[Medicinski fakultet u Rijeci]

Curriculum
2023/2024

[Za kolegij]

Medical Physics and Biophysics

Study programme:	**Medical Studies in English (R)** [Sveučilišni integrirani prijediplomski i diplomski studij]
Department:	**[Katedra za medicinsku fiziku i biofiziku]**
Course coordinator:	**prof. dr. sc. Žauhar Gordana, prof. fizike i kemije**
Year of study:	**1**
ECTS:	**6**
Incentive ECTS:	**0 (0.00%)**
Foreign language:	**Possibility of teaching in a foreign language**

Course information:

Medical Physics and Biophysics is an introductory course, which gives students an insight into the physical principles required for a better understanding of processes in other fields, such as anatomy, biochemistry, physiology, histology, pathology, etc. The purpose of this course is to motivate students to use the analytical and quantitative approach in the research of human body functions.
COURSE STRUCTURE
Lectures: 30 hours
Seminars: 20 hours
Practicals: 25 hours
Total hours: 75

The lectures and practicals will be held at the University Campus on Trsat at the Faculty of Physics (Address: Radmile Matejčić 2, 51000 Rijeka).
During practicals, students will develop abilities and skills in using various measuring devices, which are a part of different medical devices. Upon completing this course, students will be able to collect data, critically evaluate and interpret the results, as well as correctly use the International System of Units and Measurements in medicine.

List of assigned reading:

I.P. Herman. Physics of the Human Body, Springer, Berlin, 2016

List of optional reading:

R. K. Hobbie, B.J. Roth. Intermediate Physics for Medicine and Biology, Springer, New York, 2015

Curriculum:

Lectures list (with titles and explanation):

L1 Introduction. SI Units.

-

L2 Optics in Medicine. Laws of Refraction and Reflection: Image Formation by Plane and Spherical Surfaces of Refraction

-

L3 The Human Eye – the Optical Model

-

L4 Errors of optical systems

-

L5 Image Formation by Lens and Microscope

-

L6 Types of Optical Microscopes. Electron microscopes

-

L7 Fundamental Forces. Statics of the Body. Review of Forces, Torques and Equilibrium

-

L8 Mechanics of the Human Body. Implementation of Newton’s Laws: Levers in the Body, Passive Walking and High Jump.

-

L9 Mechanical Properties of Tissues. Elasticity and Strength of Materials. Viscoelastic Properties of Body Tissues – Mechanical Models.

-

L10 Fluids. Hydrostatics. Surface Tension and Its Implications. Law of Laplace.

-

L11 Hydrodynamics. Bernoulli's Equation, Viscosity and Poiseuille's Law. Turbulent Flow

-

L12 Rheological Properties of Blood. Physics of the Circulatory System. Consequences of Clogged Arteries

-

L13 Ideal and Real Gases. Gas Laws. Physics of Breathing

-

L14 Basic Principles of Thermodynamics: I and II Law.

-

L15 Thermodynamics of a Biological system. Transfer of Heat.

-

L16 Transfer of Particles and Ions through Membranes. Action Potential.

-

L17 Physical Basis of Electro- and Magneto- Diagnostics (EKG, EEG, EMG).

-

L18 Dielectric Properties of Tissues. Tissues in Electric Field.

-

L19 Oscillations and Waves d Waves.

-

L20 Sound Waves: The Physics of Hearing. Intensity of Soun. Connection between Physical and Physiological Parameters of Sound.

-

L21 Therapeutic Applications of Electric Fields.

-

L22 Matter in the External Magnetic Field: A Biological System in the Electric Circuit, Magneto therapy

-

L23 Structure of Atom and Molecule: Molecular Bonds and Energy States

-

L24 Electromagnetic Waves

-

L25 Medical Use of X Rays

-

L26 Structure of the Atomic Nucleus. Nuclear Decay. Decay Rate and Half-life

-

L27 Radioactivity. Alfa, Beta and Gamma Decay.

-

L28 Interaction of Photons with Matter. Detection and Dosimetry of Ionizing Radiation.

-

L29 Application of Ultrasound in Medicine.

-

L30 Final Lecture and Preparation for Final Exam.

-

Seminars list (with titles and explanation):

S1 Calculating Measurement Errors and Estimating Measurement Accuracy

-

S2 Optics

-

S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and Interpretation of Graphs. Differential Calculus.

