

MEDICAL UNIVERSITY OF ŁÓDŹ
PREMEDICAL PREPARATORY COURSE

(SYLABUS)

1. **Name of the department providing the course:** Zakład Chemii i Biochemii Klinicznej
2. **Course title:** Physics
3. **Course language:** English
4. **Type of course unit:** compulsory
5. **Course aims:** As a result of the implementation of the curriculum course the students gain knowledge about the physical processes taking place in the environment around us and are able to apply the information obtained in further stages of learning, during classes in chemistry, biology and genetics. The experience gained in laboratory work also gives the students the skills needed in the course of further studies and in subsequent scientific and research work.
6. **Types of educational activities and number of hours allocated:**

	Lecture	Seminar	Laboratory classes	classes	Total
stationary		22	32		54
on-line (in the real time scheduled in the timetable)	32	42	0		74
e-learning (on the e-learning platform)					
Total	32	64	32	0	128

7. **Names of course unit's faculty:** dr Łukasz Pietrzak, dr Wioletta Rozpędek - Kamińska
8. **Prerequisites:** none
9. **Learning activities and teaching methods:** lectures (both in form of shared files and tests on Pearson platform, seminars and laboratories.
10. **Course unit content:**

Lectures:

1. Measurement Uncertainty, kinematics and one dimensional movement
 - Types of errors
 - Errors calculations
 - Reporting the measurements
 - Units
 - Instantaneous velocity
 - Displacement vector
2. 2D Motion & Newton's Laws
 - Uniformly accelerated motion
 - Average acceleration
 - Instantaneous acceleration
 - 2-D Motion - projectile motion
 - Assumptions for 2D motion
 - Newton's laws of motion - introduction
3. Friction, simple machines & introduction to circular motion
 - Newton's laws of motion
 - Friction, normal force

- Apparent weight
 - Weightlessness
 - Free body diagram
 - Simple machines
4. 2D Gravity and Circular Motion
 - Newton's Law of Universal Gravity
 - Newton's Law of Universal Gravity – superposition
 - Gravitation and spherically symmetric bodies
 - Gravitation near Earth's surface
 - Kepler laws
 - Circular motion (accelerated and constant)
 5. Work, Energy, Power & Linear Momentum; Impulse
 - Work – units and calculation
 - Work calculation – positive or negative
 - Work-energy theorem
 - Gravitational potential energy
 - Power – units and theorem
 - Conservation of energy
 - Linear momentum
 6. Collisions & Rotational Motion
 - Collisions types
 - Two-dimensional collisions
 - Center of mass
 - Center of mass – two-dimensional case
 - Rotational motion
 - Rigid object assumptions
 - Angular displacement definition
 7. Rotational Motion & Waves part 1
 - Rotational kinematics
 - Relationship between angular and linear quantities
 - Centripetal acceleration
 - Resultant acceleration
 - Rotational kinetic energy
 - Waves – introduction
 - Wave motion and types of waves
 - Energy transported by waves
 - Interference, principle of superposition
 8. Temperature and Kinetic Theory
 - Atomic theory
 - Brownian motion
 - Temperature and thermometers
 - Temperature scales
 - Zeroth law of thermodynamics
 - Thermal expansion
 - Gases introduction and pressure
 9. Kinetic Theory and Calorimetry

- Heat as energy transfer
 - Heat and temperature change
 - Kinetic theory
 - Equipartition of energy
 - Molar specific heat
 - Phase Change
10. The Laws of Thermodynamics
- Thermodynamics – basic terms
 - The zeroth law of thermodynamics
 - The first law of thermodynamics
 - Processes and the first law
 - Work and volume changes
 - The second law of thermodynamics
 - Heat engines
11. Carnot Engine & Electric Field Introduction
- Carnot engine – principle of working
 - Carnot cycle
 - Entropy
 - Electric charge in the atom
 - Electric charge and its conservation
 - Static electricity
 - Coulomb's law
12. Electric Potential
- Electric potential energy
 - Electric potential difference
 - Relation between electric potential and electric field
 - Electric potential energy
13. Capacitance
- Equipotential lines and surfaces
 - Electric potential vs distance from point charge
 - Electric Dipole Potential
 - Capacitance and units
 - Capacitors in Parallel Connection
 - Capacitors in Series Connection
14. Electric Current part 1
- Dielectric in capacitor – mechanism
 - Energy Storage in Capacitors
 - Ohm's law
 - Resistivity
 - Resistance and resistivity
 - Parallel and series circuits – resistors
15. Electric Current part 2
- Kirchhoff's Laws – topology
 - Kirchhoff's Current Law
 - Kirchhoff's Voltage Law
 - Alternating Current – introduction

- Electric power
 - Transformers
16. Magnetic Field
- Magnetism
 - Magnetic field
 - Magnetic field characteristics
 - Right hand rule
 - Vector product
 - Lorentz force
 - Electrodynamical force
17. Electromagnetic Induction Faraday's Induction Law
- Electromagnetic field – induced fields
 - Magnetic flux
 - Faraday's law
 - Lenz's rule
18. Geometric Optics Introduction
- Principles – optics
 - Geometrical optics – model of rays assumptions
 - Fermat Rule
 - Reflection
 - Total Internal Reflection
 - Refractive Index
 - Spherical Lenses
19. Optics part 2
- Optical Instruments
 - Combinations of Lenses
 - Cameras
 - Flat Mirror Image
 - Spherical Mirrors
 - Converging Lenses
 - Lens Maker's Equation

Seminars:

Seminars topics are defined by corresponding lectures and are about of solving physical problems and case studies. Also difficulty levels of problems depend on the students' knowledge level.

Laboratories:

Students activities are about to prepare (using provided tools and laboratory equipment) the physical experiments and make measurements, to verify hypothesis given in the instruction. Important part of each experiment is also obtaining the knowledge about physical phenomena and team work to solve problems arose during the process of obtaining data.

10. Course objectives:

- *Knowledge:*

Student gains knowledge about:

physical processes occurring in environment around us and in living organisms

physical background of chemical processes in human and animal bodies

- *Skills:*
Using information from the analysis of experiments.
Knowledge of physical and biological phenomena and processes.
Planning and conducting observations and experiments; obtaining conclusions based on their results.
- *Attitudes and transferrable (generic) competencies:*
Student:
systematically enriches professional knowledge and improves skills
develops the ability to active listening,
communicates effectively,
uses the technique of verbal and non-verbal communication

11. Required and recommended learning resources (readings):

- *Required: "Physics 7th. Ed." Giancoli*
- *Recommended:*

12. Assessment methods and criteria: Online tasks on the remote learning platform in the form of a quiz/test. Preparing reports after experiments made during laboratory classes.

13. Additional information: -

Statement and signature of the course leader: *I hereby state that the content of the curriculum included in the syllabus below is the result of my individual work completed as part of work contract/cooperation resulting from a civil law contract, and that author rights to this title are not the property of a third party.*

Dean's signature:

Data: 17.11.2023