

Master of Science in Physiology
Program code: 053010

INTRODUCTION

The Department of Physiology (Faculty of Medicine) offers a Master of Science program in Physiology. Only full-time students are admitted to this program. The program is designed to raise general knowledge of physiology and to acquire an in depth knowledge in specific topics in physiology. This knowledge is required to join any Ph.D. program in physiology or to pursue a career in a wide range of areas where knowledge of human physiology is an advantage, e.g. in academic and non-academic environments including pharmaceutical and medical or biotechnology industry, education, healthcare, health promoting activities such as exercise and nutrition, or other health related business, law, and policy. During this program, a successful student should develop ability to identify research strategy to explore physiological or pathophysiological mechanisms, develop hypothesis, design experiments, evaluate and present results.

According to the University Council decision dated 4/2/2007, Thesis students admitted with effect from September 2007 are exempted from the comprehensive examination.

PROGRAM REQUIREMENTS

31 TOTAL COURSE CREDITS

17 COMPULSORY COURSES (credits in parenthesis)

0510-501	Biostatistics & Computer in Medicine	(2)
0530-511	Seminar I	(1)
0530-512	Seminar II	(1)
0530-521	Experimental Physiology	(1)
0530-533	System Physiology	(3)
0530-538	General Physiology	(2)
0530-539	Advanced Cellular Physiology	(1)
0530-574	Advanced Physiology I	(1)
2000-501	Scientific Writing and Communication Skills	(3)
2000-503	Ethics and Professionalism	(2)

5 ELECTIVES COURSES

The students may choose an elective course from the following, or from other M.Sc. programs at Kuwait University, or other accredited Universities related to his/her student with the approval of the Graduate Program Director.

0530-522	Advanced Experimental Physiology	(2)
0530-535	Integrative Physiology	(2)
0530-537	Pathophysiology	(1)

0530-551	Nerve and Muscle Physiology	(3)
0530-552	Fluid, Electrolytes and Acid-Base Physiology	(3)
0530-553	Exercise Physiology	(3)
0530-554	Computational Physiology: Introduction in advanced image processing and quantification	(3)
0530-555	Nutrition and nutrition related disease	(3)
0530-561	Cardiovascular Physiology	(3)
0530-562	Renal Physiology	(3)
0530-563	Respiratory Physiology	(3)
0530-564	Gastro-Intestinal Physiology	(3)
0530-565	Endocrine Physiology	(3)
0530-566	Neurophysiology	(3)
0530-567	Reproductive Physiology	(3)
0530-575	Advanced Physiology II	(2)
0530-576	Advanced Physiology III	(3)

9 COMPULSORY COURSES

0530-597	Thesis	(0)
0530-598	Thesis	(0)
2000-599	Thesis	(9)

COURSE DESCRIPTION

0530-511: SEMINAR I
CR: 1

Current literature topics in physiology. Introductory course for first semester graduate students in physiology.

familiar with techniques currently used in the departmental labs.

0530-522: ADVANCED EXPERIMENTAL PHYSIOLOGY
CR:2 PR:0530-521

Same as 0530-521 but advanced concepts.

0530-512: SEMINAR II
CR: 1 PR:0530-511

The course will introduce basic principles of physiological research, preparation of scientific projects, and writing scientific reports. The students will also have an opportunity to get familiar with techniques currently used in the departmental labs.

0530-533: SYSTEM PHYSIOLOGY
CR: 3

The course covers the physiology of all major organ systems in the body.

0530-521: EXPERIMENTAL PHYSIOLOGY
CR: 1

The course will introduce basic principles of physiological research, preparation of scientific projects, and writing scientific reports. The students will also have an opportunity to get

0530-535: INTEGRATIVE PHYSIOLOGY
CR: 2

The major theme of this course is to homeostasis. In addition to that, environmental physiology is also addressed. Lecture material ranges from cellular processes to the whole organism and the interaction with the environment.

0530-537: PATHOPHYSIOLOGY

CR: 1

The goal of this course is to introduce students to main concept in Pathophysiology and the effect of organ dysfunction or failures on homeostasis.

0530-538: GENERAL PHYSIOLOGY

CR: 2

The course introduces the fundamental mechanisms underlying normal function of cells, tissues, organs, and organ systems of the human body. These include body fluid compartment, diffusion, osmosis, membrane transport, cell membrane physiology, electrophysiology, cellular signaling, and general principle of neuronal and muscle function. The molecular and cellular concepts of cardiovascular, renal, acid-base, respiratory, gastrointestinal, neurological and endocrine physiology are also presented.

0530-539: ADVANCED CELLULAR PHYSIOLOGY

CR: 1

The course will cover more advanced concept in cellular physiology that are not presented in the course General Physiology.

0530-551: NERVE AND MUSCLE PHYSIOLOGY

CR: 3

An advanced course on the biophysics, electrical phenomena of excitable tissue, metabolism, energetic and molecular architecture of muscle contraction.

0530-552: FLUID, ELECTROLYTES AND ACID-BASE PHYSIOLOGY

CR: 3

An advanced course in the principles underlying the regulation of body fluids, electrolytes and acid-base balance.

0530-553: EXERCISE PHYSIOLOGY

CR: 3

Application and interpretation of the principles of physiology involved in muscular activity. Current research in exercise physiology as well as laboratory experiences demonstrating these principles.

