PROGRAMME SPECIFICATION

Part 1: Information	
Awarding Institution	UWE Bristol
Teaching Institution	University Centre Weston (UCW) (levels 1 and 2) UWE Bristol (level 3 in part) Defence Academy (MOD) (level 3 in part).
Delivery Location	UCW (as above) UWE Bristol (as above) Defence Academy (as above)
Study abroad / Exchange / Credit recognition	Not applicable
Faculty responsible for programme	Faculty of Environment and Technology
Department responsible for programme	Engineering, Design and Mathematics
Professional Statutory or Regulatory Body Links	IMechE accreditation being sought for apprenticeship delivery
Highest Award Title	BEng(Hons) Mechanical Engineering (Nuclear)
Default Award Title	Not applicable.
Interim/Progression Award Titles	BEng Mechanical Engineering FdSc Mechanical Engineering Certificate of Higher Education, Engineering Students must successfully complete the FdSc Mechanical Engineering at UCW prior to entry to level 3 of BEng Mechanical Engineering (Nuclear).
UWE Progression Route	BEng (Hons) Mechanical Engineering (Nuclear)
Mode of Delivery	Year 1 full-time (attendance); Years 2 to 5 part-time (attendance)
ISIS code/s	
For implementation as part of an apprenticeship from	September 2017
Apprenticeship Standard and type	Nuclear Scientist and Engineer (integrated)
Main training provider	UCW
UWE's role (if UWE is not the main training provider)	Awarding institution and delivery sub-contractor
End Point Assessment Institution/Organisation	TBC
Additional training provider(s)	Defence Academy (MOD) (delivering 60 credits at level 3)

Part 2: Description

The Nuclear Scientist and Engineer Apprenticeship Standard defines the mandatory qualification requirements which all apprentices must achieve in order to complete an apprenticeship. Alongside the development of foundation and development competencies, apprentices must achieve a BEng(Hons) which will be stipulated by the employer and must be accredited by an Engineering Council licenced Professional Engineering Institution. In this case the employer has stipulated the BEng(Hons) Mechanical Engineering (Nuclear) which is accredited by the Institute of Mechanical Engineers. A phased approach is taken to the delivery of this apprenticeship, for the first 3 years apprentices will be studying towards an FdSc in Mechanical Engineering. Successful completion of the Foundation Degree enables direct entry to level 3 of the BEng(Hons) which will take a further two years to complete

For full details how FdSc Mechanical Engineering and BEng(Hons) Mechanical Engineering (Nuclear) align to the Apprenticeship Standard please see **appendix 1**.

The aims of the programme are that graduates will be able to:

1. apply established and novel Mechanical Analysis concepts to the solution of engineering problems involving Design, Operations and Manufacture.;
2. use systems incorporating digital hardware, software, communication, processing algorithms, interfacing circuits and parameter sensing and actuating devices;
3. model mechanical engineering systems so as to be able to specify and assess the technical design;
4. understand the manufacturing, financial and marketing implications of design proposals;
5. identify the links between design, manufacturing and production management
6. operate effectively either as individuals or as members of a multi-disciplinary team;
7. communicate effectively both orally and in written form;
8. make considered judgements and decisions on complex engineering issues in which not all facts and consequences are accurately known
9. apply engineering design, systems and management concepts within the nuclear sector.

Programme requirements for the purposes of the Higher Education Achievement Record (HEAR)

This programme forms the knowledge qualification for a degree apprenticeship and is designed to produce graduates with a broad understanding of mechanical analysis and design, combined with knowledge of engineering practice, information technology and project management within the nuclear sector. 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.

