

Physiology

1	Course name	Physiology
2	Course Code	PH 106
3	Course type: /general/specialty/optional	Specialty
4	Accredited units	3 credits(2 hours/week/THEORY 2 hours/ week/ lab)
5	Educational hours	4 hours /week
6	Pre-requisite requirements	Biology
7	Program offered the course	Department Pharmacology and Toxicology
8	Instruction Language	English
9	Date of course approval	12/2021

Brief Description:	Physiology is the study of how the human body works. It describes the chemistry and physics behind basic body functions, from how molecules behave in cells to how systems of organs work together. It helps us understand what happens in a healthy body in everyday life and what goes wrong when someone gets sick.
Textbooks required for this Course:	1. Guyton and Hall Textbook of Medical Physiology (12 th Edition) for John E. Hall. 2. Costanzo Physiology (7 th edition) for Linda S. Costanzo. 3. Textbook of Medical Physiology, D.Venkatesh&H.H.Sudhakar, Wolters Kluwer.
Course Duration	28 weeks
Delivery	- Lectures (Tools: board, data show). -Tutorials and group discussions. -Assignments (if applicable). -Videos. - Practical classes (Lab experiments+ computerized experiments simulation).
Course Objectives:	1. Define homeostasis and explain how homeostatic mechanisms normally maintain a constant interior milieu. 2. State the functions of each organ system of the body, explain the

	<p>mechanisms by which each function, and relate the functions and the anatomy and histology of each organ system.</p> <p>3. Understand and demonstrate the interrelations of the organ systems to each other.</p> <p>4. Predict and explain the integrated responses of the organ systems of the body to physiological and pathological stresses.</p> <p>5. Explain the pathophysiology of common diseases related to the organ systems of the body.</p>	
Course Assessments	Midyear exam	20%
	Quizzes, reports, presentation	10%
	Practical continuous assessment, exam	10%
	Final Practical exam	20%
	Final theoretical exam	40%
	Total	100%
Content Breakdown Topical Coverage	Content Breakdown Topical Coverage	
Session 1 (Week 1)	General Physiology: Structure and function of the cell	
Session 2 (Week 2)	General Physiology: Structure and function of the cell	
Session 3 (Week 3)	Nervous System	
Session 4 (Week 4)	Nervous System	
Session 5 (Week 5)	Nervous System	
Session 6 (Week 6)	Blood and body fluids	
Session 7 (Week 7)	Blood and body fluids	
Session 8 (Week 8)	Cardiovascular system	
Session 9 (Week 9)	Cardiovascular system	
Session 10 (Week 10)	Body defense	
Session 11 (Week 11)	Midyear Exam	
Session 12 (Week 12)		
Session 13 (Week 13)		
Session 14 (Week 14)		
Session 15 (Week 15)	Body temperature homeostasis	
Session 16 (Week 16)	Endocrine system	
Session 17 (Week 17)	Endocrine system	
Session 18 (Week 18)	Urinary system	
Session 19 (Week 19)	Acid-base balance	
Session 20 (Week 20)	Fluid-electrolyte balance	
Session 21 (Week 21)	Respiratory system	
Session 22 (Week 22)	Respiratory system	
Session 23 (Week 23)	Digestive system and metabolism	
Session 24 (Week 24)	Digestive system and metabolism	
Session 25 (Week 25)	Special senses	
Session 26 (Week 26)	Special senses	

Session 27 (Week 27)	Reproductive system
Session 28 (Week 28)	Reproductive system
Final theoretical exam	
Practical work	1. Osmotic behavior of red cell membrane and osmotic fragility of cells
	2. Hematological lab.: Hematological methods(Hemoglobin, PCV , ABO system, ESR, , Element count (RBCs count), Bleeding and Coagulation time, Red cell indices, total and differential leukocyte count)
	3. (Hemoglobin, PCV, ABO system , ESR, , Element count (RBCs count), Bleeding and Coagulation time, Red cell indices, total and differential leukocyte count)
	4. (Hemoglobin, PCV, ABO system, ESR , , Element count (RBCs count), Bleeding and Coagulation time, Red cell indices, differential leukocyte count)
	5. (Hemoglobin, PCV, ABO system, ESR, , Element count (RBCs count) , Bleeding and Coagulation time, Red cell indices, differential leukocyte count)
	6. (Hemoglobin, PCV, ABO system, ESR, , Element count (RBCs count), Bleeding and Coagulation time , Red cell indices, differential leukocyte count)
	7. (Hemoglobin, PCV, ABO system, ESR, , Element count (RBCs count), Bleeding and Coagulation time, Red cell indices , differential leukocyte count)
	8. (Hemoglobin, PCV, ABO system, ESR, , Element count (RBCs count), Bleeding and Coagulation time, Red cell indices, differential leukocyte count)
	9. Electrocardiography
	10. Arterial blood pressure in man
	11. Examination of sensory system
	12. Study of reflexes in man
	13. a) To demonstrate the function of olfactory nerve b) To examine the different types of taste.
	14. a) To demonstrate the visual acuity b) To demonstrate the reflex activity
	15. Measure of basal mass index (BMI)
	16. Study of family planning devices and pregnancy diagnosis test.
	17. Final Practical Exam
Attendance Expectations	Students are expected to attend every session of class, arriving on time, returning from breaks promptly and remaining until class is dismissed. Absences are permitted only for medical reasons and must be supported with a doctor's note.
Generic Skills	The faculty is committed to ensuring that students have the full range of knowledge and skills required for full participation in all aspects of their lives, including skills enabling them to be life-long learners. To ensure graduates have this preparation, such generic skills as literacy and numeric, computer, interpersonal communications, and critical thinking skills will be

	embedded in all courses.
Course Change	Information contained in this course outline is correct at the time of publication. Content of the courses is revised on an ongoing basis to ensure relevance to changing educational employment and marketing needs. The instructor will endeavor to provide notice of changes to students as soon as possible. Timetable may also be revised.

Pharmacology I

1	Course name	Pharmacology I
2	Course Code	PH 205
3	Course type: /general/specialty/optional	specialty
4	Accredited units	4 Units (Theoretical 3 Lecture/Week Practical 2 hours/Week)
5	Educational hours	5 hours /week
6	Pre-requisite requirements	Pass the first year of pharmaceutical science program or equivalent
7	Program offered the course	Department of Pharmacology and Toxicology
8	Instruction Language	English Language
9	Date of course approval	12/2021

Brief Description:	This course is designed to serve as an introduction to the pharmacology of drugs which affect the various functions of the autonomic nervous system and drugs that modulate the actions of the local hormonal systems, grossly named as "autacoids" as well as covers the pharmacology of drugs acting on cardiovascular system, respiratory system, renal system and haematopoietic system.	
Textbooks required for this Course:	-Lippincott Illustrated Reviews: Pharmacology, 7th Edition -Goodman & Gilman's: The Pharmacological Basis of Therapeutics - Rang and Dale's Pharmacology. -Additional Resources: Lectures Notes and Practical Notes.	
Course Duration	28 weeks	
Delivery	- Lectures (Tools: board, data show). -Tutorials and group discussions. -Assignments (if applicable). -Videos. - Practical classes (Lab experiments+ computerized experiments simulation).	
Course Objectives:	<ol style="list-style-type: none"> 1. Upon successful completion of this course, the students should be able to: Identify route of drug administration, advantages and disadvantages of each. 2. Explain the principles of pharmacodynamics and pharmacokinetics and classify different types and locations of receptors and the responses mediated by neurotransmitters, agonist and antagonist drugs. 3. Explain the mechanism of pharmacological actions, therapeutic uses and adverse effects of cholinergic, anticholinergic, adrenergic, antiadrenergic drugs. 4. Describe different mechanism of skeletal muscle and neuromuscular blockers. 5. Define autacoids, list their classes, explain their pathophysiological role and explain the mechanism of pharmacological actions, therapeutic uses and adverse effects of drugs modulating the functions of autacoids. 6. Illustrate the mechanisms of actions, therapeutic uses, adverse drug reactions, contraindications, and interactions of drugs used in cardiovascular, Haemopoietic, urinary and respiratory systems. 	
Course Assessments	- Midyear exam	20%
	Quizzes, reports, presentation, discussion	10%
	Practical continuous assessment, exam	10%
	Final Practical exam	20%
	Final theoretical exam	40%
	Total	100%
Content Breakdown Topical Coverage	Content Breakdown Topical Coverage	
Session 1 (Week 1)	General pharmacology: a. Introduction & definitions b. Dose and factors modifying dose	

	c. Routes of administration
Session 2 (Week 2)	General pharmacology: d. Pharmacokinetics: i. General principles and relevant terms. ii. Absorption of drugs, bioavailability, passage of drugs across cell membrane iii. Drug distribution in body
Session 3 (Week 3)	General pharmacology: d. Pharmacokinetics: iv. Drug biotransformation, Enzyme induction & inhibition v. Elimination of drugs
Session 4 (Week 4)	General pharmacology E. Pharmacodynamics: i. Types and mechanisms of drug action (including receptors, ion channels, enzymes and signaling mechanisms) ii. Drug interactions (including potentiation, antagonism & mechanisms) iii. pharmacogenetics. iv. Adverse drug reactions-side effects, toxicity drug allergy, tachyphylaxis tolerance and addiction
Session 5 (Week 5)	Autonomic Nervous System (A.N.S) a. Introduction : Anatomical & physiological considerations
Session 6 (Week 6)	Autonomic Nervous System (A.N.S) b. Parasympathomimetics: Directly acting on receptors, Anticholinesterases (Reversible & Irreversible), Organophosphate poisoning and treatment – cholinesterase reactivators
Session 7 (Week 7)	Autonomic Nervous System (A.N.S) c. Parasympathetic blocking drugs (Muscarinic receptor blockers)
Session 8 (Week 8)	Autonomic Nervous System (A.N.S) d. Neuromuscular blocking agents (Nm blockers and persistent depolarizers)
Session 9 (Week 9)	Autonomic Nervous System (A.N.S): E. Sympathomimetics (Direct and Indirectly acting)
Session 10 (Week 10)	Autonomic Nervous System (A.N.S) : F. sympathetic blocking drugs: i. Adrenoceptor blockers
Session 11 (Week 11)	Midyear exam
Session 12 (Week 12)	
Session 13 (Week 13)	
Session 14 (Week 14)	
Session 15 (Week 15)	Autonomic Nervous System (A.N.S): F. Sympathetic blocking drugs: ii. Adrenergic neuron block centrally acting drugs, Reserpine G. Autonomic ganglion stimulants and blockers
Session 16 (Week 16)	Autacoids: i. Histamine and antagonists- Origin, synthesis, metabolism, physiological and pathological considerations, release and depletors; Receptors of histamine; Antihistaminics - H1 receptor blockers, H2 receptor blockers.
Session 17 (Week 17)	Autacoids:

	<ul style="list-style-type: none"> ii .5 hydroxytryptamine and antagonists - 5HT and its receptors in CNS and periphery; receptor blockers and their pharmacology
Session 18 (Week 18)	<p>Autacoids:</p> <ul style="list-style-type: none"> iii. Angiotensin - synthesis, actions, renin-angiotensin system - Blockers of renin-angiotensin system iv. bradykinin, kallekrein system. v. Eicosanoids vi. Prostaglandins, Thromboxane A2, Prostacyclin, Leukotrienes- their synthesis and physiopathological considerations; -Pharmacology of eicosanoids and relation with therapeutics; - overview of synthesis and receptor block.
Session 19 (Week 19)	<p>CVS</p> <p>A. Drugs used in treatment of hypertension including</p> <ul style="list-style-type: none"> -hypertensive emergencies
Session 20 (Week 20)	<p>CVS</p> <p>B. Angina pectoris –Pathophysiology</p> <p>Drugs in treatment and prevention</p>
Session 21 (Week 21)	<p>CVS</p> <p>C. Drugs in congestive heart failure:</p> <ul style="list-style-type: none"> i. Pathophysiology of congestive heart failure ii. Cardiotonics, vasodilators and other drugs in CHF
Session 22 (Week 22)	<p>CVS</p> <p>D. Antiarrhythmic drugs:</p> <ul style="list-style-type: none"> i. Electrophysiology of cardiac rhythm ii. Mechanism and types of cardiac arrhythmic iii. classifications and pharmacology of anti-arrhythmic
Session 23 (Week 23)	<p>CVS</p> <p>E. Drugs in hyperlipoproteinemias</p> <ul style="list-style-type: none"> i. Overview of cholesterol and triglycerides and lipoproteins metabolism ii. Types and pharmacology of hypolipidemic drugs
Session 24 (Week 24)	<p>Haematopoietic system:</p> <p>i. Drugs in anemia:</p> <ul style="list-style-type: none"> -Iron: Absorption, preparations and use, Acute and chronic toxicity and treatment Folic acid: physiology, metabolism. Relation vitamin B12, use -Vitamin B12: Absorption, deficiency, uses. Inter relationship with folic acid metabolism -Erythropoietin and colony stimulating factors
Session 25 (Week 25)	<p>Hematopoietic system:</p> <ul style="list-style-type: none"> ii. Drugs and blood coagulation: A. Cascade of blood coagulation B. Anticoagulants : Heparin & oral anticoagulants , their mechanism of , indications ,Contraindications, toxicity and antagonists
Session 26 (Week 26)	<p>Hematopoietic system:</p> <ul style="list-style-type: none"> C. Fibrinolytic and antithrombotic & antagonist

	D. Coagulants and hemostatic in bleeding disease.
Session 27 (Week 27)	Urinary system i. Physiology of urine formation and possible sites of diuretic actions ii. Control of acid-base balance iii. Diuretics and antidiuretics
Session 28 (Week 28)	Respiratory system i. Drugs in bronchial asthma treatment ii. Drug treatment of cough – central peripheralAntitussives and expectorants. iii. Oxygen therapy.
	Final theoretical exam
Practical work	1. Introduction: a) general terminology b) Animals used in experimental pharmacology. c) Handling of laboratory animals and techniques of drug administration 2. Effect of route of administration of drug on the pharmacological response 3. Isolated rabbit intestine: a) Effects of spasmogens. b) Dose-Response curve in absence and presence of antagonists. c) Identification of unknown drug solution. 4. Effect of drugs on rabbit eye. 5. Blood pressure. 6. Effect of drugs on rabbit heart.
	7- Final Practical Exam.
Attendance Expectations	Students are expected to attend every session of class, arriving on time, returning from breaks promptly and remaining until class is dismissed. Absences are permitted only for medical reasons and must be supported with a doctor's note.
Generic Skills	The faculty is committed to ensuring that students have the full range of knowledge and skills required for full participation in all aspects of their lives, including skills enabling them to be life-long learners. To ensure graduates have this preparation, such generic skills as literacy and numeric, computer, interpersonal communications, and critical thinking skills will be embedded in all courses.
Course Change	Information contained in this course outline is correct at the time of publication. Content of the courses is revised on an ongoing basis to ensure relevance to changing educational employment and marketing needs. The instructor will endeavor to provide notice of changes to students as soon as possible. Timetable may also be revised.

Pharmacology II

1	Course name	Pharmacology II
2	Course Code	PH 305
3	Course type: /general/specialty/optional	Specialty
4	Accredited units	4 Units (Theoretical 3 Lecture/Week Practical 2 hours/Week)
5	Educational hours	5hrs/week
6	Pre-requisite requirements	Pass pharmacology I course
7	Program offered the course	Department of Pharmacology and Toxicology
8	Instruction Language	English Language
9	Date of course approval	12/2021

Brief Description:	This course aims to offer students with a comprehensive background in the pharmacology of drugs used in central nervous, endocrine, and gastrointestinal systems, as well as chemotherapy drugs Lectures will focus on drugs classes, action and mechanisms, pharmacokinetics, clinical uses, adverse effects, and drug-drug interaction
Textbooks required for this Course:	1. Lippincott Illustrated Reviews: Pharmacology, 7th Edition 2. Goodman & Gilman's: The Pharmacological Basis of Therapeutics 3. Rang and Dale's pharmacology. Additional Resources: 4. Lectures Notes, 5. Practical notes.
Course Duration	28 weeks
Delivery	-Lectures (Tools: board, data show). - Tutorials group discussions. - Assignments (if applicable). - Videos - Practical classes (Lab experiments+ computerized experiments simulation)
Course Objectives:	Upon successful completion of this course, the students should be able to: 1. Describe the Pathophysiology of diseases and explain the rational basis for the use of drugs. 2. Classify drugs used of central nervous (CNS), endocrine, and gastrointestinal(GIT) systems and explain the mechanism of

	<p>action, pharmacological actions and their therapeutic actions.</p> <ol style="list-style-type: none"> 3. Describe the adverse and toxic effects of drugs used in various CNS, endocrine, GIT disorders and drug interaction. 4. Discuss patient and drug related factors that influence the selection of the appropriate antimicrobial agent and discuss the pharmacokinetic and Pharmacodynamics considerations. 5. Identify the most common/serious drug interactions, adverse effects and compare contrast the therapeutic of antimicrobial drugs that are appropriate for treating the disease state. 	
Course Assessments	Midyear exam	20%
	Quizzes, reports, presentation	10%
	Practical continuous assessment, exam	10%
	Final Practical exam	20%
	Final theoretical exam	40%
	Total	100%
Content Breakdown Topical Coverage	Content Breakdown Topical Coverage	
Session 1 (Week 1)	CNS <ol style="list-style-type: none"> 1. Introduction: Anatomical & physiological Considerations; central neurotransmitters and their receptors. 2. Sedatives, hypnotics and anxiolytics. 	
Session 2 (Week 2)	CNS <ol style="list-style-type: none"> 3. Alcohols: Ethyl alcohol and pharmacology: - Acute poisoning and treatment CNS 4. General anesthetics including pre-anesthetic medication 5. Local anesthetics: 	
Session 3 (Week 3)	CNS <ol style="list-style-type: none"> 6. Antiepileptic drugs: principles of treatment of epilepsy: Experimental methods 	
Session 4 (Week 4)	CNS <ol style="list-style-type: none"> 7. Drugs in Parkinson's disease and other neurodegenerative diseases 8. Central muscle relaxants 	
Session 5 (Week 5)	CNS <ol style="list-style-type: none"> 9. Antipsychotics – typical and atypical & Anti-depressants and anti-manic drugs 	

Session 6 (Week 6)	CNS 10. Opioidanalgesics: <ol style="list-style-type: none"> Pathophysiology of Endogenous opioids & system Opioidanalgesics: Drugs of abuse and treatment: hallucinogen
Session 7 (Week 7)	CNS 11. Non-opioid analgesics & ant gout types
Session 8 (Week 8)	GIT <ol style="list-style-type: none"> Drugs used in peptic ulcer drugs treatment of constipation (laxative and purgatives).
Session 9 (Week 9)	GIT <ol style="list-style-type: none"> Antidiarrheal drugs Emetics and anti-emetics
Session 10 (Week 10)	Endocrine pharmacology <ol style="list-style-type: none"> Overview of hormones of hypothalamus and anterior pituitary; directly acting and controlling hormones; pharmacology of growth and prolactin Hormones of posterior: Oxytocin and A.D.H
Session 11 (Week 11)	Midyear exam
Session 12 (Week 12)	
Session 13 (Week 13)	
Session 14 (Week 14)	
Session 15 (Week 15)	Endocrine pharmacology <ol style="list-style-type: none"> Gonadotropic hormones: Control of male and female sex hormones; Oestrogens, progestins; Oral contraceptives females
Session 16 (Week 16)	Endocrine pharmacology <ol style="list-style-type: none"> Androgens and anabolic steroids: male contraceptives Iodine metabolism: TSH; The regulation of thyroid hormones; Thyroid hormones, antithyroid and their pharmacology
Session 17 (Week 17)	Endocrine pharmacology <ol style="list-style-type: none"> ACTH and regulation of corticosteroids secretion ; Hormones of adrenal cortex and synthetic substitutes and their pharmacology
Session 18 (Week 18)	Endocrine pharmacology <ol style="list-style-type: none"> Calcium metabolism : pharmacology of calcitriol, parathormone and calcitonin
Session 19 (Week 19)	Endocrine pharmacology <ol style="list-style-type: none"> Glucose metabolism; pancreatic hormones; Diabetes mellitus and anti-diabetic drugs (Insulin and oral drugs) (2 lectures)
Session 20 (Week 20)	Chemotherapy <ol style="list-style-type: none"> General chemotherapy: <ol style="list-style-type: none"> principles of antimicrobial drug action, Microbes and drugs of choice, Resistance to antimicrobial drugs

	b. Antifungal agents c. Antiviral drugs
Session 21 (Week 21)	Chemotherapy 1. General chemotherapy: d. Antibacterial drugs (Chemotherapeutic agents & Antibiotics)
Session 22 (Week 22)	Chemotherapy 1. General chemotherapy: d. Antibacterial drugs (Chemotherapeutic agents & Antibiotics)
Session 23 (Week 23)	Chemotherapy 2. Specific chemotherapy a. Chemotherapy of tuberculosis and leprosy
Session 24 (Week 24)	Chemotherapy 2. Specific chemotherapy b. Drugs in helminth infestation
Session 25 (Week 25)	Chemotherapy 2. Specific chemotherapy c. Drugs in protozoal Infestation
Session 26 (Week 26)	Chemotherapy 2. Specific chemotherapy d. Chemotherapy of malignancy
Session 27 (Week 27)	Immunosuppressants
Session 28 (Week 28)	Vitamins
	Final theoretical Exam
Practical work	<ol style="list-style-type: none"> 1. prescription writing. 2. Screening of analgesic effect using (Writhing test). 3. Screening of analgesic effect analgesics using (Hot plate analgesiometer). 4. Sedative and hypnotics experiments. 5. Experimental Parkinsonism. 6. Induction of convulsants and evaluation of anticonvulsants effect. 7. Local anesthetics (on Rabbit eye) 8. Frog rectus abdominus muscle. 9. Collection of blood from laboratory animals.
	10- Final Practical Exam
Attendance Expectations	Students are expected to attend every session of class, arriving on time, returning from breaks promptly and remaining until class is dismissed. Absences are permitted only for medical reasons and must be supported with a doctor's note.
Generic Skills	The faculty is committed to ensuring that students have the full range of knowledge and skills required for full participation in all aspects of their lives, including skills enabling them to be life-long learners. To ensure graduates have this preparation, such generic skills as literacy and numeric, computer, interpersonal communications, and critical thinking skills will be embedded in all courses.
Course Change	Information contained in this course outline is correct at the time of

	<p>publication. Content of the courses is revised on an ongoing basis to ensure relevance to changing educational employment and marketing needs. The instructor will endeavor to provide notice of changes to students as soon as possible. Timetable may also be revised.</p>
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Toxicology and First aid

1	Course name	Toxicology and First aid
2	Course Code	BH403
3	Course type: /general/specialty/optional	Specialty
4	Accredited units	3 Units (Theoretical 2 Lecture/Week Practical 2 hours/Week)
5	Educational hours	5 hr/week
6	Pre-requisite requirements	Pass in Pharmacology and Therapeutics
7	The program offered the course	B.Sc. in Pharmaceutical Sciences
8	Instruction Language	English
9	Date of course approval	12/2021

Brief Description:	This course will provide students with a fundamental understanding of the basic principles of molecular, systemic, clinical, and environmental toxicology and their applications. To know the basic principles of emergency medicine.
Textbooks required for this Course:	<ol style="list-style-type: none"> 1. Casarett&Doull's: The Basic Science of Poisons (7th Edition) 2. Loomis's Essentials of Toxicology (4th Edition) Lu's Basic Toxicology Fundamentals, Ta Organs, and Risk Assessment, Seventh Edition 3. Clinical Toxicology and antidotal therapy 4. Science Toxicology: A Case-Oriented Approach John Joseph Fenton 5. http://www.benghazi.edu.ly/ 6. http://toxnet.nlm.nih.gov/ 7. Practical notes
Course Duration	28 weeks
Delivery	Lectures Practical classes (Lab experiments+ computerized experiments simulation) Tutorials and group discussions E- Tutorials (if applicable) Presentations Assignments (if applicable)

	Videos. Case studies	
Course Objectives:	<p>A. Knowledge and understanding: 1a-Illustrate different routes of exposure to toxicants, their metabolic pathways, and experimental techniques used to assess their harmful effects on the cellular organ system and the whole body. 2a-Classify toxic agent and environmental toxic substances that have known effects on individuals or populations. 3a- Know about the laboratory analysis and how to identify drugs or toxins 4a- Understand and know how to diagnose properly and what the emergency management of acute poisoning.</p> <p>B. Intellectual Skills: 1b- Analyze, evaluate, and interpret toxicological information in daily practice e.g., information regarding overdoses of drugs and management of poisoning. 2b- Recognize different populations at risk due to toxic agent exposure, occupational and environmental exposure. 3b-Know how to give emergency help to avoid death and complication and how to treat the complication. 4c- Assessing the poisoned patient with taking a history, Clinical Examination.</p> <p>C. Professional and Practical Skills: 1c- Assess the relative toxicity or safety of various compounds. 2c-Use different materials and techniques in first aid properly.</p> <p>D. General and Transferable Skills: 1d-Design a research project using biological assay methods. 2d-Interpret, critically analyze, and discuss different experimental results and research papers. 3d-Provide advice and help in poisoning and emergency cases.</p>	
Course Assessments	Midyear exam	20%
	Quizzes, reports, presentation	10%
	Practical continuous assessment, exam	10%
	Final Practical exam	20%
	Final theoretical exam	40%
	Total	100%
Content Breakdown Topical Coverage	Content Breakdown Topical Coverage	
Session 1 (Week 1)	<p>General toxicology Introduction to toxicology, Definitions of terms, Basic principles of toxicology: Areas of toxicology, Spectrum of the toxic dosage, Classification of toxic agents. Characteristic of exposure, Type of exposure, Toxic effects, Characteristic of Toxic Effect, Dose response curve, LD50, Mechanisms of selective toxicity. Animal toxicity testing Toxicokinetics , Toxicodynamics, Type of interactions</p>	
Session 2 (Week 2)	Mechanisms of cellular injury and Factors affecting Toxicity.	
Session 3 (Week 3)	<p>Genetic Toxicity; Introduction to genetics, The targets of DNA damages. Types of DNA Damages and damaging agents. Responses of the cell to DNA damage. DNA repair mechanisms. mutation and types of mutations (small and large genetic anomalies)</p>	

Session 4 (Week 4)	Examples of genetic defects and pattern of inheritance of genetic defects. mutation and cancer. mutagen testing system (genotoxicity tests).
Session 5 (Week 5)	Chemical Carcinogenesis; definition of terms, the major genetic properties of cancer (hallmarks of cancer), Classification of carcinogens, Types of chemical carcinogens (genotoxic and nongenotoxic carcinogens). Mechanism of carcinogenesis (multistage process).
Session 6 (Week 6)	International regulations of the testing procedure required for the safety of chemicals and pharmaceuticals for human use. Developmental toxicology; Teratogenesis Definitions of terms. Principles of Teratology. Normal morphological development. Factors that affect teratogenicity.
Session 7 (Week 7)	Mechanisms of Teratogenic effects. Patterns of dose exposure. Factors that modify the developmental toxicity of xenobiotics.
Session 8 (Week 8)	Systemic toxicology: Toxic response of the blood; Hematopoiesis, Toxicology of the erythrocytes and toxicology of platelets and hemostasis. Toxic response of the respiratory system; Structure of the respiratory tract, Pulmonary physiology, Classification of inhaled toxic materials, Factors influence regional deposition. Defense mechanisms. Acute pulmonary injury and Chronic pulmonary injury.
Session 9 (Week 9)	Toxic response of the heart and vascular system; Cardiac electrophysiology, General mechanisms of cardiac toxicity, Cardiotoxic agents. Toxic responses of the eye; External contact agents, Systemic drug affecting the cornea and Some drugs that affect the lens and retina.
Session 10 (Week 10)	Toxic responses of the Kidney; Site of action of nephrotoxicants and Nephrotoxicants therapeutic agents. Toxic responses of the Liver; Mechanism of liver injury and Factors involved in liver injury
Session 11 (Week 11)	Midyear Exam
Session 12 (Week 12)	
Session 13 (Week 13)	
Session 14 (Week 14)	
Session 15 (Week 15)	Toxic responses of the Nervous system; Patterns of neurotoxic injury. Compounds associated with different type of neurotoxic injury. Toxic responses of the Skin; Skin histology, Percutaneous absorption. Biotransformation. Contact dermatitis, Chemical burns, Photo toxicology, Acne, Pigmentary disturbance and Skin cancer.
Session 16 (Week 16)	Toxic responses of the immune system; -the concept of immunomodulation. -immunosuppression: halogenated aromatic hydrocarbons, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, nitrosamines, inhaled substances, mycotoxins, natural and synthetic hormones, therapeutic agent, electromagnetic fields and ultraviolet radiation. -immune-mediated diseases.
Session 17 (Week 17)	Toxic agents; A-Heavy metals, Heavy Metals, Sources, Chemical forms, Site of action and

