ES97C-15 Research and Professional Skills in Biomedical and Clinical Engineering

23/24

Department
School of Engineering
Level
Taught Postgraduate Level
Module leader
Christopher James
Credit value
15
Module duration
10 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

An introduction to Biomedical Engineering for MSc students on H800. This module is held at the beginning of the term 1 and aims to quickly give students an overview of the biomedical various topics to help them choose an appropriate MSc project. The module also equip students with the required background knowledge and skills for the MSc course.

Module web page

Module aims

The principal aims of this module are to:

i) provide engineers with a fundamental understanding of the structure and function of the human body;
ii) provide an awareness and advanced understanding of established and emerging biomedical technology for the measurement and modification of the structure and function of the human body;

iii) enable the participants to investigate and communicate ideas from pioneering areas in biomedical engineering research;
iv) provide an understanding of the biomedical engineering profession and the various roles of the biomedical engineer.

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.

Introduction to Biomedical Engineering and an overview of the human body – basic physiology and anatomy. The major organs and how they perform.

Biomechanics: Bones and muscles. The skeleton, and the operation of the muscular system. Statics, force loading, measurement of motion, forces and levers.

Cardiovascular systems: The heart, circulatory system, and respiration, including consideration of dimensions, flow rates and forces.

Medical Diagnostics and Medical Imaging: The role of technology in providing early diagnostics and remote monitoring. Clinical imaging technology, including MRI, PET, CT, and ultrasound.

DNA: How DNA carries the genetic code, DNA sequencing, and evolution. Nanotechnology.

Neural Engineering: The structure and function of the brain. Accessing information from the brain through bioelectric potentials: EEG & MEG. The use of neural implants such as deep brain stimulation & cochlear implants.

Biomedical Engineering as a profession: various roles of the biomedical engineer, career paths, the role of ethics in BME.

Matlab/Simulink skills for Biomedical Engineering.

Learning outcomes

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

- Critically assess and evaluate research and technology carried out by others including use of modelling, statistics, communication, feasibility and relevance.
- Identify skills and knowledge required for Biomedical and Clinical Engineering, evaluating and evidencing own skills and identifying and planning opportunities for development
- Understand the operating principles of modern and advanced technologies in BME including: biomedical imaging, biomechanics, biomedical signal processing.
- Describe and analyse current trends in technological innovations in the cardiac, neural and rehabilitation fields.
- Understand BME as a profession and the ethical considerations considering latest developments.
- Exercise initiative and personal responsibility, which may be as a team member or leader.

Indicative reading list

"Anatomy & Physiology: The Unity of Form and Function", Saladin, K.S., 2014, McGraw-Hill
"Introduction to Biomedical Engineering", Enderle, J.D., Bronzino, J., 2011, Academic Press
"Medical Instrumentation Application & Design", Webster, J.D., 2009, John Wiley & Sons
"Human Anatomy & Physiology", Marieb, E.N., 2007, Pearson Education
"Basic Biomechanics", Hall, S.J., 2011, McGraw-Hill Higher Education
“Biomedical Signal Processing: Principles and Techniques”, Reddy, D.C., McGraw-Hill Education, 2005

Subject specific skills

Critical review of research papers.

Transferable skills

Team work, Project Management.

Study

Study time

Type	Required
Lectures	10 sessions of 1 hour (7%)
Seminars	6 sessions of 1 hour (4%)
Project supervision	4 sessions of 2 hours (5%)
Practical classes	2 sessions of 2 hours (3%)
Private study	122 hours (81%)
Total	150 hours

Private study description

Includes work on group project and individual project

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A4

	Weighting	Study time
Group Project - Application of Biomedical Engineering to solve a problem	40%	
Groups are required to apply engineering skills to address a biomedical problem. Assessed by a 10-15 min presentation.		
Individual Report	30%	
Research Seminar Assessment	30%	
Assesses understanding from ES97C research seminars (x3 moodle quizzes)		

Feedback on assessment

Summative written feedback on final submission of courseworks.

Availability

Courses

This module is Core for:

- Year 1 of TESA-H800 Postgraduate Taught Biomedical Engineering