

INSPIRING MINDS SINCE  
2012  
ES TD  
IMMERSE EDUCATION

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EDUCATION

# Medicine

SYLLABUS OVERVIEW

16-18 YEARS OLD

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## About the Programme

The aim of these introductory programmes is to provide participants with academically challenging content in a classroom environment based on the university style of learning. Through academic sessions, the programmes also offer young students unique and valuable insights into what it would be like to study their chosen subject at an advanced level.

This Syllabus Overview provides a summary of the topics and subject areas that participants can encounter during their studies with Immerse. It has been carefully created by our expert tutors who are members of faculty at world-leading universities, and who have experience in teaching undergraduate students.

# Academic Sessions

The academic sessions at Immerse are arranged into modules to enable participants to explore a broad range of topics over the course of their programme. The modules included in this syllabus overview are indicative but not prescriptive.

Tutors are encouraged to include their own specialisms and also focus on any particular areas of interest expressed by participants within the class. They may choose to provide further detail on a specific topic, or they may include new material and information that builds on the knowledge already developed during the programme.





## Personal Project

Each programme includes an element of individual work, generally termed the 'Personal Project'. This can take many forms but is commonly an essay or presentation delivered on the final day of the programme. Participants will receive feedback on this work which may also be mentioned in the participant evaluation which is provided in writing by the tutor once the programmes have ended.



## Preparatory work

Some tutors may ask participants to complete some preparatory work, such as reading or a series of exercises in advance of the programme. Participants are strongly encouraged to complete this work since it will be included in the opening sessions of the programme. Any preparatory tasks will be provided in advance of the programme directly to the participant.

## Academic Difficulty

As all of our programmes are designed to provide a unique introduction to advanced material, the syllabus will be academically challenging at times.

This is something to be excited about and all of our tutors will encourage and support participants throughout the programme. Immerse Education aims to develop every participant regardless of ability, and our tutors will adapt their teaching to individual needs.

# Aim of the Medicine Programme

The Immerse Education Medicine programme is designed to build upon the foundation of scientific knowledge that participants have already gained in a traditional classroom environment and highlight how this can be used to inspire further study at university. Participants are encouraged to explore new material in-depth and to form independent and considered opinions and ideas based on sound academic knowledge and research. With a strong foundation of theory, participants will explore the practical side of medicine through a series of practicals. By the end of the programme, participants will have a good understanding, not only of university-level content, but also the variety of degree programmes available in subjects related to biological sciences. Beyond this, participants will also explore the career opportunities available to graduates in this field.



# Medical Research: From Bench to Bedside

Scientific research is an incremental process occurring over years or decades, costing millions, and requiring painstaking work to be undertaken by vast teams of scientists and clinicians spanning various fundamental, translational and clinical research disciplines. In this session we will reaffirm the principles of the scientific method, delve into the various stages of medical research and the growing necessity for interdisciplinary approaches and international collaboration. In particular we will focus on the journey of laboratory bench discoveries to patient bedside, clinical trials, and careers in medical research.



## Functional Genomics and Epigenetics

In the 60+ years after the discovery of DNA's structure there has been astonishing progress in our understanding of heritability, gene function and variability. Since the completion of the Human Genome Project, considerable attention has been given to the emerging field of epigenetics, an area of research that focuses on the modifiers of gene expression. In class, we will extract and isolate DNA, and learn about the influences of parents on children in the womb, transgenerational epigenetics, and evidence for inherited memories. We will also cover the most recent breakthrough in genetics; the development of CRISPR-Cas9, a tool which allows virtually unlimited editing of the genome of any species.



## Anatomy and Histology

Humans have long been fascinated with anatomy, yet it wasn't until the invention of the microscope a few centuries ago, that we discovered the building blocks of life – cells, and thus the field of histology was born. Today we know our cells make up four basic tissue types which together form organs that carry out specific functions and work in concert with one another to comprise the 11 systems of the human body. During this session, students will become familiar with the anatomical locations, characteristics and microanatomical features of several vital organs through dissections and microscopy analysis so as to better understand their structure-function relationships.