Regulations

Delete one of the following statements as appropriate

A: Approved to University Regulations and Procedures

Part 3: Learning Outcomes of the Programme	
A Knowledge and understanding of 1. The principles governing the behavior of mechanical components and systems. 2. Mathematical methods appropriate to Mechanical engineering and related fields. 3. The properties, characteristics and selection of materials used in mechanical components and systems. 4. A sound understanding of core engineering science and technologies with greater depth in areas pertinent to mechanical systems. 5. The principles of information technology and data communications from a user's perspective. 6. Social, environmental, ethical, economic and commercial factors 7. The complexity of large-scale engineering systems and projects, with particular emphasis upon mechanical systems. 8. apply engineering design, systems and management concepts within the nuclear sector.	**Teaching/learning methods and strategies:** Acquisition of 1 to 8 is through a combination of formal lectures, tutorials, laboratory work, guided project work, group assignments, independent projects and case studies. The acquisition of 8 with its specific emphasis on the nuclear sector is achieved by the inclusion of 60 credits of nuclear specialist material at level 3 of the programme which includes a 40 credit individual project. The programme of study is designed to introduce basic knowledge and understanding of the technologies underpinning engineering, design and product development through a range of level 1 modules. This basic knowledge is developed through a range of taught modules at level 2, and integrated through group design and project work at levels 3. Advanced tools and technologies are studied in the final years of the programmes, and the programme as a whole is integrated through the B.Eng individual project at level 3. Throughout the student is encouraged to undertake independent reading both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject. **Assessment:** Testing of the knowledge base is through assessed course work, through tasks undertaken under examination conditions, through oral presentations and assessed practical work done in various laboratories.
B Intellectual Skills	
Intellectual Skills 1. The ability to produce solutions to problems through the application of engineering knowledge and understanding. 2. The ability to use scientific principles in the modelling and analysis of engineering systems, processes and products. The ability to select and apply appropriate mathematical methods for modelling and analysing relevant problems. 3. The ability to use a broad spectrum of technologies/techniques to solve complex engineering problems.	**Teaching/learning methods and strategies:** At all levels students are required to bring together knowledge and skills acquired in several modules and hence determine new ways of working. As the student progresses, the need to synthesize ever- greater volumes of information and approaches into a coherent approach is developed and consequently so is their critical thinking. At level 1 analysis, evaluation and problem solving are developed on small-scale problems in various programming activities in a number of modules. Here the focus is on understanding the problem and then solving it free from the environmental implications of real- world problems and without the need to examine alternatives and to balance conflicting goals.

Part 3: Learning Outcomes of the Programme	
4. The ability to select and apply appropriate computer based methods for modelling and analysing problems in fields relating to the design, manufacture and control of Mechanical components and systems. 5. Adoption of a creative and innovative approach to solving problems and design. 6. Comprehension of the broad picture and demonstration of of a professional attitude to the responsibilities of engineering practitioners.	At level 2 there is a move away from small-scale problems to the design of larger scale systems. With this comes the need to evaluate alternative methods and designs and to balance conflicting objectives. Level 3 sees the move to specific application examples and with it the need to appreciate problem contexts is developed as well as striking the right balance when facing conflicting objectives. **Assessment:** The development of engineering solutions requires demonstration of all of the intellectual skills. At level 1 the focus is on the skills of Analysis, Evaluation and Problem Solving. At levels 2 and 3 this branches out to include all the remaining skills. Independent reading is used to enable students to focus on their own areas of interest and in the process assess skills in submitted reports, assignments and exam answers. Mechanical Engineering work requires demonstration of a very wide range of skills (1 - 6). These skills are assessed through a combination of coursework assessments, projects and examinations.
C Subject, Professional and Practical Skills	
Subject, Professional and Practical Skills 1. Appropriate skills including safe working in experimental work in laboratories and workshops. 2. Demonstrate practical testing of engineering ideas through laboratory work or simulation with supporting technical analysis and critical evaluation of results. 3. Understanding and execution of the design process. 4. Use of a range of computer software for design, analysis and control. 5. Execution and management of multi-disciplinary projects, both individually and as a member of a group.	**Teaching/learning methods and strategies:** Throughout the program, the skills listed are developed through a combination of theoretical discussion, practical laboratory based work, classroom based tutorial exercises and directed self-study. The majority of modules delivered underpin theoretical work with practical sessions. Many of the skills listed are introduced at level 1 and then drawn into sharper focus at levels 2 and 3. A consistent design methodology is delivered throughout the Programme. The general teaching/learning method is to impart these practical/professional skills by a process of moving from an overview of what is required to a specific application of an individual skill at a higher level. Some very specific skills are introduced at level 3. These are underpinned by the more generalized capabilities that are practised throughout the levels in most of the modules that contribute to the award.

