



الجامعة الوطنية - السودان  
National University - Sudan

## M.Sc. in Human Physiology



## Introduction

Strengthening the postgraduate education and enlarging NUSU network of academic and non-academic connections is one of the academic achievement goals and university progression in the future. Furthermore, the vast need of high degree of independent learning, with self-directed with critical and research skills is important, especially with large expansion of the medical schools in Sudan, and the need of well skilled lecturer in medical basic sciences is essential. For all of the mentioned reasons, we have proposed a M.Sc. programme in human physiology to engage the students in advanced study and research of the human physiology and prepare them for carrier success in teaching and/ or research in academic setting or application in PhD degree.

## Vision

To graduate lecturer with high degree of independent learning, with self-directed with critical and research skills, and to vast the need of medical schools of well skilled teachers and researchers.

## Mission

Bridge the gap in qualified staff in the field of Human Physiology

## Expected Learning Outcomes

**By the end of the programme candidate is expected to be able to:**

- Discuss basic science relevant to the understanding of physiological principles.
- Provide a general education in the principles of human physiology
- Identify the importance of physiology in the world of modern biomedicine. Integrate physiology in some pathophysiological disorders.
- Develop self-independent, and self-directed learning from different resources.
- Address and perform research methodology, including experi-

mental design, instrumentation, and analysis in physiology.

- Write thesis dissertation, which is an original contribution and approve oral defense.
- Be professional and understand ethical judgments and issues within science.

## Admission requirements

- Applicant must satisfy the general regulations set by the faculty of graduate studies and scientific research of National University for registration for master degrees.
- Eligible applicants are holders of Bachelors degrees from the National University or from any other accredited University or a college in the following:
- MBBS.
- Basic Medical Sciences majoring human physiology, Veterinary Medicine, Dentistry, Nursing, Radiography and Physiotherapy
- All eligible candidates should pass an interview and entry examination.

## Study Programme

### Semester One:

| Code   | Course Name                                                     | Credit Hours | Contact Hours/ Week |           |
|--------|-----------------------------------------------------------------|--------------|---------------------|-----------|
|        |                                                                 |              | Theory              | Practical |
| HP-611 | Principles of Physiology<br>مبادئ علم وظائف الأعضاء             | 2 (1+1)      | 1                   | 3         |
| HP-612 | Haematology<br>فسيولوجيا الدم                                   | 2 (1+1)      | 1                   | 3         |
| HP-613 | Physiology of Cardiovascular<br>فسيولوجيا الجهاز القلبي الوعائي | 3 (2+1)      | 2                   | 3         |

|        |                                                                                                          |         |   |    |
|--------|----------------------------------------------------------------------------------------------------------|---------|---|----|
| HP-614 | Physiology of Respiratory<br>فسيولوجيا الجهاز التنفسي                                                    | 3 (2+1) | 2 | 3  |
| HP-615 | Physiology of Exercise, High Altitude, Diving and Space<br>فسيولوجيا التمارين والمرتفعات و الغطس والفضاء | 2 (1+1) | 1 | 3  |
| HP-616 | Nerve and Muscles<br>فسيولوجيا الاعصاب والعضلات                                                          | 2 (1+1) | 1 | 3  |
| Total  |                                                                                                          | 14      | 8 | 18 |

**Semester Two:**

| Code   | Course Name                                                   | Credit Hours | Contact Hours/Week |           |
|--------|---------------------------------------------------------------|--------------|--------------------|-----------|
|        |                                                               |              | Theory             | Practical |
| HP-621 | Medical Molecular Physiology<br>البيولوجيا الجزيئية التطبيقية | 2 (1+1)      | 1                  | 3         |
| HP-622 | Physiology of Renal<br>فسيولوجيا الكلية                       | 2 (1+1)      | 1                  | 3         |
| HP-623 | Physiology of Gastrointestinal<br>فسيولوجيا الجهاز الهضمي     | 2 (1+1)      | 1                  | 3         |
| HP-624 | Physiology of Endocrine<br>فسيولوجيا الجهاز الغدي             | 3 (2+1)      | 2                  | 3         |
| HP-625 | Physiology of Reproductive<br>فسيولوجيا الجهاز التناسلي       | 2(1+1)       | 1                  | 3         |

|        |                                                           |         |   |    |
|--------|-----------------------------------------------------------|---------|---|----|
| HP-626 | Neurophysiology<br>الفسيولوجيا العصبية                    | 3 (2+1) | 2 | 3  |
| HP-627 | Contemporary Medical Physiology<br>فسيولوجيا الطب المعاصر | 2(1+1)  | 1 | 3  |
|        | Total                                                     | 16      | 9 | 21 |

