[Medicinski fakultet u Rijeci]

**Curriculum**
**2024/2025**

[Za kolegij]

# Physics of Medical Diagnostics

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|---|---|
| Study program: | **Medical Studies in English (R)**<br>[Sveučilišni integrirani prijediplomski i diplomski studij] |
| Department: | **[Katedra za medicinsku fiziku i biofiziku]** |
| Course coordinator: | **izv. prof. dr. sc. Jurković Slaven, spec. med. fiz.** |
| Year of study: | **3** |
| ECTS: | **1** |
| Incentive ECTS: | **0 (0.00%)** |
| Foreign language: | **Possibility of teaching in a foreign language** |

## Course information:

Physics of Medical Diagnostics is a course which gives students an insight into the physical principles required for the acquisition of acceptable diagnostic information. The main part of the course will be dedicated to application of ionizing radiation for imaging. Also, the introduction into physics principles of use non-ionizing radiation (ultrasound and magnetic resonance imaging) for imaging will be presented. The purpose of this course is to introduce students into physical principles of medical imaging and devices used for this purpose.

## List of assigned reading:

1. P. Allisy-Roberts and J. Williams:Farr’s Physics for Medical Imaging 2nd edition, Elsevier, 2008.

## List of optional reading:

1. D.R.Dance, S.Cristofides; A.D.A.Maidment, I.D.McLean, K.H.Ng: Diagnostic Radiology Physics-A Handbook for Teachers and Students, http://www.pub.iaea.org/MTCD/Publications/PDF/Pub1564webNew-74666420.pdf
2. D.L. Bailey, J.L. Humm, A. Todd-Pokropek, A. van Aswegen: Nuclear Medicine Physics-A Handbook for Teachers and Students, http://www-pub.iaea.org/MTCD/publications/PDF/Pub1617web-1294055.pdf
3. P. Fish: Physics and Instrumentation of Diagnostic Medical Ultrasound, John Wiley & Sons, 1996.
4. C.R. Hill, J.C. Bamber, G.R. ter Haar: Physical Principles of Medical Ultrasonics, John Wiley & Sons, 2004.

## Curriculum:

**[Predavanja] list (with titles and explanation):**

**L1 Physics of ionizing radiation**

Physics of ionizing radiation

**L2 Interaction of X irradiation with matter**

Interaction of X irradiation with matter

**L3 Dosimetry, principles of quality assurance and radiation protection**

Dosimetry, principles of quality assurance and radiation protection

**L4 Basic physics of magnetic resonance imaging**

Basic physics of magnetic resonance imaging

**L5 Physics of ultrasound**

Physics of ultrasound

**L6 Bioeffects, dosimetry and safety of ultrasound; New methods in ultrasound imaging**

Bioeffects, dosimetry and safety of ultrasound. New methods in ultrasound imaging.

**[Seminari] list (with titles and explanation):**

**S1. Mammography, digital radiography, fluoroscopy, computed tomography**

Mammography
Digital radiography
Fluoroscopy
Computed tomography

**S2. Single photon emission tomography (SPECT), positron emission tomography (PET), magnetic resonance imaging (MRI), devices for radiation oncology treatment planning**

Single photon emission tomography (SPECT)
Positron emission tomography (PET)
Magnetic resonance imaging (MRI)
Devices for radiation oncology treatment planning

**S3. Physical principles of medical ultrasound imaging, doppler ultrasound methods, bioeffects, dosimetry and safety of ultrasound, application of ultrasound in therapy, quality assurance in ultrasound**

Physical principles of medical ultrasound imaging
Doppler ultrasound methods
Bioeffects, dosimetry and safety of ultrasound
Application of ultrasound in therapy
Quality assurance in ultrasound

## Student obligations:

The attendance at lectures and seminars is mandatory. If necessary, a student can be absent from 30% of the classes of the overall course workload. Students’ obligations are course attendance, active participation, preparation of the seminar and presentation in front of the group.

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

**Students who: cannot take the final exam.**
• They did not prepare a seminar before presenting it in front of the group and who have 30% or more unexcused absences from classes
Such a student is graded F (fail), cannot earn ECTS credits or take the final exam, that is, must re-enroll in the course the following academic year.

**The final exam can be taken by students who:**
• have create a seminar that was positively evaluated and successfully presented it front of the group.

