



**Faculty of Earth Sciences**



**Geophysics Department**



**The Geological Society**  
Accredited degree courses

***INTRODUCTION TO GEOPHYSICS***

<b>Course Name</b>	<b>Course ID</b>	<b>Prerequisites</b>
<b><i>INTRODUCTION TO GEOPHYSICS</i></b>	<b><i>EGP 211</i></b>	<b><i>EMR 201, PHYS 110, PHYS 281</i></b>

**Time Table for Course Lectures**

**INTRODUCTION TO GEOPHYSICS (EGP 211)**

<b>Week</b>	<b>Lecture Topic</b>
1	<b>Note Outline: Refraction Seismic Methods</b> <sup>[1]</sup> <b>Introduction Seismic Methods: Refraction and Reflection</b> Advantages and Disadvantages of Seismic Methods versus Other Methods Studied Advantages and Disadvantages of Refraction and Reflection Methods / Elastic Waves Types of Seismic Waves Wave Propagation: Wave fronts and Raypaths
2	<b>Seismology and Geology:</b> Wave Interaction with Boundaries, Snell's Law Velocities and Rock Properties Seismic Velocities of Common Earth Materials
3	<b>Refraction Basics</b> Another Simple Earth Model: Low-Velocity Layer Over a Half space Head Waves, Records of Ground Motion Travel-time Curves for a Simple Earth Model First Arrivals
4	Determining Earth Structure from Travel Times Derivation of Travel Time Equations High-Velocity Layer Over a Half space: Reprise <b>Refraction Seismic Equipment and Field Procedures</b> Equipment Overview Types of Seismic Sources

	Seismometers or Geophones Recording Ground Displacement at Several Offsets
5	<b>Midterm Exam</b> , Simultaneously Recording Systems Sources of Noise
6	<b>Note Outline: Geophysical Surveying Using Gravity</b> <b>Introduction</b> Gravitational Force Gravitational Acceleration Units Associated With Gravitational Acceleration <b>Gravity and Geology</b> How is the Gravitational Acceleration, g, Related to Geology The Relevant Geologic Parameter is not Density, but Density Contrast
7	Density Variations of Earth Materials A Simple Model, Measuring Gravitational Acceleration Mass and Spring Measurements
8	<b>Factors that Affect the Gravitational Acceleration</b> Overview Temporal Based Variations 12 S6 Instrument Drift Tides, Tidal and Drift Corrections: A Field Procedure Tidal and Drift Corrections: Data Reduction Spatial Based Variations 13 M8 Latitude Dependent Changes.
9	Correcting for Latitude Dependent Changes Variation in Gravitational Acceleration Due to Changes in Elevation. Accounting for Elevation Variations: The Free-Air Correction Variations in Gravity Due to Excess Mass
10	<b>Note Outline: Geophysical Surveying Using Magnetics Methods</b> <b>Introduction</b> Magnetic Monopoles Forces Associated with Magnetic Monopoles Magnetic Dipoles Field Lines for a Magnetic Dipol , <b>Magnetization of Materials</b> Induced Magnetization Magnetic Susceptibility Mechanisms of Magnetic Induction
11	Susceptibilities of Common Rocks and Minerals Remnant Magnetism, <b>The Earth's Magnetic Field</b> Magnetic Field Nomenclature The Earth's Main Field Magnetics and Geology - A Simple Example
12	Temporal Variations of the Earth's Main Field - Overview Secular Variations, Diurnal Variations, Magnetic Storms. <b>Magnetometers</b> Instrumentation Overview, Fluxgate Magnetometers Proton Precession Magnetometers, <b>Magnetometers</b> Instrumentation Overview, Fluxgate Magnetometers Proton Precession Magnetometers, Total Field Measurements, Total Field Measurements
13	<b>Note Outline: Geophysical Surveying Using DC Resistivity Introduction</b> Active and Passive Geophysical Methods Advantages and Disadvantages of Each Method <b>Resistivity Basics</b> Current Flow and Ohm's Law The Fundamental Electrical Property is Resistivity, NOT Resistance
14	Current Density and Electric Field A First Estimate of Resistivity, Current Flow From Two Closely Spaced Electrodes

	A Practical Way of Measuring
15	<b>Resistivity Surveys and Geology</b> Sources of Noise Depth of Current Penetration Versus Current Electrode Spacing Current Flow in Layered Media 27 SI9 Variation in Apparent, Homogeneous Media Current Flow in Layered Media Versus Electrode Spacing A Second Example of Current Flow in Layered Media
16	<b>Final Exam</b>

*Reference:*

<http://www.mines.edu/academic/courses/geophysics/>