-

S4 Levers in the Human Body

-

S5 Hydromechanics

-

S6 Physics of Breathing

-

S7 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes

-

S8 Sound. Hearing and the Ear.

-

S9 Medical Use of X-Rays

-

S10 Application of Radioactive Isotopes in Nuclear Medicine

-

Exercises list (with titles and explanation):

P0 Introduction to Practicals. General Laboratory Safety Procedures and Rules.

-

P1 Mechanical Waves

-

P2 Audiometry

-

P3 Surface Tension and Viscosity

-

P4 Calorimetry

-

P5 Thermal Environmental Conditions

-

P6 Index of Refraction. Spectroscopy

-

P7 Spherical Mirrors and Lenses

-

P8 Electric Circuits

-

P9 Measurement of Resistance. The Wheatstone Bridge Method

-

P10 Ionizing radiation

-

P11 Compensation

-

P12 Compensation

-

Student obligations:

The attendance at lectures, seminars and practicals is mandatory. If necessary, a student can be absent from 30% of the classes of the overall course workload but has to make up for the practicals he/she failed to attend. Students' obligations are course attendance and active participation in all practicals and seminars.

Throughout the course, students have two midterm exams (tests) consisting of 14 questions each.
Test 1 covers the topics presented in seminars 1-5.
Test 2 covers the topics presented in seminars 6-10.

The completion and proper documentation of each practical as well as the consent of the course instructor are required for course completion.

Evaluation of students' work:
Students can obtain a total of 100 credits (a maximum of 50 credits during the course and a maximum of 50 credits on the final exam). Students are allowed to take the final exam if they acquire a minimum of 25 credits during the semester.
Students who did not gain 50% on each midterm exam may retake their midterm exams. A student can repeat the mid-term exam a maximum of two times, and if he/she still does not pass it, he/she must re-enrol for the course.

On the final exam, students can obtain a maximum of 50 credits. The final exam is oral.

Exam (exam taking, description of the written/oral/practical part of the exam, point distribution, grading criteria):

Assessment (exams, description of written / oral / practical exam, the scoring criteria):

	Assessment	Grade Point Maximum
Midterm Exams	Midterm 1 (14 questions)	14
	Midterm 2 (14 questions)	14
	total	**28**
Practicals	Accepted practicals and reports 10 x 5 x 0.4 credits	20
	total	**48**
Active participation	Active participation during seminars	**2**
TOTAL		**50**
Final exam	Oral part	50
	total	**50**
TOTAL		**100**

Partial exams:
Two midterm exams are scheduled during the trimester.
1. Midterm exam. 14 questions
2. Midterm exam. 14 questions

Practicals:
Throughout 10 practicals a student can obtain a maximum of 20 credits.
Each completed and accepted practical is assessed. A student may miss a maximum of two practicals, which he/she must make up in order to fulfil the requirements for taking the final exam.

Active participation during seminars:
During the trimester student participation and dedication will be monitored. A maximum of 2 points is awarded through active participation.

Final exam:

The final exam is oral.

Assessment of the oral part of the final exam:

Grade on oral exam	Credits
sufficient	10-20

good	21-30
very good	31-40
excellent	41-50

Assessment of the oral part of the final exam:

Grade on oral exam	Credits
sufficient	10-20
good	21-30
very good	31-40
excellent	41-50

The ECTS grading system is defined by the following criteria:

A (5) – 90 - 100 credits

B (4) – 75 - 89,9 credits

C (3) – 60 - 74,9 credits

D (2) – 50 - 59,9 credits

Other notes (related to the course) important for students:

Retaking the course: A student who acquires less than 25 credits during the course has failed the course, is graded with F, and must retake the course MEDICAL PHYSICS AND BIOPHYSICS.

