

MODULE SPECIFICATION

Part 1: Information			
Module Title	Advanced Medical Engineering		
Module Code	USSKLE-30-3	Level	3
For implementation from	September 2017		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Health & Applied Sciences	Field	Applied Sciences
Department	Applied Sciences		
Contributes towards	BSc (Hons) Healthcare Science (Clinical Engineering)		
Module type:	Standard		
Pre-requisites	USSKLB-30-2 Advanced Clinical Engineering USSKLC-30-2 Applied Clinical Engineering		
Excluded Combinations	N/A		
Co- requisites	N/A		
Module Entry requirements	Level 5 (or equivalent) biomedical engineering qualification		

Part 2: Description
<p>This module examines the science and principles supporting Medical Engineering. The syllabus covers:</p> <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> ○ Pressure measurement <ul style="list-style-type: none"> ▪ 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 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

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

Component B will provide an opportunity for students 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 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)	A2
---	----

% weighting between components A and B (Standard modules only)	A:	B:
	50	50

First Sit

Component A (controlled conditions) Description of each element	Element weighting (as % of component)
1. Examination (1.5 hours)	50%
2. Open book in-class test (1.5 hours)	50%

Component B Description of each element	Element weighting (as % of component)
1. Case study integrated assignment (2000 words)	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 integrated assignment (2000 words)	100%

Part 4: Teaching and Learning Methods																										
Learning Outcomes	<p>On successful completion of this module students will be able to:</p> <ul style="list-style-type: none"> • Critically evaluate physiological signals, their production, characteristics and propagation [A1, B1] • Critically evaluate the passage and effects of electric current through the human body [A1, B1] • Critically evaluate the process of evaluation and selection of equipment [A1, B1] • Critically evaluate the impact of control of infection on the purchase, use and disposal of medical devices [A2, B1] • Describe how the equipment management lifecycle is applied by clinical engineers [A2] • Critically evaluate the various methods medical devices use to collect, process, store and transfer data [A2] 																									
Key Information Sets Information (KIS)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="5" style="text-align: left;">Key Information Set - Module data</th> </tr> </thead> <tbody> <tr> <td colspan="5"><i>Number of credits for this module</i></td> </tr> <tr> <td colspan="4"></td> <td style="text-align: center; border: 2px solid black;">30</td> </tr> <tr> <th style="text-align: center;">Hours to be allocated</th> <th style="text-align: center;">Scheduled learning and teaching study hours</th> <th style="text-align: center;">Independent study hours</th> <th style="text-align: center;">Placement study hours</th> <th style="text-align: center;">Allocated Hours</th> </tr> <tr> <td style="text-align: center;">300</td> <td style="text-align: center;">72</td> <td style="text-align: center;">228</td> <td style="text-align: center;">0</td> <td style="text-align: center;">300</td> </tr> </tbody> </table>	Key Information Set - Module data					<i>Number of credits for this module</i>									30	Hours to be allocated	Scheduled learning and teaching study hours	Independent study hours	Placement study hours	Allocated Hours	300	72	228	0	300
Key Information Set - Module data																										
<i>Number of credits for this module</i>																										
				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	<p>The table below indicates as a percentage the total assessment of the module which constitutes a;</p> <p>Written Exam: Unseen or open book written exam Coursework: Written assignment or essay, report, dissertation, portfolio, project 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)</p>																									
Total Assessment	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: left;">Total assessment of the module:</th> </tr> </thead> <tbody> <tr> <td>Written exam assessment percentage</td> <td style="text-align: center;">50%</td> </tr> <tr> <td>Coursework assessment percentage</td> <td style="text-align: center;">50%</td> </tr> <tr> <td>Practical exam assessment percentage</td> <td style="text-align: center;">0%</td> </tr> <tr> <td></td> <td style="text-align: center;">100%</td> </tr> </tbody> </table>	Total assessment of the module:		Written exam assessment percentage	50%	Coursework assessment percentage	50%	Practical exam assessment percentage	0%		100%															
Total assessment of the module:																										
Written exam assessment percentage	50%																									
Coursework assessment percentage	50%																									
Practical exam assessment percentage	0%																									
	100%																									
Reading List	<p>Modernising Scientific Careers Programme Training Manual for appropriate Division and Specialist Route. Available from http://www.nshcs.hee.nhs.uk/curricula</p> <p>Guidance for healthcare and social services organisations on managing medical devices in practice. Available from: https://www.gov.uk/government/publications/managing-medical-devices</p> <p>Brown, B.H., Smallwood, R.H., Barber, D.C., Lawford, P.V. and Hose, D.R. (1999) Medical physics and biomedical engineering. St Louis: Turtleback Books.</p> <p>Dunn, S., Constantinides, A. and Moghe, P.V. (2005) Numerical Methods in Biomedical Engineering. Cambridge: Academic Press.</p>																									

	<p>Northrop, R.B. (2010) Signals and Systems Analysis In Biomedical Engineering. 2nd edition. Boca Rato: CRC press.</p> <p>Ratner, B.D., Hoffman, A.S., Schoen, F.J. and Lemons, J.E. (2012) Biomaterials science: an introduction to materials in medicine. 3rd ed. Cambridge: Academic Press.</p> <p>Webster, J.G. (2009) Medical Instrumentation Application and Design. 4th ed. Chichester: Wiley.</p>
--	--

FOR OFFICE USE ONLY

First CAP Approval Date	23 February 2017			
Revision CAP Approval Date		Version	1	Link to MIA-10627