

# Jordan University of Science and Technology

## Faculty of Medicine 2018-2019

**COURSE TITLE :** General Pharmacology.

**COURSE CODE :** MED 251.

**CREDIT HOURS :** 3 CREDIT HOURS

**SEQUENCE :** YEAR 2, FIRST SEMESTER

**COURSE COORDINATOR:** Dr. Ahmad Altarifi

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## **Course Description:**

This is a general pharmacology module for second year medical students. In this series of lectures, students will be introduced to the fundamental concepts of Pharmacology including pharmacokinetics, pharmacodynamics, drug metabolism, toxicology, and drug interactions. In addition, the course will introduce students to the pharmacology of the central and autonomic nervous systems. Students will also be introduced to the major drug classes that are used to treat diseases of the cardiovascular system. This course will provide an introduction to the pharmacology and clinical use of antibiotic drugs used in the treatment of infectious diseases. Additional lectures will also cover drugs used in chemotherapy and the treatment of cancer. Other topics will include drugs used for pain management.

This course is 3 credit hours, with a total of 26 lectures per semester. The main method of teaching is through lectures that are given twice per week. Students are encouraged for critical thinking and asking questions to enhance their understanding of the course. There are no labs in this course; however, simulation lab for the effects of drugs working on the autonomic nervous system may be given optionally for students. Although this course is a general pharmacology course, subjects such as antibiotics and analgesics are discussed extensively for students. The main method of assessment is through theoretical exams throughout the semester (first, second, and final exams). The whole pharmacology department faculties participate in teaching this course considering their individual specialization.

## **Course Learning Outcomes**

1. To study the general principles of pharmacology that enables the students to use drugs properly and safely in their practice.
2. To discuss general drugs dealing with the sympathetic and parasympathetic systems in regard of their classifications, actions, indications, side effects, and contraindications.
3. To understand the therapeutic indications, mechanism of action, contraindications, toxic effects, and drug interactions of commonly used antibiotics and analgesics in clinical practice.
4. To explore tools and methods used in drug evaluation and discovery culminating in clinical trials and approval of drugs.

## Recommended Textbooks:

1. Goodman and Gilman's: The Pharmacological basis of therapeutics, 11th edition, 2006. McGraw-Hill.
2. Pharmacology, H.P. Rang M. M. Dale and J.M. Ritter, 6th edition, 2007, Churchill Livingstone.
3. Elsevier's Integrated Pharmacology, M. Kester, K.E. Vrana, S.A. Quraishi and K.D. Karpa, 1st edition, 2008, MOSBY.
4. Basic and Clinical Pharmacology, Bertram G Katzung and Anthony J Trevor, 13th edition, 2012, McGraw-Hill

# Learning Objectives

## (A) Lectures objectives

<p><b>General Pharmacology (I, II)</b></p>	<p><b>General Pharmacology I &amp; II: Pharmacokinetics</b></p> <ol style="list-style-type: none"> <li>1. Define the science of Pharmacology and its branches including: pharmacognosy, pharmacokinetics, pharmacodynamics, pharmacotherapeutics, and toxicology.</li> <li>2. Introduce students to the principles of pharmacokinetic parameters including: Drug Absorption, Distribution, Metabolism, and Elimination.</li> <li>3. Describe the physicochemical and physiological factors that influence the absorption of drugs from enteral and parenteral routes of administration, their distribution within the body, and their metabolism and mechanisms of elimination.</li> <li>4. Explain how dose, bioavailability, rate of absorption, apparent volume of distribution, total clearance, and elimination half-life affect the plasma concentrations of a drug after administration.</li> </ol>
<p><b>General Pharmacology (III, IV)</b></p>	<p><b>Drug–Receptor Interactions and Pharmacodynamics</b></p> <ol style="list-style-type: none"> <li>1. Understand what is meant by pharmacodynamics.</li> <li>2. Describe what is meant by the term ‘cell receptor’.</li> <li>3. Understand the concept of receptor occupancy.</li> <li>4. Give examples of different cell receptors.</li> <li>5. Outline how drugs affect the body.</li> <li>6. Understand the drug dose-response relationships.</li> <li>7. Define important drug properties including its affinity for receptor binding, potency, efficacy and therapeutic index.</li> <li>8. Differentiate between a drug that is an agonist and a drug that is an antagonist.</li> </ol> <p>Use basic maths to calculate simple drug dosages.</p>
<p><b>Antibiotics (I through VI)</b></p> <ul style="list-style-type: none"> <li>- Principles of antimicrobial therapy.</li> <li>- Cell wall inhibitors.</li> <li>- Protein synthesis inhibitors.</li> <li>- Inhibitors of bacterial DNA synthesis.</li> </ul>	<ol style="list-style-type: none"> <li>1. Know the principles of antimicrobial therapy.</li> <li>2. Know the classification of antimicrobial agents.</li> <li>3. Identify these terms: narrow spectrum antibiotic, broad spectrum antibiotic, superinfection, bacteriostatic, bactericidal, empiric therapy, and prophylactic therapy.</li> <li>4. Know the advantages and disadvantages of antibiotics combination.</li> <li>5. Know the mechanisms of action, indications, adverse effects, contraindication, cautions, and relative safety in pregnancy and children of antibacterial agents.</li> <li>6. List the B-lactam drugs and non B-lactam drugs.</li> <li>7. Know the mechanism of action of penicillins and cephalosporins, their clinical uses, adverse effects, and contraindications.</li> <li>8. List the drugs that inhibit protein synthesis, their actions, clinical uses, contradictions, and adverse effects.</li> <li>9. List the drugs that inhibit bacterial DNA synthesis, their actions, clinical uses, contradictions, and adverse effects.</li> </ol>

