ES3F0-15 Medical Device: Design, Maintenance and Assessment

21/22

Department
School of Engineering
Level
Undergraduate Level 3
Module leader
Leandro Pecchia
Credit value
15
Module duration
9 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

ES3F0-15 Healthcare Technology Engineering Design

Module web page

Module aims

To develop a firm understanding of the principles of modern design, manufacturing, maintenance and assessment of healthcare technologies, and particularly medical devices. This module will follow the World Health Organization (WHO) healthcare technologies definition, which includes: medical devices (including medical software), equipment, treatments and drugs for health and care (i.e., prevention, diagnoses, treatment, rehabilitation and end of life management). Students will learn how to generate and collect relevant clinical evidence, how to assess clinical needs, and how to consider cost-efficacy constrains, ethical issues, regulatory frameworks and management methods and tools.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The module will be organized in 3 parts:

- Part 1: health technology design
  o Physical and physiological principles, block diagrams and ordinary maintenance issues of exemplar medical devices will be presented (e.g., electrocardiography, medical devices for radiology unit, assistive technologies, point of care devices, diagnostics, active implantable devices, monitors and medical devices for intensive care units or surgery units, principal medical devices for surgery or technologies for minimally invasive surgery).
  o Block diagrams and technical requirements for exemplar medical locations or settings: hospital wards; surgery units, emergency units.
  o Information and communication technologies for healthcare
  o Human centered design
  o User need elicitation to inform the design of medical devices
- Part 2: clinical engineering
  o The medical device life cycle
  o European legislation for medical devices and comparison with the USA Food and Drugs Administration (FDA)
  o Medical software
  o Risk management in hospital: patient and healthcare professionals safety
  o Healthcare technology management
- Part 3: health technology assessment
  o Introduction to the evidence based medicine
  o Methods for systematic literature reviews
  o Standard methods to measure the impact of medical devices: the quality of life
  o incremental cost-efficacy analysis
  o Cost minimization analysis
  o Cost-utility, cost-effectiveness and cost-benefit assessment

Learning outcomes

By the end of the module, students should be able to:

- Describe the physical and physiological principles that underpin complex medical devices for prevention, diagnosis, treatment, rehabilitation or end of life.
- Apply methods to design advanced healthcare technologies
- Analyse the appropriateness of innovative health care technologies by reading a health technology assessment report.
- Analyse the technological feasibility and cost-effectiveness of a new medical device. Identify, classify, prioritize medical or epidemiological needs and participate in studies aiming to identify the most suitable technological solutions to satisfy those needs.
- Participate in multidisciplinary working group for the design and development of medical devices.
- Identify, classify and priorities the main ethical issues arising from the design,regulation and use of medical devices

Indicative reading list

1. Miniati, Roberto, Ernesto Iadanza, and Fabrizio Dori. Clinical engineering: from devices to systems. Academic Press, 2015.
2. Tony Easty, "Human Factors for Health Technology Safety: Evaluating and improving the use of health technology in the real world” (to be published in June 2014)
3. E. IAdanza, “Clinical Engineering Handbook", Elsevier Academic Press, 2020, ISBN: 9780128134672
4. Selected articles from scientific journals, including:

Subject specific skills

TBC

Transferable skills

TBC

Study

Study time

Type	Required
Lectures	1 session of 1 hour (1%)
Seminars	3 sessions of 1 hour (2%)
Project supervision	8 sessions of 1 hour (5%)
Demonstrations	(0%)
Online learning (independent)	18 sessions of (0%)
Private study	138 hours (92%)
Total	150 hours

Private study description

Guided independent learning 138 hr

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time
Individual Assignment Essay plus presentation	40%	
Group Project (Max 6000 words, excluding figures, including peer assessment)	60%	

Feedback on assessment

Coursework and Group Project marked with detailed comments
Face-to-face feedback in seminars

Availability

Courses

This module is Core for:

- Year 3 of UESA-H161 BEng Biomedical Systems Engineering
- Year 3 of UESA-H163 MEng Biomedical Systems Engineering

This module is Core optional for:

- Year 4 of UESA-H164 MEng Biomedical Systems Engineering with Intercalated Year
- Year 3 of UESA-H115 MEng Engineering with Intercalated Year

This module is Optional for:

- Year 3 of UESA-H113 BEng Engineering
- Year 3 of UESA-H114 MEng Engineering
- Year 4 of UESA-H115 MEng Engineering with Intercalated Year

This module is Option list A for:

- Year 4 of UESA-H111 BEng Engineering with Intercalated Year
- UESA-H112 BSc Engineering
    - Year 3 of H112 Engineering
    - Year 3 of H112 Engineering