

**COURSE SCHEDULE**  
**GE 381/GE 382 FIELD METHODS AND APPLIED DESIGN I& II**  
**Summer 2019**

**RATIONALE:** These are introductory courses in the methods and procedures for the acquisition of geological data in the field, field data reduction, analysis, and the preparation of technical reports that include summaries of the findings, conclusions, and recommendations. The courses provide students with an introduction to the tools for site characterization to aid in the design of engineering works, assessment of geologic hazards in support of engineering construction, construction material evaluation, and metallic, non-metallic and energy resources exploration

**COURSE DESCRIPTIONS:** (UAF Cat. 2015-2016) GE 381/382 - Techniques in geological mapping and geotechnical instrumentation applied to engineering design and resource evaluation. *Prerequisites: ENGL F111X; ENGL 212X or ENGL 213X or permission of the instructor; GE F261; GEOS F213; GEOS F214; GEOS F322; GEOS F332 or equivalent; 6 credits total).*

**INSTRUCTOR:** Dr. Paul Metz, Professor of Geological Engineering, Department of Mining and Geological Engineering, College of Engineering and Mines; Phone (907) 474-6749; Cell (907) 322-6928; email [pametz@alaska.edu](mailto:pametz@alaska.edu); Office 313 Duckering Bldg.. Additional instructional assistance during posted office hours and in the field prior to or after the normal field work day (0800 – 1700 hrs).

**LEARNING OBJECTIVE:** The objective of these two courses is to provide students with an introduction to field methods for geological engineers as applied to the exploration and evaluation of mineral and energy resources, geotechnical engineering site characterization and geologic hazards assessment.

**COURSE GOALS** (students are expected to achieve the following):

1. Develop the ability to observe, and identify geological materials and measure geological structures in the field and record these through the creation of geological maps and cross sections, and from accompanying field notes, drawings, and photographs write a descriptive and interpretive report on the findings.
2. Develop the ability to sample earth materials in appropriate quantities for laboratory testing and analysis.
3. Develop the ability to write a technical report of findings based of the data collected in the field that includes a summary of findings, conclusions from the field work and laboratory analyses, and recommendations concerning the sufficiency of the data for the development of the next phase of the project for which the field examination was conducted.

**TEXT: Instructors Notes and Handouts**

Compton, R. R., 1985, *Geology in the Field*: Wiley & Sons, N.Y., 398 p.

**ADDITIONAL READINGS:** See attached bibliography

**GRADING:** Projects I, II, III, V, and VI shall each constitute 18 percent of the final grade. Project VII is 10 percent of the final grade.

**CLASS SCHEDULE:**

GE 381 Field Methods and Applied Design I, May 20 – May 31, 2019

- I Project 1 - Elliot Highway Material Sites Geologic Mapping, Sampling, and Evaluation (5 days).
  1. Objective: Create geologic maps of the Wilbur Creek Flysch at the Alaska Department of Transportation Material Site at Mile 47 on the Elliot Highway and at the Alyeska Pipeline "Quarry Site". Compare the two sites with alternative material sites at Mile 38 (Globe Creek), and Mile 60 (Tolovana River).
  2. Tasks:
    - a. Create geologic maps by tape and compass methods.
    - b. Create a geologic cross section for each map.
    - c. Sample major rock units for material testing.
    - d. Review previous test results.
    - e. Visit alternative sites at Mile 38 and at Mile 60.
    - f. Review test results from alternative sites.
    - g. Compare Material Site at Mile 47 and the "Quarry Site" with alternative sites for sources of construction materials.
    - h. Write a geologic report for the sites including a comparative analysis with the alternative material sites in the area.
    - i. Report, Field Notebook, Maps with Cross Sections, and Samples due July 5, 2019.
- II. Project 2 – Nenana Canyon Geologic Mapping, Sampling, and Geologic Hazard Assessment (5 days).
  1. Objective: Create a geologic map of the Nenana River Canyon from the Garner Tunnel to the entrance to Denali National Park and assess the geologic hazards of the area.
  2. Tasks:
    - a. Create a geologic map of the area from a topographic base and from aerial photographs.
    - b. Create a geologic cross section for the map.
    - c. Conduct RQD analysis of various rock units from outcrops.
    - d. Reduce structural data collected during Tasks a & c using stereonet.
    - e. Sample major rock units for material testing.
    - f. Write a geologic report for the area including an assessment of the geologic hazards of the map area.

