COURSE SYLLABUS

University	**Alexandru Ioan Cuza University of Iaşi**	**Course title**	
Faculty	**Physics**	**NUCLEAR MAGNETIC RESONANCE IN MEDICINE AND BIOLOGY**	
Department	**Physics**		
Domain	**Physics**	**Course category** (FC/SC/CC[1]): FC	**Term** (1-4): 3
Level	**Postgraduate (MA)**	**Course type** (Co/El/F[2]): Co	

I. Course structure

Number of hours/week				Credits	Total class hours/ semester	Total hours of individual activity	Examination type (C/Ex/CE[3])	Teaching language
Course	Seminar	Lab.	Project	**6**	**56**	**124**	**Ex**	**English**
28		**28**						

II. Instructors

	Academic degree[4]	Scientific degree	Name and surname	Faculty position (tenure/ associate - organization)
Course	Assoc. Prof.	PhD.	DIMITRIU DAN-GHEORGHE	Tenure
Seminar				
Laboratory	Assoc. Prof.	PhD.	DIMITRIU DAN-GHEORGHE	Tenure

III. Prerequisites

Nuclear Physics

IV. Course objectives

The students become accustomed with the nuclear magnetic resonance (NMR) methods. The student will develop their abilities to investigate complex molecules by NMR spectroscopy. The students will learn and develop abilities to operate with NMR medical imaging techniques. The students will develop practical abilities to interpret the results of some complex medical tests, as well as the NMR spectra.

V. Course content

Course	Nuclear spin and nuclear magnetic moment. The hyperfine structure of the spectra. Stern-Gerlach method and NMR methods (Rabi, Bloch and Purcell) to measure the nuclear magnetic moments. NMR spectroscopy. Biological tissues magnetization. NMR medical imaging device components. NMR image acquisition and reconstruction. Spatial characteristics of the NMR image. Functional NMR imaging. NMR image artifacts removing methods. Protection methods during the NMR image acquisition. Advantage and disadvantage of the NMR imaging as against other medical imaging methods.
Seminar	
Laboratory	The estimation of the nuclear magnetic resonance frequency of the proton in water. The structural analysis of some complex molecules by mean of RMN spectroscopy. The acquisition and analysis of RMN images showing different types of medical diseases. The analysis of the human circulatory system by NMR medical imaging (functional NMR imaging).

VI. Minimal required references

1. D. G. Dimitriu – Rezonanţa magnetică nucleară în medicină şi biologie – Note de curs, Edit. PIM Iaşi, 2008;
2. J. B. Lambert, E. P. Mazzola – Nuclear magnetic resonance spectroscopy. An introduction to principles, applications, and experimental methods, Pearson Education, Upper Saddle River, New Jersey, 2003;
3. P. Sprawls – Magnetic resonance imaging. Principles, methods and techniques, Medical Physics Publishing, Madison, 2000.

VII. Didactic methods

[1] FC – fundamental course, SC – specialty course, CC – complementary course
[2] Co – compulsory, El – elective, F – facultative
[3] C – colloquium, Ex – exam, CE – colloquium AND exam
[4] Professor / Associate professor / Lecturer / Assistant professor / Teaching assistant

Exposure, conversation, university lecture, synthetic analysis, demonstration, experiment, simulation

VIII. Assessment

Pre-conditions	Attendance and active participation to all laboratory activities.	
Exam dates	**1st Assessment**	**8th week**
	2nd Assessment	**16th week**

	Assessment means and methods	**Percentage of the final grade**
Exam/Colloquium	Written and oral	70%
Seminar		
Laboratory	Laboratory colloquium	30%