



## **Module Specification**

### **Advanced Medical Engineering**

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## Part 1: Information

**Module title:** Advanced Medical Engineering

**Module code:** USSKLE-30-3

**Level:** Level 6

**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:** Applied Clinical Engineering 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 examines the science and principles supporting Medical Engineering.

**Features:** Module Entry requirements: Level 5 (or equivalent) biomedical engineering qualification

**Educational aims:** To learn fundamental principles, systems and methods in medical engineering, and apply them to specific areas of relevance in the students' own practice.

**Outline syllabus:** The syllabus covers:

Propagation of electrical signals in the human body

Effects of electrical current on the human body

Biomedical signals frequency and bandwidth

Common mode rejection

Isolation – importance and impact on design, data signals, power supplies and patient safety

Sample and hold circuits and their importance in the collection of biomedical signals

Detection and control systems used in medical devices

Advantages and disadvantages of analogue and digital signal processing

Display techniques

Data storage and retrieval

Electronic systems in clinical engineering

Mechanical systems in clinical engineering

Clinical engineering terminology

Fault finding methodology

Principles of safety tests

Understands the range of principles used by medical equipment that underpins their operation. A typical list of the types of equipment that should normally be considered is:

Pressure measurement

Invasive

Non Invasive

Temperature Measurement

Monitoring or recording of Physiological signals which are electrical in origin:

Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG)

Pulse Oximetry

Electrosurgery

Infusion devices

Suction devices

Gas analysers and Monitors

Endoscopic systems

Physiotherapy Equipment

Life support equipment:

Defibrillators, ventilators, Anaesthetic equipment

Parameters being measured:

Normal ranges

Limits

Use of alarms

External influences

Principles of operation of telemedicine applied to clinical engineering applications

Principles of equipment networking applied to clinical engineering applications

Principles of remote equipment monitoring applied to clinical engineering applications

Storage and transfer of data for analysis and reporting

### **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.

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 individual and group working level.

The remainder of the independent learning time allocated to the module should be spent preparing written assessments for submission (B), and undertaking revision for the exams (A).

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

**MO1** Critically evaluate physiological signals, their production, characteristics and propagation

**MO2** Critically evaluate the passage and effects of electric current through the human body

**MO3** Critically evaluate the process of evaluation and selection of equipment

**MO4** Critically evaluate the impact of control of infection on the purchase, use and disposal of medical devices

**MO5** Describe how the equipment management lifecycle is applied by clinical engineers

**MO6** Critically evaluate the various methods medical devices use to collect, process, store and transfer data

**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/usskle-30-3.html) via the following link <https://uwe.rl.talis.com/modules/usskle-30-3.html>

## **Part 4: Assessment**

**Assessment strategy:** Assessment Task 1:

The set exercise will provide apprentices with an opportunity to demonstrate their knowledge on a broad range of topics.

Assessment Task 2:

Assessment Task 2 is a case study. The case study will provide an opportunity for apprentices to demonstrate their ability to apply the principles of their relevant area of clinical engineering.

Group discussions in workshops underpin the case study. Apprentices are provided with formative feed-forward for their set exercise through a revision and preparation session and through the extensive support materials supplied through Blackboard.

### **Assessment components:**

#### **Set Exercise** (First Sit)

Description: Set Exercise

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO2, MO3, MO4, MO5, MO6

#### **Case Study** (First Sit)

Description: Case study integrated assignment (2000 words)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO5, MO6

**Set Exercise (Resit)**

Description: Set Exercise

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO2, MO3, MO4, MO5, MO6

**Case Study (Resit)**

Description: Case study integrated assignment (2000 words)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO5, MO6

**Part 5: Contributes towards**

This module contributes towards the following programmes of study:

Healthcare Science (Rehabilitation Engineering) {Apprenticeship-UWE}  
[Sep][FT][Frenchay][3yrs] BSc (Hons) 2021-22

Healthcare Science (Medical Engineering) {Apprenticeship-  
UWE}[Sep][FT][Frenchay][3yrs] BSc (Hons) 2021-22