COLORADOSCHOOLOFMINES
EARTH • ENERGY • ENVIRONMENT

Course Code: GPGN 436 – Geophysical Computing
Semester Year: Fall Semesters

Instructor: Jeff Shragge, Ge Jin

Pre-requisites: CSCI250, Python programing

Required Technology: Canvas

Profile in Canvas:
As part of the learning experience at the Colorado School of Mines, our class will be utilizing online learning resources and experiences through the Canvas learning management system. In order to help build community in this online learning environment, you are encouraged to upload your profile picture to Canvas. Photos should be similar to the photos taken for passports or state identification cards.

Course Description:
This course develops the principles of geophysical computing in the context of simulating and validating numerical solutions to the types of partial differential equations commonly found in geophysical investigations (e.g., potential fields, heat flow/diffusion, seismic wave propagation). Students are introduced to architecture of modern computing systems and learn how algorithms can be developed to leverage this architecture to efficiently generate numerical solutions to multidimensional geophysical problems using efficient computing methods.

Learning Outcomes:
This senior-level undergraduate course builds on analytical geophysical and numerical/computational skills learned in previous years by applying them in the context of common geophysical computing challenges. Major objectives of the course include:

1. Students will understand and be able to apply concepts of computing in the context of solving complex geophysical problem, many involving field data.
2. Students will develop practical programming skills and combine with knowledge of numerical algorithms to solve real-world geophysical problems.
3. Students will develop independent research skills by undertaking a project involving a substantial piece of analytic, numerical and computation work involving solving a real-world geophysical problem.

4. Independently design, develop, validate and apply computer programs to solve geophysical data analysis and numerical modeling tasks, largely using the Python language and its associated tool kits (i.e., Numpy, Scipy, and Matplotlib).

Assessments:

The course will be assessed according to the following:

- Labs (60%)
- Final Project (40%)

Recommended Resources

- **Course Materials:** You will be provided with a set of **Jupyter Notebooks** that contain the course notes and reproducible DSP Python code examples that use the powerful Numpy, Scipy and Matplotlib packages.
  - Course materials are available at: https://github.com/jinwar/GPGN_436_536
  - You will receive "handouts" for lab assignments in electronic format.
- *Advanced Engineering Mathematics*, 3rd Edition, by Erwin Kreyszig.
  - **Recommended (but optional):** This textbook covers both the analytical mathematical physics behind much of the couse material as well as the numerical section. It is recommended as a good survey EngMath textbook at senior undergraduate level.