Jordan University of Science and Technology

Faculty of Medicine
2018-2019

COURSE TITLE: Endocrine System.

COURSE CODE: MED 320.

CREDIT HOURS: 4 CREDIT HOURS

SEQUENCE: YEAR 3, 4 WEEKS

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Course Description:

The endocrine system module is 32-hour course (4 credit hours) of which 24 hours are devoted to didactic classroom lectures utilizing PowerPoint presentations, 2 hours of active learning through small group discussions, and 6 hours of laboratory exercises in anatomy and pathology of the endocrine system.

This course is designed to provide a broad overview of human endocrinology. Course topics will include studying the major endocrine glands, production and synthesis of hormones, mechanisms of action and regulation of hormone secretion, as well as various aspects regarding the anatomy, biochemistry and physiology of the endocrine systems and the pathophysiology, epidemiology, and treatment of various endocrine diseases. These topics will equip the students with the basic knowledge to understand the normal function of the endocrine system and will introduce basic principles of clinical diagnosis and management of endocrine disorders.

Laboratory exercises are designed to supplement lectures and are well coordinated with the lecture materials. Thus, lectures in anatomy and pathology are coordinated with the laboratory material and are given at the same time.

The course objectives for the endocrine system course are clearly outlined. The course director and instructors were familiar with the objectives. The course director informs students of the objectives by distributing handouts at the beginning of the course.

The breadth and depth of the course appears to be well balanced, without overwhelming students with more materials than they can handle. The course appears to cover all aspects of human endocrinology with sufficient thoroughness.

The frequency and method of student evaluation in the endocrine system consist of one midterm objective written examination in multiple choice questions format, and a final practical examination in a multiple choice format covering the laboratory material and clinical sessions.

Average class score on standardized exams ranged from 70-80%. The failure rate has ranged consistently between 2 to 5%.

Student evaluation on the endocrine system course shows a great deal of satisfaction and students expressed general satisfaction that they possess an excellent level of knowledge.

Course Learning Outcomes

Students enrolled in this course are expected to acquire the following set of skills:

1. Structures of the various endocrine glands, their development, their histology and their blood supply.
2. The classification of the hormones, their basic structure, their mechanism of action and their synthetic pathways.
3. The regulation of hormone synthesis and secretion.
4. The physiological role of hormones in achieving homeostasis, including their interaction with the other chemical messenger systems of the body.
5. Pathogenesis, morphological changes and the complications associated with the disruption of endocrine function.
6. The use of hormones and their derivatives in the diagnosis and treatment of the various endocrine disorders.
7. The Public health issues associated with the more common endocrine disease in Jordan, in the region and elsewhere in the world.

Recommended Textbooks and Atlases:

Subject	Book (Resources)
Anatomy	1. Gray's anatomy for students, Drake,Vogl, Mitchell 2. Clinical Anatomy for Medical Students. By R. S. Snell, Latest Edition. 3. Grants Atlas of Anatomy or any other Atlas of Human Anatomy. 4. Basic Histology. By L. Carlos Junqueira, Latest Edition. 5. Before we are born. By K. L. Morre and T. V. N. Persuade, latest edition. 6. Langman's medical embryology 7. Color textbook of histology Gartner and Hiatt
Physiology	• Textbook of Medical physiology. By Guyton and Hall, Latest Edition.
Biochemistry	• Delvin: Textbook of Biochemistry with Clinical correlations.
Pathology	• Basic Pathology. By Kumar, Cotran, and Robbins, Latest Edition.
Pharmacology	1. Lippincott's Illustrated Reviews: Pharmacology, Latest Edition. 2. Goodman and Gilman's: The pharmacological basis of therapeutics, Latest Edition. 3. Basis and Clinical Pharmacology B.G. Katzung Latest Edition. 4. Pharmacology Rang, Dale, Ritter and Moore Latest Edition.
Public Health	• Supplementary Departmental handouts.
Clinical Lectures	• To be assigned by the lecturer.

Learning Objectives

(A) Lectures objectives

#	LECTURE	OBJECTIVES
1	Introduction to endocrinology; mechanisms of hormone actions and second messengers	1. Understand nature and major classes of the hormones and their roles in the human body. 2. Characterize the major hormonal biorhythms. 3. Describe the general aspects that govern the regulation of hormone secretion. 4. Describe how feedback relationship is important in determining the level of circulating hormones. 5. Describe the mechanism of action of peptide hormones 6. Describe the mechanism of action of amino acid derivative hormones 7. Describe the mechanism of action of hormones derived from cholesterol.
2	Morphology of the endocrine glands	1. Review the differences between endocrine and exocrine glands. 2. List the endocrine glands. 3. Describe the structure of the major endocrine glands. 4. Describe the location, relation, blood supply, nerve supply, and lymphatic drainage of the major endocrine glands.
3	Histology and embryology of the endocrine glands	1. Describe the development of the major endocrine glands (thyroid, parathyroid, pituitary, adrenal, and the pancreas). 2. Describe the microscopic structure and cells of the pituitary gland.

