

NON-INVASIVE RADIOLOGIC DIAGNOSTICS OF THE CENTRAL NERVOUS SYSTEM	
GENERAL INFORMATION	
Course coordinator	Asst. Prof. Tamer Salha, MD, PhD
Assistant/Associate	Zdravka Krivdić Dupan, MD Silva Guljaš, MD
Study Programme	Integrated undergraduate and graduate university study of Medicine
Status of the course	Elective
Year of study, semester	4th year, 8th semester
ECTS	2
Workload (hours)	Seminars (25)
Expected number of students	30
COURSE DESCRIPTION	
Course objectives	
<p>Get to know the basics of radiological anatomy of the central nervous system, the basics of devices for conventional radiography, computer tomography (CT), magnetic resonance (MR) as well as examination techniques. Analysis of the findings obtained by the mentioned imaging modalities in order to identify normal anatomical structures, congenital, pathological or traumatic changes in the skull and spine, as well as their influence on neurological symptoms.</p> <p>Learn the basics of the doppler technique for imaging extracranial supraaortic arteries and veins and the transcranial doppler technique for examining intracranial circulation in order to recognize normal and pathological findings. Comparison of radiological findings and clinical symptomatology of neurological and neurosurgical patients.</p>	
Enrolment requirements and entry competencies	
Attended Radiology subject	
Learning outcomes at the Programme level	
1.2.,2.1.,3.1.	
Learning outcomes (5-10)	
<p>After completing the seminars, independent study and passing the exam, students will be able to:</p> <ol style="list-style-type: none"> 1. Argue the possibilities and limitations of devices for conventional radiography, computer tomography, magnetic resonance as well as doppler imaging techniques. 2. Critically evaluate the choice of imaging modality depending on neurological symptomatology and clinical inquiry 3. Assess and distinguish anatomical and physiological changes from pathological changes 4. Independently analyze radiological findings 5. Independently compare the radiological findings with the clinical symptoms of neurological or neurosurgical patients and draw a conclusion 	
Course content	
<p>Seminars: Basic anatomy of the skull and spine with their anatomical structures, Radiological anatomy of the skull and spine and their content, Conventional X-ray devices and examination techniques;</p> <p>Analysis of conventional radiographs and the possibility of determining direct or indirect congenital, pathological or traumatic changes in the skull and spine and their contents;</p> <p>Basics of computed tomography (CT) devices and examination techniques (spiral and multidetector spiral CT, CT-angiography of the supra-aortic arteries) analysis of the three-dimensional layered images obtained in this way, in order to familiarize and recognize anatomical structures, traumatic changes and the occurrence, localization, extension, consequences and type of pathological processes or congenital anomalies of the neurocranium and spine with spinal brain (ischemias, hemorrhages, tumors, anomalies/variants, inflammations,</p>	

tumors, parasites, etc.); Basics of magnetic resonance (MR) devices and examination techniques by analysis neurocranium and spine images obtained with this method, in order to familiarize and recognize anatomical structures, traumatic changes and determine the existence of pathological processes and their localization, size, type, extension and consequences on surrounding structures, especially demyelinating diseases. Techniques of MR-angiography and its display and analysis possibilities; Doppler imaging technique of extracranial supraaortic arteries and veins. Analysis of the obtained findings in order to recognize and familiarize with normal anatomy and pathological findings and their influence on neurological symptoms. Transcranial Doppler-technique of examination of intracranial circulation for familiarization and recognition of normal and pathological findings; Comparison results of radiological findings and clinical symptomatology of several neurological and neurosurgical patients.

Mode of teaching

Seminars

Student obligations

Attending all forms of classes is mandatory, and the student must pass all knowledge tests. A student can excuse himself from 30% of each form of teaching. Undone exercise must be graded.

Monitoring student work (*alignment of learning outcomes, teaching methods and grading*)

Teaching activity	ECTS	Learning outcome	Student activity	Assessment methods	Grade points	
					Min.	Max.
Attending classes	0,5	1-5	Attendance at classes	Record	5	20
Seminars	0,5	1-5	Attendance and active participation in seminars	Presentation	15	30
Final exam	1,0	1-5	Studying for the oral exam	Oral exam	30	50
Total	2				50	100

Calculation of final grade:

Students who achieved 30 or more points in the final exam, the points obtained in the final exam are added to the grade points obtained during the class, and this sum constitutes the final grade. Since the study program schedule descriptive assessment of elective courses, the course coordinator awards the grade "passed" to a student who achieves 50 or more grade points in the course.

Required reading (available in the library and through other media)

Title	Number of copies in the library	Availability through other media
1. Marušić A, Krmpotić-Nemanić J: Anatomija čovjeka, Medicinska naklada, Zagreb 2004.	10	
2. Aumüller G, Aust G, Conrad A, Engele J, Kirsch J, Maio G, Zilch HG. (ur. hrv. izdanja: Katavić V, Petanjek Z, Vinter I): Duale Reihe Anatomija, Medicinska naklada, Zagreb, 2018.		

<ol style="list-style-type: none"> 3. Hebrang A, Klarić – Čustović R. i suradnici. Radiologija, udžbenik, 3. dopunjeno i obnovljeno izdanje, Zagreb, Medicinska naklada, 2007 4. Bešenski N, Janković S: Klinička neuroradiologija kralježnice i kralježnične moždine. Zagreb, Medicinska naklada,2013. 5. Eterović D, Janković S: Fizikalne osnove i klinički aspekti medicinske dijagnostike. Zagreb,, Medicinska naklada, 2002. 6. Fučkan I: Magnetska rezonancija, priprema i planiranje pregleda. Zagreb, Tko zna zna doo.,2012. 		
Additional reading		
<ol style="list-style-type: none"> 1. Deller, T, Sebestény, T: Fotografski atlas neuroanatomije, Medicinska naklada Zagreb, Zagreb 2015. 2. Josip Stojanović: "Trzajna ozljeda vratne kralježnice - riješena enigma", Naklada Ljevak Zagreb 2006. 3. Osborn AG, Ross JS,Moore KR, Anderson JF: Imaging anatomy brain and spine, Elseviere, Philadelphia 2020. 		
Course evaluation procedures		
<p>E-learning is not included in the norm of subject hours, but it is used in teaching and contains links to various pages, video and audio materials available on the website.</p>		
Note /Other		
<p>E-učenje ne ulazi u norma sate predmeta, ali se koristi u nastavi i sadrži poveznice na različite stranice, video i audio materijale dostupne na mrežnim stranicama.</p>		