UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title:	Medical Instrumentation and Imaging
Module Code:	MHT6001-A
Academic Year:	2019-20
Credit Rating:	10
School:	Department of Biomedical and Electronics Engineering
Subject Area:	Medical and Healthcare Technology
FHEQ Level:	FHEQ Level 6
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	**Hours**
Lectures	18
Tutorials	6
Directed Study	76

Availability	
Occurrence	**Location / Period**
BDA	University of Bradford / Semester 2 (Feb - May)

Module Aims

To acquire a systematic and advanced knowledge of the methods of modern medical instrumentation, including image processing techniques.

Outline Syllabus

* Medical Instrumentation: Sensors for biological signals, generic and specialised sensors, digital displays and computer based patient monitors. Noise reduction by hardware and introduction to signal processing. Biopotentials, ECG and EEG. Radioactive hazards and levels, x-ray radiography. Radioactive tracer scanning techniques; gamma camera, and PET scanners. Ultrasound scanning and beam-forming methods. Nuclear magnetic resonance and MRI techniques. K-space MRI and real-time methods. Comparison of resolution, time, cost and

applicability of techniques.
* Image Processing: Digital images and signals, image coding and compression, image analysis and enhancement. The Fast Fourier Transform and applications to image and signal processing; digital filtering. Convolution and the Convolution Theorem: Image smoothing, image sharpening, edge detection, artefact removal. Filtering in frequency and spatial domains, finite impulse response. Comparison of filter kernels and equivalences. Motion estimation and applications.

Learning Outcomes	
1	critically evaluate instrumentation in medical engineering, and how this is used to generate and process images;
2	have skills in the use of hardware and software to generate and process images, problem-solving, real-time interfacing;
3	have widely applicable skills in data presentation and interpretation, scientific method, and systematic problem solving.

Learning, Teaching and Assessment Strategy

The scientific basis of the subject is established by lectures, supported by direct reading for specific areas. Demonstration of techniques of Fourier analysis and image processing using course-specific software takes place during tutorial sessions.

Mode of Assessment

Type	Method	Description	Length	Weighting
Summative	Examination - closed book	Examination - closed book	2 hours	100%

Reading List

To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html.

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.