IBSc in Cardiovascular Science

Despite major improvements in care, cardiovascular disease remains the major cause of death and disability in the UK, mainly from heart attack and stroke. Preventable risk factors such as blood pressure, cholesterol and diabetes, and lifestyle factors such as smoking and obesity account for the majority of deaths.

The IBSc in Cardiovascular Science is administered and taught by the Institute of Cardiovascular Science which research is broad, spanning discovery-based laboratory science, clinical translation and experimental medicine, as well as healthcare evaluation, implementation and policy. Much of the work is interdisciplinary, integrating with UCL Engineering, Nanotechnology, Chemistry, Behavioural Science.

AIMS & OBJECTIVES

The course is designed to build upon existing knowledge of cardiovascular physiology and pharmacology and give a sound, but contemporary view, of the scientific basis of cardiovascular disease and how this relates to clinical diagnosis and patient treatment. Specifically, the course will enable students to:

- gain a holistic view of the heart and circulation through an understanding of the physiological, pharmacological and pathophysiological mechanisms underpinning cardiovascular function in health and disease
- develop an understanding of the etiology, diagnosis and clinical management of common cardiovascular diseases through case-based, team work and class discussions
- appreciate current controversies and as well as the limitations of knowledge in the field of cardiovascular sciences.
- critically appraise basic science and clinical research papers with respect to experimental design, analytical methods and conclusions in a variety of cardiovascular-related topics
- have a foundation in scientific methodology and be able to use appropriate standard statistical techniques for analysing data as well as interpreting data
- to become an independent learner by leading on their own research project in an area of specialist interest.
- demonstrate effective oral and written communication skills

PROGRAMME STRUCTURE

The course has been designed to provide 3rd year medical students with a connected curriculum in Cardiovascular Medicine. Two core modules will be taken - Heart & Circulation and Clinical Case Studies in Cardiovascular Medicine. A choice of complimentary optional modules on different aspects of heart and vascular disease within ICS or elective modules run outside the Institute (e.g. receptor mechanisms; control of cardiorespiratory function), will be offered. Two new modules, including a Research Project geared towards translational medicine and Clinical Case Studies in Cardiovascular Medicine exploring epidemiology, pathophysiology, pharmacology and therapeutic strategies, have been specifically designed for this IBSc. For those students wanting additional transferable research skills, courses covering methods of research, critical analysis, writing/presentation, statistical analysis/interpretation, epidemiology, experimental, project design, fundamental laboratory skills and more advanced molecular biology methods can be taken in term 1.

The course is multidisciplinary and has contributions from Departments and Faculties across the School of Life and Medical Sciences at UCL, including the Institute of Cardiovascular
Science (ICS; the host department) as well as the Divisions of Biosciences, Medicine and Surgery & Interventional Science. The course will consist of four taught modules run over two terms (2.5 credits) and a research project (1.5 credits) in a cardiovascular or disease-related topic, involving either an experimental laboratory-based approach, or for example, an evidence-based review involving data analysis of patient cohorts.

The course material will be taught using a mixture of lectures, small group based tutorials, journal clubs and practical classes with e-learning sessions. Students will be assessed by individual and group coursework, 3,000 word essay, written exams (short & long answer essays, single best answer MCQs, data interpretation of seen paper), poster and oral presentations. Students must take core and optional courses and submit a 7500 word research project on a cardiovascular topic.

CORE MODULES

**PHOL3002:** The Heart and Circulation
1 unit
Module organiser: Prof Lucie Clapp
Term 1
The module builds upon your primary knowledge of the heart and circulation. Essential aspects of cardiac and vascular physiology will be considered. This will enable you to grasp a number of areas of experimental, applied and patho-physiology.

**Module assessment:** Blood Pressure Practical 2 %, Organ Bath Pharmacology Practical 3%, Poster preparation plus 15 minute presentation 15%, Unseen three-hour written examination 65 %, Essay (3000 words) 15%.

**CARD3001:** Clinical Case Studies in Cardiovascular Medicine
0.5 unit
Module organiser: Dr Tom Lumbers
Term 1
The workshop in Cardiovascular Pharmacology and clinical case scenarios will cover topics such as hypertension, heart failure, diabetes, obesity, coronary artery disease and congenital heart disease. The workshop will help the student to identify and characterize current & novel treatment options for patients with cardiovascular diseases and cover principals of how data analysis and statistics for research are applied to assess the action of these drugs.

Learning will be through seminar-style lectures, tutorials, class discussions on a case study that students will have written-up as a report, attending a clinic in one/two of the above specialities.

**Module assessment:** Data interpretation of a pre-read clinical research paper (45%), 2/5 short answer questions on course work(40%) and Oral presentation of case study (15%)

**CARD3002:** Independent Research Project in Cardiovascular science
1.5 unit
Module organiser: Professor Lucie Clapp
Term 2
Students will choose from a range of cardiovascular topics that can be laboratory based, involve data collection and/or analysis of retrospective or ongoing clinical research or involve gene annotation. Where appropriate, the supervisor will have obtained ethical approval for the work, but students will be expected to write a research plan pointing out ethical and statistical
issues. Deadlines for choosing research projects and writing ethics applications will be set early in the 1st term.

Students will carry out the research principally during term 2 and will write a dissertation to be handed in just before the Easter holidays. All students will be expected to adhere to a series of deadlines for plan, draft and final dissertation.