COURSE HOURS 2023/2024

Medical Physics and Biophysics

Lectures (Place and time or group)	**Exercises** (Place and time or group)	**Seminars** (Place and time or group)
06.03.2024		

L1 Introduction. SI Units.:
• [Kampus O-029] (08:15 - 10:00) [149]
  ○ MPBP
 	
L2 Optics in Medicine. Laws of Refraction and Reflection: Image Formation by Plane and Spherical Surfaces of Refraction:
• [Kampus O-029] (08:15 - 10:00) [149]
  ○ MPBP		

prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
13.03.2024		

L3 The Human Eye – the Optical Model:
• [Kampus O-029] (08:15 - 10:00) [149]
  ○ MPBP
 	
L4 Errors of optical systems:
• [Kampus O-029] (08:15 - 10:00) [149]
  ○ MPBP
	P0 Introduction to Practicals. General Laboratory Safety Procedures and Rules.:
	• [Kampus O-162] (10:00 - 11:00) [457]
	  ○ MPBP P A
	• [Kampus O-162] (12:00 - 13:00) [337]
	  ○ MPBP V B
	• [Kampus O-162] (13:00 - 14:00) [337]
	  ○ MPBP P C
		S1 Calculating Measurement Errors and Estimating Measurement Accuracy:
		• [Kampus O-029] (10:15 - 12:00) [149]
		  ○ MPBP S B

Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
15.03.2024		
		S1 Calculating Measurement Errors and Estimating Measurement Accuracy: • [P06] (08:15 - 10:00) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
20.03.2024		

L5 Image Formation by Lens and Microscope:
• [Kampus O-029] (08:15 - 10:00) [149]
  ○ MPBP
 	
L6 Types of Optical Microscopes. Electron microscopes:
• [Kampus O-029] (08:15 - 10:00) [149]
  ○ MPBP
	P1 Mechanical Waves:
	• [Kampus O-162] (10:00 - 12:00) [457]
	  ○ MPBP P A
	• [Kampus O-162] (12:00 - 14:00) [337]
	  ○ MPBP V B
	• [Kampus O-162] (14:00 - 16:00) [337]
	  ○ MPBP P C
		S2 Optics:
		• [Kampus O-029] (10:15 - 12:00) [149]
		  ○ MPBP S B

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22.03.2024		

		S2 Optics: • [P05] (08:15 - 10:00) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
27.03.2024		

L7 Fundamental Forces. Statics of the Body. Review of Forces, Torques and Equilibrium:
• [Kampus O-029] (08:00 - 11:00) [2300]
  ○ MPBP
 	
L8 Mechanics of the Human Body. Implementation of Newton’s Laws: Levers in the Body, Passive Walking and High Jump.:
• [Kampus O-029] (08:00 - 11:00) [2300]
  ○ MPBP
 	
L9 Mechanical Properties of Tissues. Elasticity and Strength of Materials. Viscoelastic Properties of Body Tissues – Mechanical Models.:
• [Kampus O-029] (08:00 - 11:00) [2300]
  ○ MPBP
	P2 Audiometry:
	• [Kampus O-162] (11:00 - 13:00) [457]
	  ○ MPBP P A
	• [Kampus O-162] (13:00 - 15:00) [337]
	  ○ MPBP V B
	• [Kampus O-162] (15:00 - 17:00) [337]
	  ○ MPBP P C
		S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and Interpretation of Graphs. Differential Calculus.:
		• [Kampus O-152] (11:00 - 13:00) [149]
		  ○ MPBP S B
		• [Kampus O-152] (13:00 - 15:00) [149]
		  ○ MPBP S A

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03.04.2024		

L10 Fluids. Hydrostatics. Surface Tension and Its Implications. Law of Laplace.:
• [Kampus O-029] (08:00 - 10:30) [2300]
  ○ MPBP
 	
L11 Hydrodynamics. Bernoulli's Equation, Viscosity and Poiseuille's Law. Turbulent Flow:
• [Kampus O-029] (08:00 - 10:30) [2300]
  ○ MPBP
 	
L12 Rheological Properties of Blood. Physics of the Circulatory System. Consequences of Clogged Arteries:
• [Kampus O-029] (08:00 - 10:30) [2300]
  ○ MPBP
	P3 Surface Tension and Viscosity:
	• [Kampus O-162] (11:00 - 13:00) [457]
	  ○ MPBP P A
	• [Kampus O-162] (13:00 - 15:00) [337]
	  ○ MPBP V B
	• [Kampus O-162] (15:00 - 17:00) [337]
	  ○ MPBP P C
		S4 Levers in the Human Body:
		• [Kampus O-152] (10:30 - 12:00) [149]
		  ○ MPBP S B

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05.04.2024		
		S4 Levers in the Human Body: • [P08] (08:15 - 10:00) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
10.04.2024		

