

Course Title: **Applied Geophysics (concentrated course - 4 points)**

Course Number: 224.4098

Professor Michael Lazar

Limited to 10 participants

Course Description:

This course provides an in-depth, practical exploration of geophysical methods applied to coastal environments, integrating both terrestrial and marine techniques. Students will gain hands-on experience with Ground Penetrating Radar (GPR) and Frequency Domain Electromagnetic (FDEM) systems for land-based surveys, as well as sidescan sonar, subbottom profilers, and magnetometers for shallow sea investigations. The course will cover data acquisition, processing, and interpretation, with an emphasis on real-world applications such as coastal erosion studies, sediment transport, archaeological site investigation, and environmental monitoring.

The geophysical methods examined in this course have many applications. These include: Environmental Studies (contaminant mapping, soil and groundwater studies, landfill monitoring); Construction and Civil Engineering (utility detection, concrete scanning, road and bridge inspections); Archaeology (site surveying, non-invasive exploration); Military and Security (mine detection, tunnel and bunker detection); Forensics (crime scene investigation, disaster recovery); Mining (resource exploration, mine safety); Agriculture (soil structure analysis, irrigation planning) and more.

Course Objectives:

- To understand the fundamental principles of geophysical methods applicable to coastal environments.
- To develop practical skills in operating GPR, FDEM, sidescan sonar, subbottom profiler, and magnetometer systems.
- To analyze and interpret geophysical data in the context of geoscience, archaeology and environmental issues.
- To apply geophysical methods to real-world problems, including environmental and archaeological challenges.
- To develop critical thinking and problem-solving skills in designing and conducting geophysical surveys in coastal areas.
- To prepare professional-quality geophysical reports

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Prerequisites:

- Basic knowledge of geophysics or geology.
- Familiarity with coastal processes and marine environments is recommended but not required.

Course Structure:

The course will be divided into lectures, fieldwork, lab sessions, and a final project.

Topics to be covered:

Theoretical:

- Introduction to geophysical techniques: GPR, FDEM, sidescan sonar, subbottom profiling, and magnetometry.
- Overview of coastal processes and the role of geophysics in coastal studies.
- Survey planning
- Data acquisition, processing and interpretation.

Applied:

- The applied module of the course will include land based data collection using GPR and FDEM and a marine survey utilizing the marine instruments.

Assessment:

- Fieldwork and lab reports: 40%
- Final project (report and presentation): 50%
- Participation and attendance: 10%

Recommended Texts and Resources:

- "An Introduction to Applied and Environmental Geophysics" by John M. Reynolds.
- "Applied Geophysics" by W.M. Telford, L.P. Geldart, and R.E. Sheriff.
- "Near-Surface Applied Geophysics" by Mark E. Everett