

Fall 2025

**GEOL 340/540**  
**Modern Methods in Geosciences**  
Monday/Wednesday 10:30-11:45 am Exploratory 1005

Instructor: Dr. Andrew Hoxey, [ahoxey@gmu.edu](mailto:ahoxey@gmu.edu)  
Office hours: Mondays, 3:00-4:30 pm  
Office: 3412 Exploratory Hall

## **Course Description**

This is an experience-based course designed to foster expertise in collecting and analyzing geologic and geophysical data. We will practice quantitative assessments of geologic data and consider various ways to analyze and communicate data, effectively building skills essential to academic and professional research.

The course will be delivered in an in-person format with both lecture and in-class exercises. Course materials will be organized on Canvas.

## **Course Goals**

*Student Learning Outcomes of the class:*

- Gain experience using research-grade data and tools to investigate geologic problems.
- Learn to evaluate scientific data via quantitative and qualitative analysis, and critically examine the sources and validity of scientific information.
- Build an understanding of professional standards for communication of geologic data.

*Methods for achieving our goals:*

- Lectures on tools used and exercises
- Reading and discussion of relevant literature
- Interpretation of maps, analytical results, and remote sensing data
- Field trips to use tools in a real-world setting
- Student-lead presentations and discussion

## **Materials**

Linear Algebra for Earth Scientists, Walker & McLean; Recommended

Accounts on various data source sites:

Strabospot.org (required), Openopography.org (required), Mapbox.com (required), Earthexplorer.usgs.gov (recommended), Likely others as the semester progresses

## Course Grades

Grading in the course will be on a 100-point scale, with points earned the following way:

| Item             | Points |
|------------------|--------|
| Exercises        | 30     |
| Homework         | 40     |
| Research Project | 30     |
|                  |        |
| Total            | 100    |

|    |           |
|----|-----------|
| A+ | 97 - 100% |
| A  | 93 - 96%  |
| A- | 90 - 92%  |
| B+ | 87 - 89%  |
| B  | 83 - 86%  |
| B- | 80 - 82%  |
| C+ | 77 - 79%  |
| C  | 73 - 76%  |
| C- | 70-72%    |
| D  | 60 - 69%  |
| F  | 0 - 59%   |

### *Class Exercises*

There will be weekly exercises that are designed to gain familiarity with a broad suite of software. Some exercises will be compounding.

### *Homework Assignments*

Homework assignments are an opportunity to use the skills developed through the exercises. The homework assignments will be more self-guided and will contribute more significantly to the final grade.

### *Research Project*

The term projects will be presented using PowerPoint during the last weeks of class. Each person will prepare a 15-minute oral presentation with graphics.

## Other class policies

You may work in groups during the exercises, however, you must hand in individual work.

You are not permitted to use AI in lab or for any assignments unless otherwise stipulated by the assignment.

## GMU POLICY GUIDELINES

These university and class policies are important to understand:

- Integrity: GMU has academic standards with guidelines regarding academic integrity; please see [academicstandards.gmu.edu/](http://academicstandards.gmu.edu/) for more information.
- Disability: If you are a student with a disability and you need academic accommodations, please contact me and also contact the Office of Disability Services (ODS) at 703-993-2474 of [ds.gmu.edu](http://ds.gmu.edu) All academic accommodations must be arranged through the ODS.
- Diversity: Diversity is a core value at GMU; please see <https://oacc.gmu.edu/> more information.
- Privacy: Students must use their MasonLive email account to receive important University information, including messages related to this class. Please see <http://masonlive.gmu.edu> for more information.
- Electronics: Please be respectful of our time together and do not engage in activities that are unrelated to class. Cell phones may be left on but muted and used for emergencies only.

## Tentative Course Schedule

| Date                    | Topic                           | Exercise Topics                            |
|-------------------------|---------------------------------|--------------------------------------------|
| <b>25-Aug</b>           | Introduction                    |                                            |
| <b>27-Aug</b>           | Map Components                  | Getting familiar with QGIS                 |
| <b>1-Sep</b>            | GIS - Plotting Geologic Data    |                                            |
| <b>3-Sep</b>            |                                 | Georeferencing, Map Components, Hillshades |
| <b>8-Sep</b>            | Geologic Maps                   |                                            |
| <b>10-Sep</b>           |                                 | Digital Mapping                            |
| <b>15-Sep</b>           | Balanced Cross Sections         |                                            |
| <b>17-Sep</b>           |                                 | Cross sections                             |
| <b>22-Sep</b>           | HW Workday                      |                                            |
| <b>24-Sep</b>           |                                 |                                            |
| <b>Saturday, 27-Sep</b> | <b>Field Trip</b>               | <b>Optional (please notify me ASAP)</b>    |
| <b>29-Sep</b>           | GIS - Plotting Geologic Data II |                                            |
| <b>1-Oct</b>            |                                 |                                            |
| <b>6-Oct</b>            | GIS - Plotting Geologic Data II |                                            |
| <b>8-Oct</b>            |                                 | Krigging, Scaled Symbolology,              |
| <b>13-Oct</b>           | GIS - Topographic Analysis      |                                            |
| <b>15-Oct</b>           |                                 | Contours, Raster Math, Zonal Statistics    |
| <b>20-Oct</b>           | GIS - Topographic Analysis II   |                                            |
| <b>22-Oct</b>           |                                 | Swath Profiles, projecting data            |
| <b>27-Oct</b>           | Detrital Zircons                |                                            |
| <b>29-Oct</b>           |                                 | Detrital Zircons                           |
| <b>3-Nov</b>            | Subsurface Data                 |                                            |
| <b>5-Nov</b>            |                                 | Well Logs                                  |
| <b>10-Nov</b>           | Applied Geosciences             |                                            |
| <b>12-Nov</b>           |                                 |                                            |
| <b>17-Nov</b>           | Student Project Workday         |                                            |
| <b>19-Nov</b>           |                                 |                                            |
| <b>24-Nov</b>           | Student Project Workday         |                                            |
| <b>26-Nov</b>           | THANKSGIVING BREAK              |                                            |
| <b>1-Dec</b>            | Presentations                   |                                            |
| <b>3-Dec</b>            | Presentations                   |                                            |
| <b>8-Dec</b>            | Presentations                   |                                            |
| <b>10-Dec</b>           | FINALS WEEK                     |                                            |