HUMAN BIOLOGY - 2024/5

Module code: ENG2092

Module Overview

This module describes the structure and function of the human body from the molecular to the system level, including the function of major organ systems. Furthermore, regulation of internal environmental conditions (homeostasis) by feedback loops and an introduction into measuring physiological activities and basic anthropometrics will be covered throughout.

Module provider

Mechanical Engineering Sciences

Module Leader

GILSON Rosanna (Mech Eng Sci)

Number of Credits: 15

ECTS Credits: 7.5

Framework: FHEQ Level 5

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

Overall student workload

Independent Learning Hours: 62

Lecture Hours: 33

Tutorial Hours: 11

Guided Learning: 11

Captured Content: 33

Module Availability

Semester 1

Prerequisites / Co-requisites

N/A

Module content

- Introduction to cellular biology, including structure and function of organelles; concept of the fluid mosaic model in animal cells; DNA structure and its role in protein synthesis.Basic biochemistry, including molecular structure of substrates for metabolic processes, types of reactions including synthesis and degradation of adenosine triphosphate (ATP). [3h]

- Musculoskeletal System: This includes the introduction of bone ossification and growth/remodelling (Wolff's Law); fractures and their treatment; structural and functional classification of joint types and their position in the body; the sliding filament theory; introducing the concept of lever systems (effort, fulcrum and lever) in relation to the musculoskeletal system; disorders of the musculoskeletal system.[15h]

- Structure and function of the cardiovascular system, including the blood, blood vessels and the heart. Factors contributing to disorders of the system including thromboembolisms..The lymphatic system and its function and cooperation with the cardiovascular system.Structure and function of the respiratory system, including gaseous exchange at the alveoli with blood. [6h]

- Development of blood cells from stem cells, particularly leukocytes of the immune system. Functions of the 5 main types and their response to inflammation and bacterial infection. Disorders of the immune system will be covered. The role of the digestive and endocrine systems. [3h]

- Detailed structure and function of the nervous system, both central (CNS) and peripheral (PNS) as the control centre of the human body. Disorders arising as a consequence of system deterioration such as Parkinson's and Alzheimer's. [6h]

- Biomedical engineering practices for measuring anthropometric data and physiological measurements of blood flow, ECG, lung capacity and other electrical signals from major organs of the human body will be covered throughout the course.

Assessment pattern

Assessment type	Unit of assessment	Weighting
Coursework	Coursework 1	10
Coursework	Coursework 2	30
Examination	Examination	60

Alternative Assessment

N/A

Assessment Strategy

The assessment strategy is designed to provide students with the opportunity to demonstrate understanding of the function, anatomy and interaction of the multiple key systems that form the human body. The coursework allows students to increase the depth of their knowledge in a specific aspect of biomedical engineering relating to human biology, but requires an understanding of the broader biological context. The examination will assess students on a broad range of topics within the course content.

Thus, the summative assessment for this module consists of:

Coursework 1 [Learning outcomes 1, 2, 3, 6]

Coursework 2 [Learning outcomes 4, 6, 7, 8]

Examination [Learning outcomes 1-8]

Formative assessment and feedback through in module starters and plenary tasks.

Formative verbal feedback is given in tutorials.

Verbal feedback is given on draft coursework assessment at a specific tutorial ahead of coursework submission.

Written feedback is given on coursework tasks when marked.

Module aims

- An introduction to cellular biology and biochemical reactions critical for intracellular metabolic processes.
- A comprehensive understanding of bone ossification, joints, structure of the skeletal system and bone's role in the regulation of blood calcium levels. Furthermore, the dependence of other factors such as hormones, vitamins and minerals on bone growth will be covered, along with the importance of lifestyle and nutrition in combating bone disorders.
- Detail knowledge of muscle anatomy and physiology, i.e., muscular contraction at the microscopic level due to contributing factors including nerve impulses, ATP, calcium and specific muscular proteins.
- A general overview of transport processes at the cellular level across the lipid bilayer; with a more detailed look at fluid systems within the body (i.e., blood and lymph; circulatory, urinary, respiratory and immune systems) including their composition and function.
- A solid understanding in the structure and function of the nervous system (CNS and PNS). Control and propagation of nerve impulses at the microscopic level will be covered and the outcome of degenerative disorders of the nervous system will be examined (i.e., epilepsy, Parkinson's and Alzheimer’s).
- Common techniques used in medical engineering to for basic anthropometric measurements will be introduced. In addition the techniques used to measure physiological activities of internal systems will also be investigated (e.g., ECG, EMG, spirometry).

Learning outcomes

		Attributes Developed
001	Define and discuss the interdependence of the musculoskeletal system and joints in providing movement, locomotion and work	KC
002	Describe anatomical directions and name major parts and features of the skeletal system, including the classifications of all joint types within the human body;	K
003	Identify the 3 major muscle groups in the body and translate their microscopic anatomy to their specialised function;	K
004	Interpret fluctuations in homeostatic balances and attribute imbalances to a particular system;	CP
005	Discuss the important aspects of fluid systems including cardiovascular, respiratory, urinary and immune systems and their respective roles in maintaining a constant internal environment;	KCP

		Attributes Developed
006	Differentiate between diseases of the bone and joints, and compare causes and treatments for these diseases;	KC
007	Recognize the importance of micturition, ultra-filtration and the role the kidney plays in hormone and electrolyte balancing;	KP
008	Compare and evaluate the cause and effects of diseases in the cardiovascular system and nervous system, and describe how biomedical engineering might remediate them.	KCP

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 the function and interaction of the key components of the human body and their disorders through a systemic approach, using worked examples. This is delivered principally through lectures, tutorial classes and captured content.

The learning and teaching methods include:

- Independent Learning Hours
- Tutorial
- Captured content
- Lectures

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: ENG2092

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. This module is designed to allow students to develop knowledge, skills and capabilities in the following areas;

Digital Capabilities:For assessments in this module, students will need to use search engines to find suitable academic literature sources to research subject matter relevant to coursework themes. Students will need to use word processing and referencing tools to produce written pieces of work.

Employability: Through the learning on this module, students will become familiar with various anatomical and scientific terms that will support them in their pursuit of a career in medical or biomedical engineering. Through the content of this module, students will gain insight into various clinical roles that may be adjacent to their future work as biomedical engineers. The coursework requirement of demonstrating criticality when reading academic literature will encourage students to consider good experimental and statistical practices in research, that may be useful to them later on in a research role.

Resilience & Resourcefulness: The iterative nature of the coursework of this module promote student progress over time, giving students the opportunity to reflect and act on their feedback in previous assignments to improve success in later assignments. The coursework tasks of this module necessitate that students embark on their own reading around a subject, interrogating what they read to form their own opinion.

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