Name of the course	**Radiology**			***Code***	MSE402
Type of study program:	Integrated university study program, Medicine			***Year of study:***	4
Credits (ECTS):	6	***Semester:***	VII	***Number of hours per semester (l+s+e)***	100 (35+16+49)
Status of the course:	obligatory	***Preconditions:***	Passed all exams of the previous year	***Comparative conditions:***	None
Access to course:	Fourth year students			***Hours of instructions:***	According to schedule

***Course teacher*:**	Assistant professor Vedran Markotić, MD, PhD
Consultations:	As agreed with students
E-mail address and phone number:	vedran_markotic@yahoo.com +387 63 349 280
Associate teachers	Assistant professor Vilma Kosović, MD, PhD Assistant professor Krešimir Dolić, MD, PhD Associate professor Igor Borić, MD, PhD Senior assistant Antonela Krasić Arapović, MD, PhD Assistant Dorijan Radančević, MD
Consultations:	As agreed with students
E-mail address and phone number:	vilmakosovic@gmail.com; kdolic79@gmail.com; igor.boric@svkatarina.hr; antonelakrasiou0107@yahoo.com; dorijan.r@gmail.com
The aims of the course:	The aim of this course is to introduce medical students to basics of imaging anatomy, radiology equipment, biological effects of ionizing radiation, patient and staff radiation protection and radiology imaging techniques.
Learning outcomes (general and specific competences):	Upon completing this course and passing the exam students will be able to: <u>General outcomes:</u> Apply the independent learning throughout the course by using critical and self-critical judgment of scientific truths. Demonstrate the possession of personal qualities (team-work and personal involvement, curiosity, active listening and building positive relationship with team members). <u>Specific outcomes:</u> Explain the basic of radiology physics, biological effects of radiation, radiation protection, contrast agents, normal and pathologic imaging findings of specific organ systems (central nervous system, eye, ear, nasopharynx, larynx, face and neck area, thoracic organs, breast, heart and large blood vessels, hepatobiliary system, pancreas, spleen, genitourinary and musculoskeletal system) and contemporary imaging techniques. Outcomes will be evaluated by continuous examinations, seminar tests, practical examinations, active studying through lectures, exercises, seminars and final written and oral (with practical) examination.
Course content (Syllabus):	Radiology course consists of 35 hours of lectures divided in 16 units, with 16 hours of seminars and 49 hours of practical work (exercises).

Format of instruction (mark in bold)	**Lectures**	**Exercises**	**Seminars**	Independent assignments
	Consultations	Work with mentor	Field work	Other
	Remarks: Each unit starts with lectures followed by seminars and exercises. At seminars students are given problem-based assignments to complete in small groups. Finally, knowledge is tested through quiz-tests with correct answers discussed afterwards.			

Student responsibilities:	Final exam; oral presentations at seminars; quick tests; attending and actively participating in course contents. Students will be evaluated based on: - Active participation in seminars and exercises - Preparing materials for seminars - Oral examination (discussing imaging findings) - Written examination

Screening student work: ***(mark in bold)***	**Class attendance**	**Class participations**	**Seminar essay**	**Practical training**
	Oral exam (including practical, through imaging materials)	**Written exam**	**Continuous assessment**	Essay

Detailed evaluation within a *European system of points*

STUDENTS RESPONSIBILITIES	**HOURS**	**PROPORTIONS OF ECTS CREDITS**	**PROPORTIONS OF MARK**
Class attendance and participations	100	3.3	0%
Seminar essay	10	0.3	10%
Written exam	50	1.7	70%
Oral (practical) exam	20	0.7	20%
Total	**180**	**6**	**100%**

Further clarification:

Course examination consists of the written and oral (practical) part, as well as of seminars.

Written examination (70% of the total grade).
Students with full attendance record (seminars and exercises) have the right to take written examination. After the written examination student will have oral examination, discussing imaging findings with the teacher. Successfully completed written examination is a precondition for taking oral examination. Successfully completed written examination is valid through the current academic year. Written examination criteria: total percentage of correct answers needed for successful completion of written examination is 55%.

