SEMESTER LEARNING ACTIVITY PLANS
(SLAP)
SEMESTER EVEN 2022/2023

Magnetic Resonance in Medical Physics

MFF5872 / 2 Credits

Lecturer Coordinator:

Dr. Bambang Murdaka Eka Jati, M.S.

UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
2022

Universitas Gadjah Mada
Faculty of Mathematics and Natural Science
Physics Department / Study Program Master Physics
Semester Even 2022/2023

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (credits)	Semester	Status	Prerequisite
MFF5872	*Magnetic Resonance in Medical Physics*	*2*	*Even*	*Elective*	*None*

Short Description

Magnetic Resonance in Medical Physics course is Elective course 2 credits (Theory) in the 2022 Curriculum Master Physics Study Program, Faculty of Mathematics and Natural Science UGM.

The syllabus of this course is as follows:
Magnetic resonance is related to the existence of NMR (Nuclear Magnetic Resonance) and ESR (Electron Spin Resonance) spectroscopy, also the development of NMR technology in the form of MRI (Magnetic Resonance Imaging). The basis of NMR spectroscopy; NMR spectroscopy: Zeeman's breakdown, exemplary spectrum, and super-fine spectrum. NMR spectrometer, instrumentation systems, methods of use, and analytical techniques. Several scientific cases are discussed based on NMR spectroscopy. MRI technology and history of development. MRI working principles, instrumentation systems, imaging techniques, SOPs for use, and safety dynamics.

The courses are held in class for 14 weeks, each week's session last for 2 x 50 minutes. Four weeks of course period is used for Midterm Exam and Final Exam, each held for two weeks as scheduled.

Student evaluation for course assessments is performed summative and formative. The summative evaluation is implemented as written exams, both Midterm and Final Exam, which take a maximum of 120 minutes. The formative evaluation is implemented as individual assignments for each student in the form of completing an assignment individually. Monitoring is carried out by observing student activities during the course, such as attendance, Q&A and discussion about the material presented, and student performance in completing individual assignments.

Program Learning Outcomes (PLO) Imposed on the Course

PLO 2	Having the professional ability of a scientist.
PLO 3	Mastering further knowledge of classical and modern physics theory, and its relationship with other disciplines, and has mastered an advanced field of physics specialization that allows him to keep up with the latest international research developments.
PLO 4	Mastering various mathematical disciplines related to an advanced field of physics, and able to develop physical models using various mathematical and computational tools with an inter or multidisciplinary approach to solving problems related to an advanced field of physics.
PLO 5	Able to plan, manage and carry out experiments and conclude the results, or be able to create and use modeling and simulations based on the basic principles of physics to study and solve a problem in a scientific field of Physics or applied Physics that produces models, methods, or theories tested and innovative.
PLO 6	Able to apply knowledge to analyze, synthesize, formulate problems and solve problems comprehensively in one of advanced field of physics, through

		experimental or theoretical research, then be able to classify and draw conclusions about their findings for the development of science and technology.

Course Outcomes (CO)	**Upon completion of this course, students should be able to:**	
	CO1	Understand magnetic resonance and its classification.
	CO2	Understand the NMR superfine spectrum analysis method.
	CO3	Understand how the NMR spectrometer and its instrumentation work.
	CO4	Understand the application of NMR to MRI for tissue image optimization.
	CO5	Use magnetic resonance knowledge for Medical Physics research.
	CO6	
	CO7	
	CO8	

The Correlation of CO to Learning Materials and Methods, and Time Allocation		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO1			2 x 50 minutes
	CO1			2 x 50 minutes
	CO1			2 x 50 minutes
	CO2			2 x 50 minutes
	CO2			2 x 50 minutes
	CO2			2 x 50 minutes
	CO2			2 x 50 minutes
	CO3			2 x 50 minutes
	CO3			2 x 50 minutes
	CO3			2 x 50 minutes
	CO4			2 x 50 minutes
	CO4			2 x 50 minutes
	CO4			2 x 50 minutes
	CO4			2 x 50 minutes
	Final Exam/ Project Task Results/ Case Analysis Results			
Learning Methods				

Student Learning Experience	Learn to analyze and review: , , , , , , , , , , , , , .
Access to Learning Media/ LMS and Offline and Online Percentage	
Assessment Methods and Synchronization with CO	

Assessment Methods	**Assessment Percentage**	**Criteria/Indicators**	**CO1**	**CO2**	**CO3**	**CO4**
Participatory Activity*						
Project Results/ Case Study Results/ PBL Results*						
Cognitive						
Assignment	30%		7,5%	7,5%	7,5%	7,5%
Quiz						
Midterm Exam	35%		17,5%	17,5%		
Final Exam	35%				17,5%	17,5%

*) can also be obtained from the Midterm or Final Exam as the result of participatory activities or project/ case study results. According to IKU 7, the percentage of project results/ case study/ PBL results is at least 50%.

References	**Main references:** 1. Brown, M.A. & Semelka, R.C., 2003: MRI (basic principles and application), 3rd edition, Wiley-Liss, New Jersey. 2. Hendee, W.R. & Ritenour, E.R., 2002: Medical Imaging Physics, 4th edition, Wiley-Liss, New York. 3. Jati, B.M.E. & Utomo, B.A.S., 2009: Instrumentation and Analysis of Magnetic Resonance NMR, monograph of doctoral program in Physics, Department of Physics FMIPA UGM, Yogyakarta. 4. Schellart, N.A.M., 2008: Compendium of Medical Physics, Medical Technology, and Biophysics, 2nd edition, Dept. of Medical Physics, University of Amsterdam, Amsterdam. 5. Westbrook, C., 2003: MRI at a Glance, 2nd edition, Blackwell Science Ltd., Oxford.
Lecturers (*Team Teaching*)	1. Dr. Bambang Murdaka Eka Jati, M.S. 2. 3. 4.

Authorization	**Date of Drafting**	**Lecturer Coordinator**	**Head of Curriculum Committee**	**Head of Study Program**
		Dr. Bambang Murdaka Eka Jati, M.S.	Dr.Ing. Ari Setiawan	Mirza Satriawan, M.Si., Ph.D