PROGRAM PLAN AND SEMESTER LEARNING ACTIVITIES (RPKPS) SCHOOL YEAR 2021/2022

Geophysics

Artificial Intelligence for

Geosciences MFG-4649/ 2 credits

Supervisory Team:

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UNIVERSITAS GADJAH MADA FACULTY OF MATHEMATICS AND NATURAL SCIENCES
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	Gadjah Mada University Faculty of Mathematics and Natural Sciences Department of Physics / S1 Geophysics Study Program Academic Year 2021/2022		**Document Code:**
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SEMESTER LEARNING PROGRAM AND ACTIVITY PLAN (RPKPS)

Course Code	Course Name	Weight (credit)		Semester	Course Status		Prerequisite Courses
MFG-4649	*Artificial Intelligence for Geosciences*	*T: 2*	*P:-*	*Odd*	*Choice*		*MFG-1102*

Course Brief Description	This Artificial Intelligence for Geosciences (MFG-4649) course contains material on introduction to data science, especially in the field of earth science. In the digital era like today, proficiency and mastery of technology is one of the obligations that must be owned by university graduates. In particular, this course introduces the use of *data science* in earth sciences for S1 Geophysics students. In this course, students will be given material on the basic methodology of *data science* along with exercises using the Python programming language. Then students are also invited to work on small data science projects to answer problems in geoscience. In the end, students are expected to be able to understand the basic methodology of *data* science, and design the right methodology and *task analytics* to answer their respective problems that are still related to earth science.	
Graduate Learning Outcomes (CPL) Charged to MK	***CPL-2***	**Mastery of general knowledge:** Graduates are able to apply basic science (mathematics, physics, chemistry, biology, geology), and geophysics in general and their relationship with other sciences such as geology, geodesy, geochemistry, geography, computing and information technology
	CPL-4	**Application and analysis skills**: Graduates are able to carry out and manage a geophysical survey which includes scientific steps in the acquisition, processing and interpretation of data for the exploration of natural resources both for energy (e.g. oil and gas, coal, for energy exploration (e.g. oil and gas, coal, geothermal), mining materials (eg: iron, copper, gold, silver, tin) as well as groundwater and disaster mitigation
	CPL-5	**Synthesis and Evaluation Skills** : Graduates are able to interpret geophysical data in the form of solving advanced and reverse problems (inverse problems) in an integrated manner that have ambiguous characters, carry out interpretation by making models and / or solving simple forward and reverse problems and are skilled in the use of computers both for the purposes of solving geophysical problems and for communication and internet access
Course Learning Outcomes (CPMK)	**After completing the learning of this course, students are expected to be able to:**	
	CPMK-1	Able to mention the definition and history *of data science* and artificial intelligence [CPL-2]
	CPMK-2	Able to identify, compare, and design data review processes [CPL-2] [CPL-4]
	CPMK-3	Able to formulate, demonstrate, and design data correction, data cleaning, and feature engineering processes [CPL-2] [CPL-4] [CPL-5]
	CPMK-4	Able to explain classification, regression, and clustering methods [CPL-2] [CPL-4] [CPL-5]
	CPMK-5	Able to demonstrate *Artificial Neural Network* (ANN) and *Deep Learning* [CPL-2] [CPL-4] [CPL-5] methods
	CPMK-6	Able to design *data science* model evaluation [CPL-4] [CPL-5]

CPL mapping with CPMK

	CPMK1	CPMK2	CPMK3	CPMK4	CPMK5	CPMK6
CPL-2						
CPL-4						
CPL-5						

The Relationship of CPMK with Learning Materials and Forms, as well as Time Allocation

	Learning Materials	Forms of Learning	Time Allocation
CPMK-1	Able to mention the definition and history *of data science* and artificial intelligence	TCL - SCL mixed	4 Hours
CPMK-2	Able to identify, compare, and design data review processes	TCL - SCL mixed	6 Hours
CPMK-3	Able to formulate, demonstrate, and design data correction processes, data cleaning, and feature engineering	TCL - SCL mixed	4 Hours
UTS/Project Task Results/Case Analysis			
CPMK-4	Able to explain Classification, regression, and clustering methods	TCL - SCL mixed	6 Hours
CPMK-5	Able to show Artificial Neural Network *(ANN) and* Deep Learning *methods*	TCL - SCL mixed	4 Hours
CPMK-6	Able to design model evaluation *Data Science*	TCL - SCL mixed	4 Hour
UAS/ Project Task Results/ Case Analysis			

Learning Methods

Student centered Learning

Student Learning Experience

Class discussions, problem solving, *machine learning cases* in geosciences

Access Learning Media / LMS and Offline &; Online Percentage

Paper, whiteboard, laptop, ELok, zoom meeting and google meet

Assessment Methods and Alignment with CPMK

Assessment Techniques	Assessment Percentage	Criteria/ Indicators	CPMK1	CPMK2	CPMK3	CPMK4	CPMK5	CPMK 6
Participatory Activities*)	**10**	**Liveliness**						
***Project Results*/Case Study Results/PBL**	**50**	**Presentation and Final Report**						
Cognitive								
UTS	**20**	**Test scores**						
UAS	**20**	**Test scores**						

	Total	**100**							
	*) can also be obtained from UTS or UAS which is the result of participatory activities or *project* / case study results. In accordance with IKU 7, **the percentage of** participatory activities and project results/case studies/PBL results is at least 50%.								
Reference List	1. Aggarwal, C. C. (2021). An Introduction to Artificial Intelligence. In Artificial Intelligence (pp. 1-34). Springer, Cham. 2. Bishop, C. M. (2006). Pattern recognition. Machine learning, 128(9). 3. Duda, R. O., & Hart, P. E. (2006). Pattern classification. John Wiley & Sons. 4. Friedman, J. H. (2017). The elements of statistical learning: Data mining, inference, and prediction. Springer Open. 5. VanderPlas, J. (2016). Python data science handbook: Essential tools for working with data. " O'Reilly Media, Inc.". 6. Zheng, A., & Casari, A. (2018). Feature engineering for machine learning: principles and techniques for data scientists. " O'Reilly Media, Inc.".								
Name of Lecturer (*Team Teaching*)	Sudarmaji, Theodosius Marwan Irnaka								
Authorization	**Drafting Date**	**Course Coordinator**		**Coordinator of Expertise (if any)**				**Head of Study Program**	
	Aug 16, 2022	 Dr. Sudarmaji, MSi.		Dr. rer.nat. Ade Anggraini, M.T.				 Dr. Sudarmaji, MSi.	