<ul style="list-style-type: none"> <li>- <b>Folic acid antagonists.</b></li> <li>- <b>New antimicrobial drugs.</b></li> </ul>	<p>10. Know the main mechanism of action of folic acid antagonists, their clinical use, contraindications, and adverse effect.</p>
<p><b>Antifungal Agents</b></p>	<ol style="list-style-type: none"> <li>1. Understand the relationship between fungal structure and the mechanisms of action of antifungal drugs.</li> <li>2. Outline the general indications, adverse effects profile, and contraindications for the following antifungal drugs: ketoconazole, fluconazole, and nystatin.</li> </ol>
<p><b>Antiprotozoal and Anthelmintic Drugs</b></p>	<ol style="list-style-type: none"> <li>1. Understand the major therapeutic options in the treatment of malaria, their mechanisms of action, indications, and adverse effects.</li> <li>2. Understand the concept of combination therapy in the treatment of malaria.</li> <li>3. List the major therapeutic options used in the treatment of major worms encountered in Jordan.</li> <li>4. Understand the major mechanisms of action of anthelmintic drugs.</li> </ol>
<p><b>Antiviral Agents</b></p>	<ol style="list-style-type: none"> <li>1. Relate the viral life cycle to the mechanisms of action of antiviral drugs.</li> <li>2. Outline the general indications, adverse effects profile, and contraindications for the following antiviral drugs: amantadine, oseltamivir, and acyclovir</li> </ol>
<p><b>Introduction to CNS Pharmacology</b></p>	<ol style="list-style-type: none"> <li>1. Revise concepts of action potential and its importance in neuronal signalling.</li> <li>2. Discuss different neurotransmitters and their functions in the brain.</li> <li>3. Describe the life cycle of 2 major neurotransmitters: acetylcholine and norepinephrine.</li> <li>4. Describe different types of drugs' mechanism of action, and give examples of drug classes in each steps.</li> <li>5. Differentiate between agonists, antagonists, biased agonists, inverse agonists, and biased agonists.</li> </ol>
<p><b>Pharmacology of ANS (I, II, &amp; III)</b></p>	<ol style="list-style-type: none"> <li>1. Identify the key conceptual similarities and differences between autonomic cholinergic and adrenergic pathways including receptor subtypes, neurotransmitters, transmitter synthesis, storage, and release, and relative specificities of drugs that stimulate or inhibit each branch or activity.</li> <li>2. List the major systems or organs innervated by the autonomic cholinergic and adrenergic systems.</li> <li>3. Describe the organ system effects of cholinergic and adrenergic stimulation or antagonism.</li> <li>4. Relate the tissue expression profiles of cholinergic and adrenergic receptors to their specific functions.</li> </ol>

