

Bioscience for Engineers

Department of Chemical Engineering, School of Chemical Engineering

College of Engineering and Physical Sciences

Details

Code 19767

Level of study Third/Final year

Credit value 10

Semester 1

Pre-requisite modules None

Other pre-requisites None

Module description

1. Molecules of life · Structure and function of lipids, carbohydrates, proteins and nucleic acids (2 hours of lectures) 2. Cellular structure · Structure and function of cellular components within eukaryotic and prokaryotic cells (3 hours of lectures) 3. Cellular function and activity· Cellular thermodynamics, including derivation of cellular energy through oxidative and anaerobic generation of ATP (2 hours of lectures)· Gene expression: What is a gene? Transcription, translation, control of gene expression, the lac operon. (2 hours of lectures)· DNA replication and the cell cycle: prokaryotic and eukaryotic genomes, meiosis, mitosis, binary fission (2 hours of lectures + team exercise to design an experiment to prove DNA replication is semi-conservative)· Cellular signalling and control: endocrine, paracrine and synaptic signalling. Function of intracellular and cell-surface receptors (channel-linked, G-protein-linked and catalytic receptors) (2 hours of lectures)4. Biological systems in engineering (6 hours of lectures + 2 hours practical fermentation demonstration)· Introduction to how biological systems can be used by biochemical engineers, including key terms and definitions used by biochemical engineers. · Consideration of a wide range of bioprocesses and their products. · Key biological and mechanical components of manufacturing processes and how this influences the choice of biological system. · Survey of applications in the key bio-industries including pharmaceuticals, food processing, fine chemicals, waste water treatment environmental remediation and tissue engineering/regenerative medicine.5. Cellular organisation· Introduction to histology (1 hour)· Anatomy and physiology of biological systems and structures important in "molecular delivery" e.g. digestive system, respiratory system and skin (3 hours)Lectures are supported by 3 hours of problem-solving tutorials.6. Practical skills for microbiology· Aseptic technique· Importance of pure culture· Microbial form and function · Analytical techniques (e.g. imaging technology, traditional microbiological enumeration, histochemistry and proteomics)· Shake flask fermentation

Teaching and learning methods

Lectures, tutorials and laboratory classes

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