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

Geophysics of Geothermal

Exploration

MFG 4727/ 2 credits

Mentoring Team:

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**UNIVERSITAS GADJAH MADA FACULTY OF MATHEMATICS AND NATURAL SCIENCES**
**2021**

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

## SEMESTER LEARNING PROGRAM AND ACTIVITY PLAN (RPKPS)

| Course Code | Course Name | Weight (credit) | | Semester | Course Status | Prerequisite Courses |
|---|---|---|---|---|---|---|
| *MFG 4727* | *Geothermal Exploration* | *T: 2* | *P:-* | *Odd* | *Choice* | *All Geophysical methods* |

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| **Course Brief Description** | Geophysical methods is one of three major disciplines applied to exploring geothermal resources, including geology and geochemistry. The most successful methods are aimed at parameters that are directly affected by geothermal activity, such as magnetic, electromagnetic and MEQ methods. Successful geothermal exploration leads to resource development, and its success can save time, effort and money, for the utilization of new renewable energy, which will nationally improve a country's energy security.<br>After attending geothermal exploration lectures, students are expected to be able to explain hydrothermal systems and be able to determine the boundaries of geothermal energy source prospect areas, dimensions, and conditions using integrated geophysical methods together with geology and geochemistry. | |
| **Graduate Learning Outcomes (CPL) Charged n in MK** | ***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*** | Students know the elements of geothermal systems and their relationship to geophysical methods [CPL-4] |
| | ***CPMK-2*** | Students are able to integrate geophysical methods for geothermal exploration. [CPL-5] |

**CPL Mapping with CPMK**

| | CPMK1 | CPMK2 |
|---|---|---|
| CPL-4 | √ | |
| CPL-5 | | √ |

| CPMK link with | | Learning Materials | Forms of Learning | Time Allocation |
|---|---|---|---|---|
| | ***CPMK1*** | Introduction: geothermal definition | TCL - SCL mixed | 2 Hours |

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| **Material and Form of Learning, as well as Time Allocation** | ***CPMK1*** | Geothermal Geology: The Tectonic Order | TCL - SCL mixed | 2 Hours |
| | ***CPMK1*** | Geothermal Geology: Types of Geothermal Systems | TCL - SCL mixed | 2 Hour |
| | ***CPMK1*** | Geothermal Geology: Geothermal Manifestations | TCL - SCL mixed | 2 Hour |
| | ***CPMK1*** | Geothermal Geochemistry: Alteration | TCL - SCL mixed | 2 Hours |
| | ***CPMK1*** | Geothermal Geochemistry: Ternary Diagrams | TCL - SCL mixed | 2 Hours |
| | ***CPMK1*** | Geothermal Geochemistry: Geothermometer | TCL - SCL mixed | 2 Hours |
| | ***CPMK2*** | Geophysical Methods for Geothermal Exploration | TCL - SCL mixed | 2 Hours |
| | ***CPMK2*** | Case Study 1: Gravity Methods for Geothermal Exploration | TCL - SCL mixed | 2 Hour |
| | ***CPMK2*** | Case Study 2: Magnetic Methods for Geothermal Exploration | TCL - SCL mixed | 2 Hour |
| | ***CPMK2*** | Case Study 3: DC Resistivity Method for Geothermal Exploration | TCL - SCL mixed | 2 Hour |
| | ***CPMK2*** | Case Study 4: Electromagnetic Methods for Geothermal Exploration | TCL - SCL mixed | 2 Hour |
| | ***CPMK2*** | Case Study 5: MEQ Method for Geothermal Exploration | TCL - SCL mixed | 2 Hour |
| | ***CPMK2*** | Case Study 6: Temperature Methods for Geothermal Exploration | TCL - SCL mixed | 2 Hour |
| **Learning Methods** | TCL - SCL mixed | | | |
| **Student Learning Experience** | Listen to lecturers' explanations, presentations and discussions | | | |
| **Access to Learning Media an/ LMS and Offline &; Online Percentage** | LCD, Simaster (e-learning), 100% offline | | | |

| **Assessment Methods and Alignment with CPMK** | **Assessment Techniques** | **Assessment Percentage** | **Criteria/ Indicators** | **CPMK-1** | **CPMK-2** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Participatory Activities*)** | **20** | **Participation Rubric** | √ | | | | |
| | ***Project* Results / Case Study / PBL Results *)** | **40** | **Case Study Results Presentation Assessment Rubric** | | √ | | | |

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| | **Cognitive** | | | | | | | |
| | **UTS** | **20** | | √ | | | | |
| | **UAS** | **20** | | | √ | | | |
| | **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. Ellis, A.J., and Mahon, W.A.J., 1977, Chemistry and Geothermal systems. Academic press Inc.<br>2. Rybach, L. and Muffler, L.P.J., 1981, Geothermal Systems; Priciples and case Histories. John Wiley and Sons.<br>3. Hochstein, M.P. and Sayogi S., 2010, Indonesia Development of Geothermal Procpecting. Geothermics.<br>4. Stober, Ingrid, Bucher, Kurt, 2013, Geothermal Energy From Theoretical Models to Exploration and Development, Springer. | | | | | | | |
| **Name of Lecturer (*Team Teaching*)** | 1. Dr. rer. Nat. Mochamad Nukman<br>2. Dr. rer. Nat. Sintia Windhi Niasari | | | | | | | |

| **Authorization** | **Drafting Date** | **Course Coordinator** | **Coordinator of Expertise (if applicable)** | **Head of Study Program** |
|---|---|---|---|---|
| | *2022* | | | Dr. Sudarmaji, MSi |