	<p>Mechanism of toxicity. Absorption, Distribution, Elimination, and Excretion Types of heavy metal intoxication and Treatment of heavy metal toxicity 1-Arsenic: Mechanism of action, Clinical presentation and Management 2-Lead: Mechanism of action, Mechanism of action, Clinical presentation and Management 3-Mercury: Mechanism of action, Clinical presentation and Management</p>
Session 18 (Week 18)	<p>B-Pesticides: 1-Insecticides: Classification of insecticides: a-Organochlorinated, b- anticholinesterase, and c-pyrethroids Pesticides 2-Herbicides. 3-Rodenticides</p>
Session 19 (Week 19)	<p>Environmental Toxicology. Air pollution, Water and soil pollution. Food pollution.</p>
Session 20 (Week 20)	<p>Plant and animal toxin. Occupational toxicology Risk assessment</p>
Session 21 (Week 21)	<p>Clinical Toxicology</p>
Session 22 (Week 22)	<p>Clinical Toxicology continue.</p>
Session 23 (Week 23)	<p>Forensic Toxicology</p>
Session 24 (Week 24)	<p>Fist Aids: Introduction; Definitions; purpose of first aid-fixing of priorities in first aid, how to confront an emergency. Medical emergency cards and symbols. Physical injuries, signs and symptoms and first aid treatment [2] Abrasion, Wounds-classification, and Concussion.</p>
Session 25 (Week 25)	<p>Bleedings-types (capillary, venous, arterial) and differences, examples of manifest and concealed bleedings, methods of stopping bleedings- different pressure points included. Muscle disorders Fractures, definitions, types, causes, general methods of immobilization, transfer to hospital. Dislocations, important dislocations and methods of correction (shoulder, mandible, finger)</p>
Session 26 (Week 26)	<p>Foreign bodies; Sign and symptoms, methods of removal; foreign bodies in skin, eyes, nose, ear, stomach, respiratory tract- phases and methods to remove. Water drowning; Types, prophylaxis and pathophysiology of fresh water and saline-water drowning, treatment (FA) and management. Accidents with chemicals: (a) Chemical burns-acid and alkali burns, prevention and first aid management. (b) Acute poisoning-causes and management, methods of decreasing absorption, removal from body, antidotes. (c) Nerve gas- signs and symptoms and treatments.</p>
Session27 (Week 27)	<p>Emergencies with temperature (a) Frost bite- signs and symptoms and treatment. (b) Sun stroke (head stroke), causes, susceptible persons, treatment. (c) Heat burns-types (steam, hot water, fire) Animal bites Signs and symptoms and first aid management and prophylaxis. Bee bite, scorpion, snakes: classification of types and differentiation between poisonous and nonpoisonous snakes, poisonous spiders. Dogs bite-prophylaxis and treatment.</p>
Session 28 (Week 28)	<p>Complications and their treatment [1]</p>

	<ul style="list-style-type: none"> (i) Shock. (ii) Acute respiratory arrest (iii) Acute cardiac arrest. (iv) Coma (v) Convulsions.
	Final theoretical Exam
Practical Work 2hr /week	<ul style="list-style-type: none"> 1-Lethality studies and determination of LD50. 2-Toxic response of the blood. 3-Corrosives and irritants. 4-CNS stimulants. 5-Carbon monoxide and cyanide. 6-Picrotoxin and strychnine poisoning. First Aid practical
	Final practical exam
Attendance Expectations	<p>Students are expected to attend every session of class, arriving on time.</p> <p>Absences are permitted only for medical reasons and must be supported with a doctor's note.</p>
Generic Skills	<ul style="list-style-type: none"> Independent learning, critical thinking, and problem solving. Basic IT and presentation skills. Integration of different fields of knowledge. Team working. Communication skills.
Course Change	<p>The details of course contents are updated according to the outcomes of new research and published paper. Content of the courses is revised on an ongoing basis to ensure that the course fit the graduation competences and community needs. Any changes will be approved by the department's scientific committee and department council.</p>

Bioassay

1	Course name	Bioassay
2	Course Code	PH 404
3	Course type: /general/specialty/optional	Specialty
4	Accredited units	3 Units (Theoretical 2 Lecture/Week Practical 2 hours/Week)
5	Educational hours	4 hr/week
6	Pre-requisite requirements	Pharmacology I, II
7	The program offered the course	Department of Pharmacology and Toxicology
8	Instruction Language	English /Arabic
9	Date of course approval	12/2021

Brief Description:	To know the basic methods of bioassay and drug screening.	
Textbooks required for this Course:	No.	Reference
	1.	Drug screening methods (Editor SK Gupta)
	2.	Essentials of Bioassay & Screening of drugs (A.S. Elhwuegi& S.S. Ahmed)
	3.	Science
	4.	http://www.benghazi.edu.ly/
	5.	http://toxnet.nlm.nih.gov/
	6.	Practical notes
Course Duration	28 weeks	
Delivery	Lectures Practical classes (Lab experiments+ computerized experiments simulation) Tutorials and group discussions E-tutorials(if applicable) Presentations Assignments (if applicable) Videos.	
Course Objectives:	A.Knowledge and understanding:	

	<p>Demonstrate the different methods of biological assays and the application of statistical tests in these assays.</p> <p>B. Intellectual Skills: Design screening methods for different drug groups.</p> <p>C. Professional and Practical Skills: Screening of newly discovered drugs.</p> <p>D. General and Transferable Skills: 1d-Design a research project using biological assay methods. 2d-Interpret, critically analyze, and discuss different experimental results and research papers.</p>	
Course Assessments	Midyear Examination	20.0%
	Practical continuous Assessment	10.0%
	Quizzes, reports, presentation	10.0%
	Final practical Examination	20.0%
	Final theoretical Examination	40.0%
	Total	100%
Content Breakdown Topical Coverage	Content Breakdown Topical Coverage	
Session 1 (Week 1)	<p>Introduction Definition; assay, bioassay, standardization, biostandardization, international units. Objectives of bioassay, principles of bioassay. Requirements. Advantages and disadvantages of bioassay.</p>	
Session 2 (Week 2)	<p>Biological variation and how to reduce it. Use of controls and reference standard, Type of control. Limitation in animal experiments. How to perform bioassay.</p>	
Session 3 (Week 3)	<p>Methods of bioassay 1-Direct methods; a-Bioassay of Digitalis. b-Bioassay of D- tubocurarine 2-Graded response methods. a-Direct method techniques. b-Multiple point bioassay. (i) 3-point assay (ii) 4-point assay (iii) 6-point assay Their advantages and disadvantages. Introduction of bioassay</p>	
Session 4 (Week 4)	<p>Toxicity studies: Acute toxicity test, Sub-acute toxicity tests, Sub-chronic toxicity tests and Chronic toxicity tests. Other studies; Clinical studies and clinical trials: objectives, Principle, Phases and Sequential trials. Special Tests: Teratogenicity, Carcinogenicity.</p>	
Session 5 (Week 5)	<p>Bioassay of Hormones 1-Anterior pituitary hormones: Growth hormones, Prolactin, hormones Gonadotropic</p>	
Session 6 (Week 6)	<p>ACTH and TSH (thyrotrophin). 2-Posterior pituitary hormones: Oxytocin, Vasopressin.</p>	
Session 7 (Week 7)	<p>3-Peripheral hormones; Insulin and methods to produce experimental diabetes, Glucagon, Corticosteroids, Calcitonin, Thyroxin,</p>	
Session 8 (Week 8)	<p>Parathyroid hormones and Sex hormone and related drugs (Oestrogens. Progesterone, Androgens. And Anabolic Steroids).</p>	
Session 9 (Week 9)	<p>Bioassay of Biological Products; Heparin, and Vitamins: A, D and C.</p>	
Session 10 (Week 10)	<p>Bioassay (wherever applicable) and screening of drugs.</p>	

