MODULE SPECIFICATION

Part 1: Information			
Module Title	Advanced Radiation Physics and Nuclear Medicine		
Module Code	USSKLN-30-3	Level	3
For implementation from	September 2018		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Health and Applied Sciences	Field	Applied Sciences
Department	Department of Applied Sciences		
Contributes towards	BSc (Hons) Healthcare Science (Medical Physics)		
Module type:	Standard		
Pre-requisites	None		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	Level 5 (or equivalent) medical physics qualification		

Part 2: Description

This module explores advanced topics in radiation physics and nuclear medicine and contains two distinct units, namely

- Unit 1: Framework for Radiation Governance and Risk Management
- Unit 2: Physics and Instrumentation

Students complete one of these units as prescribed by their pathway. Unit 1 aligns to the Healthcare Science (Medical Physics) Radiation Physics pathway. Unit 2 aligns to the Healthcare Science (Medical Physics) Nuclear Medicine pathway.

The syllabus covers:

1. Framework for Radiation Governance and Risk Management [Radiation Physics pathway]

The overall aim of this unit is to ensure that the student has an understanding of the main sources of ionising and non-ionising radiation encountered in the clinical environment, the legislative and organisational framework surrounding their use, and the principles of risk assessment and risk management.

- Review of the main clinical sources of diagnostic kV ionising and non-ionising radiation and their interaction with human tissue: external and internal radiation, non-ionising radiation interactions, risks of exposure to ionising and non-ionising radiation
- Review of the organisation of radiation protection in hospitals
- Review and application of the general principles of radiation protection and international and national

legislation, guidance, codes of practice, standards and recommendations
- International Commission on Radiological Protection (ICRP) recommendations and rationale
- Current regulations and recommendations relating to: radiation protection of staff and the public, comforters and carers, environmental protection, the administration of radioactive substances, transportation of dangerous goods, Health and Safety at Work, electromagnetic fields (EMF), mobile phones, MRI, lasers, UV and intense light sources (ILS), ultrasound, enforcement and prosecution

Quality systems
- Accreditation of calibration laboratories; National Physical Laboratory (NPL), United Kingdom Accreditation Service (UKAS)

Risk assessment, risk management and emergency procedures
- Diagnostic X-ray installations
- Radiotherapy using radioactive materials
- Diagnostic use of radioactive materials
- Ultrasound and MRI
- Lasers, UV and ILS

Use of radioactive materials
- Contamination monitors, wipe tests
- Instrument types, range of probes
- Survey meters and isotope calibrators
- Calibration of above instruments

2. Physics and Instrumentation [Nuclear Medicine pathway]

The overall aim of this unit is to ensure that the student has an understanding of instrumentation and procedures carried out in the nuclear medicine department and understands the physical processes that underpin them.

- Performance, application, risk assessment and QC procedures for of each of the following imaging systems used in nuclear medicine: gamma camera, SPECT, SPECT-CT, PET, PET-CT, PET-MR
- Dosimetry of unsealed and sealed radionuclide sources
- Review of practical administration of radioactivity and specific radiation protection and risk considerations: inpatients, pregnant and breastfeeding patients, paediatrics, comforters and carers, nursing staff on wards with therapy patients, staff and public.
- Principles of radionuclide production
    - carrier-free radionuclides
    - radionuclide generator systems: growth and decay curves, elution profiles
    - generator elution
    - kit reconstitution
    - aseptic techniques
    - drawing up
    - available generator systems and their construction
    - cyclotron and reactors and their role in radionuclide production
- Basic mathematical methods as applied to nuclear medicine: counting statistics, precision of net sample counts, radioactive decay and decay calculations, isotope dilution methods, clearance techniques
- The assay of radioactivity: problems associated with assay, background and shielding, counting loss associated with dead time and its correction, efficiency and the optimisation of counting conditions, dual isotope counting, geometry of the detecting system, assay of radioactive samples, radionuclide identification, quantification of uptake, relative and absolute, use of standards, background and phantoms, whole body monitors
- Department design or refurbishment: services, equipment, room design, clinical workload, patient pathways

There will be 3 weeks of contact time at UWE in 3 x 1 week blocks. Included in each block week are laboratory workshops, lectures and tutorials. The contact time will equate to approximately 12 hours per block (a total of 36 hours).

