UNIVERSITY of BRADFORD

# Module Descriptor

## Medical Instrumentation and Imaging

| | |
|---|---|
| Module Code: | MHT6001-A |
| Academic Year: | 2018-19 |
| Credit Rating: | 10 |
| School: | Department of Biomedical and Electronics Engineering |
| Subject Area: | Medical and Healthcare Technology |
| FHEQ Level: | FHEQ Level 6 |
| Module Leader: | Dr Peter Olley |

Additional Tutors:

Pre-requisites:

Co-requisites:

### Contact Hours

| Type | Hours |
|---|---|
| Lectures | 18 |
| Tutorials | 6 |
| Directed Study | 74 |
| Examinations DO NOT USE | 2 |

### Availability Periods

| 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.

## Module Learning Outcomes

*On successful completion of this module, students will be able to...*

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 | Final Assess' |
|---|---|---|---|---|---|
| Summative | Examination - closed book | Examination - closed book | 2 hours | 100% | Yes |

## Legacy Code (if applicable)

ENG3020M

## Reading List

To view Reading List, please go to **rebus:list**.