	INSTITUT TEKNOLOGI SEPULUH NOPEMBER FACULTY OF CIVIL PLANNING AND GEO ENGINEERING GEOPHYSICAL ENGINEERING DEPARTMENT UNDERGRADUATE PROGRAM (S1)	
Course	**Course Name**	**Electromagnetic Exploration**
	Course Code	**CF234420**
	Credit (SKS)	**3 (Three)**
	Semester	**4 (Four)**
COURSE DESCRIPTION		
This course explains kbasic concepts of electromagnetic fields (MT, CSAMT, VLF, GPR), basic principles of the Law of Electromagnetic Induction, Maxwell, magnetic transfers, electric transfers, far field, near field. The role of electromagnetic methods in the exploration of minerals, oil and gas and earth resources; type of source and receiver; Get to know low-frequency EM methods: magnetotelluric (MT, Control Source Audio Magnetotelluric (CSAMT), radio magnetotelluric (RMT), Very Low Frequency (VLF), Transient Electromagnetics (TEM), EM induction; Understand high-frequency EM methods: Ground-penetrating radar (GPR), Remote Sensing; low frequency EM practicum (VLF, TEM), high frequency EM laboratory (GPR), and examples of EM applications in geotechnical, mining, hydrogeological studies, earth crust studies, oil and gas and geothermal explorationThe course applies case method-project based learning.		
PROGRAM LEARNING OUTCOMES (PLO)		
PLO-5	Able to explain concepts, principles of geophysical methodology to create or modify models in solving complex geophysical engineering problems (complex geophysical engineering problems) in depth and procedurally by prioritizing concepts and principles of environmental conservation, occupational safety and health in the laboratory and field, principles and current issues in legal, economic, environmental, socio-cultural, political, health and safety aspects, sustainable development as well as the development of the latest technology and advanced materials in the field of geophysical engineering.	
PLO-6	Able to apply procedural processes or components of geophysical engineering methods starting from identifying, formulating, analyzing and finding the source of problems, proposing the best solutions to solve problems, designing and operationalizing processes, processing systems and equipment needed in existing geophysical engineering designs, utilizing resources local, national resources as well as engineering design and analysis tools that are most appropriate, effective and efficient in solving geophysical engineering problems in depth by taking into account legal, economic, environmental, socio-cultural, political, health, public safety, cultural and sustainable development factors development).	
COURSE LEARNING OUTCOMES (CLO)		
CLO-1	Able to master the concepts and principles of mathematics and natural science for Electromagnetic Methods (GPR, VLF, and MT)	
CLO-2	Able to implement Electromagnetic Methods procedurally starting from data search, processing, subsurface geology and modeling to solve in-depth engineering problems.	
SUB COURSE LEARNING OUTCOMES (SUB CLO)		
Sub CLO-1	[C2,A3] Be able to explain the basic concepts and principles of Electromagnetic Waves and their relationship to the physical characteristics of rocks	

Sub CLO-2	[C3, P3, A4] Able to explain concepts, process and interpret low frequency EM data: Very Low Frequency
Sub CLO-3	[C3, P3, A4] Able to explain concepts, process and interpret low frequency EM data: Magnetotelluric
Sub CLO-4	[C3, P3, A4] Able to explain concepts, process and interpret high frequency EM data: Ground Penetrating Radar

STUDY MATERIALS

- **Basic concepts of electromagnetic waves**: wave properties, physical and mathematical principles for electric and magnetic fields.
- **Electromagnetic exploration management**procedurally: Concept, survey design with 1D-2D, data processing and interpretation.
- **Application of EM methods in the earth field:**Writing scientific reports with integration of EM method data and geological conditions, map standards and geophysical cross sections.

PRECONDITION

Geophysical Data Modeling, Mathematical Geophysics, Rock Physics, Geodynamics

REFERENCES

1. Telford, W., Geldart, LP, Sheriff, RE (1976). Applied Geophysics. Cambridge Univ Press, Cambridge.
2. Zhdanov, MS (2009). Geophysical Electromagnetic Theory and Methods. Elsevier.
3. Simpson, F. and Bahr, K. (2005). Practical Magnetotelluric. Cambridge.
4. Griffiths, DJ (1999). Introduction to Electrodynamics, 3rd ed., Prentice Hall.
5. Journal of Geophysics
6. Google Scholar Wien Lestari:https://scholar.google.co.id/citations?user=_wrH5DsAAAAJ&hl=en

Journal Paper for Citations:

1. Identification of Soil Contamination Using VLF-EM and Resistivity Methods : A Case Study (http://iptek.its.ac.id/index.php/jts/article/view/5004)

Seminar Paper for Citation:

1. Mapping of Kendeng Thrust Active Fault in East Java Using Magnetotelluric Method(https://www.earthdoc.org/content/papers/10.3997/2214-4609.201800424)
2. Earthquake Risk Reduction Study with Mapping an Active Fault at The Southern of East Java(https://iopscience.iop.org/article/10.1088/1742-6596/1373/1/012031/meta)
3. Earthquake Potential Source Identification using Magnetotelluric Data of Kendeng Thrust Surabaya Area(https://www.e3s-conferences.org/articles/e3sconf/abs/2020/16/e3sconf_iceedm2020_01002/e3sconf_iceedm2020_01002.html)
4. Active Fault Delineation Using Magnetotelluric Data in The Western Region of East Java(https://iopscience.iop.org/article/10.1088/1755-1315/506/1/012054/meta)
5. Identification of geothermal systems based on 1D, 2D, 3D inversion and TDEM static shift correction study case Mt. Arjuno-Welirang, East Java(https://aip.scitation.org/doi/abs/10.1063/5.0015771)
6. Application of empirical mode decomposition (EMD) filtering at magnetotelluric time-series data(https://aip.scitation.org/doi/abs/10.1063/5.0015767)