Pharmacology

Course Text

Hitner, Henry, et al. *Pharmacology: An Introduction*. 8th ed., McGraw-Hill Education, 2022.

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Course Description

This course introduces pharmacology as the study of drugs. The course begins with an explanation of therapeutic and adverse effects, in addition to the basic operation of the nervous system. Several major body systems are covered including the cardiovascular, urinary, respiratory, gastrointestinal, and reproductive systems, with particular emphasis on the endocrine and immune systems. The drugs that are used to treat such conditions are studied with respect to their mechanism of action, therapeutic effects, and adverse effects. Topics include muscle relaxants, anesthetics, pain medication, and psychoactive medications. As students work through this course, their understanding of how drugs impact the body, as intended and otherwise, will improve.

Course Objectives

After completing this course, students will be able to:

- Relate drug terminology to their appropriate definitions, and analyze aspects of drug actions, effects, interactions, and individual responses.
- Solve dosage calculation problems involving fractions, decimals, percents, ratios, proportions and using the metric, apothecary, and household measurement systems.
- Evaluate the contribution of nutrients towards maintaining normal body function, and explain nutrition deficiency, drug and supplement interaction, and effects of supplement overdose.
- Describe brain structure and functioning; examine the functioning of the sympathetic, parasympathetic, and autonomic nervous systems; and how drugs increase or decrease their activities.
- Compare and contrast general and local anesthetics with reference to their routes of administration, mechanisms of action, effects, and adverse effects.
- Evaluate the contribution of muscle relaxants, opioid, and non-opioid analgesics towards relieving pain and reducing inflammation, and assess their effects and adverse effects.

- Analyze the various types of mental disorders and evaluate the effects of antipsychotic, antianxiety, antidepressant, antimanic, barbiturates, benzodiazepines, hypnotic and psychotomimetic drugs; examine the potential for abuse.
- Describe the normal cardiac cycle, common cardiac conditions, and drugs used to treat cardiac arrhythmias, angina pectoris, congestive heart failure and high blood pressure.
- Explain the mechanisms of action of coagulants and anticoagulants, causes and treatment of anemia, the mechanisms and actions of the various hypolipidemic drugs, and their adverse effects.
- Analyze the structure and function of the kidneys, their effect on other body systems, and the actions and side effects of diuretics.
- Relate the nature of allergic reactions to the use of antiallergic and antihistamine drugs, and explain the actions of drugs used to treat respiratory diseases.
- Examine the actions, adverse effects, and interactions of drugs used to treat hyperacidity, gastroesophageal reflux disease, vomiting, ulcers, simple diarrhea, and laxatives and cathartics.
- List and explain clinical indications and contraindications, administration, and drug interactions of growth hormones, thyroid hormones, and adrenal steroids.
- Relate the action of insulin and glucagon to the treatment of diabetes, and explain the aspects of drug administration including adverse effects, contraindications, and drug interactions.
- Explain how antiseptics and disinfectants work to prevent infection; the actions of antibacterial, antifungal, antiprotozoal, antiparasitic, and antiviral drugs in fighting infections; and their adverse effects, contraindications, and interactions.
- Describe the characteristics and types of cancer, as well as the actions and effects of drugs used to treat them.

Course Prerequisites

There are no prerequisites for this course.

Important Terms

In this course, different terms are used to designate tasks:

- **Proctoring**: all final exams require proctoring which can be completed conveniently from your home. A webcam is required.
- **Tutoring**: memberships include online tutoring for students to access with any content/subject related questions in the place of faculty. If your tutor is not able to answer your questions please contact a student advisor.
- **Practice Exercise**: A non-graded assignment to assist you in practicing the skills discussed in a topic.
- **Exam**: A graded online test

Academic Integrity Statement

Academic integrity is the pursuit of scholarly activity in an honest, truthful and responsible manner. Violations of academic integrity include, but are not limited to, plagiarism, cheating, fabrication and academic misconduct. Failure to comply with the Academic Integrity Policy can result in a failure and/or zero on the attempted

assignment/examination, a removal from the course, disqualification to enroll in future courses, and/or revocation of an academic transcript.

Course Completion Policy

In order for a course to be considered complete, all required coursework must be attempted, submitted, and graded. Required coursework consists of graded assignments. Any Academic Integrity Policy violations may prevent a course from being considered complete.

