



#### [Medicinski fakultet u Rijeci]

# **Curriculum 2025/2026**

[Za kolegij]

## **Medical Physics and Biophysics**

Study program: 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

#### [Način polaganja ispita]:

#### **FINAL EXAM**

#### Final Exam:

Students cannot take the final exam if:

- they have achieved less than 25 grade points at the end, and/or
- have 30% or more unexcused absences from class
- have not passed the First and Second Midterm Exam
- have not positive grade for each practical

Such a student will be graded F (fail), will not be able to earn ECTS credits or take the final exam, or will have to re-enroll for the course the following academic year.

#### 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

#### Final Exam Date:

15.06.2026.

29.06.2026.

13.07.2026.

03.09.2026.

17.09.2026.

# Curriculum: [Predavanja]

Predavanja] 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 Oscillations and Waves d Waves.
- L11 Sound Waves: The Physics of Hearing. Intensity of Soun. Connection between Physical and
Physiological Parameters of Sound.
-
L12 Fluids. Hydrostatics. Surface Tension and Its Implications. Law of Laplace.
- L13 Hydrodynamics. Bernoulli's Equation, Viscosity and Poiseuille's Law. Turbulent Flow
-
L14 Rheological Properties of Blood. Physics of the Circulatory System. Consequences of Clogged Arteries
- L15 Ideal and Real Gases. Gas Laws. Physics of Breathing
<u>-</u>

Interpretation of Graphs. Differential Calculus.
-
S4 Levers in the Human Body
S5 Sound. Hearing and the Ear.
-
S6 Hydromechanics
-
S7 Physics of Breathing
-
S8 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes
-
S9 Medical Use of X-Rays
S10 Application of Radioactive Isotopes in Nuclear Medicine
-
[Vježbe] list (with titles and explanation):
DO Introduction to Departicular Company I shows town Cofety, Departures and Dules
P0 Introduction to Practicals. General Laboratory Safety Procedures and Rules.
P1 Mechanical Waves
P1 Mechanical Waves
P1 Mechanical Waves - P2 Audiometry
-
-
- P2 Audiometry
P2 Audiometry P3 Surface Tension and Viscosity
P2 Audiometry - P3 Surface Tension and Viscosity
P2 Audiometry  P3 Surface Tension and Viscosity  P4 Calorimetry
P2 Audiometry P3 Surface Tension and Viscosity
P2 Audiometry  P3 Surface Tension and Viscosity  P4 Calorimetry
P2 Audiometry  P3 Surface Tension and Viscosity  P4 Calorimetry  P5 Thermal Environmental Conditions
P2 Audiometry  P3 Surface Tension and Viscosity  P4 Calorimetry  P5 Thermal Environmental Conditions
P2 Audiometry  P3 Surface Tension and Viscosity  P4 Calorimetry  P5 Thermal Environmental Conditions  P6 Index of Refraction. Spectroscopy
P2 Audiometry  P3 Surface Tension and Viscosity  P4 Calorimetry  P5 Thermal Environmental Conditions  P6 Index of Refraction. Spectroscopy

### P9 Measurement of Resistance. The Wheatstone Bridge Method

#### P10 lonizing radiation

-

#### **P11** Compensation

-

#### **P12 Compensation**

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#### 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 1 (14 questions)	14
Midterm Exams	Midterm 2 (14 questions)	14
	total	28
Practicals	Accepted practicals and reports $10 \times 5 \times 0.4$ credits	20
	total	48
Active participation	Active participation during seminars	2
TOTAL		50
Final arem	Oral part	50
Final exam 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.

#### **Midterm Exams Date:**

Firs Midterm Exam 24.04.2026. Second Midterm Exam 08.06.2026.

#### 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.

## Professors and associates are available daily during working hours via e-mail for all questions regarding teaching.

Gordana Žauhar, PhD, Full Professor gordana.zauhar@uniri.hr Slaven Jurković, PhD, Associate Professor slaven.jurkovic@uniri.hr Marija Čargonja, PhD, Assistant Professor mcargonja@uniri.hr Ivan Pribanić, Assistant ipribanic@uniri.hr Marijana Majetić, senior tecnician marijana.majetic@uniri.hr Marija Musulin, senior tecnician marija.musulin@uniri.hr

Course content and all course-related information can be found on the Merlin 2025/2026 portal.

