

# College of Medicine

- Graduate Diploma in Child Life
- Master of Science Child Life
- Master of Science in Medical Microbiology
- Doctor of Philosophy in Medical Microbiology
- Master of Science in Physiology
- Doctor of Philosophy in Physiology
- Master of Science in Medical Biochemistry
- Doctor of Philosophy in Medical Biochemistry
- Master of Science in Biomedical Sciences
- Master of Science in Pharmacology
- Doctor of Philosophy in Medical Sciences Pharmacology
- Master of Science in Clinical Nuclear Medicine
- Doctor of Philosophy in Clinical Nuclear Medicine
- Master of Science in Anatomy
- Master of Public Health in Epidemiology
- Master of Science in Pathology
- Doctor of Philosophy in Pathology

## MEDICINE (FACULTY BASED COURSES)

### INTRODUCTION

All medicine graduate programs may require from their students to study the following Faculty Based Courses. These courses may be considered compulsory for some programs and electives for the others.

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|          |                           |     |
|----------|---------------------------|-----|
| 0500-503 | Research Communication I  | (1) |
| 0500-504 | Research Communication II | (1) |
| 0520-538 | Basic Immunology          | (1) |
| 0540-521 | Basic Molecular Biology   | (1) |

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### COURSE DESCRIPTION

#### 500-503: RESEARH COMMUNICATION I CR: 1

The aim of this course is to improve the student's ability to locate and retrieve information in the library, take effective notes, recognize and manipulate biomedical word roots and affixes of classical origin, write scientific English and communicate effectively in seminars. The course has the following components, which are designated to achieve this aim: Library skills, biomedical terminology, basic information structure, processing and seminar skills.

#### 0500-504: RESEARH COMMUNICATION II CR: 1

This course has its emphasis on improving the student's ability to collect and organize relevant information, and then communicate that information effectively for research reporting purposes, whether as a written report or a seminar presentation. The timing of the course is contrived to oblique the student to present his thesis background and methods in a seminar.

#### 0520-538: BASIC IMMUNOLOGY CR: 1

Introduction to immunity, Innate and acquired immunity, Organs and cells of the immune system, the Major Histocompatibility Complex and its role in antigen presentation, Humoral immunity, antibodies and complement, Cell-mediated immune function T cells and macrophages, Cytokines and their roles in immune responses, Transplantation immunology, immunoprophylaxis and immunotherapy, Autoimmunity and autoimmune diseases, Hypersensitivity

#### 0540-521: BASIC MOLECULAR BIOLOGY CR: 1

Nucleic acid structure and functions; DNA analysis by agarose gel and DNA sequencing; DNA Replication: Mechanism, Regulation, Differences between prokaryotic and eukaryotic process; DNA damage, repair and mutagenesis, and diseases associated with defective repair; Transcription mechanisms and processing of primary RNA; The genetic code, protein synthesis and regulation; Restriction and modification enzymes and their importance in molecular biology.



**MEDICINE (GENERAL COURSES)****INTRODUCTION**

All Medical graduate programs require the study of one or more of the following courses offered by the **Department of Community Medicine and Behavioral Sciences**.

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|----------|------------------------------------------------|-----|
| 0510-501 | Biostatistics and Computer in Medicine         | (2) |
| 0510-502 | Advanced Biostatistics                         | (1) |
| 0510-503 | Epidemiology                                   | (1) |
| 0510-504 | Radiotracer Methodology in Biological Research | (2) |
| 0510-601 | Biostatistical Method in Medical Research      | (3) |
| 0510-602 | Epidemiology of Infectious Diseases            | (3) |

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**COURSE DESCRIPTION****0510-501: BIOSTATISTICS AND COMPUTER IN MEDICINE****CR: 2**

This is a 2 credit hour faculty-required course intended for students joining the graduate M.Sc. program in the Faculty of Medicine, Kuwait University. The course takes into account the fact that enrolled students belong to various backgrounds and hence it includes a diversity of topics to meet their interest. The course is characterized by the inclusion of statistical methods in epidemiology (relative risk, odds ratio to measure the association between diseases and factors, evaluation of diagnostic tests), determination of size of investigations and power, analysis of variance, and design of controlled randomized clinical trials. It also includes multivariate statistical methods such as multiple linear regression and binary multivariable logistic regression. It focuses on concepts, limitations, validity and assumptions underlying these statistical methods.

