



Course Code OGEE-460	Course Title Geophysical Methods	ECTS Credits 6
Department Engineering	Semester Fall, Spring	Prerequisites MATH-191, PHYS-150
Type of Course Elective	Field Oil and Gas Engineering	Language of Instruction English
Level of Course 1 st Cycle	Year of Study 4 th	Lecturer(s) Dr Elias Gravanis
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites 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 rise 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 rd Edition	Wiley	2003	0470843470