L13 Ideal and Real Gases. Gas Laws. Physics of Breathing: • [Kampus O-029] (08:00 - 10:30) [2300] ○ MPBP L14 Basic Principles of Thermodynamics: I and II Law.: • [Kampus O-029] (08:00 - 10:30) [2300] ○ MPBP L15 Thermodynamics of a Biological system. Transfer of Heat.: • [Kampus O-029] (08:00 - 10:30) [2300] ○ MPBP	P4 Calorimetry: • [Kampus O-162] (11:00 - 13:00) [457] ○ MPBP P A • [Kampus O-162] (13:00 - 15:00) [337] ○ MPBP V B • [Kampus O-162] (15:00 - 17:00) [337] ○ MPBP P C	S5 Hydromechanics: • [Kampus O-152] (10:45 - 12:15) [149] ○ MPBP S B
Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]		
12.04.2024		
		S5 Hydromechanics: • [P06] (08:00 - 09:30) [149] ○ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
24.04.2024		
L16 Transfer of Particles and Ions through Membranes. Action Potential.: • [Kampus O-029] (08:00 - 11:00) [2300] ○ MPBP L17 Physical Basis of Electro- and Magneto-Diagnostics (EKG, EEG, EMG).: • [Kampus O-029] (08:00 - 11:00) [2300] ○ MPBP L18 Dielectric Properties of Tissues. Tissues in Electric Field.: • [Kampus O-029] (08:00 - 11:00) [2300] ○ MPBP	P5 Thermal Environmental Conditions: • [Kampus O-162] (11:00 - 13:00) [457] ○ MPBP P A • [Kampus O-162] (13:00 - 15:00) [337] ○ MPBP V B • [Kampus O-162] (15:00 - 17:00) [337] ○ MPBP P C	
Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]		
03.05.2024		
		S6 Physics of Breathing: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (09:15 - 11:00) [149] ○ MPBP S A • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (11:15 - 13:00) [149] ○ MPBP S B
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
08.05.2024		

L19 Oscillations and Waves d Waves.: • [Kampus O-029] (10:15 - 12:00) [149] ◦ MPBP L20 Sound Waves: The Physics of Hearing. Intensity of Soun. Connection between Physical and Physiological Parameters of Sound.: • [Kampus O-029] (10:15 - 12:00) [149] ◦ MPBP	P6 Index of Refraction. Spectroscopy: • [Kampus O-162] (08:00 - 10:00) [457] ◦ MPBP P A • [Kampus O-162] (12:00 - 14:00) [337] ◦ MPBP V B • [Kampus O-162] (14:00 - 16:00) [337] ◦ MPBP P C	S7 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes: • [Kampus O-152] (14:15 - 16:00) [149] ◦ MPBP S A
Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
10.05.2024		
		S7 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes: • [P06] (11:15 - 13:00) [149] ◦ MPBP S B
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
15.05.2024		
L21 Therapeutic Applications of Electric Fields.: • [Kampus O-029] (08:15 - 10:00) [2300] ◦ MPBP L22 Matter in the External Magnetic Field: A Biological System in the Electric Circuit, Magneto therapy: • [Kampus O-029] (08:15 - 10:00) [2300] ◦ MPBP	P7 Spherical Mirrors and Lenses: • [Kampus O-162] (10:00 - 12:00) [457] ◦ MPBP P A • [Kampus O-162] (12:00 - 14:00) [337] ◦ MPBP P C • [Kampus O-162] (14:00 - 16:00) [337] ◦ MPBP V B	S8 Sound. Hearing and the Ear.: • [Kampus O-029] (10:15 - 12:00) [149] ◦ MPBP S B
Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]		
17.05.2024		
		S8 Sound. Hearing and the Ear.: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (09:15 - 11:00) [149] ◦ MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
22.05.2024		
L23 Structure of Atom and Molecule: Molecular Bonds and Energy States: • [Kampus O-029] (08:15 - 10:00) [252] ◦ MPBP L24 Electromagnetic Waves: • [Kampus O-029] (08:15 - 10:00) [252] ◦ MPBP	P8 Electric Circuits: • [Kampus O-162] (10:00 - 12:00) [457] ◦ MPBP P A • [Kampus O-162] (12:00 - 14:00) [337] ◦ MPBP V B • [Kampus O-162] (14:00 - 16:00) [337] ◦ MPBP P C	S9 Medical Use of X-Rays: • [Kampus O-029] (10:15 - 12:00) [252] ◦ MPBP S B
izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337]		
24.05.2024		