#### **COURSE HOURS 2025/2026**

Medical Physics and Biophysics

[Predavanja] (Place and time or group)	[Vježbe] (Place and time or group)	[Seminari] (Place and time or group)
04.03.2026	3	,
L1 Introduction. SI Units.:  • [Kampus O-029] (10:15 - 12:00) [149]  • MPBP		
L2 Optics in Medicine. Laws of Refraction and Reflection: Image Formation by Plane and Spherical Surfaces of Refraction:  • [Kampus O-029] (10:15 - 12:00) [149]  • MPBP		
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije <sup>[</sup>	[149]	
11.03.2026		
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] [1458] [2812]  • MPBP P A  • [Kampus O-162] (12:00 - 13:00) [337] [1458] [2812]  • MPBP V B  • [Kampus O-162] (13:00 - 14:00) [337] [1458] [2812]  • MPBP P C	S1 Calculating Measurement Errors and Estimating Measurement Accuracy: • [Kampus O-152] (10:15 - 12:00) [149] • MPBP S B
Majetić Marijana, viša laborantica <sup>[1458]</sup> · Musulin Marija, mag. educ. phys. et math. <sup>[337]</sup> · prof. dr.		lvan, mag. edu. phys. et math. <sup>[457]</sup> · dr. sc. Čargonj nije <sup>[149]</sup>
13.03.2026		
		S1 Calculating Measurement Errors and Estimating Measurement Accuracy: • [P08] (09:15 - 11:00) [149] • MPBP S A
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije <sup>[</sup>	[149]	
18.03.2026		
	P1 Mechanical Waves:  • [Kampus O-162] (10:00 - 12:00) [457] [1458] [2812]  • MPBP P A  • [Kampus O-162] (12:00 - 14:00) [337] [1458] [2812]	S2 Optics: • [Kampus O-152] (10:15 - 12:00) <sup>[149]</sup> • MPBP S B

Majetić Marijana, viša laborantica  $^{[1458]}$  · Musulin Marija, laborantica  $^{[2812]}$  · Pribanić Ivan, mag. edu. phys. et math.  $^{[457]}$  · dr. sc. Čargonja Marija, mag. educ. phys. et math.  $^{[337]}$  · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije  $^{[149]}$ 

#### 20.03.2026

		S2 Optics: • [P06] (09:15 - 11:00) <sup>[149]</sup> • MPBP S A	
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [1	49]		
25.03.2026			
L7 Fundamental Forces. Statics of the Body. Review of Forces, Torques and Equilibrium:  • [Kampus O-029] (08:15 - 10:00) [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] (08:15 - 10:00) [2300]  • MPBP	P2 Audiometry: • [Kampus O-162] (10:00 - 12:00) [457] [1458] [2812] • MPBP P A • [Kampus O-162] (12:00 - 14:00) [337] [1458] [2812] • MPBP V B • [Kampus O-162] (14:00 - 16:00) [337] [1458] [2812] • MPBP P C	S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and Interpretation of Graphs. Differential Calculus.: • [Kampus O-152] (10:15 - 12:00) [149]  • MPBP S B	
		Ivan, mag. edu. phys. et math. <sup>[457]</sup> · dr. sc. Čargonj. mije <sup>[149]</sup> · prof. dr. sc. Žuvić Marta, prof. matematike	
27.03.2026			
		S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and Interpretation of Graphs. Differential Calculus.: • [P05] (09:15 - 11:00) [149]  • MPBP S A	
prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [1	49]		
01.04.2026			
L9 Mechanical Properties of Tissues. Elasticity and Strength of Materials. Viscoelastic Properties of Body Tissues - Mechanical Models.: • [Kampus O-029] (08:15 - 10:00) [149] • MPBP  L10 Oscillations and Waves d Waves.: • [Kampus O-029] (08:15 - 10:00) [149] • MPBP	P3 Surface Tension and Viscosity:  • [Kampus O-162] (10:00 - 12:00) [457] [1458] [2812]  • MPBP P A  • [Kampus O-162] (12:00 - 14:00) [337] [1458] [2812]  • MPBP V B  • [Kampus O-162] (14:00 - 16:00) [337] [1458] [2812]  • MPBP P C	S4 Levers in the Human Body: • [Kampus O-152] (10:15 - 12:00) [149] • MPBP S B	
Majetić Marijana, viša laborantica <sup>[1458]</sup> · Musulin l Marija, mag. educ. phys. et math. <sup>[337]</sup> · prof. dr. s		   Ivan, mag. edu. phys. et math. <sup>[457]</sup> · dr. sc. Čargonj mije <sup>[149]</sup>	
03.04.2026			
		S4 Levers in the Human Body: • [P08] (09:15 - 11:00) <sup>[149]</sup> • MPBP S A	

prof. dr. sc. Žauhar Gordana, prof. fizike i kemije <sup>[149]</sup>

08.04.2026

L11 Sound Waves: The Physics of Hearing. Intensity of Soun. Connection between Physical and Physiological Parameters of Sound.:

