



Course Code OGEE-560DL	Course Title Geophysical Methods	ECTS Credits 7.5
Department Engineering	Semester Fall, Spring	Prerequisites None
Type of Course Elective	Field Oil, Gas and Energy Engineering	Language of Instruction English
Level of Course 1 st Cycle	Year of Study 1 st /2 nd	Lecturer(s) Dr. Ernestos Sarris
Mode of Delivery Distance Learning	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.
- Study the application of numerical calculations with geo-electrical methods.
- Consider the formation evaluation from geophysical well logging.
- 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.
- Understand the methods of electric logging and radioactivity logging for formation evaluation. Specifically the students will identify the lithology of the well, bed thickness, porosity, water/hydrocarbon saturation and permeability of the formation.

Course Contents:

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

Learning Activities and Teaching Methods:

Lectures, Online Questions, Projects, Discussion

Assessment Methods:

Assignments, Online Exercises, 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