Part 3: Learning Outcomes of the Programme	
	Assessment: The possession of these skills is demonstrated by the development of practical laboratory work, coursework, presentations and examinations. The practical nature of the skills to be acquired means that some are specifically addressed by particular modules, whilst the more generic skills are assessed across a range of modules.
D Transferable Skills and other attributes	
Transferable Skills and other attributes 1. Communication skills: to communicate orally or in writing, including, for instance, the results of technical investigations, to peers and/or to "problem owners". 2. Self-management skills: to plan and manage time, to meet deadlines and to work with others. 3. IT Skills in Context (to use software in the context of problem-solving investigations, and to interpret findings) 4. Problem formulation and solution. 5. Progression to independent learning: To gain experience of and to develop skills independently of structured class work. 6. Comprehension of professional literature: to read and to use literature sources appropriate to the discipline to support learning activities.	**Teaching/learning methods and strategies:** 1 is developed through a variety of methods and strategies including the following: • Students maintain laboratory log books • Students participate in electronic conferences, workshops, and group work sessions. • Students participate in discussion tutorials • Students present research topic findings in tutorials • Students participate in individual tutorials 2 is developed through a variety of methods and strategies including the following: • Students conduct self-managed practical work • Students participate in practically-oriented tutorial laboratory sessions • Students work through practical work-sheets in teams • Students practice design and programming 3 is developed widely throughout the programme. 4 is developed through a variety of methods and strategies including the following: • Students develop problem solving programs • Students practice design and programming • Students sketch designs of larger systems 5 is developed through a variety of methods and strategies including the following: • Students are encouraged to practice programming to extend their skills • Students develop problem-solving programs • Students are encouraged to research relevant topics • Students are encouraged to use online facilities to discover information 6 is developed through a variety of methods and strategies including the following: • Students are encouraged to access online material

Part 3: Learning Outcomes of the Programme	
	Assessment: These skills are demonstrated in a variety of contexts including • examination • poster presentation. • individual and group projects • practical assignments • portfolio of exercises In addition skill two is assessed by both peers and tutors.

Part 4: Programme Structure

This section describes the programme as it will be delivered for the apprenticeship from entry through to graduation including:

- level and credit requirements
- interim award requirements
- module diet, including compulsory and optional modules

			Compulsory Modules	Optional Modules	Awards
ENTRY to FdSc Mechanical Engineering	Year 1 at UCW	Level 1 full-time	UFMFJ9-30-1 Engineering Mathematics		**Interim award**: Cert HE Mechanical Engineering (120 credits)
			UFMF7C-30-1 Design, Materials and Manufacturing (WBL)		
			UFMFH3-30-1 Stress & Dynamics		
			UFMFF3-15-1 Energy & Thermodynamics		
			UFMFG3-15-1 Fluid Dynamics		
FdSc Mechanical Engineering	Year 2.1 at UWE (Taught by UCW)	Level 2 part-time	UFMF8C-15-2 Project Management (WBL)		
			UFMFK9-15-2 Engineering Mathematics 2		
			UFMF88-30-2 Design & Electromechanical Systems		