		S9 Medical Use of X-Rays: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (09:15 - 11:00) [252] ○ MPBP S A
izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252]		
29.05.2024		

L25 Medical Use of X Rays:
• [Kampus O-029] (08:15 - 10:00) [252]
  ○ MPBP
 	
L26 Structure of the Atomic Nucleus. Nuclear Decay. Decay Rate and Half-life:
• [Kampus O-029] (08:15 - 10:00) [252]
  ○ MPBP
	P9 Measurement of Resistance. The Wheatstone Bridge Method:
	• [Kampus O-162] (10:00 - 12:00) [457]
	  ○ MPBP P A
	• [Kampus O-162] (12:00 - 14:00) [337]
	  ○ MPBP V B
	• [Kampus O-162] (14:00 - 16:00) [337]
	  ○ MPBP P C
		S10 Application of Radioactive Isotopes in Nuclear Medicine:
		• [Kampus O-029] (10:15 - 12:00) [252]
		  ○ MPBP S B

izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337]		
31.05.2024		
		S10 Application of Radioactive Isotopes in Nuclear Medicine: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (09:15 - 11:00) [252] ○ MPBP S A
izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252]		
05.06.2024		

L27 Radioactivity. Alfa, Beta and Gamma Decay.:
• [Kampus O-152] (08:15 - 10:00) [252]
  ○ MPBP
 	
L28 Interaction of Photons with Matter. Detection and Dosimetry of Ionizing Radiation.:
• [Kampus O-152] (08:15 - 10:00) [252]
  ○ MPBP
	P10 Ionizing radiation:
	• [Kampus O-162] (10:00 - 12:00) [457]
	  ○ MPBP P A
	• [Kampus O-162] (12:00 - 14:00) [337]
	  ○ MPBP V B
	• [Kampus O-162] (14:00 - 16:00) [337]
	  ○ MPBP P C	

izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] · Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337]		
12.06.2024		

L29 Application of Ultrasound in Medicine.: • [Kampus O-029] (08:15 - 10:00) [149] ◦ MPBP L30 Final Lecture and Preparation for Final Exam.: • [Kampus O-029] (08:15 - 10:00) [149] ◦ MPBP	P11 Compensation: • [Kampus O-162] (10:00 - 12:00) [457] ◦ MPBP P A • [Kampus O-162] (12:00 - 14:00) [337] ◦ MPBP V B • [Kampus O-162] (14:00 - 16:00) [337] ◦ MPBP P C P12 Compensation: • [Kampus O-162] (16:00 - 18:00) [337] ◦ MPBP P C	
Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149]		
13.06.2024		
	P12 Compensation: • [Kampus O-162] (08:00 - 10:00) [457] ◦ MPBP P A • [Kampus O-162] (10:00 - 12:00) [337] ◦ MPBP V B	
Pribanić Ivan, mag. edu. phys. et math. [457] · doc.dr. sc. Čargonja Marija [337]		

List of lectures, seminars and practicals:

LECTURES (TOPIC)	Number of hours	Location
L1 Introduction. SI Units.	1	[Kampus O-029]
L2 Optics in Medicine. Laws of Refraction and Reflection: Image Formation by Plane and Spherical Surfaces of Refraction	1	[Kampus O-029]
L3 The Human Eye – the Optical Model	1	[Kampus O-029]
L4 Errors of optical systems	1	[Kampus O-029]
L5 Image Formation by Lens and Microscope	1	[Kampus O-029]
L6 Types of Optical Microscopes. Electron microscopes	1	[Kampus O-029]
L7 Fundamental Forces. Statics of the Body. Review of Forces, Torques and Equilibrium	1	[Kampus O-029]
L8 Mechanics of the Human Body. Implementation of Newton’s Laws: Levers in the Body, Passive Walking and High Jump.	1	[Kampus O-029]
L9 Mechanical Properties of Tissues. Elasticity and Strength of Materials. Viscoelastic Properties of Body Tissues – Mechanical Models.	1	[Kampus O-029]
L10 Fluids. Hydrostatics. Surface Tension and Its Implications. Law of Laplace.	1	[Kampus O-029]
L11 Hydrodynamics. Bernoulli's Equation, Viscosity and Poiseuille's Law. Turbulent Flow	1	[Kampus O-029]
L12 Rheological Properties of Blood. Physics of the Circulatory System. Consequences of Clogged Arteries	1	[Kampus O-029]
L13 Ideal and Real Gases. Gas Laws. Physics of Breathing	1	[Kampus O-029]
L14 Basic Principles of Thermodynamics: I and II Law.	1	[Kampus O-029]

