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

Geophysics

Global Positioning System (GPS)

MFG 4709/ 2 credits

Mentoring 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:** .....

SEMESTER LEARNING PROGRAM AND ACTIVITY PLAN (RPKPS)

Course Code	Course Name	Weight (credit)		Semester	Course Status	Prerequisite Courses
MFG 4709	*Global Positioning System (GPS)*	*T: 2*	*P: -*	*Even*	*Choice*	*Basic Physics I*

Course Brief Description	After attending the lecture, students are expected to understand the basic concepts and developments of GNSS as well as the principles of positioning with navigation satellite technology. The material studied includes geodetic coordinate systems and frames of reference, orbits and ephemeris of GPS satellites, GPS observation signals and data, biases and errors, GPS positioning and data processing methods, UTM projection systems, and coordinate transformation, as well as GNSS applications for monitoring earth plates	
Graduate Learning Outcomes (CPL) Charged in 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-3	**Operational and comprehensive skills**: Graduates are able to apply all geophysical methods (seismic, gravitational, magnetic, electrical, electromagnetic, and thermic methods) 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.
Course Learning Outcomes (CPMK)	**After completing the learning of this course, students are expected to be able to:**	
	CPMK-1	Understand the concept of coordinate systems and geodetic reference frames of local and global systems for mapping (G.2.1)
	CPMK-2	Describe and discuss the orbital system, signals and GNSS equipment (G.2.4)
	CPMK-3	Understand the concepts of error and bias in GPS positioning methods and determine appropriate methods of observation and data processing according to accuracy criteria (G.3.2)
	CPMK-4	Understand and calculate the transformation of GPS position coordinates into national systems and map projection fields (G.2.1)
	CPMK-5	Understand the concept of GPS positioning for earthquake monitoring (G.3.5)

CPL Mapping with CPMK

	CPMK1	CPMK2	CPMK3	CPMK4	CPMK5
CPL-2	√	√		√	
CPL-3			√		√

CPMK link with Material and Form Learners, as well

	Learning Materials	Forms of Learning	Time Allocation
CPMK1	Geodetic Coordinate System and Frame of reference	TCL - SCL mixed	4 Hours
CPMK2	Basic Concepts of GNSS	TCL - SCL mixed	2 Hours
CPMK2	GPS satellite orbit and ephemeris	TCL - SCL mixed	2 Hours

as Time Allocation	***CPMK2***	GPS signals and equipment	TCL - SCL mixed	2 Hours
	CPMK3	GPS observation error and bias	TCL - SCL mixed	2 Hours
	CPMK3	GPS Observation Methods	TCL - SCL mixed	2 Hours
	UTS/Project Task Results/Case Analysis Results			
	CPMK3	The principle of absolute and relative positioning,	TCL - SCL mixed	2 Hours
	CPMK3	Types of GPS Surveys	TCL - SCL mixed	2 Hours
	CPMK3	GPS Data Processing and Control Methods	TCL - SCL mixed	2 Hours
	CPMK4	Coordinate transformation	TCL - SCL mixed	2 Hours
	CPMK4	UTM projection system	TCL - SCL mixed	2 Hours
	CPMK5	GPS application for monitoring	TCL - SCL mixed	2 Hours
	UAS/ Project Task Results/ Case Analysis			
Learning Methods	TCL – SCL (with CBL) mixed			
Student Learning Experience	Study, discussion, Q&A			
Access to Learning Media an/ LMS and Offline &; Online Percentage	E-Learning Simaster or Elok			

Assessment Methods and Alignment with CPMK	**Assessment Techniques**	**Assessment Percentage**	**Criteria/ Indicator**	**CPMK-1**	**CPMK-2**	**CPMK-3**	**CPMK-4**	**CPMK-5**
	Participatory Activities*)							
	***Project* Results / Case Study / PBL Results *)**							
	Cognitive							
	Assignment: 1. Calculation and depiction of point position in 3D coordinate system 2. Exercises/tasks	**30**		√		√	√	√

	GPS positioning 3. Paper GPS application							
	Quiz	**10**			√	√		
	UTS	**30**		√	√	√		
	UAS	**30**				√	√	√
	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. Elliott D. Kaplan, Christopher J., and Hegarty, 2018, Understanding GPS/GNSS: Principles and Applications*, 3rd Edition, Artech.* 2. Leick, A.,2015, GPS Satellite Surveying, John Wiley & Sons,Maine, 4th edition 3. Abidin, H.Z, 2008, GPS Positioning and Its Applications 4. Aris Sunantyo, T., 1999, Introduction to Satellite GPS Surveying, Geodesy Engineering, Fak. Engineering Universitas Gadjah Mada, Yogyakarta 5. Teunissen, P.J.G. and A. Kleusberg (eds), 1998 GPS for Geodesy, Springer, Berlin.
Name of Lecturer (*Team Teaching*)	Dr. Ir. T Aris Sunantyo, M.Sc. Dr. Ir. Dwi Lestari, ST, ME, IPM

Authorization	**Drafting Date**	**Course Coordinator**	**Coordinator of Expertise (if applicable)**	**Head of Study Program**
	2020	 Dr. Ir. Dwi Lestari		 Dr.. Sudarmaji,MSi