FACULTY OF HEALTH SCIENCES AND SPORTS

BACHELOR OF SCIENCE IN BIOMEDICAL TECHNOLOGY

(PHARMACY TECHNOLOGY)

LEARNING MODULE OUTLINE

Academic Year	2024/2025	Semester	1
Module Code	BSPY2101		
Learning Module	Pharmacology I		
Pre-requisite(s)	Nil		
Medium of Instruction	Chinese / English		
Credits	6	Contact Hours	90
Instructor	Dr. Tao Yi, Aaron	Email	yitao@mpu.edu.mo
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MODULE DESCRIPTION

This 90-hour course is the first in a series of courses that equip students with pharmacological knowledge. The course systemically introduces mechanisms of action, pharmacological effects, clinical indications, drug interactions and adverse effects of various drug classes.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Demonstrate an understanding of the basic concepts of pharmacology.
M2.	Analyse and interpret the relationship among mechanisms of action, therapeutic effects and adverse effects of different drugs.
M3.	Describe the classification, clinical indications, mechanism of actions, and significant adverse effects of commonly used drugs.
M4.	Apply pharmacology knowledge to analyse and interpret clinical cases.
M5.	Demonstrate an understanding of the relationship between disease characteristics and pharmacological effects.
M6.	Communicate scientific concepts effectively through oral presentations, demonstrating comprehension of pharmacology principles.

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	M1	M2	M3	M4	M5	M6
P1. To demonstrate understanding of a range of subjects, fields, principles and approaches relevant to pharmacy technology	✓	✓	✓	✓	✓	✓
P2. To demonstrate understanding of theories, analytical approaches and practices that underpin pharmacy operations and management	✓	✓	✓	✓	✓	✓
P3. To demonstrate understanding of major trends and issues related to pharmacy technology	✓			✓	✓	✓
P4. To apply professional knowledge and skills to analyse, interpret and solve problems, challenges and risks in pharmacy practice	✓	✓	✓	✓	✓	
P5. To critically appraise and interpret scientific and clinical literature and apply evidence-based practice	✓	✓		✓	✓	✓
P6. To acquire and apply research skills in pharmacy technology		✓		✓		✓
P7. To demonstrate effective communication and teamwork skills						✓
P8. To maintain professional and ethical standards in pharmacy practice and research	✓	✓	✓	✓	✓	✓

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
2 (8.25-8.30)	Chapter 0. Introduction to pharmacology (3 hours) 1. General principles 2. Pharmacodynamics 3. Pharmacokinetics 4. The roles of Pharmacology 5. Sources of drugs 6. How to learn Pharmacology Chapter 1. Pharmacokinetics (6 hours) 1.1 Overview 1.2 Routes of drug administration 1.3 Absorption of drugs 1.4 Drug Distribution	6
3 (9.2-9.6)	1.5 Drug clearance through metabolism 1.6 Drug clearance by the kidney 1.7 Excretion by other routes 1.8 Design and optimization of dosage regimen Chapter 2. Drug-receptor interactions and pharmacodynamics (3 hours) 2.1 Overview 2.2 Signal transduction 2.3 Dose-response relationships 2.4 Intrinsic activity 2.5 Quantal dose-response relationships	6

4 (9.9-9.13)	Chapter 3. The autonomic nervous system (2 hours) 3.1 Overview 3.2 Introduction to the nervous system 3.3 Chemical signaling between cells 3.4 Signal transduction in the effector cell Chapter 4. Cholinergic agonists (4 hours) 4.1 Overview 4.2 The cholinergic neuron 4.3 Cholinergic receptors (cholinoceptors) 4.4 Direct-acting cholinergic agonists 4.5 Indirect-acting cholinergic agonists: anticholinesterase agents (reversible) 4.6 Indirect-acting cholinergic agonists: anticholinesterase agents (irreversible) 4.7 Toxicology of anticholinesterase agents	6
5 (9.16-9.20)	Chapter 5. Cholinergic antagonists (3 hours) 5.1 Overview 5.2 Antimuscarinic agents 5.3 Ganglionic blockers 5.4 Neuromuscular-blocking agents Chapter 6. Adrenergic agonists (3 hours) 6.1 Overview 6.2 The adrenergic neuron 6.3 Characteristics of adrenergic agonists 6.4 Direct-acting adrenergic agonists 6.5 Indirect-acting adrenergic agonists 6.6 Mixed-action adrenergic agonists	6
6 (9.23-9.27)	Chapter 7. Adrenergic antagonists (3 hours) 7.1 Overview 7.2 α-adrenergic blocking agents 7.3 β-adrenergic blocking agents 7.4 Drugs affecting neurotransmitter release or uptake **Active learning and presentation 1:** Hypertension (1 hours) Chapter 8. Antihypertensives (5 hours) 8.1 Overview 8.2 Etiology of hypertension 8.3 Mechanisms for controlling blood pressure 8.4 Treatment strategies 8.5 Diuretics 8.6 β-adrenoceptor-blocking agents 8.7 ACE inhibitors 8.8 Angiotensin ii receptor blockers	6
7 (10.3-10.4)	8.9 Renin inhibitor 8.10 Calcium channel blockers 8.11 α-adrenoceptor-blocking agents 8.12 α-/β-adrenoceptor-blocking agents 8.13 Centrally acting adrenergic drugs	3