The course also provides students with knowledge about hardware and software computer technology in addition to the skills of applying the procedures of the SPSS statistical package, and information about computer uses in medicine

(hospital information system, drug information system and computer-assisted diagnoses).

**0510-502: ADVANCED BIOSTATISTICS****CR: 1**

Planning of statistical investigation. Controlled comparative studies: Clinical and simple comparative trials, two period cross over design. Analysis of variance. Experimental design. The control of misclassification error. Survivorship tables and life tables. Biological assays: Parallel-line, slope ratio and quantal response. Non-parametric statistics: One-sample run test, Mann-whitney test, Kruskal-Wallis analysis of variance, and Kendall rank correlation.

**0510-503: EPIDEMIOLOGY****CR: 1**

Scope of epidemiology, basic measures of frequency, sources of morbidity data, direct and indirect standardization. Planning of an epidemiological investigation, survey planning, variability of measurements, validation and problems in validation, measurement of experimental error, population screening and disease control.

**0510-504: RADIOTRACER METHODOLOGY  
IN BIOLOGICAL RESEARCH  
CR: 2**

This course provides an introduction to the principles and procedures underlying the use of radioactive isotopes in biological research. The material will be presented at a level requiring only elementary mathematics and the principles and procedures will be illustrated with practical examples drawn from actual laboratory work. The course begins with the materials, and detection and measurement of radiation, and progresses to discussions and illustrations of the applications and problems of radiation measurement and experimental design in biology and medicine and methods used for reduction of radiation exposure. Hazards associated with the use of radioactive material will be discussed. Topics which will be given special emphasis include Gamma and Beta counting of biological samples autoradiography, radiochromatography, use in life science and clinical research, and radiation safety measures.

**0510-601: BIOSTATISTICAL  
METHODS IN MEDICAL  
RESEARCH**

**CR: 3 PR: 0510-501 or its equivalent.**

The course primarily aims at equipping students with tools of research. This includes univariate statistical methods update, sampling methods and sample size, experimental design, multivariate analysis, logistic regression, survival analysis: clinical trials, statistical methods in epidemiology, analysis of matched data and nonparametric statistics. Mann-Whitney, Wilcoxon paired test, Kruskal-Wallis and Spearman rank correlation.

**0510-602: EPIDEMIOLOGY OF  
INFECTIOUS DISEASES  
CR: 3**

Concepts and definitions, epidemiological models, causality, epidemic process, indices of health and disease, natural history of infectious diseases, contact patterns, measuring infectivity, methods and techniques for studying an infection in the community, time and place clustering, use of routinely collected data, special surveys, surveillance of infectious diseases, field investigation, analysis of an outbreak, seroepidemiology, the effect of bias, confounding and misclassification on the identification of source/reservoir of infection and mode of transmission, statistical techniques often used in infectious disease epidemiology, mathematical models for epidemics, primary and secondary prevention in the infectious disease epidemiology, epidemiology of vaccination, control, elimination and eradication, epidemiology of emerging infections and epidemiology of specific infectious diseases.

**Master of Science in Pharmacology**  
**Program code: 055010**

**INTRODUCTION**

The Department of Pharmacology & Toxicology (Faculty of Medicine) offers a Master of Science Program in **Pharmacology**. The program, which is thesis based, aims at providing a sound understanding of the theoretical and practical aspects of the action of drugs as the basis of therapeutics. Basic course in Pharmacology are followed by advanced courses in the core areas of the discipline such as Cardiovascular, Molecular, Neuro-endocrine, Biochemical/Toxicology and Immunopharmacology. These areas also represent the key areas of research interest of the Departmental academic staff. Research requirements include only thesis option.

