COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2024-2025 SEMESTER I

Course title	*Medical Imaging physics, tomographic algorithms, MRI physics*
Course Code	MSM620ANEG
Hours/Week: le/pr/lab	2/0/2
Credits	4
Degree Programme	Biomedical Engineering MSc
Study Mode	*Full-time*
Requirements	exam
Teaching Period	fall
Prerequisites	
Department(s)	Medical School, Department of Biophysics
Course Director	*Dr. Lukács András*
Teaching Staff	*Dr. Lukács András, László Grama, Péter Bogner, András Kengyel, Ákos Járay, Norbert Trombitás, Edina Szabó-Meleg, Zsombor Ritter, Zsolt Sebestyén, Zoltán Ujfalusi, Mihály Szűcs, Gábor Szekeres, Katalin Raics, Péter Bukovics*

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description

An in-depth knowledge of diagnostic algorithms is a key objective of MSC training. Particular emphasis will be placed on a high level of understanding of the technical requirements, organizational frameworks, and expectations of applicable imaging protocols in teleradiology. Particular emphasis will be placed on practical issues of quality assurance. An important goal is the practical, independent use of computer image processing techniques.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

An in-depth knowledge of diagnostic algorithms is a key objective of MSC training. Particular emphasis will be placed on a high level of understanding of the technical requirements, organizational frameworks, and expectations of applicable imaging protocols in teleradiology. Particular emphasis will be placed on practical issues of quality assurance. An important goal is the practical, independent use of computer image processing techniques.

2. COURSE CONTENT

Neptun: Instruction/Subjects/Subject Details/Syllabus/Subject content

	TOPICS
LECTURE	*Introduction* *Electromagnetic waves, Atomic physics* *Production and absorption of X-rays* *Diagnostic X-ray imaging* *CT imaging* *Physics of ultrasound* *Ultrasound imaging* *Magnetism, electromagnetic induction, antennas* *MR phenomenon, image formation* *MR contrast, sequences*

PRACTICE LABORATORY PRACTICE	*MR artifacts, MR safety* *Nuclear physics, radioactivity, radioactive radiations* *Gamma-camera, SPECT, PET* *Radiation therapy (Oncoradiology dept.)* *Visit tof the Dept. of Medical Imaging* *Atomic spectra* *X-ray imaging - model practice* *Detectors, signal processing, monitors- seminar* *CT imaging - clinical visit* *Physics of ultrasound* *Ultrasound imaging (basics+ clinical - skill lab)* *Electromagnetic induction - practice* *MR phenomenon -practice* *Spin-echo sequence - practice* *MRI (clinical applications -clinical visit)* *Radioactive radiations* *PET (clinical applications) - clinical visit* *Radiation therapy practice (Oncoradiology dept.)*

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

LECTURE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Introduction	LECTURE NOTES	…	…
2.	Electromagnetic waves, Atomic physics	LECTURE NOTES		
3.	Production and absorption of X-rays	LECTURE NOTES		
4.	Diagnostic X-ray imaging	LECTURE NOTES		
5.	CT imaging	LECTURE NOTES		
6.	Physics of ultrasound	LECTURE NOTES		
7.	Ultrasound imaging	LECTURE NOTES		
8.	Magnetism, electromagnetic induction, antennas	LECTURE NOTES		
9.				
10.	MR phenomenon, image formation MR contrast, sequences	LECTURE NOTES		
11.	MR artifacts, MR safety	LECTURE NOTES		
12.	Nuclear physics, radioactivity, radioactive radiations	LECTURE NOTES		
13.	Gamma-camera, SPECT, PET	LECTURE NOTES		
14.	Radiation therapy (Oncoradiology dept.)	LECTURE NOTES		

PRACTICE, LABORATORY PRACTICE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Visit tof the Dept. of Medical Imaging	LECTURE NOTES		
2.	Atomic spectra	LECTURE NOTES		
3.	X-ray imaging - model practice	LECTURE NOTES		
4.	Detectors, signal processing, monitors-seminar	LECTURE NOTES		
5.	CT imaging - clinical visit	LECTURE NOTES		
6.	Physics of ultrasound	LECTURE NOTES		

7.	Ultrasound imaging (basics+ clinical - skill lab)	LECTURE NOTES		
8.	Electromagnetic induction - practice	LECTURE NOTES		
9.		LECTURE NOTES		
10.	MR phenomenon -practice Spin-echo sequence - practice	LECTURE NOTES		
11.	MRI (clinical applications -clinical visit)	LECTURE NOTES		
12.	Radioactive radiations	LECTURE NOTES		
13.	PET (clinical applications) - clinical visit	LECTURE NOTES		
14.	Radiation therapy practice (Oncoradiology dept.)	LECTURE NOTES		
15.				

3. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System)

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

…

ASSESSMENT

Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be deleted.

Course-unit with final examination

Mid-term assessments, performance evaluation and their weighting as a pre-requisite for taking the final exam

(The samples in the table to be deleted.)

Type	Assessment	*Weighting as a proportion of the pre-requisite for taking the exam*
1. *e.g..: Test 1*	*eg. max 20 points*	*eg. 20 %*
2. *e.g.: Test 2*	*eg. max 30 points*	*eg. 30 %*
3. *e.g.: home assignment (project documentation)*	*eg. max 30 points*	*eg. 30 %*
4. *…*	*eg. max 15 points*	*eg. 20 %*

Requirements for the end-of-semester signature

(Eg.: mid-term assessment of 40%)

Performing all the practical labs

Re-takes for the end-of-semester signature (PTE TVSz 50§(2))

The specific regulations for grade betterment and re-take must be read and applied according to the general Code of Studies and Examinations. E.g.: all the tests and the records to be submitted can be repeated/improved each at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.

There are three make up labs in order to perform the missed labs

Type of examination *(written, oral):* *oral*

The exam is successful if the result is minimum ***40*** ***%.*** *(The minimum cannot exceed 40%.)*

Calculation of the grade *(TVSz 47§ (3))*

The mid-term performance accounts for ***0*** %, the performance at the exam accounts for ***100*** % in the calculation of the final grade.

Calculation of the final grade based on aggregate performance in percentage.

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[1]International Atomic Energy Agency (IAEA): Diagnostic Radiology Physics, Vienna, 2014. ISBN 978–92–131010–

[2] Neri, Emanuele, Caramella, Davide, Bartolozzi, Carlo (szerk): Image Processing in Radiology Current applications. Springer 2008. pp. 429 SBN 978-3-540-49830-8

RECOMMENDED LITERATURE AND AVAILABILITY