	INSTITUT TEKNOLOGI SEPULUH NOPEMBER FACULTY OF CIVIL PLANNING AND GEO ENGINEERING GEOPHYSICAL ENGINEERING DEPARTMENT UNDERGRADUATE PROGRAM (S1)	
Course	**Course Name**	**Seismic Exploration**
	Course Code	**CF234313**
	Credit (SKS)	**3 (Three)**
	Semester	**3 (Three)**
COURSE DESCRIPTION		
This course explains the basic concepts of seismic wave propagation phenomena as well as the use of Active Seismic Methods (Reflection - Refraction) and Passive Seismic Methods. The course applies case method-project based learning.		
PROGRAM LEARNING OUTCOMES (PLO)		
PLO-5	Able to explain the concepts and principles of geophysical engineering methods that utilize geological, geospatial, instrumentation and information technology data to create or modify models to solve complex geophysical and geophysical engineering problems in depth and procedurally by prioritizing conservation concepts and principles environment, occupational safety and health in the laboratory and field, current principles and 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 processes or components of geophysical engineering methods to create or modify models that utilize geological, geospatial, instrumentation and information technology data procedurally starting from identifying, formulating, analyzing and finding the source of the problem, proposing the best solution to solve the problem, designing and operationalizing the process, processing systems and hardware and software equipment required in existing geophysical engineering designs, local and national resources as well as engineering design and analysis tools that are most appropriate, effective and efficient in solving complex geological and geophysical engineering problems in depth by taking into account factors law, economics, environment, socio-cultural, political, health, public safety, culture,and sustainable development.	
COURSE LEARNING OUTCOMES (CLO)		
CLO-1	Able to explain the concept of Seismic Methods (Basic Sciences, physical parameters and basic laws).	
CLO-2	Able to implement the Seismic Method procedurally starting from data search, processing, subsurface geology and modeling to solve deep problems.	
SUB COURSE LEARNING OUTCOMES (SUB CLO)		
Sub CLO-1	[C2, A3] Able to explain the basic concepts and principles of seismic waves and their relationship to the physical characteristics of rocks using written tests.	
Sub CLO-2	[C3, P3, A4] Able to implement the Seismic Refraction Exploration method procedurally.	
Sub CLO-3	[C3,P3,A4] Able to implement the Reflection Seismic Exploration method procedurally.	

Sub CLO-4	[C3,P3,A4] Able to implement the Passive Seismic Exploration method procedurally.

STUDY MATERIALS

- Elastic properties of earth materials
- Seismic wave propagation theory
- Ray theory
- Seismic wave speed & Seismic event characteristics
- Seismic Refraction-Seismic Reflection (Basic Concepts): Reflection, refraction and CDP surveys; land and marine seismic sources, generation and propagation of elastic waves, velocity – depth models, geophones, hydrophones, recording instruments (DFS), digital formats, field layouts, seismic noises and noise profile analysis, optimum geophone grouping, noise cancellation by shot and geophone arrays
- Acquisition and processing of Refraction-Reflection Seismic data
- Simple interpretation and modeling of Seismic Refraction-Seismic Reflection
- Introduction to Passive Seismic Methods
- Utilization of seismic methods in geophysical exploration

PRECONDITION

Seismology
Geophysical Data Modeling
Structural Geology

REFERENCES

1. Shearer, P. M., 2009, Introduction to Seismology, Cambridge University Press, Cambridge, UK.
2. Zobin, V. M., 2012, Introduction to Volcanic Seismology, Elsevier, London, UK.
3. Jens Havskov, Gerardo Alguacil (auth.)-Instrumentation in Earthquake Seismology-Springer International Publishing (2016)
4. Barbara Romanowicz, Adam Dziewonski-Seismology and Structure of the Earth_ Treatise on Geophysics-Elsevier (2009)
5. Agustin Udías-Principles of Seismology-Cambridge University Press (2000).
6. Applied Geophysics – Seismic Method
7. Keilis-Borok (auth.), V. I. Keilis-Borok, Edward A. Flinn (eds.)-Computational Seismology-Springer US (1995)
8. Geophysical Journal