# CLINICAL REHABILITATION - 2024/5

## Module code: ENG3173

## Module Overview

One of the primary clinical roles of the biomedical engineer is the assessment and remediation of physical impairment.

Prosthetics and orthotics are key technologies and clinical practices of assisting patients to restore appropriate body functions in the modern healthcare industry.

Similarly, human movement analysis offers ways to carry out an assessment to the clinical rehabilitation of the lower limb amputee.

This module provides a comprehensive overview of the assessment of functional impairments and understanding the role that prosthetics and orthotics play in rehabilitation.

### Module provider

Mechanical Engineering Sciences

### Module Leader

XU Wei (Mech Eng Sci)

### Number of Credits: 15

### ECTS Credits: 7.5

### Framework: FHEQ Level 6

### Module cap (Maximum number of students): N/A

## Overall student workload

Independent Learning Hours: 77

Lecture Hours: 22

Seminar Hours: 2

Tutorial Hours: 8

Laboratory Hours: 8

Guided Learning: 11

Captured Content: 22

## Module Availability

Semester 1

## Prerequisites / Co-requisites

N/A

## Module content

- An understanding of the basic parameters of gait and the gait cycle
- Kinematic and kinetic analysis of gait in the sagittal plane.
- Kinematic and kinetic parameters of normal gait
- Pathological gait and its characterisation
- An overview of three-dimensional kinematic and kinetic analysis of the gait.
- An overview of gait analysis tools
- Introduction to prosthetics and orthotics
- A brief introduction to assessment procedures for lower limb amputees
- Principles of operation of inner soles; AFOs and KAFOs. Introduction to spinal bracing.
- Current prosthetic socket attachment methods and future trends such as osseo-integrated implants
- Principles of operation of lower artificial limbs, with particular reference to developments in prosthetic Ankle and knee joints e.g. C-leg and etc.
- Engineering science supports the design and development of prosthetic limbs.
- Basic surgical aspects in relation to the prosthetic limb attachment.
- Ethical considerations faced by the clinical engineer

## Assessment pattern

| Assessment type | Unit of assessment | Weighting |
|---|---|---|
| Examination Online | Online exam (2 hours within 4 hours window) | 100 |

## Alternative Assessment

N/A

## Assessment Strategy

The exam has been design for student to demonstrate their knowledge in both human movement, prosthetic and orthotic rehabilitation and ability of applying the knowledge and skills in interpreting an engineering related clinical problem and presenting a solution clearly with scientific/engineering justifications.

The summative assessment for this module consists of:

- Online examination [ Learning outcomes 1, 2, 3, 4, 5, 6, 7 ]

Formative assessment and feedback

- Formative verbal feedback is given in the tutorials

## Module aims

- An understanding of the application of engineering principles for the evaluation of patients and for the development of prosthetic products and systems for lower limb amputees and introduction to the orthotics used by disabled patients.
- An understanding the role of human movement measurement technical in the clinical rehabilitation, especially for lower limb amputees.

## Learning outcomes

| Ref | | Attributes Developed | |
|---|---|---|---|
| 001 | Give qualitative and quantitative descriptions of the normal gait cycle, | CPT | C1 |
| 002 | Understand the measurement methods and quantitative analysis of gait. | PT | C1 |
| 003 | Identify symptomatic gait and describe the associated pathology. | KP | C1 |
| 004 | Describe the state of the art in external prosthetics and orthotics equipment. | KPT | C5 |
| 005 | Describe the application of engineering science for the clinical rehabilitation, in particular for the lower limbs. | KCT | C5 |
| 006 | Understand the state-of-the-art prosthetic joints development and applications and be able to define the limitations inherent in the current approaches. | CT | C13 |

| Ref | | Attributes Developed | |
|---|---|---|---|
| 007 | Understand the considerations, regulations and standards to be applied for product development in the healthcare industry. | PT | C8 |

### Attributes Developed

C - Cognitive/analytical

K - Subject knowledge

T - Transferable skills

P - Professional/Practical skills

## Methods of Teaching / Learning

The learning and teaching strategy is designed to:

Introduce human movement analysis system with worked examples. This is delivered through both lectures and a lab demonstration.

Introduce prosthetic and orthotics, the clinical application of the lower limb prosthetic joints, design and development of lower limb prosthetic joints, medical and surgical aspect of  lower limb prosthetic joints.

The learning and teaching methods include: Lectures, Labs Visit, Seminar and tutorials.

Indicated Lecture Hours (which may also include seminars, tutorials, workshops and other contact time) are approximate and may include in-class tests where one or more of these are an assessment on the module. In-class tests are scheduled/organised separately to taught content and will be published on to student personal timetables, where they apply to taken modules, as soon as they are finalised by central administration. This will usually be after the initial publication of the teaching timetable for the relevant semester.

## Reading list

https://readinglists.surrey.ac.uk
Upon accessing the reading list, please search for the module using the module code: ENG3173

## Other information

The School of Mechanical Engineering Sciences is committed to developing graduates with strengths in Employability, Digital Capabilities, Global and Cultural Capabilities, Sustainability, and Resourcefulness and Resilience.
Digital capabilities: The students will use human movement software to complete class exercises including acquisition, process, and analysis of the human movement data.
Employability: Students will be supported to develop their knowledge and skills in using human movement software to carry out gait analysis for patients. Students will also be supported to develop their knowledge and skills in the development of prosthetics for lower-limb amputees. All of the above skills will help them become employment ready.
Sustainability: Sustainability is one of the important elements in the development of prosthetic limbs.
Students will provide an opportunity to visit the clinical centre, therefore building their confidence in the clinical rehabilitation area in the future.

## Programmes this module appears in

| Programme | Semester | Classification | Qualifying conditions |
|---|---|---|---|
| Biomedical Engineering BEng (Hons) | 1 | Compulsory | A weighted aggregate mark of 40% is required to pass the module |
| Biomedical Engineering MEng | 1 | Compulsory | A weighted aggregate mark of 40% is required to pass the module |