Sci-Phy-4-Health taught modules

Our taught modules include material drawn from across the physical sciences, combined with more generic study training and personal development components to support the ongoing scientific careers of our students and graduates.The scientific content is listed below:

Open all sections

Bioscience for engineers

Delivery

Seminars, practical exercise class sessions, team working sessions, individual study, problem sessions, small group discussions.

Description

This module develops knowledge of the molecular structures and functions of carbohydrates, lipids and DNA, with attention to the cell cycle, gene expression and cell signalling. The seminars cover histology and physiology, and explore industrial applications such as tissue engineering.

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

- Describe the structures, important characteristics and functions of carbohydrates, lipids, nucleic acids, peptides and proteins in biological systems
- Describe the structural and functional characteristics of cells, tissues and selected body systems
- Explain the processes involved in cellular respiration, gene expression, DNA replication and cell division
- Explain how cellular behaviour can be controlled through chemical signalling
- Give an overview of the current applications of cells in bioprocesses
- Demonstrate safe and appropriate handling of microorganisms

Assessment

Coursework 20%, written examination 80%.

Molecules and materials in biomedicine

Delivery

Lecture/seminar classes including problem solving and small group discussions, presentations, guided study, demonstrations of instruments in action.

Description

This module introduces key concepts in the state-of-the-art uses of Molecules, Nanoparticles and Materials in Biomedicine. The module will explore the designs and approaches used for creating molecular probes that can be used to image biological systems (including contrast agents, luminescent probes and Raman probes and spectroscopy) together with related agents that are therapeutics.

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

- Explain the physical science principles behind the main uses of molecules and materials in biomedicine.
- Critically analyse and justify which approaches will suit what types of biomedical problems and explain the advantages and limitations.
- Explain the design features of molecular probes and therapeutics and how they might be applied in research in biomedical imaging science and for therapy.
- Analyse how a novel probe or therapeutic might interact with biomolecules, suggesting potential targets and techniques that might be used to assess those interactions.
- Analyse and explain what materials might be suited to what biomedical challenges and why.
- Critically analyse research publications in molecular and materials physical science applied to biomedicine.

Assessment

Coursework 30%, oral examination 70%.

Bench to market

Delivery

Lectures, seminars, exercise/laboratory classes, group discussions.

Description

From the latest technologies through to post market surveillance activities – this module looks at the stages involved in the multimillion pound process of biomedical

device development. You will learn about preclinical studies, clinical trials, manufacturing considerations and regulatory procedures.

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

- Describe and demonstrate an understanding of the key stages in the development of a biomedical product.
- Demonstrate an understanding of the regulatory and quality environment of the industry.

Assessment

Coursework 50%,oral examination 50% .

Computational tools for modelling and analysis

Delivery

Lectures, seminars, laboratory/exercise classes.

Description

This module introduces concepts, techniques and tools for the computational modelling and analysis data from medicine and biology. The key schemes for data representation and a survey of state-of-the art methods for statistical data analysis, machine learning, ~~and~~ optimisation, classification, cluster analysis, data reduction and image analysis will be presented in the context of examples drawn from a range of sources of biomedical data. The module will provide both theoretical background and practical experience of implementing and applying the techniques.

- Explain and apply mathematical and computational methods for the modelling and analysis of biomedical data.
- Analyse biomedical research problems and identify suitable modelling and analysis strategies.
- Write software to implement a range of modelling and analysis methods, and critically appraise their use on different problems.

Assessment

Coursework 30%, written examination 70%.

Frontiers in biomedicine

Delivery

Lecture/seminar classes including problem solving and small group discussions, presentations, guided study.

Description

This module will focus on introducing the three healthcare challenges and providing underpinning knowledge required for approaching research projects in these in: Rebuilding the ageing and diseased body; Understanding cardiovascular disease; Improving trauma and emergency medicine. The seminars will highlight the state-of-the-art in research and outline key problems where physical sciences may be applied. Underpinning areas covered will include: The cardiovascular and respiratory systems; the immune system; the neuromuscular system; hard tissues - tooth and bone; Regenerative medicine and stem cell technology

- Identify, justify, rationalise and critically analyse the state-of-the art in biomedicine with a particular focus on areas relevant to the key health challenges.
- Critically analyse biological and medical research publications related to imaging, and communicate this analysis.
- Identify, justify, rationalise and critically analyse the application of physical sciences to solve topical biomedical research problems, especially those influencing the outcomes in disorders related to ageing, cardiovascular disease and traumatic injury.

Assessment

Coursework 40%, oral examination 60%.

Physical science analytical and measurement techniques

Delivery

Lecture/seminar classes including problem solving and small group discussions, presentations, guided study.

Description

This module introduces the main physical science concepts, analytical measurement techniques and tools used for biomedical research and will explore the state of the art in research including in the use of physical science applied to imaging in the biomedical sciences. The module will provide practical experience of using a subset of the techniques. Topics will include optics and microscopies, mass spectrometry and mass spectrometry imaging, NMR and MRI, electron and scanned probe microscopies, X-rays and synchrotron techniques, NIR imaging, and the underlying physical science being such imaging and measurement.

- Identify, justify and appreciate the state-of-the art in analytical measurement techniques and tools applied to Biomedicine, and the physical science challenges that need to be addressed to advance research in the field.
- Critically analyse research publications in physical sciences analytical measurement techniques and tools applied to biomedicine.
- Identify and justify the importance of topical biomedical research problems which will benefit from advances in analytical measurement techniques and tools.
- Explain the principles of the main physical analytical measurement techniques used in biomedicine.
- Critically analyse and justify which techniques might suit to what types of biomedical problems and explain the advantages and limitations.

Assessment

Coursework 30%, oral examination 70%.

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