FdSc Mechanical Engineering	**Year 2.2 at UWE (taught by UCW)**	**Level 2 part-time**	UFMFL8-15-2 Dynamics UFMFQA-15-2 Stress Analysis UFMFW8-30-2 Heat Transfer, Power and the Environment		**Gateway award**: FdSc Mechanical Engineering (240 credits)
ENTRY to BEng (Hons) Mechanical Engineering (Nuclear)	**Year 3.1 at UWE**	**Level 3 part-time**	UFMFU7-15-3 Computational Methods **Choose 15 credits from:** UFMFM7-15-3 Business Environment. UFMFCL-15-3 Engineering and Society UFMF89-15-3 Industrial Placement	**Choose 30 credits from:** UFMFTA-15-3 Thermo-fluid Systems **OR** UFMFD7-15-3 Energy Technologies UFMFU6-15-3 Composite Engineering **OR** UFMFP9-15-3 Mechanics of Materials UFMFXJ-15-3 Vibrational Dynamics UFMFSL-15-3 Integrated Electro-Mechanical Systems	**Interim Award:** BEng Mechanical Engineering (300 credits at appropriate level)

BEng (Hons) Mechanical Engineering (Nuclear)	**Year 3.2 at Defence Academy (MOD)**	**Level 3 part-time**	UFMFXL-40-3 Nuclear Apprenticeship Project UFMFYL-20-3 Nuclear Knowledge NB. Credit size dictated by the National Nuclear Framework.		**Award:** BEng (Hons) Mechanical Engineering (Nuclear) 360 credits at appropriate level

End Point Assessment (EPA)

This is an integrated standard where the EPA involves a substantial work related nuclear project to ensure the broad range of knowledge, skills and behaviours in the standard are achieved contributing 40 credits towards the BEng Degree.

Project to take place in the final year of the Degree, typically up to 6 months in duration, integrating and testing the academic and vocational learning. As part of the overall assessment of the project the EPA includes a comprehensive presentation of the project plan, outcomes, and evidence of knowledge, skills and behaviours demonstrated. It is assessed in partnership by employer and academic provider and quality assurance is underpinned by the use of external examiners

Additionally, a competence Assessment interview is carried out, demonstrating the range of knowledge, skills and behaviours.

- Carried out by an independent chartered person for the discipline being assessed
- Reviews the portfolio of evidence presented by the apprentice

Part 5: Entry Requirements

In addition to the University's Standard Entry Requirements

This is a closed programme only available to MOD employees with the appropriate level of security clearance

- **GCSE:** Mathematics and English Language at grade C or above required.
- **Specific subjects:** A level Mathematics grade C; IB Mathematics (Higher) grade 5; BTEC unit Further Mathematics for Engineering Technicians; or equivalent. Also one of the following: Chemistry, Computing/Computer Science, Design and Technology, Electronics, Engineering, Information and Communications Technology, Music

Part 5: Entry Requirements

Technology, Physics.

- **Relevant subjects:** Physics, Computing, ICT, Engineering, Science
- **EDEXCEL (BTEC) Diploma:** BTEC Nationals accepted: Aerospace Engineering; Communications Technology; Electrical/Electronic Engineering; Engineering; Manufacturing Engineering; Mechanical Engineering; Operations and Maintenance Engineering; Polymer Processing and Materials Technology; Telecommunications.
- Students with a BTEC National Diploma must have passed Further Mathematics for Engineering Technicians, and those with the 14 – 19 Diploma must also offer the Additional Specialised Learning in Mathematics.
- **Access:** Achievement of the Access to HE Diploma; achievement of Level 3 credits in Mathematics to include algebra and calculus (please contact us for further information and advice); plus at least one other Science or Technology subject; achievement of Level 2 credits in Mathematics, English Language and Science.
- **Baccalaureate IB:** Accepted (see the UCAS website for the UCAS tariff points that you can gain from the IB to put towards our points requirements)
- **An interview may also be required**

For the University's general entry requirements please see
http://www.uwe.ac.uk/study/entryReqs.shtml

Mature applicants with relevant experience who do not have the stated entry requirements are encouraged to apply.