*According to the University Council decision dated 4/2/2007, Thesis students admitted with effect from September 2007 are exempted from the comprehensive examination.*

**PROGRAM REQUIREMENTS****38 TOTAL COURSE CREDITS****26 COMPLUSORY COURSES (Credits in parenthesis)**

|          |                                             |     |
|----------|---------------------------------------------|-----|
| 0510-501 | Biostatistics and Computer in Medicine      | (2) |
| 0520-538 | Basic Immunology                            | (1) |
| 0540-521 | Basic Molecular Biology                     | (1) |
| 0550-500 | Principles of Pharmacology I                | (3) |
| 0550-501 | Principles of Pharmacology II               | (3) |
| 0550-504 | Experimental Techniques                     | (3) |
| 0550-505 | Molecular Pharmacology                      | (2) |
| 0550-516 | Seminar in Pharmacology                     | (1) |
| 0550-519 | Advanced Topics in Pharmacology I           | (3) |
| 0550-520 | Advanced Topics in Pharmacology II          | (2) |
| 2000-501 | Scientific Writing and Communication Skills | (3) |
| 2000-503 | Ethics and Professionalism                  | (2) |

**3 ELECTIVE COURSES**

The remaining 3 credit hours may be selected only from the following courses offered by the Department of Pharmacology or other departments in the Faculty of Medicine, with the approval of Program Director.

|          |                                          |     |
|----------|------------------------------------------|-----|
| 0530-566 | Neurophysiology                          | (3) |
| 0540-564 | Biochemistry of Diseases                 | (3) |
| 0550-521 | Autonomic and Smooth Muscle Pharmacology | (2) |
| 0555-505 | Radiobiology & Radiation Protection      | (1) |

|          |                      |     |
|----------|----------------------|-----|
| 0570-501 | Biology of Diseases  | (3) |
| 0570-522 | Applied Cell Biology | (3) |

## 9 COMPULSORY COURSES

|          |        |     |
|----------|--------|-----|
| 0550-597 | Thesis | (0) |
| 0550-598 | Thesis | (0) |
| 2000-599 | Thesis | (9) |

### COURSE DESCRIPTION

**0550-500: PRINCIPLES OF  
PHARMACOLOGY I  
CR: 3**

This course presents the general principles of drug action including aspects of drug-receptor interaction, absorption, fate, interactions and side effects of major therapeutic substances. Advanced aspects of these topics are covered by directed reading and tutorials.

**0550-501: PRINCIPLES OF  
PHARMACOLOGY II  
CR: 3**

In this course the pharmacological basis of therapeutics is dealt with in depth and the major groups of drugs, i.e., cardiovascular, renal, chemotherapeutic, and agents affecting the autonomic and central nervous systems will be described. Therapeutic principles are explained by attention to the pathophysiology relevant to that drug group. Advanced material is covered by directed reading and seminars.

**0550-504: EXPERIMENTAL TECHNIQUES  
CR: 3**

This course provides basic training in the following: Solutions: Drug and physiological solutions, drug concentrations, preparation and storage of drugs. experimental animals: Handling of animals, anaesthesia and surgery, routes of administration, artificial respiration. Bioassay: Principles of measuring muscle contractions, isotonic, isometric, auxotonic; recording blood pressure. Behavioral techniques: Animal activity meters, stereo tactic surgery. Recording techniques: Electronic Recording systems. Laboratory reports: Recording of results and experimental data. Management and handling of

laboratory equipment. Analytical techniques: Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC), Gas Chromatography-Mass-Spectrometry (GC-MS), Molecular biology Techniques.

**0550-505: MOLECULAR PHARMACOLOGY  
CR: 2 PR: 0500-501**

The course deals with the molecular characterization of interactions between drug molecules and receptors or other macromolecular targets in cells, as well as how chemical structure correlates with biological activity. It also deals with how cells receive, transmit and respond to external signals from hormones, transmitters and pharmacological agents, and how molecular biology techniques are utilized to study these events. The first part of the course introduces students to the latest advances in molecular pharmacology, namely pharmacogenomics, bioinformatics, proteomics, micro-array technology, gene silencing technology and their applications in pharmacological research. Subsequently, the course deals with the classical aspects of receptor pharmacology, including theories of drug-receptor interactions, measurement of agonist dissociation constant, and receptor antagonism. Other areas covered include various signal transduction pathways, identification of signaling molecules as drug targets and the principles of drug design and development. Modes of delivery will include traditional lectures, linked tutorials based on published papers, as well as presentations by students of relevant topics. The course builds on information presented in the course "Basic Molecular Biology" which is its pre-requisite.