In addition to the allocated hours on campus learning, students will engage in synchronous and asynchronous online learning. This will comprise a total of approximately 36 hours of online engagement through a combination of lectures, synchronous online tutorials, synchronous and asynchronous discussions, online quizzes, and collaborative group work.

Theoretical material within the module will be presented to the students in the form of regular lectures throughout

each of the semesters in the academic year. During those times of work based learning, these lectures will be delivered online and involve a number of technological enhancements. The learning of lecture content will be reinforced through time spent in independent learning by the directed reading of recommended texts and through the use of technology enhanced learning resources that will be provided online. This online learning and engagement will be delivered through several avenues:

- Synchronous online tutorials in protected learning time where the student will contribute/attend an online activity appropriate to the content at the time at which the academic will be present online to facilitate and lead this scheduled/timetabled session. These tutorials will be themed/planned.
- Asynchronous discussions in the student's own time (or during protected time where permitted and appropriate) where they will engage/collaborate with other students on the course or in specified groups, and in which the academic is permitted to moderate where necessary, but is not expected to contribute. ·
- Synchronous surgery sessions timetabled for a specific time in which the academic will be available online to answer live questions via discussion boards/blogs/collaborate or to respond to questions posted/asked prior to the session.
- Interactive, online formative quizzes made available either following a particular package of knowledge exchange/learning, or in specified sessions/time periods.
- Lectures delivered online through a combination of one or more of the following: visual/audio/interactivity/personal formative assessment

A number of relevant practical sessions will be incorporated during the campus based blocks in addition to the work based learning that must be achieved under supervision by a workplace supervisor. Practical sessions will both drive hands on learning and the acquisition of technical skills at both an individual and group working level.

The remainder of the independent learning time allocated to the module should be spent preparing for assessments [B1], and undertaking revision for the exams [A1, A2].

Scheduled learning includes lectures, seminars, tutorials, project supervision, demonstration, practical classes and workshops; fieldwork; external visits; work based learning; supervised time in studio/workshop.

Independent learning includes hours engaged with essential reading, case study preparation, assignment preparation and completion etc. These sessions constitute an average time per level as indicated in the table below. Scheduled sessions may vary slightly depending on the module choices you make.

Part 3: Assessment: Strategy and Details

The Assessment Strategy has been designed to support and enhance the development of both subject-based and more general skills, whilst ensuring that the modules learning outcomes are attained, as described below.

Component A

The written exam will provide students with an opportunity to demonstrate their knowledge on a broad range of topics through a series of short essay questions (and will be embedded in the second block release).

The in-class open book test will assess the students' ability to research relevant information and provide critical thinking in a variety of workplace scenarios where the application of knowledge is required (and will be embedded in the third block release).

The resit element of Component A will cover both the written exam and in-class open book test components.

Component B

Component B will provide an opportunity for students to demonstrate their ability to apply the principles of their relevant area of medical physics to an unseen problem and/or case study and evidence their skills in approaching and interpreting it appropriately.

Formative feedback is available to students throughout the module through group discussions, and in workshops. Students are provided with formative feed-forward for their exam through a revision and exam preparation session prior to the exam and through the extensive support materials supplied through Blackboard.

All work is marked in line with the Faculty's Generic Assessment Criteria and conforms to university policies for

the setting, collection, marking and return of student work. Where an individual piece of work has specific assessment criteria, this is supplied to the students when the work is set.

This assessment strategy has been designed following best practice on effective assessment from JISC.

