



Module Specification

Advanced Clinical Engineering

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Part 1: Information

Module title: Advanced Clinical Engineering

Module code: USSKLB-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

Delivery locations: Not in use for Modules

Field: Applied Sciences

Module type: Module

Pre-requisites: Scientific Basis of Engineering 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: See learning outcomes.

Outline syllabus: For a range of commonly measured Physiological Signals, understand the origin, nature, transmission and characteristics of the signal including

the magnitude and normal frequency range:

Electrical origin (Electrocardiogram (ECG), Electromyogram (EMG)

Electroencephalogram (EEG), evoked responses)

Non-electrical in origin (blood pressure, temperature, oxygen saturation)

Hazards in the patient environment (Electrical, Mechanical and Other Physical Hazards)

Basic principles and technology employed in a range of commonly used transducers

Guidelines, regulations and legislation relevant to the design and development of medical devices

CE Marking and Routes to Compliance

Good equipment design:

Interpret and evaluate a basic specification for a medical device

The basic component parts used when constructing a piece of equipment to be used in a clinical environment and how they interact

Electromagnetic interference (EMI) and the effect it can have in a clinical environment

The methods, principle of operation and limitations in displaying results

Fail safe principles

Risk management

Safety Requirements for Programmable Medical Electrical Systems

Specifications:

Establishing a user specification

Establishing a technical and environmental specification

Determining applicable standards and legislation

Design Evaluation

Design, Manufacture, Testing and Documentation

Appropriate mathematical methods that can be used to analyse design

Circuit analysis:

Appropriate mathematical methods that can be used to analyse circuit behaviour and describe electrical signals

Systematic methodology that can be applied to solve problems in circuit design

Application of electronic principles and tools used in analysis of circuits

Systematic analysis of analogue circuit design

Systematic analysis of digital circuit design

Modifications of existing device:

Risk and implications and requirements

Part 3: Teaching and learning methods

Teaching and learning methods: Students are expected to spend 72 hours on scheduled learning and 228 hours on independent learning. 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.

Practical classes will include simulated case-study based investigations which will allow students to develop their analytical, interpretive and data handling skills.

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. These sessions constitute an average time per level. Scheduled sessions may vary slightly depending on the module choices you make.

There will be 2 weeks of contact time at UWE in 2 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 24 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 48 hours of online engagement through a combination of lectures, synchronous online tutorials, synchronous and asynchronous discussions, online quizzes, and collaborative group work.

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

MO1 Describe the scientific principles that support the development and implementation of innovative technical solutions to clinical problems

MO2 Review existing products and draw conclusions for suitability and evaluation purposes

MO3 Discuss a specification that meets user and environment requirements whilst adhering to the relevant standards and legislation

MO4 Explain and demonstrate the application of quality management systems relating to design and development of medical devices

MO5 Discuss medical device design proposals

MO6 Explain and demonstrate the application of the general requirements for safety of medical electrical equipment and systems during the design, manufacturing and implementation of medical electrical equipment

MO7 Appreciate the range of tests that need to be performed when designing or manufacturing a medical device

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](https://uwe.rl.talis.com/modules/ussklb-30-2.html) via the following link <https://uwe.rl.talis.com/modules/ussklb-30-2.html>

Part 4: Assessment

Assessment strategy: Assessment 1 is an independent case study of direct relevance to the student's employment, which is to be prepared and presented as a poster.

Assessment 2 is a set exercise. The set exercise will provide students with an opportunity to demonstrate their knowledge on a broad range of topics.

Formative feedback is available to students throughout the module through group discussions, and in workshops. Students are provided with formative feed-forward for their set exercise through a revision and preparation session.

Assessment components:

Case Study (First Sit)

Description: Case study (poster)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO2, MO3, MO5

Set Exercise (First Sit)

Description: Set Exercise

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO4, MO6, MO7

Case Study (Resit)

Description: Case study (poster)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO2, MO3, MO5

Set Exercise (Resit)

Description: Set Exercise

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO4, MO6, MO7

Part 5: Contributes towards

This module contributes towards the following programmes of study:

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

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

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

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