



ACADEMIC SERVICES

MODULE SPECIFICATION

Part 1: Basic Data					
Module Title	Advanced Clinical Engineering				
Module Code	USSKLB-30-2	Level	2	Version	1
UWE Credit Rating	30	ECTS Credit Rating	15	WBL module?	No
Owning Faculty	Health and Applied Sciences	Field	Healthcare Science		
Department	Biological, Biomedical and Analytical Sciences	Module Type	Standard		
Contributes towards	FdSc Healthcare Science				
Pre-requisites	USSKL6-30-1 Scientific Basis of Engineering	Co- requisites	None		
Excluded Combinations	None	Module Entry requirements	None		
First CAP Approval Date	2 February 2016	Valid from	September 2016		
Revision CAP Approval Date		Revised with effect from			

Part 2: Learning and Teaching	
Learning Outcomes	<p>On successful completion of this module students will be able to fulfil the learning outcomes (assessment intended for each learning outcome designated by [*] corresponding to assessment section):</p> <ul style="list-style-type: none"> • Describe the scientific principles that support the development and implementation of innovative technical solutions to clinical problems [A1, A2] • Review existing products and draw conclusions for suitability and evaluation purposes [B1] • Discuss a specification that meets user and environment requirements whilst adhering to the relevant standards and legislation [B1] • Explain and demonstrate the application of quality management systems relating to design and development of medical devices [A1, A2] • Discuss medical device design proposals [B1] • 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 [A1, A2] • Appreciate the range of tests that need to be performed when designing or manufacturing a medical device [A1, A2]
Syllabus Outline	<ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> ○ Electrical origin (Electrocardiogram (ECG), Electromyogram (EMG), Electroencephalogram (EEG), evoked responses, etc) ○ Non-electrical in origin (blood pressure, temperature, oxygen saturation, etc)

	<ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ Risk and implications and requirements
Contact Hours	<p>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).</p> <p>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.</p>
Teaching and Learning Methods	<p>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:</p> <ul style="list-style-type: none"> • 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.

The remainder of the independent learning time allocated to the module should be spent preparing written assessments for submission [B1, B2, B3], and undertaking revision for the controlled component [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.

Key Information Sets Information

Key Information Sets (KIS) are produced at programme level for all programmes that this module contributes to, which is a requirement set by HESA/HEFCE. KIS are comparable sets of standardised information about undergraduate courses allowing prospective students to compare and contrast between programmes they are interested in applying for.

Key Information Set - Module data				
Number of credits for this module				30
Hours to be allocated	Scheduled learning and teaching study hours	Independent study hours	Placement study hours	Allocated Hours
300	72	228	0	300

The table below indicates as a percentage the total assessment of the module which constitutes a -

Written Exam: Unseen written exam, open book written exam, In-class test

Coursework: Written assignment or essay, report, dissertation, portfolio, project

Practical Exam: Oral Assessment and/or presentation, practical skills assessment, practical exam

Please note that this is the total of various types of assessment and will not necessarily reflect the component and module weightings in the Assessment section of this module description:

	<table border="1"> <tr> <td colspan="2">Total assessment of the module:</td> <td></td> <td></td> </tr> <tr> <td>Written exam assessment percentage</td> <td></td> <td>50%</td> <td></td> </tr> <tr> <td>Coursework assessment percentage</td> <td></td> <td>50%</td> <td></td> </tr> <tr> <td>Practical exam assessment percentage</td> <td></td> <td>0%</td> <td></td> </tr> <tr> <td></td> <td></td> <td>100%</td> <td></td> </tr> </table>	Total assessment of the module:				Written exam assessment percentage		50%		Coursework assessment percentage		50%		Practical exam assessment percentage		0%				100%	
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		100%																			
Reading Strategy	<p>All students will be encouraged to make full use of the print and electronic resources available to them through membership of the University. These include a range of electronic journals and a wide variety of resources available through web sites and information gateways. The University Library's web pages provide access to subject relevant resources and services, and to the library catalogue. Many resources can be accessed remotely. Students will be presented with opportunities within the curriculum to develop their information retrieval and evaluation skills in order to identify such resources effectively.</p> <p>Any essential reading will be indicated clearly, along with the method for accessing it, e.g. students may be expected to purchase a set text, be given or sold a print study pack or be referred to texts that are available electronically, etc. This guidance will be available either in the module handbook, via the module information on Blackboard or through any other vehicle deemed appropriate by the module/programme leaders.</p> <p>If further reading is expected, this will be indicated clearly. If specific texts are listed, a clear indication will be given regarding how to access them and, if appropriate, students will be given guidance on how to identify relevant sources for themselves, e.g. through use of bibliographical databases.</p> <p>A detailed reading list will be made available through relevant channels, e.g. module handbooks, Blackboard, etc.</p>																				
Indicative Reading List	<p>Modernising Scientific Careers Programme Training Manual for appropriate Division and Specialist Route. Available from http://www.networks.nhs.uk/nhs-networks/msc-framework-curricula/ptp</p> <p>BSI (2006) BS8888 Technical Product Specification. London: British Standards Institute.</p> <p>Cross, N. (1990) <i>Engineering Design Methods</i>. Chichester: Wiley.</p> <p>Storey, N. (2009) <i>Electronics a Systems Approach</i>. Prentice Hall.</p> <p>Lathi, B.P. (1998) <i>Modern Digital and Analog Communication Systems</i>. Oxford U P.</p>																				

Part 3: Assessment

Assessment Strategy	<p>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.</p> <p>Component A</p> <p>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.</p> <p>Continuous assessment will be provided by the use of 3 x 30 minute online activities embedded in the module. These activities will require UWE login. The module leader will have full access to up-to-date data to monitor progress and marks obtained by</p>
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students. Feedback at this level will also be provided online and will be by review of the tests after they have been completed and will include the correct answers (after the relevant assessment period has concluded).

The design of these online assessed activities will be varied, for example:

- Timed essay questions
- MCQ
- Label the structure
- Prioritisation structure
- Scenario based questions

Component B

The element will capture the content of online learning and practical workshops delivered in the block weeks. This summative assessment will take the form of a poster presentation.

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 Department'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 assessment component and element	Component B1	
% 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. 3 x 30 minute online activities embedded in the learning process	50%	
Component B Description of each element	Element weighting (as % of component)	
1. Case study (poster)	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 (poster)	100%	
If a student is permitted a retake of the module under the University Regulations and Procedures, the assessment will be that indicated by the Module Description at the time that retake commences.		