• [Kampus O-029] (08:15 - 10:00) [2300] • MPBP

L12 Fluids. Hydrostatics. Surface Tension and Its Implications. Law of Laplace.:

• [Kampus O-029] (08:15 - 10:00) [2300]

P4 Calorimetry:

- [Kampus O-162] (10:00 12:00) [457] [1458] [2812] • MPBP P A
- [Kampus O-162] (12:00 14:00) [337] [1458] [2812] • MPBP V B
- [Kampus O-162] (14:00 16:00) [337] [1458] [2812]

o MPBP P C

S5 Sound. Hearing and the Ear.:

• [Kampus O-152] (10:15 - 12:00) [149]

• MPBP S B

Majetić Marijana, viša laborantica  $^{[1458]}$  · Musulin Marija, laborantica  $^{[2812]}$  · Pribanić Ivan, mag. edu. phys. et math.  $^{[457]}$  · dr. sc. Čargonja Marija, mag. educ. phys. et math.  $^{[337]}$  · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije  $^{[149]}$  · prof. dr. sc. Žuvić Marta, prof. matematike i fizike  $^{[2300]}$ 

#### 10.04.2026

S5 Sound. Hearing and the Ear.:
• [P06] (09:15 - 11:00) [149]
• MPBP S A

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

#### 15.04.2026

L13 Hydrodynamics. Bernoulli's Equation, Viscosity and Poiseuille's Law. Turbulent Flow

• [Kampus O-029] (08:15 - 10:00) [2300] • MPBP

L14 Rheological Properties of Blood. Physics of the Circulatory System. Consequences of Clogged Arteries:

• [Kampus O-029] (08:15 - 10:00) [2300] • MPBP P5 Thermal Environmental Conditions:

- [Kampus O-162] (10:00 12:00) <sup>[457]</sup> [1458] [2812]
  - o MPBP P A
- [Kampus O-162] (12:00 14:00) [337] [1458] [2812]
  - MPBP V E
- [Kampus O-162] (14:00 16:00) [337] [1458] [2812]

 $\circ \ \mathsf{MPBP} \ \mathsf{P} \ \mathsf{C}$ 

Majetić Marijana, viša laborantica [1458] · Musulin Marija, laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · dr. sc. Čargonja Marija, mag. educ. phys. et math. [337] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]

#### 22.04.2026

L15 Ideal and Real Gases. Gas Laws. Physics of Breathing:

• [Kampus O-029] (08:15 - 10:00) [2300]

o MPBP

L16 Basic Principles of Thermodynamics: I and II Law.:

• [Kampus O-029] (08:15 - 10:00) <sup>[2300]</sup>
• MPBP

P6 Index of Refraction. Spectroscopy:

- [Kampus O-162] (10:00 12:00) [457] [1458] [2812]
  - o MPBP P A
- [Kampus O-162] (12:00 14:00) [337] [1458] [2812]
  - ∘ MPBP V B
- [Kampus O-162] (14:00 16:00) [337] [1458] [2812]
  - o MPBP P C

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#### 29.04.2026

L17 Thermodynamics of a Biological system. Transfer of Heat.:

• [Kampus O-029] (08:15 - 10:00) <sup>[2300]</sup> • MPBP

L18 Transfer of Particles and Ions through Membranes. Action Potential.:

• [Kampus O-029] (08:15 - 10:00) [2300] • MPBP P7 Spherical Mirrors and Lenses:

- [Kampus O-162] (10:00 12:00) [457] [1458] [2812]
  - o MPBP P A
- [Kampus O-162] (12:00 14:00) [337] [1458] [2812]
  - o MPBP V B
- [Kampus O-162] (14:00 16:00) [337] [1458] [2812]
  - o MPBP P.C.