### Semester Three:

| Code   | Course Name                                                              | Credit Hours | Contact Hours/Week |           |
|--------|--------------------------------------------------------------------------|--------------|--------------------|-----------|
|        |                                                                          |              | Theory             | Practical |
| HP-631 | Biostatistics and Data Analysis<br>الإحصاء الطبي التطبيقي                | 2 (1+1)      | 1                  | 3         |
| HP-632 | Principles of Medical Education<br>أسس التعليم تاطبي                     | 2 (2+0)      | 2                  | 0         |
| HP-633 | Research Methodology and Ethics<br>الطريف البحثية وأخلاقيات البحث العلمي | 2 (2+0)      | 2                  | 0         |
| HP-634 | Dissertation<br>الطروحة (البحث)                                          | 6 (0+6)      | 0                  | 18        |
|        | Total                                                                    | 12           | 5                  | 21        |

## Courses Contents

### HP-611 Principles of Physiology

General concepts and principles are basic to the function of all the systems. It also includes a short review of fundamental aspects of cell physiology. Additional aspects include; Organization of the Body, body Composition, measure-

ment of body fluid volumes, Membrane Potential, cell structure and function, Intercellular Communication and Homeostasis including the control system, and Autonomic Nervous System (ANS).

### **HP-612 Haematology**

Stem cell and Erythropoiesis, iron Metabolism and Deficiency related Disorders, red cell Metabolism, Haemoglobin and Inherited globulin Disorders, Polycythaemia, White Blood Cells and disorders, Vascular Function of Platelets and Hemostasis, blood groups and transfusion, Basic Immunology and inflammation, Hypersensitivity Reactions, Bleeding Disorders, Anti-coagulants in Clinical Practice.

### **HP-613 Physiology of Cardiovascular System**

Unique Characteristics of Cardiac Muscle, Electrophysiology of the Heart, Cardiac Function, Cardiac Cycle Physiology of Cardiac Defects (Heart Sounds), The Normal Electrocardiogram (ECG) and the ECG in Cardiac Arrhythmias and Myopathies, Cardiac Output and Venous Return, Fluid Dynamics Arterial Pressure and the Circulation, The Microcirculation and Lymphatic, Regulation of Arterial Pressure, Local Control of Blood Flow, Fetal and Neonatal Circulation, Hemostasis and Injury, Hemorrhage, Shock Coronary Circulation, Cerebral, Splanchnic and Cutaneous Circulation.

### **HP-614 Physiology of Respiratory System**

Physiology of the Respiratory System explores the mechanisms of pulmonary ventilation, gas exchange, and oxygen transport in health and disease. This course emphasizes the regulation of respiration, acid-base balance, and adaptations to environmental and physiological challenges. It provides a foundation for understanding respiratory disorders and their clinical implications.

### **HP-615 Physiology of Exercise, High Altitude, Diving and Space**

Cardiovascular and respiratory consequences of exercise, climbing, diving and spacing on peripheral resistance, cardiac output, A-V oxygen differ-

ence, and arterial pressure, Cardiac output changes to the CNS, coronary, splanchnic, cutaneous, and skeletal muscle vascular beds, Adaptations to physical training, high altitude, diving and spacing on the cardiovascular system, Effects of static vs. dynamic exercise on blood pressure, neural and local control of skeletal muscle blood flow, Phasic and sustained skeletal muscle contraction, changes during the Valsalva maneuver, insulin action and glucose entry during exercise, peripheral fatigue,

### **HP-616 Nerve and Musculoskeletal**

This course concerned Physiology of the Neuron and with the ways these neurons are excited and the way they integrate and transmit impulse, Resting Membrane Potential, Action Potential, Ionic Basis of Excitation and Conduction, General Principles for Skeletal, Cardiac, and Smooth Muscle, Mechanism of Contraction, Excitation-Contraction Coupling and Neuromuscular Transmission, Mechanics and Energetics of Skeletal Muscle Contraction, Smooth Muscle, Cardiac Muscle

### **HP-621 Medical Molecular Physiology**

Fundamental research in molecular aspects of genetics, regulation of gene expression, and protein synthesis of clinical medicine

### **HP-622 Physiology of Renal System**

Body Fluids, Structure of the Kidney and Nephrons, Renal Clearance, Glomerular Filtration Rate and Renal Hemodynamics, Transport Properties of Nephron Segments, Urine Concentration and Dilution, Na<sup>+</sup> Balance and Regulation of Extracellular Fluid Volume, K<sup>+</sup> Balance, Ca<sup>2+</sup> and Phosphate Balance, Acid-Base Balance, Integrative and Pathophysiological Aspects; Hypertension

