems in advanced engineering applications.

<b>Module Title &amp; Code</b>	<b>Dynamics and Control ASU_5_DAC</b>
<b>Description</b>	The module covers dynamics and classical theory. It extends the treatment of dynamics from point masses to rigid bodies and covers a wider scope of applications of the principles of mechanics. The module also deals with applying various mathematical techniques to the study of dynamics and feedback problems. Additionally, various methods of classical control, such as Bode, Nyquist and Root Locus will be analysed. The module includes a practical component where students conduct experiments in teams, analyse data, and communicate experimental results in written technical reports in order to improve their knowledge and understanding of basic concepts of automatic control.

<b>Module Title &amp; Code</b>	<b>Thermofluids and Sustainable Energy ASU_5_TSE</b>
<b>Description</b>	This module provides further study of heat transfer, fluid mechanics and thermodynamics over the L4 module on Thermodynamics, where the theory needed to allow an industrial-level analysis of processes is presented. The topics include Steam cycles, Air standard cycles, Refrigeration cycles, Turbulence, Combustion and Heat Transfer, including heat equation conduction resistance networks, applications, convection and radiation.

<b>Module Title &amp; Code</b>	<b>Engineering Design ASU_5_END</b>
<b>Description</b>	The first half of this module is designed to extend the student's understanding and ability to appropriately select and then apply a range of design methodologies, computer-aided design tools, and techniques to the solution of engineering design problems. A wide range of problem-solving techniques will be introduced to reinforce the need for a structured approach to engineering design. "Hands-on" experience is offered to the student, including further 2D design work software, together with a strong emphasis on 3D parametric modelling and the associated tools widely used in industry.

<b>Module Title &amp; Code</b>	<b>Internship ASU_5_INT</b>
<b>Description</b>	This module provides the students with an opportunity to experience the industrial world and be part of a team working on real-world projects. The University assists each student in finding the most suitable industry.



<b>Module Title &amp; Code</b>	<b>Dynamics and System Modelling ASU_6_DSM</b>
<b>Description</b>	<p>To provide participants with an appropriate way of visualising the complex interrelationships between various parts of real-world problems; problems that continually change over time and are resistant to corrective action. Therefore, the module provides a solid foundation for developing strategies and managing problems for which conventional reductionist ways of thinking are ineffective. The module is subsequently designed to provide the understanding of the following:</p> <ul style="list-style-type: none"> <li>• System dynamics and why use it</li> <li>• The modelling approach/ processes</li> <li>• The basic feedback structures</li> <li>• How to develop a system dynamics model.</li> </ul> <p>Therefore, this module introduces the concepts of system dynamics modelling, including the modelling process, fundamental modes of dynamic behaviour, and the stock-flow-feedback structures that generate them, system mapping tools, and modelling human behaviour. Emphasis will be on examples from the energy and water sectors and aquaculture management, but students will have the opportunity to engage with their own real-world problems.</p>

<b>Module Title &amp; Code</b>	<b>Project ASU_6_PRO</b>
<b>Description</b>	<p>The project is a learning experience that enables students to do independent research and bring together many of the concepts they have learned. The work calls for careful planning, critical judgment, engineering competence, and communication skills. Further details are provided in the Individual Project Guide for Students. This guide may be updated from time to time, including information generally on how to plan the project, milestones, important dates, and deliverables. The module will spread over the first and second semesters of Year 4.</p>

<b>Module Title &amp; Code</b>	<b>Innovation and Enterprise ASU_6_IAE</b>
<b>Description</b>	<p>The module is intended to be practical, with students developing some appropriate ideas of their own in such a way that they become practical, profitable propositions. Students will practice ways of finding ideas, testing those ideas and developing them, and will write their own business strategies, risk assessments and scenario testing so that they demonstrate the commercial viability of their ideas. Topics include project management skills which help determine the critical path of a proposed business, such as intellectual property, market research, market placement, advertising and finance. Students will be expected to reflect on what they can contribute to a group.</p>

<b>Module Title &amp; Code</b>	<b>Thermofluids and Turbo Machinery ASU_6_TTM</b>
<b>Description</b>	This module provides a further study of heat transfer, fluid mechanics and thermodynamics, exploring in-depth internal combustion engines, fluid mechanics governing equations, the performance of various types of pumps and turbines, and application of heat transfer to extended surfaces and heat exchangers. The module involves conducting experiments in teams; on condensation apparatus, boiling heat transfer apparatus, central heating system, refrigeration cycle apparatus, weather station, four-stroke spark ignition engine.

<b>Module Title &amp; Code</b>	<b>Manufacturing Systems and Materials Technologies          ASU_6_MMT</b>
<b>Description</b>	This module provides an advanced study on stress analysis, materials behaviours, and process selection. The module also introduces the core concepts of manufacturing systems, manufacturing and operations strategies, manufacturing automation, manufacturing process planning, material handling storage and retrieval. Students will also develop an understanding of the role of robotics in manufacturing and the principles of operations management.