**0550-516: SEMINAR IN PHARMACOLOGY  
CR: 1**

Current literature topics in Pharmacology. This is an advanced course for second year graduate students in Pharmacology.

**0550-519: ADVANCED TOPICS IN  
PHARMACOLOGY I  
CR: 3**

This course covers important topics from three areas of Pharmacology, namely the Cardiovascular, Neuro and Endocrine areas. Within each area teaching will take an integrated approach and where possible integration across the systems or areas will also be undertaken. This course will build on, and deal with the advanced aspects of, the materials already covered in the Principles of Pharmacology I & II (500 & 501) courses. In the Cardiovascular section, topics to be covered include the physiology of the heart and the vascular systems, pathophysiology and drug treatment of a number of cardiovascular disease states, including hypertension, heart failure, hyperlipidaemias and angina pectoris. Novel and potential therapeutic targets as well as pharmacogenomic approaches to the identification of new targets will be discussed. The endocrine component will cover the hormones of the anterior pituitary, the feedback control mechanisms of hormone secretion, pharmacology of insulin and insulin resistance as well as the thyroid and anti-thyroid drugs. The Neuropharmacology section will cover central and peripheral pain systems and their control, opioid and non-opioid analgesics, anti-psychotics and antidepressants as well as anti-Parkinson drugs.

**0550-520: ADVANCED TOPICS IN  
PHARMACOLOGY II  
CR: 2 PR: 0500-502**

This course covers important topics from two areas of Pharmacology, namely Immunopharmacology and Biochemical Pharmacology / Toxicology. Within each area teaching will take an integrated approach and where possible integration across sections will be undertaken. This course will build on, and deal with the advanced aspects of, the materials already covered in "Basic Immunology" as well as in Principles of Pharmacology I & II (500 & 501) courses. The Immunopharmacology section of the course will cover areas such as pathogenesis of allergic reactions, mechanisms of mediator release and signal transduction pathways, principles of drug allergy, drug therapy of allergic diseases, pathophysiology of asthma and drug

therapy. Others will include mechanisms and drug therapy of autoimmune diseases and chronic inflammatory diseases, graft rejection and immunosuppressive agents. The second part will cover basic principles of biochemical toxicology, role of drug metabolism in drug toxicity, target organ toxicity, toxic effects of reactive oxygen species, cell necrosis and apoptosis, mutagenesis and carcinogenesis, developmental toxicology, applications of toxicology, basic principles in the treatment of acute poisoning, poisoning with common drug groups, alcohols, environmental toxins, principles of therapeutic drug monitoring, toxicological screening in clinical toxicology.

**0550-521: AUTONOMIC AND SMOOTH  
MUSCLE PHARMACOLOGY  
CR: 2**

The first part of this course will deal with innervation of smooth muscles with emphasis on autonomic and peptidergic nerves. This will be followed by the discussion of receptors activated by neurotransmitters released by these nerves. In the second part of the course, emphasis will be on the role of signaling mechanisms involving ion channels (calcium and potassium channels, protein kinase C, tyrosine kinase and mitogen activated protein kinases (ERK, p38 MAPK and JNK), AMP and cGMP in the regulation of smooth muscle tone and agonist-induced contraction and relaxation of smooth muscles. The role of Ca<sup>2+</sup> sensitization (and the RhoA/Rho kinase pathway) in smooth muscle contraction will be discussed. Finally the relevance of these processes to the pathogenesis of some cardiovascular and non-cardiovascular diseases will be discussed.

**0550-597: THESIS  
CR: 0**

**0550-598: THESIS  
CR: 0**

**2000-599: THESIS  
CR: 9**