



**Course: Physics of Medical Diagnostics**

**Course Coordinator: Slaven Jurković, PhD, Associate Professor**

**Department: Department of Medical Physics and Biophysics**

**Study program: Integrated Undergraduate and Graduate University Study of Medicine in English**

**Study year: third**

**Academic year: 2022/23**

## SYLLABUS

**Course description (a brief description of the course, general instructions, where and in what form the lessons are organized, necessary equipment, instructions for attendance and preparation for classes, student obligations, etc.):**

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

### COURSE STRUCTURE

Formal lectures: 6 hours

Seminars: 9 hours

Total hours: 15

### Assigned reading:

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

### Optional/additional 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

### COURSE TEACHING PLAN:

#### The list of lectures (with topics and descriptions):

- L1 Physics of ionizing radiation
- L2 Interaction of X i  $\gamma$  radiation with matter
- L3 Dosimetry, principles of quality assurance and radiation protection
- L4 Basic physics of magnetic resonance imaging
- L5 Physics of ultrasound
- L6 Bioeffects, dosimetry and safety of ultrasound. New methods in ultrasound imaging.

**The list of seminars with descriptions:**

S1

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

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

**Students' 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.

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

Final written exam has 15 multiple choice questions. Each question has five offered answers. Correct answer gain 1 credit. There are no negative credits for incorrect answer.

Prepared and presented seminar is obligatory prior final exam.

Positively evaluated seminar and at least 8 credits on final exam are required for student to pass the course.

**Other important information regarding to the course:**

**COURSE SCHEDULE (for academic year 2022/2023)**

<b>Date</b>	<b>Lectures (time and place)</b>	<b>Seminars (time and place)</b>	<b>Instructor</b>
10/3/2023 Friday	L1 (11.00-12.00) LH15		Slaven Jurković, PhD, Associate Professor
21/3/2023 Tuesday		S1 G1 (13.00-15.30) Online MS Teams	Slaven Jurković, PhD, Associate Professor
23/3/2023 Thursday	L2-3 (12.00-14.00) LH15	S1 G2 (8.30-11.00) Online MS Teams	Slaven Jurković, PhD, Associate Professor  Slaven Jurković, PhD, Associate Professor
28/3/2023 Tuesday		S2 G1 (13.00-15.30) Online MS Teams	Slaven Jurković, PhD, Associate Professor
30/3/2023 Thursday	L4-5 (11.00-13.00) LH15	S2 G2 (8.30-11.00) Online MS Teams	Slaven Jurković, PhD, Assistant Professor  Gordana Žauhar, PhD, Full Professor
04/4/2023 Tuesday		S3 G1 (13.30-16.00) LH9	Gordana Žauhar, PhD, Full Professor
06/4/2023 Thursday		S3 G2 (8.30-11.00) LH9	Gordana Žauhar, PhD, Full Professor
7/4/2023 Friday	L6 (11.00-12.00) LH15		Slaven Jurković, PhD, Associate Professor

**List of lectures and seminars:**

	<b>LECTURES (Topics)</b>	<b>Teaching hours</b>	<b>Location/Lecture room</b>
L1	Physics of ionizing radiation	1	LH15
L2	Interaction of X and gama radiation with matter	1	LH15
L3	Dosimetry, principles of quality assurance and radiation protection	1	LH15
L4	Basic physics of magnetic resonance imaging	1	LH15
L5	Physics of ultrasound	1	LH15
L6	Bioeffects, dosimetry and safety of ultrasound. New methods in ultrasound imaging.	1	LH15

	<b>SEMINARS (Topics)</b>	<b>Teaching hours</b>	<b>Location/Lecture room</b>
S1	Mammography	3	Online MS Teams
	Digital radiography		
	Fluoroscopy		
	Computed tomography		
S2	Single photon emission tomography (SPECT)	3	Online MS Teams
	Positron emission tomography (PET)		
	Magnetic resonance imaging (MRI)		
	Devices for radiation oncology treatment planning		
S3	Physical principles of medical ultrasound imaging	3	LH9
	Doppler ultrasound methods		
	Bioeffects, dosimetry and safety of ultrasound		
	Application of ultrasound in therapy		
	Quality assurance in ultrasound		

	<b>FINAL EXAM DATES</b>
1.	6.4.2023.
2.	26.6.2023.
3.	11.07.2023.
4.	18.9.2023