<b>Introduction to CVS Pharmacology</b>	<ol style="list-style-type: none"> <li>1. Understand the major physiological mechanisms regulating cardiac and vascular functions in the body.</li> <li>2. Understand the term: chronotropy, dromotropy, inotropy, and lusitropy.</li> <li>3. Understand the role of renin-angiotensin-aldosterone in the regulation of blood pressure.</li> <li>4. Describe the major pharmacological strategies used in the treatment of hypertension and ischemic heart diseases, based on the principles discussed before.</li> </ol>
<b>Autacoids</b>	<ol style="list-style-type: none"> <li>1. Understand the concept of autacoids and their functions in the body.</li> <li>2. Know histamine properties and effects.</li> <li>3. Know histamine receptors and their location in the body.</li> <li>4. Identify the types of histamine antagonists and their clinical use and adverse effects.</li> </ol>
<b>NSAIDs</b>	<ol style="list-style-type: none"> <li>1. Understand the physiological pathway of prostanoid biosynthesis and list the therapeutic uses of prostaglandins.</li> <li>2. Understand the mechanism of action of NSAIDs and their chemical classes, therapeutic uses, and side effects.</li> <li>3. Compare between different classes of NSAIDs and recognize the therapeutic differences with Aspirin and Acetaminophen.</li> </ol>
<b>Antineoplastic Drugs (I &amp; II)</b>	<ol style="list-style-type: none"> <li>1. Discuss the principles of conventional cytotoxic anticancer drugs (Cancer Chemotherapy)</li> <li>2. Understand the pharmacology of conventional cytotoxic anticancer drugs (Cancer Chemotherapy)</li> <li>3. Understand the side effects and limitations associated with the use of conventional cytotoxic drugs</li> <li>4. Review the molecular basis of tumour EGFR signalling and angiogenesis as potential pharmacological targets for therapeutic intervention</li> <li>5. Discuss the pharmacology of current molecular targeted anticancer drugs including monoclonal antibodies and tyrosine kinase inhibitors and the rationale for their use in cancer therapy</li> </ol>
<b>Management of Drug Poisoning</b>	<ol style="list-style-type: none"> <li>1. Understand the concept of drug poisoning.</li> <li>2. Give examples of common toxidromes.</li> <li>3. Understand the term "antidote".</li> <li>4. Outline the major therapeutic strategies used in the emergency treatment of common drug poisoning cases.</li> </ol>
<b>Drug Interactions / Drug Evaluation and Clinical Trials</b>	<ol style="list-style-type: none"> <li>1. Understand the concept of drug-drug interactions, and the pharmacological bases of this phenomenon.</li> <li>2. List common examples of frequently encountered drug interactions in clinical practice.</li> <li>3. Outline the major therapeutic strategies used in the prevention and reversal of drug interactions.</li> <li>4. Describe the process of drug discovery, from the lab into the market.</li> <li>5. Outline major strategies used in the evaluation of new drugs.</li> <li>6. Understand the concept of clinical trials, their phases, requirements, and regulatory laws</li> </ol>

# Course Assessment

<b>Assessment</b>		
<b>Assessment Type</b>	<b>Expected Due Date</b>	<b>Weight</b>
First Exam		<b>25</b>
Second Exam		<b>30</b>
Midterm Exam (Theory)		--
Evaluation		<b>5</b>
Quizzes		--
Research activity		--
OSCE		--
Mini-OSCE		--
<b>Final Exam (Practical)</b>		<b>40</b>
Final Exam(Oral)		--
<b>Total</b>		<b>100</b>

# Students Learning Outcomes

<b>Student Learning Outcomes(SLOs)</b> <b>(4-8 Maximum)</b>			
Upon successful completion of this course, students should be able to:			
SLOs	Related ILO(s)* (numbers only)	Evaluation Criteria (MCQ, OSCE, Homework...)	
		Type of Criteria (MCQ, OSCE, Homework...)	Weight (%)
To study the general principles of pharmacology that enables the students to use drugs properly and safely in their practice.	2,3	MCQ	15
To discuss general drugs dealing with the sympathetic and parasympathetic systems in regard of their classifications, actions, indications, side effects, and contraindications.	9	MCQ	20
To understand the therapeutic indications, mechanism of action, contraindications, toxic effects, and drug interactions of commonly used antibiotics and analgesics in clinical practice.	9	MCQ	50
To explore tools and methods used in drug evaluation and discovery culminating in clinical trials and approval of drugs.	10	MCQ	15
			<b>100</b>

## **Intended Learning Outcomes (ILOs)**

- 1) Demonstrate a sufficient understanding of the structural organization and functions of the following systems of the human body: circulatory, respiratory, gastrointestinal, endocrine, hematopoietic & lymphatic, musculoskeletal, nervous, and genitourinary systems.
- 2) Conceptualize the cellular, molecular, genetic, and biochemical mechanisms that maintain body's homeostasis and their derangements in disease states.
- 3) Apply their knowledge of human anatomy and function to solve questions regarding major clinical cases and diseases.
- 4) Attain appropriate and systematic clinical history of different medical conditions and settings.
- 5) Demonstrate proficiency in performing clinical skills and procedures.
- 6) Perform relevant physical examination on patients professionally and ethically.
- 7) Identify the major signs and symptoms of disease states, recognizing risk factors and etiologies, in an interdisciplinary approach to differentially diagnose patients.
- 8) Order and interpret results of relevant basic diagnostic procedures, such as laboratory investigations and conventional imaging procedures.
- 9) Apply safe and accurate methods of pharmacotherapy of major disease states.
- 10) Critically appraise research studies guided by evidence-based medicine.
- 11) Demonstrate ability to work in diverse settings and communities.