Teaching Guide			
Identifying Data			2020/21
Subject (*)	Nuclear explorations in neurology: SPET and PET. Digital neuroimaging	Code	610490011
Study programme	Mestrado Universitario en Neurociencia (Plan 2011)		

Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3

Language	SpanishGalician		
Teaching method	Hybrid		
Prerequisites			
Department	Fisioterapia, Medicina e Ciencias Biomédicas		
Coordinador	Pereira Loureiro, Javier	E-mail	javier.pereira@udc.es
Lecturers	Pereira Loureiro, Javier	E-mail	javier.pereira@udc.es
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General description	Block II of the subject is taught on-line through the Moodle platform. Classroom hours are used to answer questions or work in groups. In this course, students must achieve the following objectives. - Analyze the fundamentals of modern radiopharmacy (PET and SPECT) for the study of neurological processes - Transfer of basic concepts to clinical and lay the basis for future isotopic explorations - Analyze isotope nuclear explorations (PET and SPECT) and the daily use for routine use in hospitals of Public Health Service. - Know the new systems of medical imaging - Understand the molecular fundaments of the pharmacological treatment of the neurological diseases. - Know the theoretical bases of the digital image of neuroscience. - Understand differences between the types of images used in neuroscience - Understand the importance of the medical imaging and research trends, particularly in the field of neuroscience. - Know to do medical imaging processing, using free and commercial software		
Contingency plan	1. Modifications to the contents Block I may be replaced by a virtual visit to the nuclear medicine service with the support of multimedia content 2. Methodologies *Teaching methodologies that are maintained The same methodologies will continue to be used, changing the presence of the master sessions to synchronous online classes *Teaching methodologies that are modified The master sessions will be on-line 3. Mechanisms for personalized attention to students By email or video conference 4. Modifications in the evaluation No changes 5. Modifications to the bibliography or webgraphy No changes		

Study programme competences	
Code	Study programme competences
A10	Coñecer os principais métodos empregados pola neurociencia cognitiva actual, con especial acento nas técnicas psicofisiolóxicas, neuropsicolóxicas e de neuroimaxe.
B2	Coñezan e saiban utilizar as técnicas experimentais dos campos da neurociencia obxecto do seu interese.

B3	Posúan un grao de especialización, o que significa o coñecemento de problemas, teorías e técnicas específicas, en polo menos un campo da neurociencia.
B5	Saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en ámbitos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa neurociencia.
B8	Saiban traballar en grupos de carácter multidisciplinar
C3	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C8	Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.

Learning outcomes			
Learning outcomes	Study programme competences		
Know the technological principles of the software and hardware for working in digital neuroimaging	AR10	BR3 BR5	CR3
Know a department of nuclear medicine, both from a clinical and technological perspective	AR10	BR2 BR5 BR8	CR8
Know how to behave in department of digital neuroimaging, management and processing data using computer tools.	AR10	BR2	CR3
Know the communication and storage standards DICOM and NIfTI in the field of neuroimaging	AR10	BR2 BR3	CR3

Contents	
Topic	Sub-topic
BLOCK I: NUCLEAR ISOTOPIC STUDIES IN NEUROLOGY	Introduction - Biological fundaments of diseases of the central nervous system - Medical imaging systems - Radiopharmacy. Biological fundaments of studies with radiopharmaceuticals - Quality control of radiological protection devices and bases - The cyclotron - Study of cerebral perfusion - Pharmacological modulation of cerebral vascularization - Isotopic study of: Brain perfusion, Dementias, Tumors, Epilepsies, Brain death, Dopaminergic receptors, Other processes PET. Physical principles. QA. Radiopharmacy. Clinical applications. Future uses. The cyclotron of Hospital of Santiago de Compostela: Research lines
BLOCK II. MEDICAL DIGITAL NEUROIMAGING	- Principles of digital neuroimaging. The digital imaging. Principles and codification of information. The graphic formats of the digital image. General formats and specific formats in neuroscience. - The DICOM standard. Digital imaging and communications in Medicina. Modalities of digital imaging in neuroscience - Sources of generation of imaging in neuroscience. Radiology, CT, MRI, Nuclear medicine. DICOM Applications -Applications and viewers free and commercial of DICOM imaging. - Neuroimaging applications. The NIfTI format.

PRACTICAL CLASS PROGRAM	Block I Practice 1. Visit to the Nuclear Medicine Department Service of Hospital of the University of Santiago de Compostela Practice 2. To do PET and SPECT isotopic studies in neurology and psychiatry Practice 3. Visit to the Cyclotron Block II DICOM and NIfTI medical image management practices with free software

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Case study	A10 B2 B3 B5 B8 C8	5	5	10
ICT practicals	B2 B5 B8 C3 C8	10	25	35
Guest lecture / keynote speech	A10 B2 B3 B5 C8	5	5	10
Online forum	B8 C3	8	8	16
Personalized attention		4	0	4
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Case study	In the visit to the nuclear medicine service of the CHU in Santiago will propose cases that will be studied by the student and discussed
ICT practicals	Using the e-learning platform, neuroimaging practices will be carried out within the deadlines established by the proposed calendar
Guest lecture / keynote speech	Theoretical fundaments of the course will be presented in class. Contents can be followed with the online media available on the e-learning platform. Assistance is optional
Online forum	Active participation in the forums of the platform will be an part of the course

Personalized attention	
Methodologies	Description
Case study ICT practicals Online forum	It is intended that each student individually work in the field of neuroimaging focusing on their lines of interest. Being a subject with very heterogeneous students in relation to their basic training will try to look for topics of interest to each one

Assessment			
Methodologies	Competencies	Description	**Qualification**
Case study	A10 B2 B3 B5 B8 C8	Practices in the CHUS nuclear medicine service	50
ICT practicals	B2 B5 B8 C3 C8	The delivery of the exercises on the scheduled dates through the platform of e-learning	35
Guest lecture / keynote speech	A10 B2 B3 B5 C8	Videotutorials available in the platform of e-learning are necessary to be able to carry out the exercises correctly.	5
Online forum	B8 C3	Active and intelligent participation in the forum will be evaluated in the final evaluation.	10
Others			

Assessment comments
In order to overcome the complete subject, it isnecessary to take a minimum of scoring in each of the two sections. Attendance is mandatory in Block I

Sources of information	
Basic	- Carreras JL, Lapeña L, Asensio C (2002). PET en oncología. Madrid : Nova Sidonia - Souto M, García P. (2001). El ojo clínico de la Red. Santiagode Compostela: Universidad de Santiago de Compostela - Deinendengen LE, Shreeve WW, Eckelman WC, Bahk YW, Wagner HN jr. (2003). Molecular nuclear Medicine. Heidelberg : Springer Verlag - Von Schulthess GK (2003). Clinical molecular anatomic imagingf. Philadelphia : Lippinhcott W&W - NEMA (2012). DICOM Standard Status. Base Standard. http://medical.nema.org/ - ACR: American College of Radiology (2012). Neuroimaging . http://www.acr.org - Maestú F, Cabestrero R, Ríos M (2008). Neuroimagen : técnicas y procesos cognitivos. Barcelona : Masson
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
In Block II we use the tele-learning platform created by the teacher. (the institutional Moodle does not support access of students from outside universities) All the works are delivered through the teletraining platform in digital format without the need for printing, which contributes to an education based on a sustainable model. Learning platform: https://www.imedir.udc.es/formacion