- g. Report, Field Notebook, Geologic Map with Cross Section, and Samples due July 5, 2019.

- III. Extra Credit Project – Examine the stream drainage patterns and create longitudinal profiles for three streams near Livengood, or near the Yukon River Bridge, Alaska. Determine whether the streams are the consequence of stream capture. Write a short geologic summary including the relationship between stream capture and the active tectonics of the Yukon Tanana Uplands Schist Terrain (Report due July 5, 2019).

GE 382 Field Methods and Applied Design II, June 3 – June 28, 2019

- IV. Dalton Highway Geologic Mapping – Livengood to the Yukon River (10 days)
  - 1. Objective: Field check compiled geologic maps along the route of the proposed North Slope Railroad Extension.
  - 2. Tasks:
    - a. Verify lithologies and collect structural data for all the outcrops along and adjacent to the Dalton Highway.
    - b. Collect discontinuity data for RQD and for slope stability analyses.
    - c. Collect geological materials for laboratory testing.
    - d. Sample geological materials for hardness testing in the field.
    - e. Write an engineering geologic report for the site investigation.
    - f. Report, Field Notebook, Maps with Cross Sections, and Samples due July 5, 2019.
- V. Dalton Highway Geologic Mapping – Yukon River to Coldfoot (10 days)
  - 1. Objective: Field check compiled geologic maps along the route of the proposed North Slope Railroad Extension.
  - 2. Tasks:
    - a. Verify lithologies and collect structural data for all the outcrops along and adjacent to the Dalton Highway.
    - b. Collect discontinuity data for RQD and for slope stability analyses.
    - c. Collect geological materials for laboratory testing.
    - d. Collect geological materials hardness data in the field.
    - e. Write an engineering geologic report for the site investigation.
    - f. Report, Field Notebook, Geologic Maps with Cross Sections, and Samples due July 5, 2019.
- VI. Dalton Highway Geologic Road Log (Concurrent with projects IV and V).
  - 1. Objective: Assess the impact of the geology and geological hazards of interior and northern Alaska on the development of the North Slope petroleum and natural gas fields through the creation of a Road Log for the geology, geological materials, and geologic hazards of the Dalton Highway from Livengood to Prudhoe Bay.

2. Tasks:

- a. Create a road log for the bedrock and surficial geology of the Dalton Highway from Livengood to Prudhoe Bay.
- b. Supplement the published road logs with field observations and photographs of the bedrock and surficial geology of the region including state and federal material site locations and locations of recent geologic hazards.
- c. Comment on these observations with respect to the operation and maintenance of the Trans-Alaska Pipeline System (TAPS), the site selection for an Alaska Railroad Extension from Dunbar to Prudhoe Bay, the Dalton Highway maintenance and upgrades, and the design of the various proposals for natural gas pipelines from the North Slope to either tidewater ports in south-central Alaska or to the natural gas markets in the continental United States.
- d. Road Log/Report due July 5, 2019.

**Course outcomes: This course is considered to be contributing towards the following educational outcomes set forth by the Department of Mining & Geological Engineering**

Outcome	Role of GE 381/382
Outcome 1: Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (ABET (k)).	Introduction to the application of modern concepts of applied geology to site selection and site characterization.
Outcome 2: A knowledge of engineering applications a related to geological resources and geo-hazards in Alaska and an ability to practice engineering in arctic-related projects (ABET (l)).	Transect and mapping of the major geologic terrains from interior Alaska to the Alaska North Slope and examination of the major engineering works in the realms of discontinuous and continuous permafrost.