Technical design and deployment of the activities will also follow best practice developed at UWE by the Academic Practice Directorate in collaboration with academic colleagues across the university. Staff guidance and support are already in place (http://info.uwe.ac.uk/online/Blackboard/staff/guides/summative-assessments.asp).

All students will be issued with the same exam paper [A1], integrated assignment [B1] & in-class test [A2], where they will complete the sections specific to their unit, i.e. Unit 1: Framework for Radiation Governance and Risk Management or Unit 2: Physics and Instrumentation.

Identify final timetabled piece of assessment (component and element)	Component A2	
% weighting between components A and B (Standard modules only)	**A:** **50%**	**B**: **50%**

First Sit	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**
1. Examination (1 hour)	50%
2. Open book in-class test (1 hour)	50%
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Case study integrated assignment (1500 words)	100%
Resit (further attendance at taught classes is not required)	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**
1. Examination (2 hours)	100%
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Case study integrated assignment (1500 words)	100%

Part 4: Learning Outcomes & KIS Data	
Learning Outcomes	On successful completion of this module students will be able to fulfil the learning outcomes from 1 of the following 2 Medical Physics themed units of study: • Unit 1: Framework for Radiation Governance and Risk Management • Unit 2: Physics and Instrumentation Unit 1 aligns to the Healthcare Science (Medical Physics) Radiation Physics pathway. Unit 2 aligns to the Healthcare Science (Medical Physics) Nuclear Medicine pathway. **1. Framework for Radiation Governance and Risk Management [Radiation Physics pathway]** • Critically evaluate the main clinical sources of ionising and non-ionising radiation and their interaction with human tissue [A1] • Evaluate the organisational arrangements for radiation protection and the role of

quality management, with particular regard for patient safety [A1, A2]
- Critically review and evaluate legislation and codes of practice associated with the control of ionising and non-ionising radiation [A2]
- Describe and evaluate risk assessment and emergency procedures of all clinical diagnostic X-ray and non-ionising radiation sources and their role in ensuring patient safety and comfort [B1]
- Appraise the safe use of radioactive materials in the clinical environment [B1]

2. Physics and Instrumentation [Nuclear Medicine pathway]

- Critically evaluate imaging systems used in nuclear medicine, their performance, uses and applications, QC procedures and their role in the patient pathway [B1]
- Explain radiation dosimetry as applicable to nuclear medicine practice [A1]
- Critically evaluate the procedures, radiation protection and legislative issues surrounding the administration of radioactive materials with adult and paediatric patients, with particular regard to patient safety and dignity [A2]
- Explain the principles of radionuclide production, with reference to the different methods of production [A1]
- Critically appraise the problems associated with the assay of radioactive material and the principles of such measurements [A1]
- Describe the design or refurbishment of a nuclear medicine department [A2]

Key Information Sets Information (KIS)

Contact Hours

Key Information Set - Module data

Number of credits for this module 30

Hours to be allocated	Scheduled learning and teaching study hours	Independent study hours	Placement study hours	Allocated Hours
300	72	228	0	300

The table below indicates as a percentage the total assessment of the module which constitutes a;

Written Exam: Unseen or open book written exam
Coursework: Written assignment or essay, report, portfolio, project or in class test
Practical Exam: Oral Assessment and/or presentation, practical skills assessment, practical exam (i.e. an exam determining mastery of a technique)

Total Assessment

Total assessment of the module:	
Written exam assessment percentage	50%
Coursework assessment percentage	50%
Practical exam assessment percentage	0%
	100%

Reading List

The module reading list can be accessed through the following link:

https://uwe.rl.talis.com/lists/0B7C9005-4D5B-43B3-48C1-A5384D59D668.html

FOR OFFICE USE ONLY

First CAP Approval Date	20 March 2018			
Revision CAP Approval Date *Update this row each time a change goes to CAP*		Version	*1*	*Link to CAR ID 4581*