	Introduction: Definitions and typed of screening objectives and principles. Screening of drugs, type of screening.
Session 11 (Week 11)	Midyear Exam
Session 12 (Week 12)	
Session 13 (Week 13)	
Session 14 (Week 14)	
Session 15 (Week 15)	1- Simple screening, 2-Blind screening: a-Neuropharmacological observations, , b-Cardiovascular system tests. C-2-Cardiovascular system tests and 4-Tests on guinea pig ileum and vas deferens preparation. 3- Programmed screening.
Session 16 (Week 16)	Screening of important systemic drugs. a) Autonomic drugs: a) Cholinergic and anticholinergic. b) Adrenergic and ant adrenergic. c) mixture of adrenalin and nor-adrenaline. d) Ganglion blocking agents.
Session 17 (Week 17)	b) Muscle relaxants
Session 18 (Week 18)	c) Cardiovascular system Screening for antihypertensive drugs. Methods of producing experimental hypertension.
Session 19 (Week 19)	Screening for cardiotoxic drugs. Experimental methods to produce heart failure. Screening for diuretic activity.
Session 20 (Week 20)	Screening for anti-arrhythmic activity. Experimental methods to produce arrhythmias in animals. Screening for anti-anginal activity.
Session 21 (Week 21)	Drugs used for gastro-intestinal tract. Screening for anti-peptic ulcer activity. Methods to produce experimental gastro-intestinal tract. Screening for antidiarrheal activity and Screening for purgative action of a drug.
Session 22 (Week 22)	Drugs used for central nervous system A-Psychopharmacological drugs, including experimental methods. 1- Screening for anti-psychotic activity. Drugs for schizophrenia and Antidepressant drugs 2-Screening for anti-anxiety drugs; B- Screening for hypnotic drugs, b-Screening for anticonvulsant activity-Variou experimental methods.
Session 23 (Week 23)	C-Anti-parkinsonism drugs-experimental parkinsonism. D-Screening for analgesic activity-experimental pain models. E-Screening for anti-pyretic and anti-inflammatory activity-different models of experimental inflammation (acute and chronic).
Session 24 (Week 24)	Bioassay of histamine and other autocooids (Angiotensin, 5-HT, bradykinin, Prostaglandins
Session 25 (Week 25)	Drugs in malignancy-methods to produce experimental tumors.
Session 26 (Week 26)	Miscellaneous topics. -Preliminary studies in toxicity evaluation -Study of antagonistic activity-types of antagonists-study of determination of competitive and non-competitive antagonism
Session 27 (Week 27)	-Physiological salt-solutions
Session 28 (Week 28)	-Radio-immunoassay-principles and methods
	Final theoretical Exam

Practical Work	<p>1-Whole Animal: Irwin Primary Test Table</p> <p>2-Standard Response on Cat Blood Pressure and Nictitating Membrane (Demonstration only).</p> <p>3-Methods of Bioassay</p> <p>Models for Screening:</p> <p>4-Photoelectric Cell Meter for Measurement of Spontaneous Motor Activity.</p> <p>5-The Plus Maze for Screening of Anxiolytic and Measuring the SMA (Demonstration only).</p> <p>6-Swimming Maze for Screening of Antidepressant Drugs.</p> <p>7-Muricide behavior.</p> <p>8- Final Practical Exam.</p>
	Final Practical Exam
Attendance Expectations	Students are expected to attend every session of class, arriving on time. Absences are permitted only for medical reasons and must be supported with a doctor's note.
Generic Skills	<p>Independent learning, critical thinking, and problem solving.</p> <p>Basic IT and presentation skills.</p> <p>Integration of different fields of knowledge.</p> <p>Team working.</p> <p>Communication skills.</p>
Course Change	The details of course contents are updated according to the outcomes of new research and published paper. Content of the courses is revised on an ongoing basis to ensure that the course fit the graduation competences and community needs. Any changes will be approved by the department' scientific committee and department council.