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

Geophysical Computational

Methods

MFG-1102/ 2 credits

Supervisory

Team: Wiwit

Suryanto

**GADJAH MADA UNIVERSITY**
**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 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-1102* | *Computational Methods* | *T: 2* | *P:1* | *Odd* | *Mandatory* | | - |

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| **Course Brief Description** | After attending and graduating from this lecture, students are expected to be able to make simple application programs to solve physics and geophysical problems, and be able to process and analyze geophysical data using computer programs. | |
| **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) 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*** | Explain basic terms in computing, programming languages, and algorithms. [CPL-1] [CPL-2] |
| | ***CPMK-2*** | Demonstrate Python and/or Matlab to solve geophysical problems. [CPL-1] [CPL-3] |

**CPL mapping with CPMK**

| | CPMK1 | CPMK2 |
|---|---|---|
| CPL-1 | | |
| CPL-2 | | |
| CPL-3 | | |

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

| | Learning Materials | Forms of Learning | Time Allocation |
|---|---|---|---|
| ***CPMK-1*** | Motivation understanding of computational methods | TCL - SCL mixed | 2 Hour |
| ***CPMK-1*** | Time series data analysis | TCL - SCL mixed | 2 |
| ***CPMK-1*** | Looping with loops | TCL - SCL mixed | 2 |
| ***CPMK-1*** | Store data in lists, tuples, etc | TCL - SCL mixed | 2 Hour |
| ***CPMK-1*** | Data analysis from multiple files | TCL - SCL mixed | 2 |
| ***CPMK-1*** | Creating functions, errors and handling them | TCL - SCL mixed | 2 Hour |

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|---|---|---|---|---|
| | ***CPMK-2*** | Defensive programming, some geophysical applications with Python/Matlab language | TCL - SCL mixed | 2 Hours |
| | **UTS/Project Task Results/Case Analysis** | | | |
| | ***CPMK-1*** | Classes in Python | TCL - SCL mixed | 2 |
| | ***CPMK-1*** | *Interfacing* (Command Line Interface and Graphical User Interface) | TCL - SCL mixed | 2 Hours |
| | ***CPMK-1*** | *Benchmarking* and *profiling* | TCL - SCL mixed | 2 |
| | ***CPMK-1*** | Concurrency and parallelization | TCL - SCL mixed | 4 |
| | ***CPMK-2*** | Geophysical applications using Python/Matlab: geostatistical calculations, data analysis in space-frequency regions, filtering | TCL - SCL mixed | 2 Hours |
| | ***CPMK-2*** | Computational and programming applications in physics and geophysics: interpolation, sorting | TCL - SCL mixed | 2 Hours |
| | **UAS/ Project Task Results/ Case Analysis** | | | |

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| **Learning Methods** | Student centered Learning, Presentations, discussions |
| **Student Learning Experience** | Students listen to the lecturer's explanation when the lecturer presents, then continues the discussion / question and answer. |
| **Access Learning Media / LMS and Offline &; Online Percentage** | LCD, paper, Simaster and ELok (e-learning), presentation impressions. |
| **Assessment Methods and Alignment with CPMK** | |

| Assessment Techniques | Assessment Percentage | Criteria/Indicators | CPMK1 | CPMK2 |
|---|---|---|---|---|
| **Participatory Activities*)** | 10 | Participation Rubric | | |
| **Project Results/ Case Study Results/ PBL Results*)** | 20 | Task grading rubric | | |
| **Cognitive** | | | | |
| **UTS** | 35 | Answer key | | |
| **UAS** | 35 | Answer key | | |
| **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. Landau, R. H., &; Páez, M. J. (2018). Computational Problems for Physics: With Guided Solutions Using Python. CRC Press.
2. Matthes, E. (2019). Python crash course: A hands-on, project-based introduction to programming. No starch press.
3. Press, W. H., Teukolsky, S. A., Vetterling, W. T., &; Flannery, B. P. (2007). Numerical recipes 3rd edition: The art of scientific computing. Cambridge university press.

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| **Name of Lecturer (*Team Teaching*)** | 1. Wiwit Suryanto<br>2. Theodosius Marwan Irnaka | | | |
| **Authorization** | **Drafting Date** | **Course Coordinator** | **Coordinator of Expertise (if any)** | **Head of Study Program** |
| | *Aug 18, 2022* | Dr.rer.nat. Wiwit Suryanto M.Si. | Dr. rer.nat. Ade Anggraini, M.T. |  <br>Dr. Sudarmaji, MSi. |