Course Evaluation Criteria

Your score provides a percentage score and letter grade for each course. A passing percentage is **70%** or higher.

There are a total of 1000 points in the course:

Topic	Assessment	Points Available
4	Graded Exam #1	125
8	Graded Exam #2	125
8	Midterm Exam	200
13	Graded Exam #3	125
17	Graded Exam #4	125
18	Final Graded Exam	300
Total		1000

Course Topics and Objectives

Topic	Topic	Subtopics	Objectives
1	Introduction to Pharmacology	• Basics of Pharmacology • Drug Terminology • Drug Effects • Drug Actions • Drug Response • Individual Variability and Drug Interaction • Drug Dependence and Abuse • Pediatric Pharmacology • Geriatric Pharmacology	• Relate the basic drug terminology used in pharmacology to its appropriate definition. • Analyze the effects that a drug can produce in the body with specific reference to therapeutic effect, side effect, and toxic effect. • Evaluate what happens when a drug is ingested into the human body with reference to the processes of drug absorption, distribution, metabolism, and excretion. • Analyze the response of a drug in the human body with reference to half-life, blood drug levels, and bioavailability. • Analyze the factors that influence drug response in individuals and

Topic	Topic	Subtopics	Objectives
			explain how individual variability is different from drug interaction. • Distinguish between drug dependence and abuse with respect to the reasons for taking the drug. • Evaluate drug actions in pediatric patients and propose appropriate drug administration methods. • Evaluate drug actions in elderly patients and propose appropriate drug administration methods.
2	Dosage Calculations	• Fractions, Decimals, and Percents • Systems of Measurements • Ratios and Proportions • Solutions and IV	• Solve problems using fractions, decimals, and percents. • Solve dosage calculation problems using metric, apothecary, and household systems of measurement. • Solve dosage calculation problems for solutions and intravenous infusions.
3	The Nervous System	• Autonomic Nervous System Functioning • Parasympathetic Stimulation • Central Nervous System Structure • Organ Function • Effects of Drugs on the Sympathetic Nervous System • Effects of Drugs on the Parasympathetic Nervous System • Effects of Drugs on the Autonomic Ganglia	• Illustrate the functions of the autonomic nervous system, including the role of neurotransmitters. • Examine the effects of parasympathetic stimulation. • Examine the structure of the human brain and explain the functions of its various parts. • Evaluate the role of norepinephrine and epinephrine on alpha- and beta-adrenergic receptors. • Analyze how drugs act to reduce para- and sympathetic activity. • Assess the role of acetylcholine on the parasympathetic nervous system. • Distinguish between drugs that produce ganglionic stimulation and ganglionic blockade with respect to their effects and adverse effects.
4	Psychological Disorders and Drugs	• Sedative- Hypnotic Drugs • Psychotomimetic Drugs • Mental Disorders • Antipsychotic Drugs • Antianxiety Drugs	• Analyze the role of hypnotic drugs in relation to the sleep cycle and describe their adverse effects. • Analyze the mechanisms of action of various psychotomimetic drugs. • Compare and contrast barbiturates and benzodiazepines in terms of

Topic	Topic	Subtopics	Objectives
		• Antidepressants • Antimanic Drugs	their mechanisms of action, pharmacokinetics, adverse effects, contraindications, and drug interactions. • Compare various psychotomimetic drugs with reference to their tolerance and dependency and treatment for intoxication. • Classify mental disorders as psychoses, neuroses, and mood disorders. • Distinguish among various antianxiety, antidepressant, and antimanic drugs in terms of mechanisms of action, effects, and adverse effects.
5	Common Pain Relief Agents	• Muscle Activity • Muscle Relaxants • General Anesthetics • Local Anesthetics • Administration • Excretion • Side Effects and Adverse Effects • Effects of Opioid Analgesics • Other Effects of Opioid Analgesics • Adverse Effects and Drug Interactions • Nonopioid Analgesics • Inflammation • Gout	• Describe the process of muscle relaxation and contraction. • Distinguish among the various types of muscle relaxants with reference to their mechanism of action, route of administration, clinical indications, and effects. • Relate the various types of muscle relaxants to their adverse effects and drug interactions. • Sequence the stages of general anesthesia with specific reference to the action of drug adjuncts. • Analyze the mechanism of action of local anesthetics and their effect on the heart. • Compare and contrast the routes of administration for various general and local anesthetics. • Compare and contrast the ways in which general and local anesthetics are excreted from the body. • Compare and contrast the side effects and adverse effects of general and local anesthetics. • List the sources of opioid analgesics and relate their effects to the physiology of pain. • Examine the actions of opioid analgesics as antitussives on the smooth muscles, cardiovascular system, and eyes.

