MODULE SPECIFICATION

Part 1: Information			
Module Title	Advanced Medical Physics		
Module Code	USSKLK-30-2	Level	Level 5
For implementation from	2020-21		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Faculty of Health & Applied Sciences	Field	Applied Sciences
Department	HAS Dept of Applied Sciences		
Module type:	Standard		
Pre-requisites	Scientific Basis of Medical Physics 2020-21		
Excluded Combinations	None		
Co- requisites	Applied Medical Physics 2020-21		
Module Entry requirements	None		

Part 2: Description

Overview: This module explores advanced topics on medical physics relating to radiation governance and principles of scientific measurement.

Educational Aims: The overall aim of this module is to ensure that the student understands and can work safely within the legislative and policy framework around the safe use of ionising and non-ionising radiation in a healthcare environment.

Outline Syllabus: The syllabus covers:

Clinical sources of radiation
Net positive benefit, dose limits
Stochastic and deterministic effects
Principles of designation of areas
External audit standards
Registration, safe custody, transport, use and disposal of radioactive sources
Contingency plans, including radiation emergencies
Notification of radiation accidents and incidents
Biological and effective half-life
Record keeping
Personnel and environmental dose monitoring

Operation of a personal monitoring service and approved dosimetry service
Film and thermoluminescent dosimeter (TLD), optically stimulated luminance (OSL) monitoring, real-time dosimeters, e.g. Electronic Personal Dosimeter (EPD)
Instrument calibration
Internal dosimetry
Patient dosimetry
In-vivo dosimetry in radiotherapy, e.g. diodes, TLD, transit dosimetry
Principles of radiation dose limitation (including factors affecting the design of radiation facilities)
Risk assessment
Controls
Calculation of shielding requirements
Environmental radiation surveys
Radiation protection in the administration of radioactive substances
Decontamination of radionuclide spills
Contamination monitoring isotope calibrators
Contamination monitors, wipe tests
Waste management – biological and radioactive hazards
Radioactive source security, e.g. high-activity sources
Principles of scientific medical physics measurement
Components of an instrumentation system, matching, source and internal impedance, fault finding
System parameters (gain, linearity, accuracy, precision, error, resolution, hysteresis, sensitivity, bandwidth, frequency response and damping, time constant, noise, signal to noise)
Power supplies and isolation
Types of signal
Choice of transducers and detectors
Signal capture and process
Image manipulation, e.g. monitor calibration, windowing and filtering
Equipment sensitivity and uncertainty
Sources of error
Physiological test sensitivity and specificity
Calibration and traceability

For each detector system:
Principles
Construction
Limitations
associated equipment
common clinical applications in radiation physics, nuclear medicine and radiotherapy

Detector systems:
ionisation chambers (Farmer, pinpoint, parallel plate, thimble)
detector arrays for dosimetry.
Geiger tubes
sodium iodide and other scintillators
liquid scintillation detection
solid state detectors, e.g. diodes, amorphous silicon (a-Si)
optical detectors, e.g. Cerenkov imaging
TLDs
photographic film
gel dosimeters
alanine
OSL
chemical detectors, e.g. Gafchromic film
Physiological signals
Physiological basis of signals
Methods of measurement
Signal processing and extraction
Use of physiological signals in Medical Physics, e.g. respiratory and cardiac gating
Introduction to ECG (Electrocardiogram) in clinical practice

Teaching and Learning Methods: 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. This tutorial 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 written assessments for submission [B1] and undertaking revision for the exams [A].

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

The assessment for this module is designed to test the breadth and depth of students' knowledge, as well as their ability to analyse, synthesize and summarise information critically including published legislation, research and data from the wider literature.

Component A consists of an exam and will be 2 hours duration. This assessment provides students with the opportunity to demonstrate their knowledge and understanding of the legislative and policy framework around the safe use of ionising and non-ionising radiation in a healthcare environment.

Component B consists of a case study poster (without presentation). This assessment allows students to demonstrate both their ability to prioritise information and produce a structured & evidenced discussion on techniques. This assessment links directly to requests from employers as they require medical physics graduates proficient at written and visual communication.

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.

First Sit Components	Final Assessment	Element weighting	Description
Case Study - Component B	✓	50 %	Case study (poster)
Examination - Component A		50 %	Examination (2 hours)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Case Study - Component B	✓	50 %	Case study (poster)
Examination - Component A		50 %	Examination (2 hours)

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will achieve the following learning outcomes:

Module Learning Outcomes	Reference
Describe and explain the principles of radiation protection, relevant policy and legislation, and dose limitation	MO1
Discuss and evaluate the governance framework within the workplace to demonstrate legislative compliance	MO2
Describe the different types of personal and environmental dose monitors and explain how they are used in the healthcare environment	MO3
Explain the factors affecting the design of radiation facilities	MO4
Explain the components of an instrumentation system, describe the components of a generalised instrument system and have knowledge of range of system parameters	MO5
Discuss different radiation detector systems, the appropriate choice of detector and counting statistics	MO6
Describe and explain common techniques for the measurement of physiological signals and their impact on patient safety and comfort	MO7
Describe and explain the physiological signals used in cardiac and respiratory gating	MO8

Contact Hours

Independent Study Hours:	
Independent study/self-guided study	228
Total Independent Study Hours:	228

	Scheduled Learning and Teaching Hours:
	Face-to-face learning: 72
	Total Scheduled Learning and Teaching Hours: 72
	Hours to be allocated: 300
	Allocated Hours: 300
Reading List	*The reading list for this module can be accessed via the following link:* https://uwe.rl.talis.com/index.html

Part 5: Contributes Towards
This module contributes towards the following programmes of study: