**BSc Biomedical Sciences: Year 1 Course Outlines and Academic Leads**

Year 1 is made up of three major courses, which are subdivided into a variable number of modules, each with its own Academic Lead who will normally be a subject specialist, often with a substantial research profile in the subject of the module. In the first term, modules inter-digitate as students need to build up their knowledge base in a number of key areas simultaneously. In terms two and three, the systems teaching is largely delivered in blocks to allow students to focus on each system in turn.

***Transferable skills teaching***

A major objective of the programme is that every student should graduate with a good set of transferable skills to complement their biomedical knowledge and skills. In order to achieve this, in addition to the planned science teaching, a transferable skills module will form an independent strand alongside the science teaching in Year 1. In addition, each science module will require students to practise and make use of transferable skills which are appropriate to the subject content and the teaching and assessment modalities employed.

***Introduction to laboratory techniques***

This module forms a second strand running through the first term of teaching. Laboratory practicals are integrated into modules covering other relevant teaching.

***Self-direction and reflection***

White space is timetabled throughout the programme, to give time for the development of self-management and reflective learning skills.

***Summary of Year 1:***

Year 1 incorporates 26 weeks of teaching, each of 9 sessions. Lectures and tutorials will normally be 1 h long. Practical and transferable skills sessions will vary in length from 1 – 3 h, depending on the nature of task.

Lectures: 239

Tutorials: 34

Practicals: 31

Demonstrations: 4

Transferable skills sessions: 40

**Terms 1 – 3: Transferable skills**

Title of module: **Transferable skills**

Teaching weeks: **Throughout Year 1**

Academic Lead: **Dr Sue Smith**

Campus: **All campuses**

**Overall learning objectives**

Students should be able to:

* Speak and write fluently to communicate complex ideas with clarity
* Work effectively both independently and collaboratively as a part of a team
* Self-motivate with the ability to identify their own strengths and weaknesses and able to organise their time effectively
* Use evidence-based arguments to explain, influence and negotiate
* Research a topic efficiently, identifying appropriate sources, and extracting key points from the material accessed
* Analyse data skilfully and possess a sound understanding of key statistical methods and concepts
* Make effective use of computer and information technologies
* Possess good problem-solving skills
* Think creatively, flexibly and with the ability to innovate when necessary
* Adapt to make effective use of changing environments and opportunities
* Manage and plan their own career
* Appreciate the ethical implications of their work
* Work with integrity and honesty at all times

**Course content (approx numbers of lectures, tutorials, practical classes):**

40 interactive workshops across the first academic year

**Summative assessment of the module:**

**Coursework:** Workshop outputs will not be assessed summatively as stand-alone items. However, the skills acquired will be assessed in coursework from other modules

**Examination:** Assessment integrated into all summative examinations

**Term 1: Cell and Molecular Biomedical Science**

Title of module: **Chemistry and Biochemistry of Biomolecules**

Teaching weeks: **Weeks 2 and 7**

Academic Lead: **Dr Muireann Coen**

Campus: **South Kensington**

**Overall learning objectives**

Students should be able to:

* Identify the main families of bioactive molecules
* Summarise their key features, relating structures and functions
* Use information on the chemical structures of the molecules to predict functions in biological systems
* Be familiar with the main methods that may be used to separate and identify biomolecules.
* Understand the strengths and weakness of these analytical techniques.
* Be able to combine the information above to plan analytical approaches.

**Course content (approx numbers of lectures, tutorials, practical classes):**

8 Lectures

1 Tutorial

4 Practical Classes

**Transferable skills and integrated skills (IS)**

2 transferable skills sessions

IS in module: Team working, academic writing, academic honesty, self motivation, data handling

**Summative assessment of the module:**

**Coursework:** Two practical write-ups

**Examination:** In the Cell and Molecular Biomedical Science exams

**Term 1: Cell and Molecular Biomedical Science**

Title of module: **Biology of cells and tissues**

Teaching weeks: **Weeks 2, 5, 8**

Academic Leads: **Dr Peter Clark and Prof Mike Ferenczi**

Campus: **South Kensington**

**Overall learning objectives**

Students should be able to:

* Understand and compare the general organisation of prokaryotic and eukaryotic cells
* Understand the structure and general functions of membranes
* Describe the structure and function of the membranous organelles, including those involved in the processes of exocytosis and endocytosis
* Outline the three major components of the cytoskeleton and understand their structure and function
* Explain the structure and mechanisms of action of the actomyosin contractile apparatus
* Describe the structure and functions of intercellular junctions
* Understand the how cells receive and process signals from the extracellular environment
* Describe how cells signal to other cells
* Describe mitotic cell division
* Understand the cell cycle and its regulation
* Be able to set up and optimally use a standard light microscope
* Outline the major cellular components of blood
* Describe the structure, organisation and functions of the major extracellular matrix components
* Understand the composition of the major fluid compartments in cells and tissues
* Describe the cellular specialisations and histological organisation of major tissue types (epithelia, connective tissues, muscle, nerve)

**Course content (approx numbers of lectures, tutorials, practical classes):**

21 Lectures

1 Tutorial

4 Practical Classes

**Transferable skills and integrated skills (IS)**

5 transferable skills sessions

IS in module: Team working, academic writing, academic honesty, data handling

**Summative assessment of the module:**

**Coursework:** Two practical write-ups

**Examination:** In the Cell and Molecular Biomedical Science examinations

**Term 1: Cell and Molecular Biomedical Science**

Title of module: **Metabolism (enzymes & energetics)**

Teaching weeks: **Weeks 3-4**

Academic Lead: **Dr James Pease**

Campus: **South Kensington**

**Overall learning objectives**

Students should be able to:

* Understand the concepts of primary structure, secondary structure, tertiary structure and quaternary structure with respect to proteins.
* Appreciate the different types of bond that combine to stabilise a particular protein conformation.
* Describe how enzymes act as catalysts of reactions including roles of co-factors, substrates, products, with reference to selected model enzymes.
* Understand basic enzyme kinetics
* Understand the key steps and regulatory pathways in cellular metabolism, including energy production and the importance and roles of ATP.
* Compare and contrast the pathways for the biosynthesis and metabolism of fatty acids
* Outline the biosynthesis of cholesterol from acetyl CoA, its transport around the body and its uptake into cells via LDLR
* Outline general features of metabolic activity in liver, brain, muscle, and adipose tissue citing four examples of blood-borne hormones which act as metabolic regulators.
* Describe the effects of eating and fasting on metabolism and describe some of the metabolic disturbances that arise in diabetes.

**Course content (approx numbers of lectures, tutorials, practical classes):**

10 lectures

1 practical class

1 tutorial

**Transferable skills and integrated skills (IS):**

5 transferable skill sessions

IS in module: Team working, academic writing, academic honesty, data handling

**Summative assessment of the module:**

**Coursework:** Practical write-up.

**Examination:** In the Cell and Molecular Biomedical Science examinations

**Term 1: Cell and Molecular Biomedical Science**

Title of module: **Nucleic Acids and Gene Expression**

Teaching weeks: **Weeks 3-6**

Academic Leads: **Dr Birgit Leitinger and Dr Alex Blakemore**

Campus: **South Kensington**

**Overall learning objectives**

Students should be able to:

* To provide a basic understanding of how genetic information is stored, retrieved and translated
* To provide students with the necessary basics to understand genetic disorders
* To explore analytical techniques for nucleic acid analysis so that students are able to comprehend the basic concepts behind diagnostic and research tools used in biomedicine
* To understand the structure of DNA
* To explore how cells store genetic information
* To understand how the hereditary information is passed on from one cell to its daughter cells
* To explore the cellular mechanisms that are responsible for keeping mutations to a minimum
* To examine the mechanism by which cells decode genetic information and thus to learn how DNA is copied into RNA and how cells use this information to synthesise proteins
* To understand the mechanism of protein translation
* To introduce current analytical techniques for nucleic acid analysis

**Course content (approx numbers of lectures, tutorials, practical classes):**

15 lectures

2 tutorials

**Transferable skills and integrated skills (IS):**

3 Transferable skills sessions

IS in module: Self management, problem-solving, academic reading and writing, ethics,

**Summative assessment of the module:**

**Coursework:** 1000 word essay

**Examination:** In the Cell and molecular biomedical science examinations

**Term 1: Cell and Molecular Biosciences**

Title of module: **Introduction to Laboratory Techniques**

Academic Lead: **Dr Peter Clark**

Campus: **South Kensington**

Teaching Weeks: **Weeks 3, 4, 7 and 10**

**Overall learning objectives**

Students should be able to:

* Understand the importance of laboratory techniques in biomedical diagnostic and research practice.
* Explain the general requirements for good laboratory practice.
* Understand the use of a variety of general and specialised microscopy techniques
* Explain the methodology of separation techniques in the analysis of proteins
* Describe the use of analytical and sequencing techniques of DNA and RNA
* Understand the use of genetic cloning in research and in biotechnology
* Outline the use of the broad analytical techniques of genomics, proteomics and metabolomics

**Course content (approx numbers of lectures, tutorials, practical classes):**

10 lectures

4 demonstrations

Links with 7 practical classes in other Cell and Molecular Biosciences modules

**Transferable skills and integrated skills (IS):**

Transferable skills sessions: 0

IS in module: Problem solving, team-working, statistics and data handling, use of IT, ethics

**Summative assessment:**

**Coursework (eg: essay, practical write-up):** Data interpretation and handling exercise

**Examination:** In the Cell and Molecular Biosciences exam.

**Term 1: Cell and Molecular Biomedical Science**

Title of module: **Immunology & Infection**

Teaching weeks: **Weeks 8-11**

Academic Leads: **Dr Keith Gould, Dr Marjorie Walker, Dr Ramesh Wigneshweraraj**

Campus: **South Kensington**

**Overall learning objectives**

Students should be able to:

* Understand the basic concepts in the immunological response.
* Describe the cells and organs involved in the immunological response.
* Understand the definition and use of CD markers.
* Explain clonal selection.
* Explain innate immunity.
* Describe the structure of antibodies and their mode of action.
* Understand the differences between primary and secondary immune responses.
* Understand the basic differences in mode of action of the different classes of lymphocyte.
* Describe the mechanisms of host defence against pathogens.

**Course content (approx numbers of lectures, tutorials, practical classes):**

24 lectures

3 tutorials

**Transferable skills and integrated skills (IS):**

5 Transferable skills sessions

IS in module: Self management, problem-solving, academic reading and writing, ethics,

**Summative assessment of the module:**

**Coursework:** None planned due to proximity to examination

**Examination: In the Cell and Molecular Biomedical Science examinations**

**Term 2: Biology of Integrative Systems**

Title of module: **Nervous system**

Teaching weeks: **Weeks 1-2**

Academic Leads: **Dr Steve Gentleman and Prof Maggie Lowrie**

Campus: **Charing Cross**

**Overall learning objectives:**

Students should understand the following topics in health and disease:

* Cells of the nervous system
* Ionic basis of resting and action potentials
* Neurotransmission
* Organisation of the CNS, PNS and ANS
* Development of the nervous system
* Anatomy of the cranium and brain
* Anatomy of the vertebral column and spinal cord
* Brainstem and cranial nerves
* Blood supply to the brain
* Motor systems
* Sensory systems
* Cerebral cortex

**Course content (approx numbers of lectures, tutorials, practical classes):**

20 lectures

2 tutorials

3 practical classes

**Transferable skills and integrated skills (IS):**

4 Transferable skills sessions

IS in module: Problem-solving, team working, scientific reading and writing, communication skills, ethics

**Summative assessment of the module:**

**Coursework:** 1000 word essay – choice of titles

**Examination:** In the Biology of Integrative Systems examination

**Term 2: Biology of Integrative Systems**

Title of module: **Musculo-skeletal system**

Teaching weeks: **Weeks 3-4**

Academic Lead: **Dr Paul Strutton**

Campuses: **Charing Cross & South Kensington**

**Overall learning objectives:**

Students should be able to:

* Know the primary anatomy of the human body
* Understand the impact of gross anatomy on the functions of the human body
* Understand the main structures and functions of different types of bone.
* Understand the impact of malfunctions in the formation of bone
* Know the structure of skeletal muscle
* Describe the differences in structure between skeletal and cardiac muscle
* Describe and identify the types of skeletal muscle fibres
* Explain the function of skeletal muscle
* Understand the biochemical basis for muscle contraction
* Explain the effects of malfunctions of muscle contraction

**Course content (approx numbers of lectures, tutorials, practical classes):**

20 lectures

2 tutorials

4 practicals

**Transferable skills and integrated skills (IS):**

3 Transferable skills sessions

IS in module: Problem-solving, team working, scientific reading and writing, statistics, data handling, communication skills, ethics,

**Summative assessment of the module:**

**Coursework:**Practical write-up

Oral presentation of a paper

**Examination:** In the Biology of Integrative Systems examination

**Term 2: Biology of Integrative Systems**

Title of module: **Endocrinology**

Teaching weeks: **Weeks 5-6**

Academic Leads: **Dr Katie Wynne and Dr Laura Canavari**

Campus: **Hammersmith**

**Overall learning objectives**

Students should be able to:

* Explain the role in health and disease of the
  + hypothalamus and pituitary gland
  + thyroid gland
  + adrenal gland
  + reproductive hormones and puberty
  + parathyroid gland and calcium regulation
* Understand the endocrine regulation of metabolism and the pathophysiology of diabetes
* Identify the histological features of endocrine glands

**Course content (approx numbers of lectures, tutorials, practical classes):**

15 lectures

7 tutorials

1 practical

**Transferable skills and integrated topics:**

4 Transferable skills sessions

IS in module: Problem-solving, team-working, scientific reading and writing, communication skills.

**Summative assessment of the module:**

**Coursework:** 1000 word essay – choice of titles

**Examination:** In the Biology of Integrative Systems examination

**Term 2: Biology of Integrative Systems**

Title of module: **Haematology**

Teaching weeks: **Weeks 7-8**

Academic Leads: **Dr Andy Porter**

Campus: **Hammersmith**

**Overall learning objectives:**

Students should be able to:

* Understand the biology of the different types of cells found in the circulation, and the roles they perform.
* Summarise the regulation of the production of the blood cell types
* Understand the key components of haemostasis & the factors involved.
* Have an overview of the main pathologies, including heritable disorders, linked to the main cells in the circulation.

**Course content (approx numbers of lectures, tutorials, practical classes):**

21 lectures

7 tutorials

2 practicals

**Transferable skills and integrated skills (IS):**

2 Transferable skills session

IS in module: Problem-solving, team-working, communication skills, scientific reading and writing, ethics

**Summative assessment of the module:**

**Coursework:** 1000 word essay – choice of titles

**Examination:** In the Biology of Integrative Systems examination

**Term 2: Biology of Specific Systems**

Title of module: **Cardiopulmonary systems**

Teaching weeks: **Weeks 9-10**

Academic Lead: **Dr Duncan Rogers**

Campuses for teaching: Royal Brompton and South Kensington

**Overall learning objectives**

Students should be able to:

* Understand the primary functions of the heart and lungs
* Be aware of the roles of the different structures within the lung
* Understand the structures and functions of different blood vessels
* Be aware of the impact of pathological changes on lung function (allergy, Cystic fibrosis)
* Appreciate the impact of cardiovascular disease

**Course content (approx numbers of lectures, tutorials, practical classes):**

20 lectures

2 tutorials (including one debate)

3 practicals

**Transferable skills and integrated skills (IS):**

2 Transferable skills sessions

IS in module: Problem-solving, team-working, used evidence based argument in debate, data interpretation and analysis, scientific writing

**Summative assessment of the module:**

**Coursework:** Practical write up

**Examination:** In the Biology of Specific Systems examination

**Term 3: Biology of Specific Systems**

Title of module: **Reproduction, Development and Aging**

Teaching weeks: **Weeks 1-3**

Academic Lead: **Dr Mark Sullivan**

Campus: **Hammersmith**

**Overall learning objectives**

Students should be able to:

* Understand the normal processes involved in human reproduction
* Understand the main complications of human pregnancy
* Describe the main stages of *in utero* and *ex utero* development
* Understand the main changes during adolescence and puberty
* Describe the main changes that occur during the process of aging.
* Understand the impact of aging on selected tissues and systems (eg cardiovascular system).

**Course content (approx numbers of lectures, tutorials, practical classes):**

32 lectures

4 tutorials

2 Computer-aided sessions

**Transferable skills and integrated skills (IS):**

5 transferable skill sessions

IS in module: Computer skills, ethics, problem-solving, team-working, data interpretation and analysis, evidence based argument

**Summative assessment of the module:**

**Coursework:** Oral presentation

**Examination:** In the Biology of Specific Systems examination

**Term 3: Biology of Specific Systems**

Title of module: **Digestive and Metabolic systems**

Teaching weeks: **Weeks 4-5**

Academic Leads: **Dr Julian Walters, Dr Kevin Murphy, Dr Shahid Khan and Dr Vik Khullar**

Campus: **St Mary’s**

**Overall learning objectives:**

For the gastrointestinal system, the student should be able to:

* Describe the structure and functions of GI tract
* Explain the nature of digestion, absorption and regulation of these processes
* Explain the role of the GI system in relation to energy provision
* Describe the impact of alcohol on the GI system
* Summarise the main disorders of the GI system

For the hepatic system, the student should be able to:

* Describe the structure and functions of the liver
* Explain the role of the liver as an endocrine organ
* Identify the clinical manifestations of liver disease
* Explain the role of the liver in detoxification
* Explain the underlying pathology of liver failure and jaundice

For the renal system, the student should be able to:

1. Describe the structure and function of the human kidney
2. Explain the physical principles of renal function
3. Understand glomerular function
4. Explain the regulation of ions and acid-base balance
5. Explain the impact of renal failure on human health

**Course content (approx numbers of lectures, tutorials, practical classes):**

23 lectures

2 tutorials

**Transferable skills and integrated skills (IS):**

Transferable skills sessions: None

IS in module: Problem-solving, team-working, data interpretation and analysis

**Summative assessment of the module:**

**Coursework:** Data handling exercise

**Examination:** In the Biology of Specific Systems examination