University of the West of England
BRISTOL

ACADEMIC SERVICES

MODULE SPECIFICATION

Part 1: Basic Data						
Module Title	Scientific Basis of Engineering					
Module Code	USSKL6-30-1		Level	1	Version	1
UWE Credit Rating	30	ECTS Credit Rating	15	WBL module?	No	
Owning Faculty	Health & Applied Sciences		Field	Healthcare Science		
Department	Engineering Design and Mathematics		Module Type	Standard		
Contributes towards	FdSc Healthcare Science					
Pre-requisites	None		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	On successful completion of this module students will be able to (assessment intended for each learning outcome designated by [*] corresponding to assessment section): • Explain the fundamental principles of applied mechanics [A1, B1] • Solve basic mechanical problems using the application of force [A1, B1] • Have the knowledge to select the appropriate tools to perform basic mechanical tasks [A1, B1] • Explain electric and magnetic fields and the basic laws, which underpin them [A1] • Explain basic analogue & digital electronic components, circuits and systems [A1] • Explain basic amplifier circuits for linear and non-linear applications [A1, B2] • Explain a range of basic factors will influence the signal quality and describe signal processing and signal manipulation [A1, B2] • Describe the architecture of microprocessors and programmable devices [A2] • Explain the basic principles of interfacing a device to a microprocessor or programmable device and write a very simple microprocessor/programmable device program [A2, B2] • Interpret basic circuit diagrams, recognising some common configurations [A2]
Syllabus Outline	**Indicative content includes:** **Basic Mechanics** • Fundamental concepts; Units of measurements; International system of units;

numerical calculations

- Force Mass and acceleration
- Work Energy and Power
- Effects of force on Materials
- Moments
    - Equilibrium of a particle; free body diagram; force system resultants; principle of moments; moment of a force; moment of a couple; Resultant forces and couples; equilibrium of planar system of forces; graphical and analytical method
- Internal forces
    - Shear and moments; relation between distributed load, shear and moment; stress and strain; tensile and compressive stress and strain; factor of safety
- Hooke's Law and elastic constants
- Friction
    - Dry friction; frictional forces on screws, belts and bearing, rolling resistance, lubrication
- Moment of area
    - First and second moments; polar second moment of area; centroids; theorem of perpendicular axis
- Bending of beams
    - Stresses due to bending, neutral axis, radius of curvature, moment of resistance, general bending formula
    - Principles of finite element analysis
- Torsion of shafts
    - Stresses due to top twisting, angle of twist, general torsion formula, power and work.
- Simple Harmonic Motion
- Rigid body dynamics
- Simple Machines
- Heat, Energy and Transfer
- Tools
    - Tool types, selection and use
- Safe working mechanical engineering practice

Electronics

- Concepts of electricity and magnetism, structures of matter and its properties
- SI Units and Laws associated with electrical and electronic engineering
- Conductors and Insulators
- Semiconductor Theory
- Circuit components and associated symbols
- Elementary Analogue Circuits
    - Resistive, Capacitive and inductive, oscillators, amplifiers, including op amps, power amplifiers, power circuits including transformers
- Feedback, stability and noise
- Basic transducer theory
- Motors – Alternating Current (AC), Direct Current (DC), Stepping, pumps and their control and feedback circuits and systems
- Elementary Digital systems
    - Logic theory
    - Digital circuits, functions
    - Programmable devices
    - Microprocessor/Microcontroller
    - Interfacing with Microprocessor/microcontroller
    - Programming of Microprocessor/microcontroller
    - Application to simple control problems

- Signal Processing and manipulation
    - Signal conditioning e.g. Amplification, filtering, clipping, modulation
    - Signal sampling - simple sample-and-hold/track-and-hold devices

	○ Analogue to digital and digital to analogue converters ○ Voltage-to-frequency and frequency-to-voltage converters. ○ Signal Isolation principles ○ Analogue line drivers and receivers
Contact Hours	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 6 hours per block (a total of 18 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 54 hours of online engagement through a combination of lectures, synchronous online tutorials, synchronous and asynchronous discussions, online quizzes, and collaborative group work.
Teaching and Learning Methods	The strategy of this module is to provide a platform for students to gain an understanding of the scientific basis of engineering. 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 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, B2], 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.
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:

Total assessment of the module:	
Written exam assessment percentage	40%
Coursework assessment percentage	60%
Practical exam assessment percentage	0%
	100%

Reading Strategy	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. 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. 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. A detailed reading list will be made available through relevant channels, e.g. module handbooks, Blackboard, etc.
Indicative Reading List	**Basic Mechanics** Sadler, A.J. (1996) Understanding Mechanics, 2nd Edition. Oxford University Press. Hannah, J. and Hillier, M.J. (1995) Applied Mechanics, 3rd Edition. Harlow: Longman. Hibbeler, R.C. (2009) Engineering Mechanics: Statics & Dynamics. 12th Edition. London: Pearson Prentice Hall. **Electronics** Boylestad, R.L. (2003) Introductory Circuit Analysis (10th Edition). Prentice Hall. Boylestad, R.L. and Nashelsky, L. (2009) Electronic Devices and Circuit Theory. Prentice Hall. Floyd, T. L. (2008) Electronics Fundamentals: Circuits, Devices and Applications. Pearson Education. [Herrick, R. J. (2003) DC/AC Circuits and Electronics: Principles & Applications. Thomson. Martin, M. & Schinzinger, R. (2004) Ethics in Engineering. McGraw-Hill. Rizzoni, G. (2000) Principles and Applications of Electrical Engineering. McGraw-Hill. Storey, N. (2009) Electronics a Systems Approach. Prentice Hall. Temes, L. & Schults (1998) M. E. Schaum's Outline of Electronic Communication (2nd edition). McGraw Hill.

Part 3: Assessment	
Assessment Strategy	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 exams will provide students with an opportunity to demonstrate both their knowledge on a broad range of topics through a series of short answer questions, and more in-depth knowledge though a selection of medium length questions. **Component B** The integrated mechanics assignment which will provide an opportunity for students to demonstrate their ability to apply the principles of basic mechanics to unseen problems and evidence their skills in approaching it appropriately. The second element allows students to apply their knowledge and identify examples of how the principles of electronics that underpin Clinical Engineering through preparation and defence of a poster. 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	**C**	
% weighting between components A and B (Standard modules only)	**A:**	**B**:
	40	**60**

First Sit	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**
1. Examination (1.5 hours)	50%
2. Examination (1.5 hours)	50%
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Integrated mechanics assignment	50%
2. Poster presentation and defence (20 minutes)	50%

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. Mechanics exercise and electronics case study	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.	