

Module Structure: (15 credits each)

- Lectures and Tutorials
- Assessment: 50% coursework, 50% unseen examination.

Module Title	Module 1: Bioinformatics and structural biology as applied to drug design
Module Code	MEDC0075
Module leader	Dr Edith Chan
Short description	In the post genomic era, use of Bioinformatics is important in many aspects of drug discovery, such as gene sequencing or target discovery. Biochemistry holds the key position in drug discovery at the interface of chemistry and biology. The fundamental of these two important areas in drug discovery process is taught. It is essential for students to understand the basic principles.
Module aims	<ul style="list-style-type: none"> • Basic principles of Bioinformatics and use of online databases • Basic principles of biochemistry and structural biology of proteins • Basic principles of modern protein structural determination techniques • To teach students to use simple Bioinformatics, such as Blast and RasMol • To teach students to use cloning software BioEdit • To teach students to use RasMol and PyMol
List of Lectures and Tutorials	<ul style="list-style-type: none"> • Introduction to Bioinformatics • Bioinformatics of drug targets • Use of Bioinformatics databases • Cloning and expression of proteins for structural studies • Structural Biology and tools • Blast and sequence alignment • Protein structure family
Module assessment	50% course work + 50% unseen 1 hour exam

Module Title	Module 2: The biology of drug discovery programmes
Module Code	MEDC0076
Module leader	Dr Edith Chan
Short description	What are the most important drug targets? The biology and pharmacology of the 5 major protein families will be explored. Drugs and drug action for each of the family will be explored in depth, including major experimental techniques. Emphasis on how to interpret the biological data from common experiments is stressed. Statistics for Biology will be taught and different modern techniques for target identification will be explored.
Module aims	<ul style="list-style-type: none"> • To understand the pharmacology of the main protein targets in drug discovery • To learn statistics for Biology • To learn how to interpret the biological data, such as Kd, IC50. • To understand the modern technology of identification of drug targets, such as microarray.
List of Lectures and Tutorials	<ul style="list-style-type: none"> • Pharmacology of the main drug targets • Biological data for drug discovery • Statistics for drug discovery • Identification of drug targets • Learn to use Origin • Learn statistical functions for biology • Journal Club
Module assessment	50% course work + 50% unseen 1 hour exam

Module Title	Module 3: Cheminformatics and modelling for drug design
Module Code	MEDC0077
Module leader	Dr Edith Chan
Short description	Drugs are usually small chemicals or molecules. It is important to understand their chemical and physical properties and how these are related to the “druglikeness”. The principle and practise of molecular modelling will be taught. The concept of druglikeness will be explored. The introduction of Cheminformatics and its usefulness in drug discovery will be taught, as well as its basic concept and techniques of cheminformatics
Module aims	<ul style="list-style-type: none"> • Understand the concept of 'leads, hits and drugs' and the definition of good drugs (hits and leads). • Learn concept and various methods to define drug likeness. • Familiarise with commercial software to perform basic calculation of drug likeness. • Be able to understand the concept of 'leads, hits and drugs' and the definition of good drugs (hits and leads). • Be able to use various methods and parameters to define drug likeness. • Familiarise with cheminformatics software
List of Lectures and Tutorials	<ul style="list-style-type: none"> • Cheminformatics in drug discovery and techniques • Concept of Drug likeness • Molecular modeling • QSAR • Learn how to draw small molecules • Learn how to calculate molecular properties • Learn how to do basic molecular modeling
Module assessment	50% course work + 50% unseen 1 hour exam

Module Title	Module 4: New therapies using biological molecules
Module Code	MEDC0078
Module leader	Dr Edith Chan
Short description	Traditionally, drugs are usually small chemicals or molecules. However, new therapeutics has emerged. For examples, monoclonal antibodies have become important treatment for cancer. Other therapeutics are stem cells or siRNA. Students will learn the concept and practices of these new therapeutics in drug discovery.
Module aims	<ul style="list-style-type: none"> • To learn what antibodies are? • What therapeutic areas can Antibodies be used? • What are the design concept of Antibodies? • What are siRNA and Stem cells • What are high content screening?
List of Lectures and Tutorials	<ul style="list-style-type: none"> • Protein modeling • Design of Antibodies. • Antibodies as therapies • SiRNA and Stem cells • High content screening • CRISPR-Cas 9 and Drug Discovery
Module assessment	50% course work + 50% unseen 1 hour exam

Module Title	Module 5: Biological screening methods, X-ray, protein NMR and phenotypic screening
Module Code	MEDC0079
Module leader	Dr Edith Chan
Short description	Drugs are usually small chemicals or molecules. It is important to understand their chemical and physical properties and how these are related to the “druglikeness”. The principle of molecular modelling will be taught. The concept of druglikeness will be explored. Basic concept and techniques of cheminformatics
Module aims	<ul style="list-style-type: none">• To understand the principle and concept of all major biological screening methods, their pros and cons.• The use of phenotypic screening• To learn High-throughput screening and its practices in Pharma and Biotech
List of Lectures and Tutorials	<ul style="list-style-type: none">• Biophysical screening methods for fragments/ X-ray data on fragments• Protein NMR and Biocore• Phenotypic screening• High-throughput screening• Journal club
Module assessment	50% course work + 50% unseen 1 hour exam

Module Title	Module 6: Fragment based drug design and virtual screening
Module Code	MEDC0080
Module leader	Dr Edith Chan
Short description	Fragment based drug design is an established and successful concept and practices in drug discovery projects.
Module aims	<ul style="list-style-type: none">• Learn the concept of fragment-based drug design.• Learn about interactions between protein and ligands.• Learn various techniques for performing virtual screening.• Be able to use commercial software to perform virtual screening. Learn about online chemical databases
List of Lectures and Tutorials	<ul style="list-style-type: none">• Fragment based drug discovery• Computational design of fragments• Virtual screening• Learn to use Virtual screening software• Learn to use online databases for virtual screening.• Workshop on FBDD by industry expert to learn real practise in FBDD
Module assessment	50% course work + 50% unseen 1 hour exam

Module Title	Module 7: Target selection – scientific ground
Module Code	MEDC0081
Module leader	Dr Edith Chan
Short description	In depth learning on some major pharmaceutical therapeutic and their protein targets. The druggable genome will be discussed.
Module aims	<ul style="list-style-type: none"> • How to evaluate target druggability • Cancer targets • Pain targets • Epigenetics • Case study – target validation in GSK
List of Lectures and Tutorials	<ul style="list-style-type: none"> • Druggability – druggable genome • Cancer targets • New Pain drugs • Neurodegenerative diseases • Target validation and identification of big Pharma • Epigenetics, the impact of medicine • Learn to use online database to access druggability
Module assessment	50% course work + 50% unseen 1 hour exam

Module Title	Module 8: Commercial and intellectual property
Module Code	MEDC0082
Module leader	Dr Edith Chan
Short description	The underlining operations of Pharma should be understood, especially in the area of cost of drugs: Cost of research, trail, IP, cost of drug development. Introduction of IP and law will be taught. Economics of Pharma will be explored.
Module aims	<ul style="list-style-type: none"> • Understand the importance of the concept and practises of IP in Pharma. • Law that governs IP and other practices • Law that governs drug industry • Understand the importance and complexity, and complication of cost of drug development.
List of Lectures and Tutorials	<ul style="list-style-type: none"> • Patents and the Pharma industry, the law and reality • Economics, cost of drug development • Online tutorial on Intellectual properties
Module assessment	50% course work + 50% unseen 1 hour exam