### **HP-623 Physiology of Gastrointestinal System**

Functions and Regulation of GI Tract, Salivary Glands, Esophagus, Stomach, Exocrine Pancreas, Hepatobiliary, Small Intestine, Large Intestine, Gastrointestinal Motility and Enteric Nervous System

### **HP-624 Physiology of Endocrine System**

Control of hormone secretion, bases of hormone measurements and assessment of biological activity mechanisms of Hormone action, signaling pathways of membrane bound and intracellular hormone receptors, interactions between hormones, target cells, and receptors, plasma hormone binding proteins, Hormone secretion, excretion, degradation, and of a hormone in blood plasma, patterns of hormone secretion, posterior pituitary lobe hormones, anterior pituitary lobe hormones, Growth Hormone, Thyroid Gland, Hormonal Regulation of Calcium and Phosphate, Adrenal Gland, Metabolism, Pancreas and Endocrine Integration of Energy and Electrolyte Balance,

### **HP-625 Reproductive Physiology System**

Medical Molecular Physiology examines the molecular mechanisms underlying cellular function and physiological processes in health and disease. This course integrates molecular biology, genetics, and physiology to explore signal transduction, gene regulation, and metabolic pathways. It provides insights into translational research and the molecular basis of medical conditions.

### **HP-626 Neurophysiology**

Neurochemistry, Cerebrovascular System, Cerebrospinal Fluid, Blood Brain Barriers, Somatosensory System, Visual System, Smell and Taste, Auditory System, Vestibular System, Descending Control of Movements, Spinal Cord - Brainstem Physiology, Diencephalon Function, Cerebral Cortex, Cerebellum, Basal Ganglia, Limbic System, Sleep, Seizure Activity, Nerve Conduction/EMG Studies, Electroencephalogram, Electrooculogram, Brain Imaging Techniques, Proteomics and Genomics, Gait Analysis.

### **HP-627 Contemporary Medical Physiology**

Contemporary Medical Physiology integrates advanced concepts of human physiology with cutting-edge research and clinical applications. This

course emphasizes the physiological mechanisms underlying health and disease, incorporating modern analytical techniques and evidence-based approaches. It prepares students for careers in academia, research, and healthcare by fostering critical thinking and practical skills in physiological sciences.

### **HP-631 Biostatistics and Data Analysis**

Biostatistics and Data Analysis equips students with essential statistical methods for analyzing and interpreting biological and medical data. This course covers experimental design, data visualization, and hypothesis testing, and advanced analytical techniques using statistical software. It prepares students to apply quantitative approaches in research, clinical studies, and evidence-based decision-making.

### **HP-632 Principles of Medical Education**

Principles of learning; Instructional methods and techniques used in university education; Methods of assessment and evaluation of: programs, students and instructors; Problem-based learning; Present lectures in the proper way and observe all aspects mentioned in the seminar evaluation From SC-FR, Issue/Rv. (02/00); Evaluation: integration of structure, function, Medical, Ethics and dysfunction and rehabilitation; Anatomical and physiological terminologies.

### **HP-633 Research Methodology and Ethics**

Research concepts; Types of research; Literature review; Identifying a research problem; Research hypotheses; Writing a research proposal; Design of experiments; Sampling procedures; Data collection and analysis; Interpretation of results; Writing a research report, dissertation or thesis.

### **HP-634 Dissertation**

Write research proposal; Conduct piece of research: Design of experiments, questionnaire, and Data collection: Organization, analyses, interpretation and presentation; research writing: Abstract, introduction, literature review, materials and methods, results and discussion, conclusions and recommendations references; research assessment.

## Learning Methods

Seminars, Presentation, , Group Discussions, Practical, Lectures, Assignments and Journal Clubs.

## Evaluation tools

Continuous evaluation, Essays, Short Notes, SSAQ, Problems, Matching, MCQs, Practical (OSPE), Oral Examination, Assignment and Journal clubs.

## Assessment

- Continuous assessment 30 % (attendance of performance, assignments, ....etc. )
- Final examination 70% (Theory and Practice Exam)

## Grading System of the Course

| GRADE | MARK      |
|-------|-----------|
| A+    | $\geq 90$ |
| A     | 80-89     |
| B+    | 75-79     |
| B     | 70-74     |
| C+    | 65-69     |
| C     | 60-64     |
| F     | $< 60$    |

## Award of the degree

The Scientific Council of the National University- Sudan, based on the recommendation of the Council of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate;

## M.Sc. Human Physiology



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