		3. Describe the microscopic structure of the thyroid follicle, follicular and parafollicular cells.
4	Hypothalamic-pituitary relationships	1. List the adenohypophyseal and the neurohypophyseal hormones 2. Describe the regulation of anterior pituitary hormones by the hypothalamus. 3. Describe the posterior pituitary gland relationship with the hypothalamus.
5	Anterior and posterior pituitary hormones	1. Describe growth and the metabolic effects of the growth hormone. 2. Describe the regulation of the growth hormone secretion (role of insulin-like growth factors and hypothalamic GHRH and somatostatin,). 3. List the major physiological effects of antidiuretic hormone and the regulation of its secretion. 4. List the major physiological effects of oxytocin and the regulation of its secretion.
6	Pathology of the anterior and posterior pituitary glands	1. Describe the neoplasms of the anterior and posterior pituitary glands and their clinical syndromes. 2. Describe the causes the different clinical entities related to hypopituitarism. 3. Discuss diabetes insipidus and the syndrome of inappropriate antidiuretic hormone secretion.
7	Thyroid hormones (synthesis, regulation, and actions)	1. Describe the bio-synthetic pathway of thyroid hormones. 2. Describe the regulation of thyroid hormone synthesis. 3. Discuss the physiological actions of thyroid hormones.
8	Pathology of the thyroid I	1. Define and describe the pathogenesis and clinical findings of thyrotoxicosis, diffuse

		hyperplasia of thyroid and Graves's disease. 2. Define and describe the pathogenesis of multinodular goitre. 3. List types of solitary thyroid nodules and define the meaning of "cold" and "hot" nodule. 4. Describe the clinical findings & pathology of hypothyroidism and define the terms Cretinism & Myxedema. 5. Define and describe the pathogenesis of Hashimoto's thyroiditis, lymphocytic thyroiditis, subacute thyroditis and Reidle's thyroiditis
9	Pathology of the thyroid II and parathyroid glands	1. Describe adenomas and carcinomas and their differential diagnosis. 2. Discuss various types of malignancies in the thyroid. 3. Discuss primary & secondary hyperparathyroidism. 4. Differentiate between parathyroid hyperplasia & parathyroid adenoma. 5. Describe hypoparathyroidism & its clinical manifestations & etiology.
10	Hormonal control of calcium metabolism	1. Discuss the absorption, metabolism and excretion of calcium and phosphate. 2. Discuss the role of vitamin D in calcium and phosphate absorption. 3. Outline the effect of calcium ion concentration on the regulation of the active form of vitamin D levels 4. List the major physiological effects of calcitonin and PTH and their regulation.

11	Pharmacology of the thyroid and parathyroid hormones.	1. Characterize the pharmacology of thyroid hormones. 2. Describe the pharmacology of antithyroid drugs. 3. Describe the clinical uses, routes of administration, and adverse reactions of thyroid and antithyroid drugs. 4. Characterize the pharmacology of the parathyroid hormone, vitamin D, and calcitonin. 5. List synthetic analogs of the above hormones, and describe their routes of administration, clinical uses, and adverse reactions.
12	Clinical approach to an enlarged thyroid gland	1. List the causes of an enlarged thyroid gland, its presentation in the clinic and the tests performed to differentiate between the various causes and reach the correct diagnosis. 2. Describe how the management of an enlarged thyroid differs according to its cause.
13	Endocrine functions of the pancreas	1. Discuss the principal hormones that affect blood glucose concentration. 2. Discuss the metabolic effects of insulin. 3. Discuss the regulation of insulin secretion. 4. Discuss the physiological effects of glucagon and its regulation.
14	Regulation of glucose metabolism; feed-fast cycle	1. Describe the enzymatic changes of carbohydrate and lipid metabolic pathways in the well-fed state and during starvation in various tissues (liver, brain, muscle and adipose tissues). 2. Describe the regulation of glycogen metabolism, glycolysis, hexose monophosphate pathway and