Topic	Topic	Subtopics	Objectives
			• Explain the mechanism of action of opioid analgesics. • Analyze the most common adverse effects and drug interactions of opioid analgesics and explain opioid poisoning and opioid antagonists. • Evaluate the various types of nonopioid analgesics and recommend correct doses of these drugs for adults. • Explain the absorption, metabolism, and adverse effects of nonopioid analgesics. • Select appropriate pain relief drugs for various types of inflammation. • Assess the treatment of acute gout with relation to the characteristics of the disease, drug actions, and drug interactions.
6	Cardiac Function, Disorders, and Blood Pressure	• Heart Structure and Function • Congestive Heart Failure • Blood Pressure and Hypertension • Drugs Used to Treat Congestive Heart Failure and Hypertension • Cardiac Arrhythmia • Angina Pectoris	• Relate the structure of the heart to its functioning. • Analyze the condition of congestive heart failure and the body's natural response to it. • Relate physiological factors, including kidney function, to blood pressure. • Analyze drug therapy in relation to congestive heart failure and hypertension, including pharmacological actions and adverse effects of various drugs. • Examine the normal cardiac cycle and differentiate between common cardiac arrhythmias. • Relate the four different classes of antiarrhythmic drugs to their action mechanisms and adverse effects. • Describe the common causes of two main types of angina pectoris. • Explain the mechanisms of action, routes of administration, and adverse effects of antianginal drugs.
7	Blood Clotting, Anemia, and Lipids	• Anticoagulants and Coagulants • Anemia • Lipids	• Relate the actions of coagulants and anticoagulants to the natural process of formation and dissolution of blood clots.

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			• Analyze the mechanisms of action of coagulants and anticoagulants, routes of administration, interactions, and treatment for an overdose. • Compare and contrast the various causes of anemia and their appropriate treatment. • Explain the side effects and special considerations in the treatment of anemia. • Analyze the sources and uses of dietary lipids, their normal blood levels, and the health effects of hyperlipidemia. • Evaluate the mechanisms of action of various hypolipidemic drugs with specific reference to their adverse effects.
8	Respiratory System	• Allergies and Respiratory Diseases • Drugs Used to Treat Allergies and Respiratory Diseases • Respiratory Immunology	• Describe the body's response to antigens and the actions of histamine. • Analyze the causes, processes, and effects of respiratory diseases. • Compare and contrast antiallergic and antihistaminic drugs with specific reference to their adverse reactions, drug interactions, and contraindications in the treatment of allergies and respiratory diseases. • Assess anti inflammatory drugs, bronchodilators, expectorants, and mucolytics in the treatment of respiratory diseases.
9	Gastrointestinal Disorders and Intestinal Motility	• Digestion • Drugs Used to Treat Digestive Disorders • Intestinal Motility Disorders	• Analyze the normal process of digestion and describe ulcer formation, gastroesophageal reflux disease, and vomiting. • Compare and contrast the actions of drugs used to treat ulcers, gastroesophageal reflux disease, and vomiting. Examine their mechanisms of action, adverse effects, contraindications, and interactions. • Analyze the causes and effects of diarrhea and explain the actions of drugs used to treat simple diarrhea and their contraindications.

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			• List the appropriate clinical uses of laxatives and cathartics and explain their actions, routes of administration, adverse effects, and contraindications. • Discuss irritable bowel syndrome and how this condition is treated.
10	Endocrine System and Steroids	• Hormones • Growth Hormone • Adrenal Steroids • Adrenal Steroids as Drugs	• Relate hormone production to its functions. • Examine the function of growth hormone replacement therapy, its clinical use, and adverse effects. • Analyze the effects of glucocorticoids and mineralocorticoids and the effects of deficiency of these hormones. • Explain the clinical indications and contraindications, administration, adverse effects, and drug interactions of adrenal steroids.
11	Thyroid and Parathyroid Glands	• Thyroid Hormones • Parathyroid Hormone and Other Factors that Influence Calcium	• Relate the functions of hormones produced in the para- and thyroid glands to their clinical uses. • Examine the adverse effects, contraindications, and drug interactions of drugs used to treat thyroid conditions. • Evaluate drugs used to treat parathyroid conditions and degenerative bone disorders.
12	Pancreatic Hormones	• Diabetes • Drug Therapy	• Assess the contribution of insulin and glucagon toward the maintenance of healthy blood glucose levels and describe the two types of diabetes. • Differentiate the actions of drugs used in the treatment of diabetes, including insulin, oral hypoglycemics, biguanide, insulin sensitizers, and glucose absorption inhibitors. • Compare and contrast the sources, routes of administration, and dosages of various drugs used to treat diabetes. • Describe the posterior pituitary hormones and where they are

