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

Geophysics

Physical

Seismology

MFG 3109/ 2 credits

Mentoring Team:

Ade Anggraini, Wiwit Suryanto

GADJAH MADA UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
2021

	Gadjah Mada University Faculty of Mathematics and Natural Sciences Department of Physics / S1 Geophysics Study Program Academic Year 2021/2022	**Document Code:** .....

SEMESTER LEARNING PROGRAM AND ACTIVITY PLAN (RPKPS)

Course Code	Course Name	Weight (credit)	Semester	Course Status	Prerequisite Courses
MFG3109	Seismology	T:2, P:1	Odd	Mandatory	MFG2921

Course Brief Description	Seismology is the study of earthquakes, including matters related to the propagation of elastic waves (seismic) in the earth, including conclusions about the structure of the earth. The material of this course is: History and insight of seismology*: development of elasticity theory and seismology, early knowledge of the inner earth; Seismological instrumentation*: seismometers and seismographs, period problems, seismometer calibration; *Seismic waves*: types and speeds of seismic waves through face-to-face meetings, as well as online (synchronous/asynchronous). Weekly materials can be accessed by students through the GitHub platform before the lecture starts so that students can study first so that they are better prepared for class sessions. The lecturer will give an explanation of the week's topic, then give students the opportunity to ask questions. If necessary, lecturers can also hold quizzes (pre test or post test) to see student understanding. Assignments will be given in a structured manner (there are clear instructions either in writing or orally) as part of an independent learning method, either in the form of individual assignments or in the form of group assignments (collaborative learning) Students will also be given assignments in the form of case studies *where students are expected to be able to conduct comprehensive studies by applying concepts that have been explained by lecturers at previous meetings. Snell's law, head waves, body waves from long/near/medium range earthquakes, surface waves, microwaveseismic waves; Source parameters and their determination*: epicenter, hypocenter, magnitude and energy, earthquake intensity; *Earthquake source mechanism*: fault plane resolution and earthquake source mechanism parameters. The learning method used in this lecture is in the form *of blended learning* (a combination of face-to-face sessions in class and online synchronously or asynchronously)
Graduate Learning Outcomes (CPL) Charged to MK	***CPL-1***	**Good Attitude:** Graduates are honest, disciplined, curious, critical, confident, independent, emotionally mature, cooperative, and trustworthy. Uphold norms, values, morals, religion, general ethics and professional ethics, and actively play a role in the global movement of sustainable development and behave professionally
	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-3	**Operational and comprehensive skills** : Graduates are able to apply all geophysical methods (seismic, gravitational, magnetic, electrical, electromagnetic, and thermic methods) to

<table>
<tr><td></td><td></td><td>energy exploration (e.g. oil and gas, coal, geothermal), mining materials (e.g. iron, copper, gold, silver, tin) and groundwater and disaster mitigation</td></tr>
<tr><td></td><td>CPL-4</td><td>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.</td></tr>
<tr><td></td><td>CPL-5</td><td>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.</td></tr>
<tr><td rowspan="3">Course Learning Outcomes (CPMK)</td><td colspan="2">After completing the learning of this course, students are expected to be able to:</td></tr>
<tr><td>CPMK-1</td><td>Students will be able to explain the definition of seismology and its insights, the position of seismology in geophysics, and the history of the development of elasticity theory and seismograph installations [CPL-1, CPL-2, CPL-3]</td></tr>
<tr><td>CPMK-2</td><td>Students can find P and S wave phases of local, regional, and distant earthquakes. [CPL-1, CPL-3]</td></tr>
<tr><td></td><td>CPMK-3</td><td>Students can calculate the parameters of the earthquake source: time of occurrence, position, strength/energy of the earthquake and earthquake intensity. [CPL-1, CPL-4]</td></tr>
<tr><td></td><td>CPMK-4</td><td>Students can interpret the type of earthquake source through determining the source mechanism using P waves and stereonet projection. [CPL-1, CPL-5]</td></tr>
<tr><td>CPL mapping with CPMK</td><td colspan="2">
<table>
<tr><th></th><th>CPMK1</th><th>CPMK2</th><th>CPMK3</th><th>CPMK4</th></tr>
<tr><td>CPL-1</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CPL-2</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CPL-3</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CPL-4</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CPL-5</td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td rowspan="3">The Relationship of CPMK with Learning Materials and Forms, as well as Time Allocation</td><td></td><td>Learning Materials</td><td>Forms of Learning</td><td>Time Allocation</td></tr>
<tr><td>CPMK1</td><td>History and insights of</td><td>TCL - SCL mixed</td><td>2 Hours</td></tr>
<tr><td>CPMK1</td><td>Instrumentation in seismology</td><td>TCL - SCL mixed</td><td>2 Hours</td></tr>
</table>

		(1): Definition of seismograph, seismogram, seismometer, and seismoscope Basic principles of seismometer, Second-order system		
	CPMK1	Instrumentation in seismology (2): Seismometer, Period problem, Seismometer calibration	TCL - SCL mixed	2 Hours
	CPMK1	Stress, strains, and earthquakes	TCL - SCL mixed	2 Hours
	CPMK2	Body waves, surface waves and their seismograms	TCL - SCL mixed	2 Hours
	CPMK3	Earthquake source parameters: epicenter and magnitude	TCL - SCL mixed	2 Hours
	CPMK3	Earthquake source parameters: earthquake source mechanism	TCL - SCL mixed	2 Hours
	UTS/Project Task Results/Case Analysis Results			
	CPMK2	Introduction to earthquake catalogs and sources of uncertainty	TCL - SCL mixed	2 Hours
	CPMK2	Quality of earthquake catalogue: Completeness of magnitude, homogeneity of magnitude scales, spatial variability and duration	TCL - SCL mixed	2 Hours
	CPMK2	Quality of earthquake catalog: Completeness of magnitude, homogeneity of magnitude scales,	TCL - SCL mixed	2 Hours

		Spatial and Duration		
	CPMK3	GR's law, Seismicity parameter (b value),	TCL - SCL mixed	2 Hours
	CPMK4	Seismicity parameters: statistical	TCL - SCL mixed	2 Hours
	CPMK4	Seismicity Parameter Analysis and Physical	TCL - SCL mixed	2 Hours
	CPMK4	Case study of tectonic conditions based on statistical analysis of seismicity parameters	TCL - SCL mixed	2 Hours
	UAS/ Project Task Results/ Case Analysis			
Learning Methods	TCL - SCL mixed			
Student Learning Experience	Download and study lecture materials Work on assignments			
Access Learning Media / LMS and Offline &; Online Percentage	Synchronous or asynchronous in-person/virtual lectures			

Assessment Methods and Alignment with CPMK	**Assessment Techniques**	**Assessment Percentage**	**Criteria/ Indicators**	**CPMK-1**	**CPMK-2**	**CPMK-3**	**CPMK-4**
	Participatory Activities*)						
	***Project Results/*Case Study Results/PBL Results*)**						
	Cognitive						
	Assignment	**25**					
	Quiz	**25**					
	UTS	**25**					
	UAS	**25**					
	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. Anatomy of Seismograms by Otto Kulhanek. 2. An Introduction to Seismology, Earthquakes, and Earth Structure by, S. Stein & M. Wysession.			
Name of Lecturer (*Team Teaching*)	Ade Anggraini, Wiwit Suryanto			
Authorization	**Drafting Date**	**Course Coordinator**	**Coordinator of Expertise (if applicable)**	**Head of Study Program**
	2022			 Dr. Sudarmaji, MSi