



**QUEEN'S  
UNIVERSITY  
BELFAST**

# FROM DISCOVERY TO RECOVERY

BSc  
**BIOMEDICAL SCIENCE**

# DR STEPHEN MCCULLOUGH

## PROGRAMME COORDINATOR



Welcome to our BSc Biomedical Science handbook and thank you for showing an interest in this exciting subject area.

Biomedical scientists focus on the role of cells, organs and systems in the human body; an exciting and interesting subject area that is highly relevant to the understanding and treatment of human diseases.

Our degree is accredited by the Institute of Biomedical Science and is aimed at students wishing to pursue a career in diagnostic laboratory science as biomedical scientists within the NHS, research or management careers in the pharmaceutical industries or academic research.

We aim to make sure you are applying what you are learning in the classroom, to the lab bench and to scientific research. That emphasis is demonstrated by the opportunity for all students to obtain first-hand experience of laboratory research in one of our Global Research Institutes.

We teach using cutting edge techniques and technologies so that what we teach is relevant to what you will go on to do after study, but also what is relevant to society today.

Myself and the team in the School of Medicine, Dentistry and Biomedical Science at Queen's hope that you can join us to help solve worldwide health issues and we look forward to welcoming you to Belfast soon.



**RANKED IN THE TOP  
1% OF UNIVERSITIES  
INT THE WORLD**

(QS WORLD UNIVERSITY RANKINGS 2018/  
WEBOMETRICS.INFO)



**BELFAST IS THE SAFEST  
REGION IN THE UK**

(BRITISH CRIME SURVEYS, 2015/16)



**94% OF STUDENTS  
IN BELFAST SAID THEY WERE  
'VERY HAPPY'**

**TO BE STUDYING HERE**  
(STUDENT LIVING BY SODEXO 2016)



**BELFAST VOTED  
NUMBER 1 REGION**

**IN THE WORLD TO VISIT IN 2018**  
(LONELY PLANET, 2017)



**LOWEST COST OF  
LIVING IN THE UK**

(MERCER, 2016)



**ALL MAJOR UK CITIES WITHIN  
AN HOUR'S FLYING TIME**

(COMPLETE UNIVERSITY GUIDE 2016)

# WHAT IS BIOMEDICAL SCIENCE?

Biomedical scientists focus on how cells, organs and systems function in the human body; an area that is highly relevant to the understanding and treatment of human diseases. Our Biomedical Science degree enables you to explore the sciences related to medicine and in particular, the specialist disciplines of diagnostic Biomedical Science as practised in Health Service Laboratories.

## What will I learn?

Biomedical Science comprises the sciences related to medicine and in particular these specialist disciplines of diagnostic Biomedical Science as practised in Health Service Laboratories:

- Clinical Bacteriology and Immunology
- Clinical Biochemistry
- Haematology and Transfusion Science
- Histopathology and Cytology

Further modules provide a sound background to other fundamental areas of Biomedical Sciences (including Anatomy and Physiology) along with cutting-edge subject areas of relevance to Life Science careers.

## Where will my degree take me?

The BSc in Biomedical Science at Queens is aimed at students wishing to pursue a career in:

- Diagnostic laboratory science as Biomedical Scientists within the National Health Service
- Clinical trials relating to drug registration and patents
- Government or Charity-funded research laboratories
- Management careers in the Pharmaceutical or Biotechnology Industries
- Academic Research and Development
- Postgraduate entry to Medicine, Dentistry and allied Health Professions after gaining a strong scientific training at undergraduate level

**“The knowledge and practical lab skills that I have developed over the past three years has allowed me to start my career as a biomedical scientist in a NHS haematology laboratory. This would not have happened without the high standard of teaching from leading researchers in a variety of different fields and the continued support from Queen’s.”**



# MODULE INFORMATION

## Stage 1

### The World of Microorganisms

A practical and theoretical introduction to the biology of bacteria, viruses, fungi, algae, protozoa and parasites. On completion of this module, you will be able to describe the basic structure of economically and medically important examples of bacteria, viruses, fungi, together with protozoan and metazoan parasites; outline the various interactions that such organisms may have with animals and plants; describe how microorganisms relate to production and use of food; describe how such organisms may contribute to the manifestation of disease; discuss the biotechnological potential of such organisms for the benefit of humankind.

### Human Structure and Function

This module gives you an introduction to the structure and function of cells, tissues and systems of the human body. It covers basic anatomical and physiological terminology, the microanatomy of the cell and the structure, function and classification of the basic tissues of the body including epithelium, connective, muscle and nerve; the structure and function of skin, blood, eye and ear; the structure and function of the organs and components of the major body systems including the cardiovascular, respiratory, urinary, endocrine, immune, alimentary and reproductive systems. The study of anatomy is enhanced by a range of practical classes where there are opportunities to examine prosected human cadaveric specimens, preserved potted human specimens and microscopic anatomy via virtual slides.