## Cardiovascular and Respiratory Physiology

During this session, we will probe current scientific questions and consider current and emerging therapies to fight cardiovascular and respiratory diseases. Students will have an opportunity to investigate cardio-respiratory functions and perform a series of mini-experiments to investigate the regulation of breathing and heart rate. By the end, you will have developed a deeper understanding of the roles of CPR and AED in the emergency treatment of heart attacks and addressed the following questions: 'Why do some people get altitude sickness?', 'Is snoring bad for you?' and 'What does an asthma inhaler do?'



# Musculoskeletal and Endocrine Physiology

There are some 640 muscles and 206 bones in the human body. During puberty, hormones have a dramatic impact on our bodies, affecting growth, mood, metabolism, and emotional responses. In this class, we will look at new treatments in the fight against the best-known of all hormone disorders, diabetes mellitus, which results from a deficiency in the production of or response to insulin in the face of rising blood sugar levels. We will also discuss the relationship of bone marrow and blood, as well as the following question: What happens to our bodies in space? We will also look at some exciting new discoveries and controversies in sports and exercise physiology.



## Neuroscience and Neuropsychology

In this session, we will analyse how neurons produce electrical signals (action potentials) and discuss how the 37 trillion cells of your body can communicate and coordinate with one another. This will include a brief review of disorders of the nervous system such as dementia, epilepsy, and Parkinson's disease. In particular, we will study the various senses and how specialised neurons convert stimuli into electrical signals to rapidly communicate information to the brain for processing, interpretation, and response. We will also consider reality vs perception, as we explore the power of the placebo effect, and challenge our preconceived notions using a variety of optical, auditory and tactile sensory illusions.



# Pharmacology

Drugs form an intrinsic part of modern medicine. But do you understand exactly what a drug is doing to your body, and also what is your body doing to that drug? Why do we get side effects? How do determine drug safety and when does a drug become a poison? Here we will learn about the world of pharmacodynamics, pharmacokinetics and toxicology. We will also debate the changes humanity must make to stave the antibiotic resistance crisis, where we might find potential sources of novel drugs and if society should reconsider its handling of the substance abuse and addiction pandemic.



## Emergency Medicine

This session will introduce the 'DR. ABCDEFG' protocol (Danger, Response, Airway Breathing, Circulation, Disability, Exposure, Fluids, Glucose) used by the full spectrum of healthcare professionals during medical emergencies. From the first aider to the physician, we will explore the applied anatomical and physiological knowledge that underpins our understanding of the mechanisms of injury, diagnosis, and treatment in the pre-hospital emergency care setting. Emphasis will be placed on the chain of survival and the role of pre-hospital first responders in the continuum of care. Through patient simulation clinical scenarios, we will put this knowledge into practice for both medical and trauma case studies.

# Experimental Medicine

We live in exciting times. Leaps and bounds in technology combined with a flood of new thinking has led to a new renaissance in medicine. Although many novel therapies are still in their infancy, we will touch upon some of the new strategies that hold great promise for becoming the medicines of tomorrow, including stem cell therapies for incurable diseases, 'poop pills' for treating the microbiome and mental health, reanimating organs from the dead for transplant, bionic eyes for the blind and human augmentation, using 3D printed body parts in surgery, and the possibility of three parent or same-sex parent assisted reproduction.



## Science Communication

It is an imperative of researchers to disseminate new findings to the worldwide scientific and medical communities. It is only by doing this can results be replicated, validated, and by growing consensus come to be accepted as correct and incorporated into best practice. The principle means of scholarly communication are through journal articles or papers, conferences abstracts, presentations, and posters. In this session, students will discuss the pros and cons of each medium of communication and consider how scientists might better communicate and educate the general public.

## Personal Project

Throughout the fortnight, participants will be working on their own personal project. Having been provided with a brief, participants should research and prepare a presentation for their peers. This will build upon an aspect of the theory that they have learnt over the course of the programme and is also an opportunity to showcase the academic research skills they have developed. The presentation is followed by questions from the audience and wider class discussion of particular points of interest. The tutor may also include feedback about the presentation in the written evaluation which is sent to participants after the programme has ended.





OUR AWARDS AND ACCREDITATIONS



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