College of Engineering
BEng (Hons) Electrical and Electronic Engineering – Dual Award
Module Descriptors

Module Title & Code	**Mathematics 1 ASU_S_MA1**
Description	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.

Module Title & Code	**Mathematics 2 ASU_S_MA2**
Description	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.

Module Title & Code	**Engineering Science 1 ASU_S_ES1**
Description	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.

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

Module Title & Code	**Intermediate English ASU_S_IEN**
Description	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.

Module Title & Code	**Advanced English ASU_S_AEN**
Description	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.

Module Title & Code	**Practical Electronics ASU_S_PRE**
Description	This module discusses electrical measurement equipment and practical circuit design and construction techniques. The module is a mixture of theory and practical components where students will become familiar with the basics of electrical and electronic engineering and the relating practical aspects, especially awareness of safe working practices in electronics.

Module Title & Code	**Scientific Principles of Engineering ASU_S_SPE**
Description	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.

Module Title & Code	**Study Skills and Professional Practice ASU_S_SSP**
Description	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.

Module Title & Code	Laboratory and Workshop Skills ASU_S_LWS
Description	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.

Module Title & Code	Computer Programming for Engineering ASU_S_CPE
Description	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.

Module Title & Code	Human Rights ASU_S_HUR
Description	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: a. Charter of the United Nations b. The Universal Declaration of Human Rights c. The International Covenant on Civil and Political Rights d. The International Covenant on Economic, Social and Cultural Rights e. Convention against Torture and Cruel, Inhumane Punishments. f. Protection Mechanisms and Constitutional Organisation of Public Rights and g. Freedom in the Kingdom of Bahrain

Module Title & Code	Bahrain Civilisation and History ASU_S_BCH
Description	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.

Module Title & Code	Arabic Language ASU_S_ALA
Description	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.

Module Title & Code	Arabic Language for Non-Arabic Speakers ASU_S_ALN
Description	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.

Module Title & Code	Design and Practice ASU_4_DAP
Description	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.

Module Title & Code	Engineering Mathematics and Modelling ASU_4_EMM
Description	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, 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.

Module Title & Code	Engineering Principles ASU_4_EPR
Description	The module develops the students' understanding of essential scientific principles for the study of engineering to the degree level. It is designed to be accessible to students with a wide range of prior science specialisations. The module introduces the principles of measurement systems and units, thermal physics, mechanical and electrical principles, and engineering materials and their properties.

Module Title & Code	Engineering Computing ASU_4_ENC
Description	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.

Module Title & Code	**Introduction to Electrical and Electronic Engineering ASU_4_IEE**
Description	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.

Module Title & Code	**Introduction to Digital Electronics ASU_4_IDE**
Description	This module aims to teach students introductory material that an electronic engineer should know before proceeding with any digital design. The material in this module is divided into two parts. The first part will cover the analysis and implementation of Boolean Logic circuits and the modelling using a proprietary CAD and VHDL (VHSIC Hardware Description Language). The second part of the module will focus on the analysis and implementation of Sequential Logic circuits, their modelling and implementation using Programmable Logic Devices. The module includes a practical component where students perform experiments to apply the theoretical concepts and gain practical skills in digital electronics.

Module Title & Code	**Advanced Engineering Mathematics and Modelling ASU_5_AMM**
Description	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.

Module Title & Code	**Circuits, Signals and Systems ASU_5_CSS**
Description	In practical engineering, it is very common to assume, at least initially, that the system to be analysed or designed is linear and time-invariant. Linear, time-invariant systems provide potentially good approximations of the behaviour of many systems in their normal operating region. The advantage of linear, time-invariant systems is that they can generally be analysed. On the other hand, Nonlinear systems cannot generally be analysed, and one is forced to resort to approximate analysis based on simulation. This module offers an introduction to the analysis of linear, time-invariant systems. Ideally, the analysis of a system involves the

	determination as mathematical functions of time of all of the signals associated with the system. Accordingly, it is impossible to provide an analysis procedure for systems without a preliminary discussion of signals. Specifically, the module introduces and explains the mathematical ideas, which underpin the very important concept of the frequency content of a signal. The module covers the mathematics required to undertake a study of dynamics, communication theory, signal processing, advanced circuit theory, partial differential equations and control theory, with engineering examples. The module also provides advanced techniques for the solution of linear, constant coefficient, and ordinary differential equations. The module includes a practical component where students perform Matlab/ Simulink experiments to apply the theoretical concepts and gain practical skills in the design of linear systems.