0530-554: COMPUTATIONAL PHYSIOLOGY:

Introduction in advanced image processing and quantification

CR: 3

This course introduces MSc students into processing and quantitative analysis of medical images, including microscopic pictures (immunofluorescence, phase contrast, histology etc.) and x-ray and MRT images series. It provide an entry into the basics of digital image architecture, image type, image conversion and construction of videos from image series.

0530-555: Nutrition and nutrition related disease

CR: 3

This course describes the role of macro and micronutrients in the pathophysiology of several chronic diseases, such as: obesity, atherosclerosis, diabetes type 2, metabolic X syndrome, osteoporosis. Basic principle of nutrition, related metabolic processes, energy balance, food intake, and body weight regulation will be also addressed.

0530-561: CARDIOVASCULAR PHYSIOLOGY

CR: 3

An advanced course detailing the properties of cardiac muscle, conducting systems and electrophysiology of the heart, myocardial contractility-excitation-contraction coupling, electro cardiogram, cardiac output, measurement and control, physics of blood flow, pressure and resistance, control of circulation (overall and regional including that of individual organs), fluid exchange in tissue, cardiovascular homeostasis-gravitational effects, exercise, hemorrhagic shock and heart failure, cardiac function tests.

0530-562: RENAL PHYSIOLOGY

CR:3

An advanced course in renal mechanisms, filtration, reabsorption, secretion, concentration and dilution, homeostatic role, non-excretory function of kidneys, maintenance of body fluid pH assessing acid-base status, compensatory mechanisms.

0530-563: RESPIRATORY PHYSIOLOGY

CR: 3

An advanced course in the study of factors which control pulmonary ventilation and the tests used to measure pulmonary efficiency and function. Special emphasis will be placed on topics such as: alveolar ventilation diagrams; alveolar gas

exchange, pulmonary oedema, ventilation-perfusion relationships; transport of gases; resistive and elastic work of breathing; central organization of respiratory neurons; peripheral and central chemoreceptors; control of tracheobronchial smooth muscle tone; respiratory reflexes; non-respiratory functions of the lung; functions tests; adaptation to high altitude, space, and underwater physiology.

**0530-564: GASTRO-INTESTINAL
PHYSIOLOGY**

CR: 3

Motility of G.I.tract (pressure sphincters), secretion; digestion and absorption; G.I. hormones; gastric function tests; tissues biochemistry.

0530-565: ENDOCRINE PHYSIOLOGY

CR: 3

An advanced course in neuroendocrine interrelationship, hypothalamo-hypophyseal tracts and hypophyseal portal circulation; hypothalamic control of pituitary function, hypothalamic neurosecretions, releasing and inhibitory factors; control of endocrine function by the hypothalamo-hypophyseal axis, concept of negative and positive feedback mechanisms; the role of hormones on regulation of homeostatic mechanisms, hormonal regulation of blood sugar, hormonal regulation of fluid volume, electrolyte and osmolar concentration, hormonal regulation of calcium homeostasis and hormonal control of metabolism, methods of investigating endocrine malfunction by chemical methods, bio and radioimmunoassays.

0530-566: NEUROPHYSIOLOGY

CR: 3

Morphology and biophysical properties of membrane: Nerve impulse transmission, intracellular traffic of the neuron, junctional transmission and cellular interactions, transmission at automatic ganglia. Central neural control of autonomic functions: Neuronal mechanisms underlying electrical activity of brain. Receptor morphology, transduction of sensory stimuli, properties of receptors, modality, specificity threshold, receptor potentials, adaptation projection of sensory impulses, primary sensory area, association areas, sensory testing. Vision as an example of sensory coding, retinal receptors, photopic, scotopic colour vision, adaptation, subcortical and cortical organisation: simple, complex, hypercomplex cells, models of data analysis, perception. Brainstem organisation of

visceral functions, conventional and current concepts, anatomical, physiological and neurochemical hypothalamic organisation, role of hypothalamus in energy metabolism, body fluid homeostasis and thermoregulation, hypothalamic endocrine interaction, cortical limbic, hypothalamic relationship in the control of visceral functions.

0530-567: REPRODUCTIVE PHYSIOLOGY

CR: 3

An advanced course in function of the reproductive system. Male reproductive system: Structure and function of the testes and secondary sex organs, secretion and actions of testosterone, infertility and fertility control. Female reproductive system: Structure and function of ovary, oviduct, uterus, vagina, oogenesis, ovulation, secretion and action of estrogen and progesterone, physiological changes at puberty and the menopause, description of the menstrual cycle and its control by hypothalamic adeno-hypophyseal and ovarian hormones, fertilization and implantation, pregnancy, including placental function and birth, infertility and fertility control.

0530-574: Advanced Physiology I

CR: 1

Different areas of physiology will be integrated. The topics will be tailored to the research program of the candidate and could include such areas as perinatal physiology, thermogenesis, exercise physiology, physiological basis of stress, growth, development and aging.

0530-575: Advanced Physiology II

CR: 2

Same as 0530-574 but taken for 2 credit.

0530-576: Advanced Physiology III

CR: 3

Same as 0530-574 and 0530-575 but taken for 3 credit.

0530-597: THESIS

CR: 0

0530-598: THESIS

CR: 0

2000-599: THESIS

CR: 9