Topic	Topic	Subtopics	Objectives
			stored.
13	Hormones and Reproduction	• Female Sex Hormones • Labor and Breastfeeding • Male Sex Hormones	• Summarize the clinical uses, actions, and routes of administration of female sex hormones. • Evaluate the adverse effects of female sex hormones and the risks of hormone replacement therapy. • Relate the actions of oxytocin to its clinical uses and describe its adverse effects. • Summarize the clinical uses, actions, and routes of administration of male sex hormones. • Explain the adverse effects, contraindications, and drug interactions of male sex hormones. • Explain the functions and clinical use for oxytocin. • Describe the clinical use of tocolytic drugs.
14	Viral, Bacterial, and Fungal Pharmacology	• Antiseptics and Disinfectants • Antibacterial Drugs • Antifungal Drugs • Viral Diseases and Antiviral Drugs • Antibacterial Agents	• Describe the mechanisms of action of antiseptics and disinfectants and explain how they are used. • Recommend appropriate uses of antiseptics and disinfectants, taking into account adverse and toxic effects. • Differentiate the specific uses, mechanisms of action, and routes of administration for major groups of antibacterial drugs. • Analyze adverse effects, contraindications, and drug interactions for major groups of antibiotic and antimicrobial drugs. • Differentiate the specific uses, mechanisms of action, and routes of administration for major groups of antifungal drugs. • Describe the propagation of viruses and the mechanisms of action of antiviral drugs. • Assess the value and contribution of drugs used to treat influenza, herpes, and AIDS. • Analyze adverse effects, contraindications, and drug interactions for antiviral drugs.

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15	Parasitic Infection and Wound Pharmacology	• Protozoal Infections • Helminthic Infections • Antiseptics and Disinfectants	• Compare and contrast diseases caused by protozoal infection. • Differentiate the mechanism of action, routes of administration, adverse effects, contraindications, and interactions of drugs used to treat protozoal infections. • Describe diseases caused by parasitic worms. • Analyze the mechanism of action of drugs used to treat parasitic worm infections and their adverse effects and drug interactions. • Explain the role of antiseptics and disinfectants. • Explain the categories of antiseptics and disinfection, such as virucidal and bacteriostatic. • Describe the clinical uses of antiseptics and disinfectants. • Identify common chemicals used to inhibit infectious microorganisms. • Describe adverse effects and special cautions associated with antiseptics and disinfectants.
16	Cancer and Immune Pharmacology	• Types of Cancer • Drug Therapy • Adverse Effects • Immune System • Drug Actions	• Relate types of cancer to their characteristics. • Differentiate the mechanisms of action of alkylating and antimetabolite drugs. • Explain the actions of other drugs used to treat cancer. • Examine the adverse effects of drugs used to treat cancer. • Relate types of immune cells to their functions and actions. • Analyze the mechanisms of action of immunostimulant and immunosuppressive drugs and their uses and adverse effects.
17	Nutrition, Fluids, and Diuretics	• Nutrients • Deficiency • Adverse Effects • Kidney Function • Diuretics	• Differentiate the functions of various nutrients in maintaining normal body function. • Analyze nutrient deficiency with relation to recommended levels of nutrients and symptoms of deficiency.

Topic	Topic	Subtopics	Objectives
			• Analyze the effects of supplement overdose and drug-supplement interactions. • Propose treatment plans for deficiency diseases. • Examine the structure and functions of the kidneys. • Analyze the conditions associated with renal dysfunction. • Relate diuretics to their mechanisms of action. • Explain the side effects of diuretics.
18	Review	• Review	• Complete a review of key content covered in this course and Final Examination.

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