### Molecular Basis of Life

This module will give you a knowledge and understanding of: the structure and roles of nucleic acids, amino acids and proteins, including specific named examples; some of the techniques used to study them including pH, pKa, absorbance calculations and PCR; the genetic code, its translation into proteins, its effect on the phenotype by biochemical activity; basic control of differentiation in embryogenesis, the structure and transmission of chromosomes (nuclear and organelle); independent segregation, linkage and recombination; evolution by selection; the methods of study of allele frequencies at population level, including the Hardy-Weinberg equilibrium prediction, its calculation, interpretation and use; the use of web-based bioinformatics tools to identify a protein-encoding gene, predict protein structure and function and the applications of genetics in biotechnology. You will develop laboratory skills related to molecular biology, biochemistry and genetics as well as computational analyses of genome/transcriptome data.



# MODULE INFORMATION

## Stage 2

### The Sciences of Disease

This module will give you a basic introduction to immunology, human disease and the laboratory clinical sciences of pathology, microbiology and haematology. You will gain many practical skills including working with cells of the immune system in vitro, working with antibodies and sera, protein analysis using Western blot, ELISA and the use of virtual microscopy to identify pathological and haematological abnormalities

### Cell Biology & Clinical Genetics

This module will focus on two main themes: cell biology and clinical genetics. The cell biology component provides a substantial understanding of the molecular basis of cell structure and function, including practical experience of handling and observing living mammalian cells. The medical genetics component consolidates knowledge of genetic information processing and inheritance patterns of human disease and considers the different mutational mechanisms that underlie disease phenotypes, and the detection mechanisms used to identify them. You will gain practical laboratory skills in animal cell handling and culture, phase-contrast biomicroscopy, immunofluorescent staining, confocal scanning laser microscopy alongside practical in silico skills in data analysis tools for genomic analyses.

### Professional Practice in Biomedical Science

This module introduces the practical aspects of the work carried out by hospital Biomedical Scientists and explains the important role these scientists play in the diagnosis and treatment of patients and concerns the major Biomedical Science disciplines of Cellular Pathology; Clinical Biochemistry; Clinical Immunology; Haematology; Immunohaematology and Transfusion Science; Medical Microbiology. The module will also introduce you to the application of statistics to medical research and the methodology of how to undertake scientific research. The statistics component gives an introduction to basic statistical principles/methods and experience in presenting, analysing and interpreting data and the scientific methods component provides a working knowledge of the scientific method.

## Stage 3

### Advanced Infections & Clinical Biochemistry

The module will consider requirements for a successful pathogenic microbial existence in the context of the epidemiology and spread of infection, the molecular basis of virulence and the pathogenesis of disease. The module will also include an overview of clinical biochemistry in the hospital setting followed by detailed lectures covering the areas of core biochemistry, endocrinology and specialised investigations. Students will receive an Introduction to NHS biochemistry and automated laboratory analysis.

# MODULE INFORMATION

## Stage 3 (continued)

### Research Project

You will undertake a substantial piece of project work that will provide an introduction to scientific research, further developing your capacity for independent, analytical and critical thought and improve their application of technical/transferable skills. In the first semester you will interpret and analyse the scientific literature around a specific question of relevance to biomedical or human biology research and produce an illustrated science magazine article that provides a distillation of the science for the consumption of the educated lay person. In the second semester you will carry out a short, closely defined laboratory based project or analysis of data linked to the scientific question posed in semester one resulting in a final report in the form of a scientific journal paper and a 10 min oral presentation to a panel of subject experts.

### Molecular Markers of Disease

This module aims to introduce students to molecular histology and also to provide them with a mechanistic understanding of the cell and molecular biology of haematological disorders with particular emphasis on those aspects that impact on current diagnosis and treatment. The four main tissue types are covered but the focus in each is on the structural components of cells that characterise whole tissues and how such elements are impacted by disease and its treatment. Haematology in health and disease will also be covered as this is an area that has been revolutionised by the introduction of cell and molecular biological techniques.

## WHAT'S NEXT?

### Visit our dedicated website

Our website for new students will provide you with more information on the application process, fees & funding, life in Belfast and much more.

[www.qub.ac.uk/MHLS/NewStudents](http://www.qub.ac.uk/MHLS/NewStudents)

### Get in touch

Contact a member of our team directly with any questions or queries you may have.

Email: [askmhls@qub.ac.uk](mailto:askmhls@qub.ac.uk)

WhatsApp: +44 (0)78 5188 0522