Seminars (10% of the total grade).
After every seminar, there is an oral presentation and analysis of specific patients and their radiologic findings. Seminars can have a written component as directed by the medical school. Students completing the seminar get one point that add up to 10% affecting the total grade.

Oral - practical examination (20% of the total grade).
Practical examination consists of 30 mixed radiologic imaging materials. Students should demonstrate knowledge in radiologic anatomy and radiologic pathology.

Final grade:
Final grade composition = Written examination (70%) + seminars (10%) + oral (practical) examination (20%).
According to the regulations of the study, final grade is obtained:
A = 91-100% (5); B = 79 to 90% (4); C = 67 to 78% (3); D = 55 to 66% (2); F = 0 to 54% (1) – fail.

Required literature:	1. William Herring, Learning Radiology; Recognizing the Basics, 4th edition, Elsevier, 2020. 2. Lecture and seminars presentation materials
Optional literature:	Internet based literature
Additional information about the course:	Monitoring methods of teaching quality: - student questionnaire - quality analysis by students and teachers - exam results analysis - report of the office for teaching quality and external evaluation

Annexes: calendar classes

Number of teaching unit	**TOPICS AND LITERATURE**
I.	Title: Basic radiation physics in medical applications
	Short description: History of radiology, origin and characteristics of X-rays, composition of X-ray tube etc.
	Literature: Required and optional literature.
II.	Title: Biological effects of ionizing radiation
	Short description: Radiobiology, radiation effects on cells, damage caused byionizing radiation (risk evaluation)
	Literature: Required and optional literature.
III.	Title: Radiation measurement units and radiation dosimetry
	Short description: radiation doses in radiology, measuring radiation (dosimetry), dosimeters.
	Literature: Required and optional literature.
IV.	Title: Prevention and radiation protection
	Short description: sources of radiation, prevention and radiation protection, role of radiologist in radiation protection, protective measures for staff, modes of radiation protection
	Literature: Required and optional literature.
V.	Title: Radiography systems
	Short description: electronic amplifier, X-ray films, cassettes, foils, computed radiography, flat detectors
	Literature: Required and optional literature.
VI.	Title: Factors affecting X-ray image
	Short description: X-ray films and film processing, computed radiography and processing (digitalization), physical aspects of image formation and characteristics of examined object, geometric aspects of image formation.
	Literature: Required and optional literature.
VII.	Title: Radiography equipment for special applications
	Short description: Radiographic, fluoroscopic and multi-purpose diagnostic and special X-ray machines (tomography, mammography etc.)
	Literature: Required and optional literature.
VIII.	Title: Contrast agents used in radiology
	Short description: Contrast agents in conventional and digital radiology, ultrasonography, computerized tomography, magnetic resonance imaging
	Literature: Required and optional literature.
IX.	Title: Contemporary imaging techniques
	Short description: ultrasonography, digital radiography, computerized tomography, magnetic resonance imaging
	Literature: Required and optional literature.
X.	Title: Radiology of the central nervous system (CNS)
	Short description: Neuroradiology imaging methods, pathology of CNS, imaging diseases of the brain and the spine
	Literature: Required and optional literature.
XI.	Title: Radiology of the eye, ear, nasopharynx, larynx, paranasal sinuses and teeth.
	Short description: Methods of imaging eye, ear, nasopharynx, larynx, paranasal sinuses and teeth.
	Literature: Required and optional literature.
XII.	Title: Osteoarticular system and trauma of osteoarticular system
	Short description: Methods of imaging osteoarticular system and trauma of osteoarticular system and their pathology

	Literature: Required and optional literature.
XIII.	Title: Interventional radiology
	Short description: Radiologic imaging methods in interventional radiology.
	Literature: Required and optional literature.
XIV.	Title: Thoracic organs (lung and mediastinum, heart, large blood vessels and breast radiology)
	Short description: Radiologic imaging methods and pathology of thoracic organs
	Literature: Required and optional literature.
XV.	Title: Gastrointestinal and hepatobiliary system
	Short description: Imaging methods and pathology of gastrointestinal and hepatobiliary system
	Literature: Required and optional literature.
XVI.	Title: Genitourinary system and adrenal glands
	Short description: Imaging methods and pathology of genitourinary system and adrenal glands
	Literature: Required and optional literature.