



<b>Course Code</b> OGEE-460	<b>Course Title</b> Geophysical Methods	<b>ECTS Credits</b> 6
<b>Department</b> Engineering	<b>Semester</b> Fall, Spring	<b>Prerequisites</b> MATH-191, PHYS-150
<b>Type of Course</b> Elective	<b>Field</b> Oil and Gas Engineering	<b>Language of Instruction</b> English
<b>Level of Course</b> 1 <sup>st</sup> Cycle	<b>Year of Study</b> 4 <sup>th</sup>	<b>Lecturer(s)</b> Dr Elias Gravanis
<b>Mode of Delivery</b> Face-to-face	<b>Work Placement</b> N/A	<b>Co-requisites</b> None

### Objectives of the Course:

The main objectives of the course are to:

- Introduce the students to the concepts of seismic waves.
- Teach the students to handle basic calculations with refracted and reflected seismic waves.
- Help the students to analyze and process data of recorded seismic waves from the field so as to interpret the position of possible hydrocarbon reserves in sedimentary basins.
- Introduce the students to the concepts of gravitational methods in geophysical exploration.
- Familiarize the students with explorational methods that arise from the magnetic anomalies of the earth's geodynamic system.
- Application of numerical calculations with geo-electrical methods.
- Software/numerical simulations.

### Learning Outcomes:

After completion of the course students are expected to:

- Understand the basic types of seismic waves (Compressional, Shear, Rayleigh and Love).
- Perform calculations utilizing Snell's law and understand the importance of transmission and reflection coefficients.
- Understand the reflection and refraction of waves from single and multi-layer structures in horizontal and dipping configurations so as to calculate parameters like velocity, layer thickness and dip angle of the layers.
- Handle numerical calculations of the following methods: plus minus, normal moveout, root mean square velocities (RMS) and travel two way times.
- Understand the concept of stacking for data enhancement, seismic migration, 3D seismic reflections and filtering of seismic data.
- Understand the Bouguer gravity and the concepts of gravitational attraction of structures with simplified geometry (Sphere, Cylinder, Plate)

- Perform calculations and understand the concepts of anomalies caused by magnetized structures (horizontal and inclined plates). Specifically the students will perform calculations with the following methods: Dipole models, irregular 2D models and compound 3D models so as to gain knowledge in interpreting magnetic anomalies.
- Apply geo-electrical methods in the search and discovery of hydrocarbons. The output of these methods basically includes the analysis of electrical resistivity of measurements obtained with the following methods: Barnes parallel resistor method, cumulative resistivity inversion method, characteristic curves method and electromagnetic surveying.

**Course Contents:**

- Seismic waves.
- Refracted seismic waves.
- Reflected seismic waves.
- Data processing and interpretation.
- Gravitational methods.
- Magnetic methods.
- Geo-electrical methods

**Learning Activities and Teaching Methods:**

Lectures, in class exercises, computer laboratory, discussion.

**Assessment Methods:**

Homework, mid-term tests, final exam.

**Required Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
Robinson S. Edwin and Coruh Cahit	Basic Exploration Geophysics	Wiley	1998	047187941X

**Recommended Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
Kearey Philip, Brooks Mike and Hill Ian	An Introduction to Geophysical Exploration	Wiley	2013	1118698932
Milsom John	Field Geophysics 3 <sup>rd</sup> Edition	Wiley	2003	0470843470