Tariff points as appropriate for the year of entry - up to date requirements are available through the courses database

Part 6: Reference Points and Benchmarks

Set out which reference points and benchmarks have been used in the design of the programme:

QAA UK Quality Code for HE
-Framework for higher education qualifications (FHEQ)
-Subject benchmark statements
-Qualification characteristics for Foundation degrees and Master's degrees

Strategy 2020
University policies
Staff research projects
Any relevant PSRB requirements
Any occupational standards

Apprenticeship Standard

Please see appendix 1 for the programme/Apprenticeship Standard mapping

Appendix 1: Mapping of learning outcomes from BEng (Hons) Mechanical Engineering (Nuclear) to the Nuclear Scientist and Engineer Apprenticeship Standard

The below table demonstrates how the degree satisfies the knowledge, skills and behaviours defined in the apprenticeship standard. Where the defined outcomes cannot be satisfied by the degree alone, the table states the methods through which the apprentice is expected to achieve them.

Knowledge and Skills	**Assessment method(s)**	**Where covered**	**Degree module code(s)**
Work competently in a technical nuclear environment, understand and promote personal responsibility for Health, Safety, Radiation Protection, Environmental Protection, Quality, Security, Safeguards and principles of Risk Management.	Coursework; Exam; Dissertation/ Workplace Logbook-Portfolio	Degree NVQ	UFMFYL-20-3, UFMFXL-40-3
Analyse engineering and scientific problems selecting and using mathematical, engineering and scientific tools to provide suitable solutions to nuclear applications, with considerations of the entire life cycle of a nuclear facility.	Coursework; Exam; Dissertation	Degree	Most technical modules contribute, only UFMFYL-20-3, UFMFXL-40-3 provide the nuclear context.
Develop and critically apply knowledge of the concepts, principles and theories of engineering science relevant to the interdisciplinary fields of nuclear technology.	Coursework; Exam; dissertation	Degree	As above, most technical etc. Interdisciplinary focus in UFMF88-30-2 & UFMFSL-15-3
Demonstrate an understanding of stakeholder requirements, commercial awareness, business improvement, project and business management techniques relevant to the nuclear industry.	Coursework; Presentation; Dissertation Workplace logbook-portfolio	Degree NVQ	UFMFHA-15-2 UFMFM7-15-3 UFMFXL-40-3
Apply their science or engineering discipline knowledge to the development, operation, maintenance and progression of technologies used for Decommissioning (e.g. remote handling and robotics), Waste Management, Reprocessing, and Nuclear Power Generation.	Coursework; Exam; Dissertation	Degree	UFMFXL-40-3 UFMFSL-15-3 UFMF88-30-2
Specify, plan, manage, conduct and report on nuclear projects	Dissertation / Workplace Logbook-Portfolio	Degree NVQ	UFMFXL-40-3
Synthesise information from a variety of sources and apply to the solution of a particular nuclear technology application.	Coursework; Exam; Dissertation / Workplace Logbook-Portfolio	Degree	UFMFYL-20-3, UFMFXL-40-3
Accurately observe, record and draw conclusions from data and experimental evidence, recognising inherent uncertainties and limitations.	Coursework; Exam / Workplace Logbook-Portfolio	Degree	UFMFL8-15-2; UFMF88-30-2;