	8.14 Vasodilators 8.15 Hypertensive emergency 8.16 Resistant hypertension	
8 (10.7-10.11)	**Test I (2 hours)** Chapter 9. Diuretics (2 hours) 9.1 Overview 9.2 Normal regulation of fluid and electrolytes by the kidneys 9.3 Thiazides 9.4 Loop diuretics 9.5 Potassium-sparing diuretics 9.6 Carbonic anhydrase inhibitor 9.7 Osmotic diuretics **Active learning and presentation 2:** Heart failure (1 hours) Chapter 10. Drugs for heart failure (3 hours) 10.1 Overview 10.2 Pathophysiology of heart failure 10.3 Inhibitors of the renin–angiotensin–aldosterone system	6
9 (10.14-10.18)	10.4 Angiotensin receptor-neprilysin inhibitor 10.5 β-blockers 10.6 Diuretics 10.7 Hyperpolarization-activated cyclic nucleotide-gated channel blocker 10.8 Vasodilators 10.9 Sodium-glucose cotransporter 2 inhibitors 10.10 Soluble guanylate cyclase stimulators 10.11 Inotropic drugs 10.12 Order of therapy **Active learning and presentation 3:** Arrhythmias (1 hours) Chapter 11. Antiarrhythmics (3 hours) 11.1 Overview 11.2 Introduction to the arrhythmias 11.3 Class I antiarrhythmic drugs 11.4 Class II antiarrhythmic drugs 11.5 Class III antiarrhythmic drugs 11.6 Class IV antiarrhythmic drugs 11.7 Other antiarrhythmic drugs	6
10 (10.21-10.25)	**Active learning and presentation 4:** Angina pectoris (1 hours) Chapter 12. Antianginal drugs (2 hours) 12.1 Overview 12.2 Types of angina 12.3 Treatment strategies 12.4 β-adrenergic blockers 12.5 Calcium channel blockers 12.6 Organic nitrates	6

	12.7 Sodium channel blocker **Active learning and presentation 5:** Thrombotic disorders: acute myocardial infarction (MI), deep vein thrombosis (DVT), pulmonary embolism (PE), and acute ischemic stroke (1 hours) Chapter 13. Anticoagulants and Antiplatelet agents (5 hours) 13.1 Overview 13.2 Thrombus versus embolus	
11 (10.28-11.1)	13.3 Platelet response to vascular injury 13.4 Platelet aggregation inhibitors 13.5 Blood coagulation 13.6 Parenteral anticoagulants 13.7 Vitamin K Antagonists 13.8 Direct oral anticoagulants 13.9 Thrombolytic drugs 13.10 Drugs used to treat bleeding **Active learning and presentation 6:** Hyperlipidemias (1 hours) Chapter 14. Drugs for hyperlipidemia (2 hours) 14.1 Overview 14.2 Treatment goals 14.3 Drugs for hyperlipidemia	6
12 (11.5-11.8)	**Active learning and presentation 7:** Neurodegenerative disorders: Parkinson's disease, Alzheimer's disease, multiple sclerosis (MS), and amyotrophic lateral sclerosis (ALS) (1 hours) Chapter 15. Drugs for neurodegenerative diseases (3 hours) 15.1 Overview 15.2 Neurotransmission in the CNS 15.3 Synaptic potentials 15.4 Neurodegenerative diseases 15.5 Overview of Parkinson disease 15.6 Drugs used in Parkinson disease 15.7 Drugs used in Alzheimer disease 15.8 Drugs used in multiple sclerosis 15.9 Drugs used in amyotrophic lateral sclerosis **Active learning and presentation 8:** Anxiety (1 hours) Chapter 16. Anxiolytic and hypnotic drugs (3 hours) 16.1 Overview 16.2 Benzodiazepines	6
13 (11.11-11.15)	16.3 Benzodiazepine antagonist 16.4 Other anxiolytic agents 16.5 Barbiturates 16.6 Other hypnotic agents **Test II (2 hours)**	6