L15 Thermodynamics of a Biological system. Transfer of Heat.	1	[Kampus O-029]
L16 Transfer of Particles and Ions through Membranes. Action Potential.	1	[Kampus O-029]
L17 Physical Basis of Electro- and Magneto- Diagnostics (EKG, EEG, EMG).	1	[Kampus O-029]
L18 Dielectric Properties of Tissues. Tissues in Electric Field.	1	[Kampus O-029]
L19 Oscillations and Waves d Waves.	1	[Kampus O-029]
L20 Sound Waves: The Physics of Hearing. Intensity of Soun. Connection between Physical and Physiological Parameters of Sound.	1	[Kampus O-029]
L21 Therapeutic Applications of Electric Fields.	1	[Kampus O-029]
L22 Matter in the External Magnetic Field: A Biological System in the Electric Circuit, Magneto therapy	1	[Kampus O-029]
L23 Structure of Atom and Molecule: Molecular Bonds and Energy States	1	[Kampus O-029]
L24 Electromagnetic Waves	1	[Kampus O-029]
L25 Medical Use of X Rays	1	[Kampus O-029]
L26 Structure of the Atomic Nucleus. Nuclear Decay. Decay Rate and Half-life	1	[Kampus O-029]
L27 Radioactivity. Alfa, Beta and Gamma Decay.	1	[Kampus O-152]
L28 Interaction of Photons with Matter. Detection and Dosimetry of Ionizing Radiation.	1	[Kampus O-152]
L29 Application of Ultrasound in Medicine.	1	[Kampus O-029]
L30 Final Lecture and Preparation for Final Exam.	1	[Kampus O-029]

EXERCISES (TOPIC)	Number of hours	Location
P0 Introduction to Practicals. General Laboratory Safety Procedures and Rules.	1	[Kampus O-162]
P1 Mechanical Waves	2	[Kampus O-162]
P2 Audiometry	2	[Kampus O-162]
P3 Surface Tension and Viscosity	2	[Kampus O-162]
P4 Calorimetry	2	[Kampus O-162]
P5 Thermal Environmental Conditions	2	[Kampus O-162]
P6 Index of Refraction. Spectroscopy	2	[Kampus O-162]
P7 Spherical Mirrors and Lenses	2	[Kampus O-162]
P8 Electric Circuits	2	[Kampus O-162]
P9 Measurement of Resistance. The Wheatstone Bridge Method	2	[Kampus O-162]
P10 Ionizing radiation	2	[Kampus O-162]
P11 Compensation	2	[Kampus O-162]
P12 Compensation	2	[Kampus O-162]

SEMINARS (TOPIC)	Number of hours	Location
S1 Calculating Measurement Errors and Estimating Measurement Accuracy	2	[Kampus O-029] [P06]
S2 Optics	2	[Kampus O-029] [P05]

S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and Interpretation of Graphs. Differential Calculus.	2	[Kampus O-152]
S4 Levers in the Human Body	2	[Kampus O-152] [P08]
S5 Hydromechanics	2	[Kampus O-152] [P06]
S6 Physics of Breathing	2	[P09 - NASTAVA NA ENGLESKOM JEZIKU]
S7 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes	2	[Kampus O-152] [P06]
S8 Sound. Hearing and the Ear.	2	[Kampus O-029] [P09 - NASTAVA NA ENGLESKOM JEZIKU]
S9 Medical Use of X-Rays	2	[Kampus O-029] [P09 - NASTAVA NA ENGLESKOM JEZIKU]
S10 Application of Radioactive Isotopes in Nuclear Medicine	2	[Kampus O-029] [P09 - NASTAVA NA ENGLESKOM JEZIKU]

EXAM DATES (final exam):

1.	17.06.2024.
2.	01.07.2024.
3.	15.07.2024.
4.	03.09.2024.
5.	17.09.2024.