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Apply design processes including materials selection that meet nuclear industry standards.	Coursework; Exam; Dissertation / Workplace Logbook-Portfolio	Degree NVQ	UFMF88-30-2; UFMF7K-15-3; UFMFP9-15-3; UFMFYL-20-3; UFMFXL-40-3
Demonstrate an understanding of Regulatory requirements both national and international.	Coursework; Exam; Dissertation / Workplace Logbook-Portfolio	Degree NVQ	UFMFYL-20-3; UFMFHA-15-2
Develop technical reports that meet requirements of the prevailing verification process.	Coursework; Exam; Dissertation / Workplace Logbook-Portfolio	Degree NVQ	UFMFYL-20-3, UFMFXL-40-3
Demonstrate knowledge of the nuclear industry (past, present and future) and the business, political and community environment in which the company operates including personal role within the organisation, ethical practice and codes of conduct.	Workplace Logbook-Portfolio	NVQ	
Demonstrate an understanding of root cause analysis and learning from experience (LFE) processes.	Workplace Logbook-Portfolio	NVQ	
Demonstrate knowledge of the technology, safety, environmental and economics of nuclear fuels and the nuclear fuel cycle.	Coursework; Exam / Workplace Logbook-Portfolio	Degree NVQ	UFMFYL-20-3
Apply the standards for nuclear professional practice as required by the industry and professional body institutions.	Dissertation / Workplace Logbook-Portfolio	Degree NVQ	UFMFXL-40-3

Behaviours	**What is required**	**Assessment method**	**Where covered**	**Degree module code(s)**
Communication	Communicate effectively and appropriately using a full range of skills; technical speaking to a scientific / engineering audience, active listening, professional writing, professional body language, technical presentation.	Coursework; Exam; Presentations; Dissertation / Workplace Logbook-Portfolio	Degree NVQ	Modules throughout programme develop technical writing skills. The following provide greater business/professional focus UFMFHA-15-2,

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				UFMFM7-15-3, UFMFYL-20-3, UFMFXL-40-3.
Professional Conduct	Demonstrate reliability, integrity and respect for confidentiality on work related and personal matters.	Log Book	NVQ/workplace review	
Responsibility	Work autonomously and interact effectively within a wide, multi-disciplinary project team.	Workplace Logbook-Portfolio	NVQ/workplace review	
Interaction with colleagues	Understand the impact of work on others, especially where related to diversity and equality.	Workplace Logbook-Portfolio	NVQ/workplace review	
Professional commitment	Demonstrating a personal and professional commitment to society, their profession and the environment, adopting a set of values and behaviours that will maintain and enhance the reputation of the profession.	Workplace Logbook-Portfolio	NVQ/workplace review	
Time management	Manage time effectively, being able to plan and complete work to schedule.	Coursework; Exam; Presentations; Dissertation /Workplace Logbook-Portfolio	Degree NVQ/workplace review	Various modules where individual and group task need to be completed. Particularly so on UFMFHA-15-2 and UFMFXL-40-3

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Continuous improvement	Demonstrate a supportive attitude to change and respond positively to change management processes.	Workplace Logbook-Portfolio	NVQ/workplace review	
Continuous improvement	Take responsibility for personal development, demonstrating commitment to learning and self-improvement and be open to feedback.	Workplace Logbook-Portfolio	NVQ/workplace review	
Safety culture	Demonstrate a strong commitment to personal safety behaviours and understanding of the consequences as set out in the nuclear industry requirements.	Workplace Logbook-Portfolio	NVQ/workplace review	
Safety culture	Take responsibility to actively challenge unsafe behaviours and conditions in the workplace to help reinforce nuclear, radiological and conventional safety over competing goals to ensure the protection of people and the environment.	Workplace Logbook-Portfolio	NVQ/workplace review	
Technical Standards/Verification	Demonstrate compliance by following rules, procedures and principles to ensure work completed is fit for purpose and pay attention to detail and carry out error checks throughout work activities.	Workplace Logbook-Portfolio	NVQ/workplace review	
Sustainability	Demonstrable commitment to sustainability in work design and application.	Workplace Logbook-Portfolio	NVQ/workplace review	

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Leadership	Be an enthusiastic advocate for the nuclear industry with the ability to represent this industry to a variety of audiences.	Workplace Logbook-Portfolio	NVQ/workplace review	

STUDENT AND ACADEMIC SERVICES

FOR OFFICE USE ONLY

Approval Date	**Special CAP 10 August 2017**			
Revision CAP Approval Date		Version	**1**	Link to APT (ID 4382)
Next Periodic Curriculum Review due date				
Date of last Periodic Curriculum Review				