Module Title & Code	**Principles of Control ASU_5_POC**
Description	The module is an introduction to the theory and practice of continuous-time feedback control systems to enable the design and implementation of control systems for applications such as robotics, automobiles, aircraft, automatic machinery, and chemical processes. It provides an analytical approach to the modelling of dynamical systems and their analysis by applying engineering mathematics. The module includes a practical component where students perform experiments to apply the theoretical concepts and gain practical skills in control systems.

Module Title & Code	**Team Design Project ASU_5_TDP**
Description	This module aims at developing students' skills in engineering design, including identifying and meeting requirements for new products (tangible product, process, or system), such as consideration of regulatory, professional and standards requirements. The module develops students' abilities in working as part of a team, handling information, project planning and management, and report-writing and presentation skills.

Module Title & Code	**Electrical Machines and Power Electronics ASU_5_EPE**
Description	The module discusses the design of modern electrical drives, with consideration of the machine, power electronics and control requirements. Comparisons are made between drive types and typical applications considered. Magnetic and electric loadings; thermal design; winding design, choice of pole number, phase number, field and armature location. Permanent magnet machines; induction machines; switched reluctance machines; vector control of ac machines; applications characteristic of ac drives; comparative evaluation of different drives. Use of commercially available software to perform machine analysis and design. The module includes a practical component where students perform experiments to apply theoretical concepts and gain practical skills

	in electrical machines and power electronics.

Module Title & Code	**Analogue and Digital Circuit Design ASU_5_ADC**
Description	This module provides students with the knowledge of analogue, mixed-signal and digital circuits and also experience with both the practical issues of device-level design and system-level performance requirements. A key feature is a balanced approach to both analogue and digital IC design. The module includes a practical component where students perform experiments to apply the theoretical concepts and gain practical skills in analogue and digital circuit design.

Module Title & Code	**Internship ASU_5_INT**
Description	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.

Module Title & Code	**Digital Systems Design ASU_6_DSD**
Description	This module covers the design and analysis of modern digital systems utilising finite state machines. Comparison between the use of CPLDs and microcontrollers in typical embedded systems will be made, and appropriate hardware and software methods for a successful design will be considered. Synchronous and asynchronous designs will be covered along with a consideration of the principles of 'design for testability' and JTAG technologies. CAD tools will be used to design and simulate integrated circuits on the silicon workspace. The module also covers further programming methods using HDLs and HLL programming of MCUs. The module includes a practical component where students perform lab experiments to apply the theoretical concepts and gain practical skills in designing and testing digital electronic systems.

Module Title & Code	**Project ASU_6_PRO**
Description	The Individual 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 and include 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.

Module Title & Code	**Innovation and Enterprise ASU_6_IAE**
Description	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.

Module Title & Code	**Control Engineering ASU_6_CEN**
Description	This module builds on the Level 5 module Principles of Control. It introduces a range of Analogue and Digital Control methods to estimate system dynamics and to improve system stability, servo tracking and regulation of system outputs against unknown disturbances. Implementation of these methods in a laboratory will closely support the theory. The application-oriented part of the module will use case studies and laboratory work relating specifically to the individual disciplines. The module includes a practical component where students perform experiments to apply the theoretical concepts and gain practical skills in control engineering.

Module Title & Code	**Advanced Analogue and RF Electronics ASU_6_AAE**
Description	This module covers the design and analysis of radio frequency systems from early design to modern digital systems. Noise measurement, reduction, shielding, grounding and general issues of EMC are covered. RF terminology and wave propagation are explained, along with a look at modulation/demodulation techniques and the circuits needed to carry them out, such as mixers, oscillators, amplifiers, etc. The module includes a practical component where students perform experiments to apply the theoretical concepts and gain practical skills in analogue and RF electronics.