University of the West of England
BRISTOL

MODULE SPECIFICATION

Part 1: Information			
Module Title	Advanced Medical Physics		
Module Code	USSKLK-30-2	Level	2
For implementation from	September 2018		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Health & Applied Sciences	Field	Applied Sciences
Department	Applied Sciences		
Contributes towards	FdSc Healthcare Science		
Module type:	Standard		
Pre-requisites	USSKLJ-30-1 Scientific Basis of Medical Physics		
Excluded Combinations	N/A		
Co- requisites	USSKLL-30-2 Applied Medical Physics		
Module Entry requirements	N/A		

Part 2: Description

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

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 [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

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 both their knowledge on a broad range of topics through a series of short essay questions.

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

Component B

This element will capture the content of online learning and practical workshops delivered in the block weeks. This summative assessment will take the form of a poster presentation.

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 (http://www.jisc.ac.uk/whatwedo/programmes/elearning/assessment/digiassess.aspx) and The Open University's Centre for Excellence in Teaching and Learning (http://www.open.ac.uk/opencetl/centre-open-learning-mathematics-science-computing-and-technology/activities-projects/e-assessment-learning-the-interactive-comp).

Technical design and deployment of the activities will also follow best practice developed at UWE by the Education Innovation Centre 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).

Identify final timetabled piece of assessment (component and element)	B1	
% 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 (1.5 hours)	50%	
2. In-class test (1.5 hours)	50%	
Component B **Description of each element**	**Element weighting** **(as % of component)**	
1. Case study (poster)	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 (3 hours)	100%	
Component B **Description of each element**	**Element weighting** **(as % of component)**	
1. Case study (poster)	100%	

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will be able to fulfil the learning outcomes (assessment intended for each learning outcome designated by [*] corresponding to assessment section):

- Describe and explain the principles of radiation protection, relevant policy and legislation, and dose limitation [A1]
- Discuss and evaluate the governance framework within the workplace to demonstrate legislative compliance [A1]
- Describe the different types of personal and environmental dose monitors and explain how they are used in the healthcare environment [A1]
- Explain the factors affecting the design of radiation facilities [A1]
- Explain the components of an instrumentation system, describe the components of a generalised instrument system and have knowledge of range of system parameters [A2, B1]
- Discuss different radiation detector systems, the appropriate choice of detector and counting statistics [A2, B1]
- Describe and explain common techniques for the measurement of physiological signals and their impact on patient safety and comfort [A2, B1]
- Describe and explain the physiological signals used in cardiac and respiratory gating [A2]

Key Information Sets Information (KIS)

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

Contact Hours

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, dissertation, portfolio, 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

Modernising Scientific Careers Programme Training Manual for appropriate Division and Specialist Route. Available from http://www.nshcs.hee.nhs.uk/curricula

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

https://uwe.rl.talis.com/lists/5D0E27DB-6902-36D4-E1FA-529662FF26B5.html

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