S6 Hydromechanics:

- [Kampus O-152] (10:15 12:00) [149]

   MPBP S B
- [Kampus O-152] (12:15 14:00) [149]

   MPBP S A

Majetić Marijana, viša laborantica [1458] · Musulin Marija, laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · dr. sc. Čargonja Marija, mag. educ. phys. et math. [337] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] · prof. dr. sc. Žuvić Marta, prof. matematike i fizike [2300]

#### 06.05.2026

L19 Physical Basis of Electro- and Magneto-Diagnostics (EKG, EEG, EMG).:

- [Kampus O-029] (08:15 10:00) [2300]

   MPBP
- L20 Dielectric Properties of Tissues. Tissues in Electric Field.:
- [Kampus O-029] (08:15 10:00) [2300]

  o MPBP

P8 Electric Circuits:

- [Kampus O-162] (10:00 12:00) [457] [1458] [2812]
  - MPBP P A
- [Kampus O-162] (12:00 14:00) [337] [1458] [2812]
  - o MPBP V B
- [Kampus O-162] (14:00 16:00) [337] [1458] [2812]
  - $\circ \ \mathsf{MPBP} \ \mathsf{P} \ \mathsf{C}$

S7 Physics of Breathing:

• [Kampus O-152] (10:15 - 12:00) [149]

• MPBP S B

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#### 08.05.2026

S7 Physics of Breathing:
• [P07] (09:15 - 11:00) [149]
• MPBP S A

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

#### 13.05.2026

L21 Therapeutic Applications of Electric

- [Kampus O-029] (08:15 10:00) <sup>[252]</sup>
   MPBP
- L22 Matter in the External Magnetic Field: A Biological System in the Electric Circuit, Magneto therapy:
- [Kampus O-029] (08:15 10:00) <sup>[252]</sup>
   MPBP

P9 Measurement of Resistance. The Wheatstone Bridge Method:

- [Kampus O-162] (10:00 12:00) [457] [1458] [2812]
  - o MPBP P A
- [Kampus O-162] (12:00 14:00) [337] [1458] [2812]
  - MPBP V E
- [Kampus O-162] (14:00 16:00) [337] [1458] [2812]
  - ∘ MPBP P C

S8 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes:

• [Kampus O-152] (10:15 - 12:00) [149] • MPBP S B

izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. <sup>[252]</sup> · Majetić Marijana, viša laborantica <sup>[1458]</sup> · Musulin Marija, laborantica <sup>[2812]</sup> · Pribanić Ivan, mag. edu. phys. et math. <sup>[337]</sup> · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije <sup>[149]</sup>

#### 15.05.2026

S8 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (09:15 - 11:00) [149] ○ MPBP S A prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] 20.05.2026 L23 Structure of Atom and Molecule: P10 Ionizing radiation: S9 Medical Use of X-Rays: • [Kampus O-152] (10:15 - 12:00) [252] • [Kampus O-162] (10:00 -Molecular Bonds and Energy States: 12:00) [457] [1458] [2812] • [Kampus O-029] (08:15 - 10:00) <sup>[252]</sup> o MPBP S B o MPBP P A • [Kampus O-162] (12:00 -L24 Electromagnetic Waves: 14:00) [337] [1458] [2812] • [Kampus O-029] (08:15 - 10:00) [252] o MPBP • [Kampus O-162] (14:00 -16:00) [337] [1458] [2812] izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] · Majetić Marijana, viša laborantica [1458] · Musulin Marija, laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. <sup>[457]</sup> · dr. sc. Čargonja Marija, mag. educ. phys. et math. <sup>[337]</sup> 22.05.2026 S9 Medical Use of X-Rays: • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (09:15 - 12:00) <sup>[252]</sup> o MPBP S A izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] 27.05.2026 L25 Medical Use of X Rays: P11 Compensation: S10 Application of Radioactive Isotopes in • [Kampus O-029] (08:15 - 10:00) <sup>[252]</sup> • [Kampus O-162] (10:00 -**Nuclear Medicine:** 12:00) [457] [1458] [2812] • [Kampus O-152] (10:15 - 12:00) [252] MPBP o MPBP P A o MPBP S B L26 Structure of the Atomic Nucleus. • [Kampus O-162] (12:00 -Nuclear Decay. Decay Rate and Half-life: 14:00) [337] [1458] [2812] • [Kampus O-029] (08:15 - 10:00) <sup>[252]</sup> o MPBP P C MPBP • [Kampus O-162] (14:00 -16:00) [337] [1458] [2812] o MPBP V B izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] · Majetić Marijana, viša laborantica [1458] · Musulin Marija, laborantica [2812] · Pribanić Ivan, mag. edu. phys. et math. [457] · dr. sc. Čargonja Marija, mag. educ. phys. et math. [337] 29.05.2026 S10 Application of Radioactive Isotopes in **Nuclear Medicine:** • [P09 - NASTAVA NA ENGLESKOM JEZIKU] (09:15 - 11:00) [252] o MPBP S A

izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252]