		gluconeogenesis by insulin/counter-regulatory hormones ratio.
15	Pathology of the endocrine pancreas, including diabetes I	1. Pathogenesis of diabetes mellitus type I. 2. Pathogenesis of diabetes mellitus type II.
16	Insulin and oral anti-diabetic agents I	1. Discuss the pharmacology of insulin. 2. Be able to differentiate between the clinically available types of insulin, their clinical uses and adverse reactions.
17	Pathology of the endocrine pancreas, including diabetes II.	1. Discuss the major complications of diabetes. 2. Discuss islet cell tumors.
18	Insulin and oral anti-diabetic agents II	1. Discuss the pharmacology of oral hypoglycemic drugs. 2. Understand the various mechanisms of actions of these drugs. 3. Describe the clinical uses of oral hypoglycemic drugs.
19	Acute diabetic complications (ketoacidosis, nonketotic hyperosmolar state)	1. Describe the pathophysiology, precipitating factors, clinical presentation and the metabolic basis of diabetic ketoacidosis. 2. Describe the pathophysiology, precipitating factors, clinical presentation and the metabolic basis of diabetic ketoacidosis.
20	Epidemiology of diabetes mellitus	1. To highlight the incidence and prevalence of diabetes mellitus in Jordan and worldwide. 2. To suggest suitable methods of intervention to reduce prevalence of diabetes mellitus.
21	The adrenal hormones	1. Describe the physiological effects of mineralocorticoids (aldosterone), the regulation of aldosterone secretion, and the clinical consequences of hypo and hyperaldosteronism.

		2. Describe the major physiological effects of glucocorticoids (cortisol), the regulation of cortisol secretion, and the clinical consequences of hypo and hyperadrenalism. 3. List the catecholamines secreted by the adrenal medulla and describe their actions and the regulation of their secretion.
22	Steroidogenesis	1. Describe the biosynthesis of the steroid hormones. 2. Describe the role of cytochromes P-450 in steroidogenesis. 3. Describe the metabolic consequences of the deficiency of any of the enzymes involved in steroidogenesis.
23	Pathology of the adrenal glands	1. Describe the pathological features of benign and malignant tumors of the adrenal gland. 2. List the causes of Addison's diseases and their pathological features. 3. Classify the various types of multiple endocrine neoplasia.
24	Pharmacology of glucocorticoids and mineralocorticoids	1. Characterize the pharmacology of the mineralocorticoids in terms of their pharmacokinetics, mechanisms of actions, and adverse reactions. 2. Characterize the pharmacology of the glucocorticoids in terms of their pharmacokinetics, mechanisms of action, and adverse reactions. 3. Describe the synthetic analogs of the mineralocorticoids and the glucocorticoids.

(B) Labs objectives

#	TOPIC	OBJECTIVES
1	Morphological and microscopic features of the endocrine glands	1. Identify different parts of the thyroid gland and study its relations. 2. Identify the adrenal gland and study its relations. 3. Identify the pituitary gland and study its relations. 4. Identify the ultra-structural components of the following glands and correlate between them: a. Pituitary gland b. Thyroid gland c. Parathyroid glands d. Pancreas e. Adrenal glands
2	Pathology of the major endocrine glands I	A. Pathology of the thyroid gland: 1. Describe the morphology of various types of thyroiditis. 2. Describe the features of nodular colloid goitre. 3. Describe the features of adenomas. 4. Describe the features of various carcinomas. B. Pathology of the pituitary gland. 1. Identify various types of adenomas and the significance of using immunological stains in their categorization. 2. Describe the morphology of craniopharyngioma.
3	Pathology of the major endocrine glands II	A. The parathyroid gland. Identify the morphological features of hyperplasic gland and compare with adenoma. B. The endocrine pancreas. 1. Identify the morphological features of the pancreas in diabetes 2. Identify the morphological features of islet cell adenoma. C. The adrenal gland 1. Identify the morphological features of atrophic and hyperplasic glands and compare with the features of cortical adenoma. 2. Identify the morphological features of pheochromocytoma. 3. Identify the morphological features of neuroblastoma.

Course Assessment

Assessment		
Assessment Type	**Expected Due Date**	**Weight**
First Exam		**--**
Second Exam		**--**
Midterm Exam (Theory)		**60**
Evaluation		**5**
Quizzes		**--**
Research activity		**5**
OSCE		**--**
Mini-OSCE		**--**
Final Exam (Practical)		**30**
Final Exam(Oral)		**--**
Total		**100**

Students Learning Outcomes

Student Learning Outcomes (SLOs) (4-8 Maximum) 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 (%)**
Describe the anatomical and histological structure, development, and function of the different organs of the endocrine system.	**1**	**MCQ**	**25**
Describe the various pathologic diseases affecting the endocrine system and understand their mechanisms.	**1,2**	**MCQ**	**25**
Explain signs, symptoms and investigations related to endocrine disorders and explain the scientific bases for common disease presentations by Integrating basic sciences with clinical sciences of the endocrine system.	**1-3,7,8**	**MCQ**	**25**
Describe drugs used in the treatment of various endocrine diseases and discuss the epidemiology of those diseases, their prevention and control.	**9**	**MCQ**	**25**
			100

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.