**For the final exam It is enough to register the final exam through the STUDOMAT and if the previously mentioned conditions are met, in the ISVU system will be entered "passed".**

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

Professors and associates are available every day during working hours through e-mail addresses for all questions regarding classes.
Slaven Jurković, PhD, Associate Professor slaven.jurkovic@uniri.hr
Gordana Žauhar, PhD, Full Professor gordana.zauhar@uniri.hr
Marijana Majetić, senior laboratory technician marijana.majetic@uniri.hr - administrator

## COURSE HOURS 2024/2025

Physics of Medical Diagnostics

| **[Predavanja]**<br>(Place and time or group) | **[Seminari]**<br>(Place and time or group) |
|---|---|
| **07.03.2025** | |
| L1 Physics of ionizing radiation:<br>• [P01] (09:00 - 10:00) [252]<br>  ○ POMD | |
| izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] | |
| **14.03.2025** | |
| L2 Interaction of X irradiation with matter:<br>• [P01] (09:00 - 10:00) [252]<br>  ○ POMD | |
| izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] | |
| **18.03.2025** | |
| | S1. Mammography, digital radiography, fluoroscopy, computed tomography:<br>• [ONLINE] (13:00 - 15:30) [252]<br>  ○ PMD S A |
| izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] | |
| **20.03.2025** | |
| L3 Dosimetry, principles of quality assurance and radiation protection:<br>• [P01] (11:00 - 13:00) [252]<br>  ○ POMD<br><br>L4 Basic physics of magnetic resonance imaging:<br>• [P01] (11:00 - 13:00) [252]<br>  ○ POMD | S1. Mammography, digital radiography, fluoroscopy, computed tomography:<br>• [ONLINE] (08:30 - 11:00) [252]<br>  ○ PMD S B |
| izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] | |
| **25.03.2025** | |
| | S2. Single photon emission tomography (SPECT), positron emission tomography (PET), magnetic resonance imaging (MRI), devices for radiation oncology treatment planning:<br>• [ONLINE] (13:00 - 15:30) [252]<br>  ○ PMD S A |
| izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] | |
| **27.03.2025** | |

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|---|---|
| L5 Physics of ultrasound:<br>• [P01] (11:00 - 13:00) [149]<br>◦ POMD<br><br>L6 Bioeffects, dosimetry and safety of ultrasound; New methods in ultrasound imaging:<br>• [P01] (11:00 - 13:00) [149]<br>◦ POMD | S2. Single photon emission tomography (SPECT), positron emission tomography (PET), magnetic resonance imaging (MRI), devices for radiation oncology treatment planning:<br>• [ONLINE] (08:30 - 11:00) [252]<br>◦ PMD S B |
| izv. prof. dr. sc. Jurković Slaven, spec. med. fiz. [252] · prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] | |
| **01.04.2025** | |
| | S3. Physical principles of medical ultrasound imaging, doppler ultrasound methods, bioeffects, dosimetry and safety of ultrasound, application of ultrasound in therapy, quality assurance in ultrasound:<br>• [P09 - NASTAVA NA ENGLESKOM JEZIKU] (14:00 - 16:30) [149]<br>◦ PMD S A |
| prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] | |
| **03.04.2025** | |
| | S3. Physical principles of medical ultrasound imaging, doppler ultrasound methods, bioeffects, dosimetry and safety of ultrasound, application of ultrasound in therapy, quality assurance in ultrasound:<br>• [P09 - NASTAVA NA ENGLESKOM JEZIKU] (08:30 - 11:00) [149]<br>◦ PMD S B |
| prof. dr. sc. Žauhar Gordana, prof. fizike i kemije [149] | |

### List of lectures, seminars and practicals:

| [PREDAVANJA] (TOPIC) | Number of hours | Location |
|---|---|---|
| L1 Physics of ionizing radiation | 1 | [P01] |
| L2 Interaction of X irradiation with matter | 1 | [P01] |
| L3 Dosimetry, principles of quality assurance and radiation protection | 1 | [P01] |
| L4 Basic physics of magnetic resonance imaging | 1 | [P01] |
| L5 Physics of ultrasound | 1 | [P01] |
| L6 Bioeffects, dosimetry and safety of ultrasound; New methods in ultrasound imaging | 1 | [P01] |

| [SEMINARI] (TOPIC) | Number of hours | Location |
|---|---|---|
| S1. Mammography, digital radiography, fluoroscopy, computed tomography | 3 | [ONLINE] |
| S2. Single photon emission tomography (SPECT), positron emission tomography (PET), magnetic resonance imaging (MRI), devices for radiation oncology treatment planning | 3 | [ONLINE] |
| S3. Physical principles of medical ultrasound imaging, doppler ultrasound methods, bioeffects, dosimetry and safety of ultrasound, application of ultrasound in therapy, quality assurance in ultrasound | 3 | [P09 - NASTAVA NA ENGLESKOM JEZIKU] |

**EXAM DATES (final exam):**

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|---|---|
| 1. | 17.04.2025. |
| 2. | 25.06.2025. |
| 3. | 08.07.2025. |
| 4. | 15.09.2025. |