03.06.2026

L27 Radioactivity. Alfa, Beta and Gamma Decay.:
• [Kampus O-029] (08:15 - 10:00) [149]

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

• [Kampus O-029] (08:15 - 10:00) [149]

P12 Compensation:

- [Kampus O-162] (10:00 12:00) <sup>[457]</sup> [1458] [2812]
  - o MPBP P A
- [Kampus O-162] (12:00 14:00) [337] [1458] [2812]
  - MPBP V B
- [Kampus O-162] (14:00 16:00) [337] [1458] [2812]

○ MPBP P C

Majetić Marijana, viša laborantica <sup>[1458]</sup> · Musulin Marija, laborantica <sup>[2812]</sup> · Pribanić Ivan, mag. edu. phys. et math. <sup>[457]</sup> · dr. sc. Čargonja Marija, mag. educ. phys. et math. <sup>[337]</sup> · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije <sup>[149]</sup>

#### 10.06.2026

o MPBP

L29 Application of Ultrasound in Medicine.:

• [Kampus O-029] (08:15 - 10:00) <sup>[149]</sup>
• MPBP

L30 Final Lecture and Preparation for Final Exam :

• [Kampus O-029] (08:15 - 10:00) [149]

o MPBP

prof. dr. sc. Žauhar Gordana, prof. fizike i kemije  $^{[149]}$ 

#### List of lectures, seminars and practicals:

[PREDAVANJA] (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 Oscillations and Waves d Waves.	1	[Kampus O-029]
L11 Sound Waves: The Physics of Hearing. Intensity of Soun. Connection between Physical and Physiological Parameters of Sound.	1	[Kampus O-029]
L12 Fluids. Hydrostatics. Surface Tension and Its Implications. Law of Laplace.	1	[Kampus O-029]
L13 Hydrodynamics. Bernoulli's Equation, Viscosity and Poiseuille's Law. Turbulent Flow	1	[Kampus O-029]
L14 Rheological Properties of Blood. Physics of the Circulatory System. Consequences of Clogged Arteries	1	[Kampus O-029]
L15 Ideal and Real Gases. Gas Laws. Physics of Breathing	1	[Kampus O-029]

L16 Basic Principles of Thermodynamics: I and II Law.	1	[Kampus O-029]
L17 Thermodynamics of a Biological system. Transfer of Heat.	1	[Kampus O-029]
L18 Transfer of Particles and Ions through Membranes. Action Potential.	1	[Kampus O-029]
L19 Physical Basis of Electro- and Magneto- Diagnostics (EKG, EEG, EMG).	1	[Kampus O-029]
L20 Dielectric Properties of Tissues. Tissues in Electric Field.	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-029]
L28 Interaction of Photons with Matter. Detection and Dosimetry of Ionizing Radiation.	1	[Kampus O-029]
L29 Application of Ultrasound in Medicine.	1	[Kampus O-029]
L30 Final Lecture and Preparation for Final Exam.	1	[Kampus O-029]

[VJEŽBE] (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]

[SEMINARI] (TOPIC)	Number of hours	Location
S1 Calculating Measurement Errors and Estimating Measurement Accuracy	2	[Kampus O-152] [P08]
S2 Optics	2	[Kampus O-152] [P06]
S3 Vectors and Operations with Vectors. Graphical Representation of Measurement Results and Interpretation of Graphs. Differential Calculus.	2	[Kampus O-152] [P05]

S4 Levers in the Human Body	2	[Kampus O-152] [P08]
S5 Sound. Hearing and the Ear.	2	[Kampus O-152] [P06]
S6 Hydromechanics	2	[Kampus O-152]
S7 Physics of Breathing	2	[Kampus O-152] [P07]
S8 Diffusion and Osmosis. Transport of Energy and Matter through Cell Membranes	2	[Kampus O-152] [P09 - NASTAVA NA ENGLESKOM JEZIKU]
S9 Medical Use of X-Rays	2	[Kampus O-152] [P09 - NASTAVA NA ENGLESKOM JEZIKU]
S10 Application of Radioactive Isotopes in Nuclear Medicine	2	[Kampus O-152] [P09 - NASTAVA NA ENGLESKOM JEZIKU]

#### **EXAM DATES (final exam):**

1.	15.06.2026.
2.	29.06.2026.
3.	13.07.2026.
4.	03.09.2026.
5.	17.09.2026.