Module Specification

Advanced Rehabilitation and Renal Engineering

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Contents

Part 1: Information

Module title: Advanced Rehabilitation and Renal Engineering

Module code: USSKLF-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

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 contains two distinct units, namely:

Unit 1: Advanced Rehabilitation Engineering

Unit 2: Advanced Renal Technology

Students complete one of these units as prescribed by their pathway. Unit 1 aligns to

the Healthcare Science (Clinical Engineering) Rehabilitation Engineering pathway. Unit 2 aligns to the Healthcare Science (Clinical Engineering) Renal Technology pathway.

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

Educational aims: See Learning Outcomes.

Outline syllabus: The syllabus covers:

Advanced Rehabilitation Engineering (Rehabilitation Engineering pathway):

Scope of Practice:
Scope of Rehabilitation Engineering
Scope of Assistive Technology
Range and roles of multidisciplinary teams

Technology (Design and Manufacture, Materials and Equipment):
Rehabilitation Technology Design
Mobility, wheelchairs and Special Seating Systems
Prosthetics and Orthotics
Electronic Assistive Technology (Environmental Control systems (EC), Functional Electrical Stimulation (FES), Augmentative and Alternative Communication systems (AAC), Switches, Integrated Systems)
Architectural Barriers and Design
Aids to Daily Living
Information Technology (IT) in Rehabilitation Engineering
Materials and Manufacturing

Measurement Technology:
Gait Measurement
Tissue Interface Measurement
Outcome Measurement
Digital Photography
Physiological Measurement

Transducers

Biomechanics:
Biomechanical Analysis
Biomechanical Models
Biomechanics of major muscular-skeletal structures
Tissue Biomechanics
Wheelchair Biomechanics
Biomechanics of Seating
Biomechanics of Gait
Prosthetic and Orthotic Biomechanics

Disabling Pathologies:
International Classification of Functioning, Disability and Health (ICF)
Sensation and Sensory Loss
Congenital Pathologies
Diabetes
Pressure Sores
Spinal Pathologies
Continence and Control
Joint and Muscle Pathologies
Neurological Disorders
Ageing
Cardiovascular disease

Workshop Practice:
Workshop Safety
Production planning and processes
Hand tools, machine tools and computer aided manufacture
Fixing and fastening
Materials: Metals, plastics, wood, ceramics, biomaterials
Use drawing packages
Understand engineering drawings
Device fabrication methods

Device construction processes
Knowledge of engineering test

Health and Safety in Rehabilitation and Assistive Technology:
Control of Substance Hazardous to Health (COSHH)
Manual Handling

Advanced Renal Technology (Renal Technology pathway):

Renal anatomy, physiology and pathology
Cardiovascular system and the role of blood
Biochemistry, microbiology and virology applied to renal replacement therapy
Solutions and concentrations
Fluid and chemical transport
Equilibrium and acid dissociation
Hydrogen ion regulation
Electrolytes and buffers
Chemicals in the renal environment
Formation of urine, renal perfusion
Glomerular filtration, tubular function; absorption and secretion
Homeostasis
The urinary system
Functions of the kidney
Metabolism in cells
Control of body water distribution
Renal disease
Consequences of renal failure
The artificial kidney
The history and development of dialysis
Dialysis techniques and technology
Access, the permanent and temporary catheter
The fistula
Blood temperature and low temperature treatments
The measurement of blood pressure the importance of monitoring blood pressure

data
Blood volume monitoring
Dialysis adequacy tools
Low and high flux dialysis
Middle molecule clearance
Degenerative bone disease and dialysis complications
Dialysis treatment options, long hour, short hour, frequent, alternate day, daily

Water sources and treatment – Municipal systems:
Municipal water supplies
Municipal water supply treatments
Municipal water supply standards
Sampling and testing

The importance of water quality
Legislation, standards and guidance
Renal replacement therapy treatment scientific developments
Transplant, dialysers developments, impact of stem cell research and genetics, service delivery options

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 for submission, and undertaking revision for the exams.

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.

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

MO1 Rehabilitation Engineering pathway: Describe and analyse human movement and solve quantitative biomechanical problems

MO2 Rehabilitation Engineering pathway: Demonstrate a knowledge and understanding of the main disabling conditions

MO3 Rehabilitation Engineering pathway: Critically evaluate medical and social models of rehabilitation

MO4 Rehabilitation Engineering pathway: Critically evaluate the principles that underpin assistive technology in a range of areas such as mobility, posture control, environmental controls and communication aids

MO5 Rehabilitation Engineering pathway: Demonstrate an understanding of the use of biomechanical analysis in assessment and assistive technology design

MO6 Rehabilitation Engineering pathway: Critically evaluate manufacturing techniques used in rehabilitation engineering and assistive technology

MO7 Rehabilitation Engineering pathway: Critically evaluate the properties of materials used in rehabilitation engineering technology and the key elements of design practice in rehabilitation technology

MO8 Renal Technology pathway: Critically evaluate the biochemistry, microbiology virology and different modalities of renal replacement therapy

MO9 Renal Technology pathway: Demonstrate a knowledge of the standards and quality of water available through the municipal systems and the water quality standards required for dialyses

MO10 Renal Technology pathway: Critically evaluate the role of buffers and electrolytes in dialysis fluids

MO11 Renal Technology pathway: Critically evaluate the fistula and other forms of access and be able to explain recirculation and its measurement, blood flow rates, assessment techniques and the impact of stenosis

MO12 Renal Technology pathway: Critically evaluate the principles of the operation of dialysis equipment and associated consumables

MO13 Renal Technology pathway: Demonstrate an understanding of the various standards and guidelines currently followed in renal units

MO14 Renal Technology pathway: Appreciate the impact, illness, disability and dialysis complications can have on treatment

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://uwe.rl.talis.com/modules/ussklf-30-3.html

Part 4: Assessment

Assessment strategy: The Assessment Strategy has been designed to support and enhance the development of both subject-based and more transferable graduate skills, whilst ensuring that the modules learning outcomes are attained, as described below.

Assessment Task 1:

The set exercise will provide apprentices with an opportunity to demonstrate their knowledge and critical thinking across the syllabus.

Assessment Task 2:

Assessment Task 2 will provide an opportunity for apprentices to demonstrate their ability to apply the principles of their relevant area of clinical engineering to an unseen problem and/or case study and evidence their skills in approaching and interpreting it appropriately.

Formative feedback is available to apprentices throughout the module through group discussions, and in workshops. 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 tasks:

Set Exercise (First Sit)
Description: Set Exercise
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO10, MO11, MO4, MO5, MO6, MO7, MO8, MO9

Case Study (First Sit)
Description: Case study integrated assignment (2000 words)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO12, MO13, MO14, MO2, MO3, MO5, MO8

Set Exercise (Resit)

Description: Set Exercise

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO10, MO11, MO4, MO5, MO6, MO7, MO8, MO9

Case Study (Resit)

Description: Case study integrated assignment (2000 words)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO12, MO13, MO14, MO2, MO3, MO5, MO8

Part 5: Contributes towards

This module contributes towards the following programmes of study:

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