Module Specification

Applied Medical Physics

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Contents

Part 1: Information

Module title: Applied Medical Physics

Module code: USSKLL-30-2

Level: Level 5

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Health & Applied Sciences

Department: HAS Dept of Applied Sciences

Partner institutions: None

Field: Applied Sciences

Module type: Module

Pre-requisites: Scientific Basis of Medical Physics 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module explores applied topics on medical physics relating to medical imaging and medical equipment quality assurance and quality systems.

Features: Not applicable

Educational aims: The overall aim of this module is to ensure that the student understands the principles of medical image formation, the operation, role, clinical

applications and health effects of different imaging modalities and discuss the advantages and disadvantages of each.

Outline syllabus: Introduction to image formation, acquisition, manipulation, analysis, storage and sharing:
Theory of image formation, including reconstruction from projections
Display, manipulation and analysis of images
Image registration and fusion
Image storage, sharing files and formats:
PACS
DICOM
HL7

Principles of operation:
Formation of the X-ray image, fluoroscopy, computed radiography, digital radiography (CR/DR), CT scanners, electronic portal imaging devices, cone beam CT (CBCT)
Ultrasound
Nuclear medicine
Magnetic resonance imaging (MRI)

Clinical applications (including hybrid imaging):
Choice of modality for common clinical scenarios
Common clinical applications of each modality
Planning and delivery of radiotherapy
Mammography
Future directions in imaging
Gating techniques and 4D CT imaging (cardiac and respiratory)
The possible risks and health effects of each modality (risk benefit ratios)
Overview of QA and testing
Radiation protection of patients and diagnostic reference levels

Operation and principles of non-imaging equipment in Medical Physics:
Radiation detectors

Linear accelerator
Orthovoltage (kV) radiotherapy unit
Radiotherapy Treatment Planning Systems
Brachytherapy after-loaders
Cyclotron

Basic quality systems:
International and national legislation, guidance, standards and recommendations
Record keeping
Risk assessments and risk-based analysis
Basic acceptance and safety testing

For a range of commonly performed Quality assurance tests:
Best practice protocols
Test equipment
Action limits
Frequency

Basic planned preventative maintenance:
Repair and post-repair QC requirements
Process of handover to and from clinical use
Factors affecting decisions on maintenance activity
Calibration and QA

Decontamination and waste management:
Infection control
Biological decontamination techniques
Radioactive decontamination
Decontamination records
Disinfection, sterilisation and cleaning
Special waste, clinical waste, radioactive waste, waste electrical and electronic equipment (WEEE)
Data storage
Incident investigation and reports

Part 3: Teaching and learning methods

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 [B], and undertaking revision for the exam [A].

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

MO1 Describe and explain the principles of image formation, acquisition and manipulation including image registration, reconstruction, display, storage and sharing

MO2 Describe and explain the principles of operation and application in the patient pathway of a range of ionising radiation and non-ionising radiation imaging modalities and appraise the choice of imaging technique

MO3 Appraise the risks and benefits of each modality including the health effects of radiation

MO4 Describe and explain the QA and legislative framework for each modality

MO5 Explain the role of quality systems and their place in the safe delivery of modern healthcare

MO6 Describe and understand QA tests commonly performed on medical equipment and systems encountered in medical physics and their impact on patient safety

MO7 Explain the importance of control of infection and decontamination of medical equipment

MO8 Understand the processes and regulations relating to the decommissioning and disposal of medical devices

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/A8E2CFBE-B229-73F5-16F1-6E7A1A86B1FF.html?embed=1&lti_relink_url=https:%2F%2Fuwe.rl.talis.com%2Flti%2Flaunch.html%3Fcustom_node_code_replacement%3D%2524%257B1%257D%26context_id%3DUSSKLL-30-2_19sep_1%26context_title%3DUSSKLL-30-2%2B-%2BApplied%2Bmedical%2Bphysics%2B19sep_1%26resource_link_id%3DUSSKLL-30-2_19sep_1_7174149_1%26roles%3DInstructor%26custom_node_code_regex%3D%252F%255E%2528.%257B11%257D%2529.%252A%252F%26context_label%3DUSSKLL-30-2_19sep_1%26oauth_consumer_key%3DFD5B379E-83DF-EE63-55CE-B8A282E5DA9C%26relink%3Dtrue%26embed%3Dtrue%26signature%3Dad48a590fb74daede26fb44a9ca3d7f8c44b87ced7896e894f15375f2dec05c7

Part 4: Assessment

Assessment strategy: Assessment 1: Written Assignment
Assessment 1 is a contextual review (1000 words) of a recent article related to diagnostic advance(s) in a technique(s) of relevance to the apprentice's employment, the content of which will be negotiated with the appropriate tutor.

Assessment 2: Presentation
Assessment 2 is an independent case study of direct relevance to the apprentice's employment, which is to be prepared and presented for assessment as an oral presentation.

Assessment 3: Set Exercise
The set exercise will provide apprentices with an opportunity to demonstrate their knowledge on a broad range of topics on Medical Imaging.

Assessment tasks:

Written Assignment (First Sit)
Description: Contextual review (1000 words)
Weighting: 20 %
Final assessment: No
Group work: No
Learning outcomes tested:

Presentation (First Sit)
Description: Case study oral presentation (15 minutes)
Weighting: 40 %
Final assessment: No
Group work: No
Learning outcomes tested:

Set Exercise (First Sit)
Description: Set Exercise
Weighting: 40 %
Final assessment: Yes

Group work: No
Learning outcomes tested:

Written Assignment (Resit)
Description: Contextual review (1000 words)
Weighting: 20 %
Final assessment: No
Group work: No
Learning outcomes tested:

Presentation (Resit)
Description: Case study oral presentation (15 minutes)
Weighting: 40 %
Final assessment: No
Group work: No
Learning outcomes tested:

Set Exercise (Resit)
Description: Examination (1.5 hours)
Weighting: 40 %
Final assessment: Yes
Group work: No
Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Healthcare Science (Radiation Physics) {Apprenticeship-UWE} [Frenchay] BSc (Hons) 2022-23

Healthcare Science (Radiotherapy Physics) {Apprenticeship-UWE} [Frenchay] BSc (Hons) 2022-23

Healthcare Science (Nuclear Medicine) {Apprenticeship-UWE} [Frenchay] BSc (Hons) 2022-23