BSc in Medical Sciences with CARDIOVASCULAR SCIENCES

Introduction
Cardiovascular disease is the leading cause of global morbidity and mortality. This course, significantly restructured from 2014, will provide students with an understanding of the scientific foundations and an introduction to the epidemiology, investigation and treatment of cardiovascular disease. This course will consist of a two week foundation course for the BSc, three 5-week taught modules and either a research project or a specialist course (two 5-week modules).

Course Director
Dr Cesare Terracciano  c.terracciano@imperial.ac.uk

Course Administrator
Uzma Chaudhary  cvbscteach@imperial.ac.uk

Aims and Objectives
The course will give a firm grounding in the scientific foundations of the study of cardiovascular disease. Specifically, the course will provide students with:

- A sound knowledge and understanding of cardiovascular science, extending to current research controversies and challenges.
- An understanding of and critical approach to the scientific evidence on which this knowledge is based.
- An appreciation of the fundamental principles and practice of scientific research within the field.
- An introduction to the epidemiology, investigation, management and treatment of cardiovascular disease.

Content
The course has been recently restructured to focus on cardiovascular disease areas and has a strong translational emphasis. The normal functioning of the heart and vasculature, the mechanisms that are involved in a particular disease, how these affect individual patients and populations and finally the scientific basis of established and novel treatments will be discussed in detail. There will also be an introduction to the principles of epidemiology, diagnostic imaging and therapeutic strategies as applied to cardiovascular disease.

Format of teaching
The course will be taught in a mixture of lectures, teaching seminars, small group journal clubs, practical demonstrations, practical classes and tutorials. The course will be based at the Hammersmith Campus. Some teaching will be performed at the St Mary’s Campus or the Royal Brompton Campus.
Introduction Foundation to Cardiovascular Sciences BSc Course

**Module Leaders**
Dr Julia Gorelik  
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Professor Cesare Terracciano  
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**Learning Objectives**
- To understand the nature and purpose of the scientific method and its relation to the practice of medicine.
- To learn basic concepts related to B.Sc. year Modules 1, 2 and 3.
- To understand the design of the laboratory-based project aspect of the course and the process of choosing a supervisor and subject.
- To develop further information technology skills.
- To apply information technology and journal reading skills to a Journal Club assignment.

**Module 1: The Science of Congenital Heart Disease and Arrhythmia**

**Module Leaders**
Professor Thomas Brand  
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Professor Nicholas Peters  
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Dr Zachary Whinnett  
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Professor Cesare Terracciano  
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**Aims and Content**
- To understand the structure and development of the heart, including the cardiac myocyte, and the interconnections between myocytes.
- To understand the basis of congenital heart disease, its occurrence in the population, the clinical studies and treatment.
- To be able to describe the basis and the mechanisms that bring about contraction and relaxation of the myocyte (excitation-contraction coupling) in normal and diseased hearts.
- To dissect the electrical nature of the heartbeat, and understand how the electrical properties of the heart can fail, giving origin to arrhythmia in individual patients and within populations.
- To have knowledge of developing technologies and novel approaches for imaging and treatment of arrhythmias.

**Module 2: The Science of Heart Failure**

**Module Leaders**
Professor Sian Harding  
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Professor Steve Marston  
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Professor John Cleland  
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Professor Darrel Francis  
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Aims and Content
- To understand the nature of cardiac contraction, how this is regulated and what causes it to fail.
- To discuss the different forms of cardiomyopathies and their molecular basis.
- To provide an introduction to the imaging techniques used to assess cardiovascular anatomy and function.
- To understand the methods to perform clinical trials in heart failure and discuss their impact and relevance for clinical practice.
- To explore established and novel therapeutic strategies in heart failure, with special sessions on gene therapy and stem cell therapy. The physiology of cardiac regeneration will be explored and current views on reactivation of cell cycle as treatment strategy will be discussed.


Module Leaders
Professor Anna Randi  a.randi@imperial.ac.uk
Dr Graeme Birdsey  g.birdsey@imperial.ac.uk
Dr Michael Schachter  m.schachter@imperial.ac.uk
Mr Prakash Punjabi  p.punjabi@imperial.ac.uk

Aims and Content
- To introduce students to the range of physiological functions performed by the vasculature.
- To understand normal vascular biology and its derangement in disease, with emphasis on atherosclerosis, hypertension and coronary artery disease.
- To understand the basic pharmacology of the cardiovascular system, including cellular and molecular aspects of vascular function.
- To discuss the epidemiology of vascular disease, preventive strategies and novel treatments.
- To introduce a range of surgical approaches on coronary artery disease.

Modules 4-5

Project Part C
A wide variety of laboratory-based, clinical and systematic review based projects will be offered.

Project Coordinator
Dr Michael Schachter  m.schachter@imperial.ac.uk

Past BSc Project Titles in Cardiovascular Sciences
- The prognostic significance of mid-wall fibrosis in dilated cardiomyopathy
- Mechanical unloading: potential treatment for heart failure
- Abnormal ECG referrals to Cardiology Clinics
- Assessment of microvascular ischaemia in Hypertrophic cardiomyopathy
- Separation of pressure waves directing blood flow using pressure-only analysis
- Is myocardial contraction band necrosis an important histological signature in victims of sudden cardiac death during emotional stress?
- The mouse cardiomyocyte as an in vitro model of stress cardiomyopathy
- The effect of AV delay on exercise capacity in patients with biventricular pacemakers and heart failure
- Effect of heart rate on optimal AV delay of CRT devices and the need to measure signal changes using an algorithm of alterations instead of steady state pacing
- Does Felcainide inhibit spontaneous Ca release events and triggered beats in normal cardiac myocytes?
- Examining the effect of glycaemic control on inflammatory and metabolic responses in the critically ill child following surgery for congenital heart disease
- Endothelial cells dysfunction in systemic inflammation:implications for cardiac surgery
- How to make new blood vessels: A new role for von Willebrand factor

**What do the students think of the BSc in Cardiovascular Sciences?**

I liked the way it was a very gradual course where each previous lecture served as an introduction to the next which enabled deeper understanding of the course. Also the lecturers were very helpful and very efficient with answering our questions which made us feel reassured.

Taught modules involve a mixture of lectures, seminars, small group tutorials, journal clubs, demonstrations and practical classes delivered by leading experts in the field.

The research project involves innovative research into a topic related to cardiovascular sciences or cardiovascular disease and is supervised by a member of academic research staff, who are internationally recognised leaders in their field. Many former students have presented at national and international conferences and have published their project work.

Overall it was a great course and there are no negative aspects worthy of mention.'

‘Cardiovascular Sciences is a challenging yet enjoyable BSc choice. An excellent, well organised BSc choice, with variety, highly enthusiastic lecturers and a few laughs along the way!’