	Active learning and presentation 9: Depression and mania (1 hours) Chapter 17. Antidepressants (4 hours) 17.1 Overview 17.2 Mechanism of antidepressant drugs	
14 (11.18- 11.22)	17.3 Selective serotonin reuptake inhibitors 17.4 Serotonin-norepinephrine reuptake inhibitors 17.5 Atypical antidepressants 17.6 Tricyclic antidepressants 17.7 Monoamine oxidase inhibitors 17.8 Serotonin-dopamine antagonists 17.9 Treatment of mania and bipolar disorder **Active learning and presentation 10:** Schizophrenia (1 hours) Chapter 18. Antipsychotic drugs (3 hours) 18.1 Overview 18.2 Schizophrenia 18.3 Antipsychotic drugs	7
15 (11.25- 11.29)	**Active learning and presentation 11:** Epilepsy (1 hours) Chapter 19. Drugs for Epilepsy (3 hours) 19.1 Overview 19.2 Etiology of seizures 19.3 Classification of seizures 19.4 Mechanism of action of antiseizure medications 19.5 Drug selection 19.6 Antiseizure medications 19.7 Status epilepticus 19.8 Reproductive health and epilepsy Chapter 20. Anesthetics (2 hours) 20.1 Overview 20.2 Levels of sedation 20.3 Stages of general anesthesia 20.4 Inhalation anesthetics 20.5 Intravenous anesthetics 20.6 Neuromuscular blockers 20.7 Local anesthetics 20.8 Anesthetic adjuncts Chapter 21. Opioids (3 hours) 21.1 Overview 21.2 Opioid receptors 21.3 Opioid agonists 21.4 Partial agonists and mixed agonist–antagonists	8
16 (12.2- 12.6)	21.5 Other analgesics 21.6 Antagonists **Active learning and presentation 12:** Attention deficit hyperactivity disorder (1 hours)	4

	Chapter 22. CNS Stimulants (2 hours) 22.1 Overview 22.2 Psychomotor stimulants 22.3 Drugs for Obesity	
18 (12.16-12.17)	**Final (2 hours)**	2

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
T1. Lectures with case studies and real-life examples	✓	✓	✓	✓	✓	
T2. Literature review and critical analysis	✓	✓	✓	✓	✓	✓
T3. Group discussion and presentations	✓	✓	✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	**Weighting (%)**	**ILOs to be Assessed**
A1. Presentation	9	M4, M5, M6
A2. In Class oral Tests	8	M1, M2, M3, M4, M5, M6
A3. Group discussions	8	M1, M2, M3, M4, M5, M6
A4. Test I	25	M1, M2, M3, M4, M5
A5. Test II	25	M1, M2, M3, M4, M5
A6. Final exam	25	M1, M2, M3, M4, M5

This learning module is graded on a 100 point scale, with 100 being the highest possible score and 50 being the passing score.

Any students scoring less than 35% of the total mark in the final examination will be given an "F" grade for the module even if the overall grade is 50% or higher.

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

MARKING SCHEME

Assessment Activities	Assessment Criteria	Mark Ranges				
		88-100	73-87	58-72	50-57	<50
A1. Presentation	Demonstrate the ability to apply pharmacological knowledge to analyse and interpret clinical cases, understand the relationship between disease characteristics and pharmacological effects, and communicate scientific concepts effectively through oral presentations	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A2. In Class oral Tests	Demonstrate the ability to answer questions on topics covered in the outline	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A3. Group discussions	Demonstrate the ability to apply pharmacological knowledge to analyse and interpret clinical cases, understand the relationship between disease characteristics and pharmacological effects, and communicate scientific concepts effectively through oral presentations	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A4. Test I	Demonstrate the ability to understand, identify, and apply appropriate pharmacological concepts, knowledge, and methods	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A5. Test II	Demonstrate the ability to understand, identify, and apply appropriate pharmacological concepts, knowledge, and methods	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels
A6. Final exam	Demonstrate the ability to understand, identify, and apply appropriate pharmacological concepts, knowledge, and methods	Excellent	Good/ Very Good	Satisfactory	Marginal Pass	Fail; not reaching marginal levels

REQUIRED READINGS

Karen Whalen, et al. 2023, Lippincott's illustrated reviews: pharmacology. 8th ed. Baltimore, MD: Lippincott Williams & Wilkins

REFERENCES

Katzung B, Masters S, Trevor A. 2015, Basic and clinical pharmacology. 13th ed. New York: McGraw-Hill Medical.

Brunton L, Chabner B, Knollman. 2011, Goodman and Gilman's the pharmacological basis of therapeutics. 12th ed. New York: McGraw-Hill Professional.

Lexicomp. 2017, *Drug information handbook: a clinically relevant resource for all healthcare professionals.* 26th ed. Lexi-Comp.

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.