**Module assessment:** Dissertation (80%), Assessment by supervisor of performance throughout the project (10%) and Oral presentation (10%).

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**OPTIONAL MODULES**

**CARD3003:** Congenital Heart Disease - Fundamentals
- 0.5 unit
- Module organiser: Dr Andrew Cook
- Term 1

This module will provide in-depth information on morphology, imaging, intervention & surgery for specific lesions seen in patients with congenital heart disease with a focus on anatomy.

**Module assessment:** Practical case Examination (70%) and Practical case report (30%)

**CARD3004:** An introduction to Molecular Laboratory Methods in Cardiovascular Research
- 0.5 unit
- Module organiser: Dr Petros Syrris
- Term 1

This module will provide an introduction to key molecular contemporary techniques used in cardiovascular research. Students will undertake practical work covering fundamental laboratory skills (pipetting, aseptic techniques etc.) and more advanced genetic/molecular biology methods such as genetic screening, sequencing methods and molecular cloning. Topics related to practical sessions will also be covered by lectures, exercises, e-learning and tutorials.

**Module assessment:** Method write up. This will include an overview of method(s) used and critical appraisal (50%) and Unseen exam data handling questions(50%)

**CARD3005:** Cardiovascular Diseases
- 0.5 unit
- Module organiser: Dr Ann Walker
- Term 2

This module provides an overview of the cutting edge of cardiovascular research and clinical practice, delivered by UCL and UCLH scientists and clinicians who are leaders in their field.

It introduces cardiac anatomy and cardiovascular epidemiology; describes cardiovascular risk factors and interventions to reduce the risk; describes the current molecular understanding of aetiology and pathology and treatment of cardiovascular diseases and gives examples of breakthroughs in imaging, Gal knockout biological heart valves and the future of cardiovascular gene therapy.

**Module assessment:** Essay. A choice of at least three essay titles will be provided.(100%)
ELECTIVE MODULES

**PHAR3004: Receptor Mechanisms**
0.5 unit
Module organiser: Prof. Alasdair Gibb
Term 1
This module is about the mechanisms involved in the generation of a response following receptor activation, either by a natural hormone or neurotransmitter or by drug action, and how drugs may interfere with receptor-mediated responses. Mechanisms involving ligand-gated ion channels, voltage-dependent calcium channels and potassium channels, G-proteins, second messengers (e.g. inositol phosphates, diacylglycerol) and cellular kinases and phosphatases are then considered in detail, together with the role of calcium. A final section draws these themes together by examining integrated cell responses such as the control of the release of insulin from the pancreas.

**Module assessment:** Essay 15%; Unseen three hour written examination 85%.

**PHAR3006: Drug Design and Development**
0.5 unit
Module organiser: Dr Dean Willis
Term 1
This module is about the discovery of new drugs. Students will consider the ways of identifying novel compounds for development and the processes which take place before such compounds are released onto the market following its introduction into clinical practice. The module includes an opportunity for project work on the development of a specific drug, a practical class on the effects of drugs on gastric secretion in human volunteers, seminars on ethics committee operation and on drug licensing and a one-day visit to the drug industry.

**Module assessment:** Unseen three-hour written examination 75%; 1 practical/poster presentation 25%.

**PHOL3011: Autonomic and Central Control of Cardiorespiratory Function**
0.5 units
Module organiser: Dr Ian Edwards
Term 2
This module will look at the autonomic control of the cardiovascular and respiratory systems. The module will cover the anatomy of the autonomic nervous system (introducing the relevant peripheral and central areas that are involved in homeostatic control), the sympathetic nervous system and the parasympathetic nervous system (specifically how they interact to control the activity of the cardiovascular system), the central respiratory network and how it establishes normal breathing patterns, and finally how the activity in these pathways changes in response to exercise and disease. This will be accompanied by a mini-project comparing the sympathetic/parasympathetic balance in different exercise paradigms.

**Module assessment:** Project report (2,000 words) 20%, Laboratory worksheets 10 %, Unseen three-hour written examination 70%.

Taking the lead in turn. These presentations will form part of the in course assessment together with the preparation of a 'News and Views' style review article selected from a variety of topics.

**Assessment:** Unseen three-hour written examination 70%; Oral presentation 15%; Review article (2,000 words) 15%.
BIOC3017: Cellular and Molecular Aspects of Cardiovascular Disease
0.5 unit
Module organiser: Prof. K Srai
Term 2
Module Assessment: Unseen two-hour written examination 70%; ICA reference evaluation (1,800 words) 15%; ICA Journal Club presentation (8 minutes) 15%.

ORTH3004: Research Methodologies and Transferable Skills
0.5 unit
Tutors: Dr C Pendegrass,
TERM 1
Assessment: 100% exam.
Venue: UCL Bloomsbury
This module introduces the skills required to conduct research and to understand and critically evaluate research output produced by others. It includes basic approaches to scientific writing and critical analysis of published work, together with bibliographic information management and presentation skills. A substantial proportion of the module is concerned with understanding data and how it can be analysed: variables, statistical methods and how to interpret results. The design of research (including clinical) studies, the principles of epidemiology and the ethical considerations in both laboratory and clinical research are also covered. The contents of the module will be useful in preparing for students’ own projects.

The module details listed here may be subject to change. Please contact the Module Organiser for confirmation and further details.