МЕДИЦИНСКИ УНИВЕРСИТЕТ - ВАРНА
„Проф. д-р Параскев Стоянов"
Ул."Марин Дринов" 55, Варна 9002, България
Тел. : 052/ 65 00 57, Факс: 052/ 65 00 19
e-mail: uni@mu-varna.bg, www.mu-varna.bg

MEDICAL UNIVERSITY - VARNA
"Prof. Dr. Paraskev Stoyanov"
55, Marin Drinov Str., 9002 Varna, Bulgaria
Tel.: +359 52/ 65 00 57, Fax: + 359 52/ 65 00 19
e-mail: uni@mu-varna.bg, www.mu-varna.bg

FACULTY OF MEDICINE

Approved:
Dean:
(Prof. Yoto Yotov, MD, PhD)

SYLLABUS

IN
BIOPHYSICS

Specialty	**MEDICINE**
Educational - qualification degree	**master**
Organizational form of education	**full-time**
Auditorial activity (Lectures/Seminars)	**60 (30/30)**
Extra-auditorial activity	**30**
ECTS- credits	**4**
Discipline type	**compulsory**
Semester/s of education	**second**
Semester of examination	**second**
Developer(s) of the Syllabus:	**prof. Krastena Nikolova, PhD**

Varna, 2024

ANNOTATION

Aims of the course	The course covers the fundamental physical and physicochemical phenomena and processes occurring in living organisms at the molecular and cellular levels, with the aim of clarifying the principles underlying the physiology of the organism in both normal and pathological states. Concepts from cybernetics related to regulation, self-regulation, and modeling of biological systems are examined, along with the applications of medical cybernetics in diagnostics, therapy, and treatment control. Quantum biophysics discusses some basic photobiological processes and the effects of radiant energy on vital biological macromolecules, the physical and physicochemical basis of certain diseases, and the possibilities of applying light for therapeutic purposes. An introduction to the thermodynamics and energetics of biosystems is linked to ideas about the principles of the general theory of the development of living organisms. Cellular biophysics addresses issues related to the structure and function of biomembranes, as well as the transport of substances and ions across membranes. The course also explores the application of various physical and chemical influences on the activity of cellular membranes, the physical and physicochemical basis of diseases associated with pathologies in cellular transport, and the possibilities for inducing changes in membrane activity for medical therapy. The electrical properties of biological tissues are studied, and the effects of ionizing radiation on cells are discussed, including different hypotheses about the mechanisms of impact. In the laboratory, students conduct biophysical experiments, some of which are performed on models. Laboratory exercises complement and illustrate the lecture material and provide students with the opportunity to develop their skills in working with measurement equipment and systematically presenting the results of their experimental studies. Upon completing the course, students are expected to be familiar with the fundamentals of biophysical processes occurring in living organisms.

Outcomes for students at the end of the course:	
Competences	
Competence group	1. **Patient Care** that is compassionate, appropriate, and effective for treating health problems and promoting health.

Knowledge	To acquire new scientific and clinical knowledge. To apply a research-oriented and analytical approach to solving clinical and scientific problems.
Skills	▪ Evaluation of the impact of external factors—electric current, light, ultraviolet rays, infrared rays, and ionizing radiation—on biological objects, including physical interactions, the specificity of biological effects, and the hypotheses explaining them. ▪ Assessment of free radicals, reactive oxygen species, molecular mechanisms of free radical toxicity, and oxidative stress.

Key competencies for lifelong learning[1], that the discipline develops:	
Literacy competence Literacy is the ability to identify, understand, express, create, and interpret concepts, feelings, facts and opinions in both oral and written forms, using visual, sound/audio and digital materials across disciplines and contexts. It implies the ability to communicate and connect effectively with others, in an appropriate and creative way.	**X**
Multilingual competence This competence defines the ability to use different languages appropriately and effectively for communication. It broadly shares the main skill dimensions of literacy: it is based on the ability to understand, express and interpret concepts, thoughts, feelings, facts and opinions in both oral and written form (listening, speaking, reading and writing) in an appropriate range of societal and cultural contexts according to one's wants or needs.	
Mathematical competence and competence in science, technology, engineering A. Mathematical competence is the ability to develop and apply mathematical thinking and insight in order to solve a range of problems in everyday situations. Building on a sound mastery of numeracy, the emphasis is on process and activity, as well as knowledge. Mathematical competence involves, to different degrees, the ability and willingness to use mathematical modes of thought and presentation (formulas, models, constructs, graphs, charts). B. Competence in science refers to the ability and willingness to explain the natural world by making use of the body of knowledge and methodology employed, including observation and experimentation, in order to identify questions and to draw evidence-based conclusions. Competences in technology and engineering are applications of that knowledge and methodology in response to perceived human wants or needs. Competence in science, technology and engineering involves an understanding of the changes caused by human activity and responsibility as an individual citizen.	**X**
Digital competence Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking.	**X**
Personal, social and learning to learn competence Personal, social and learning to learn competence is the ability to reflect upon oneself, effectively manage time and information, work with others in a constructive way, remain resilient and manage one's own learning and career. It includes the ability to cope with uncertainty and complexity, learn to learn, support one's physical and emotional well-being, to maintain physical and mental health, and to be able to lead a health-conscious, future-oriented life, empathize and manage conflict in an inclusive and supportive context.	**X**

[1] As defined in 2018 r. by the European Union Council (https://eur-lex.europa.eu/legal-content/BG/TXT/HTML/?uri=CELEX:32018H0604(01)&from=EN)

Citizenship competence the ability to act as responsible citizens and to fully participate in civic and social life, based on an understanding of social, economic, legal and political concepts and structures, as well as global developments and sustainability.	**X**
Entrepreneurship competence Entrepreneurship competence refers to the capacity to act upon opportunities and ideas, and to transform them into values for others. It is founded upon creativity, critical thinking and problem solving, taking initiative and perseverance and the ability to work collaboratively in order to plan and manage projects that are of cultural, social or financial value.	
Cultural awareness and expression competence Competence in cultural awareness and expression involves having an understanding of and respect for how ideas and meaning are creatively expressed and communicated in different cultures and through a range of arts and other cultural forms. It involves being engaged in understanding, developing and expressing one's own ideas and sense of place or role in society in a variety of ways and contexts.	

Methods of education

- lectures
- seminars
- practicals and laboratory exercises, practical and creative problem solving, case studies, consultations, discussions, work with scientific literature, databases, analyses, presentations, work with patients under observation, medical documentation.

Links with other courses from the curriculum of the specialty

- **Builds upon acquired knowledge in/Depends on:**
- **HUMAN BIOLOGY**
- **Mandatory for the study of:**
- **BIOPHYSICS**
- **HUMAN PHYSIOLOGY**
- **RADIOGRAPHY, RADIOLOGY**
- **EYE DISEASES**
-
- **Other related disciplines:**
- **CHEMISTRY**
- **HUMAN BIOLOGY**

o HUMAN ANATOMY AND HISTOLOGY