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FACULTY OF MEDICINE

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

SYLLABUS

IN
PHYSICS

Specialty	**MEDICINE**
Educational - qualification degree	**master**
Organizational form of education	**full-time**
Auditorial activity (Lectures/Seminars)	**90 (30/60)**
Extra-auditorial activity	**120**
ECTS- credits	**7**
Discipline type	**compulsory**
Semester/s of education	**first**
Semester of examination	**first**
Developer(s) of the Syllabus:	**prof. Krastena Nikolova, PhD**

Varna, 2024

ANNOTATION

Aims of the course	The course studies the fundamental physical phenomena and processes occurring in living organisms or forming the basis of medical diagnostics and therapy. It establishes a scientific perspective on the structure and basic processes taking place in organisms. It examines the foundations of modern clinical medical diagnostics, introducing students to contemporary achievements in developing and constructing medical equipment. Teaching the discipline develops students' logical and analytical thinking. Topics covered include rotational motion and centrifuges, the effects of accelerations on the human body, and the vestibular apparatus's functioning. Acoustics is studied alongside issues related to imaging diagnostics using ultrasound, sound perception, noise protection principles, and lithotripsy principles. Atmospheric pressure and air humidity are linked to respiratory processes and their impact on the body. The properties of fluids are explored in conjunction with blood circulation, heart function, and specific diagnostic methods involving the analysis of body fluids. The mechanical properties of biological tissues are also studied. Electricity-related topics regarding equipment for capturing and recording generated bio-potentials, including their design and operating principles, are examined. Optical phenomena are connected to vision and the possibilities for its correction, as well as to some basic analytical methods and optical devices used in laboratories. Applications of infrared and ultraviolet light in medical diagnostics and therapy are studied. Atomic and molecular physics discuss the principles underlying the operation of electron microscopes, computed tomography, and laser radiation. Ionizing radiation is explored alongside the capabilities of nuclear medicine for diagnostics and therapy. Special attention is given to the risks of radioactive exposure and the basics of radiation protection. The laboratory introduces students to the fundamentals of physical measurement, some essential measuring instruments, and methods for determining physical quantities used in medical diagnostics and therapy. Simultaneously, students are trained to work safely with electromedical equipment. The experiments conducted supplement and illustrate the lecture material, allowing students to acquire fundamental skills in handling measuring devices and systematically presenting the results of experimental studies.

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 knowledge about the physical principles underlying key diagnostic and therapeutic medical methods. • To apply a research-oriented and analytical approach to solving clinical and scientific problems.

Skills	Measurement of blood pressure; blood flow velocity (Doppler ultrasound); determination of hearing threshold; ▪ Basic concepts and working with optical lenses and microscopes; ▪ Optical corrections of the eye; measurement and calculation of ▪ Parameters of radionuclides;

Key competencies for lifelong learning[1], that the	
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.	
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.	

[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)

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, regulatory documents, databases, analyses, presentations, ...

Links with other courses from the curriculum of the specialty

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