APPLIED SCIENCE AND MANAGEMENT DIVISION
GEOL 216
3 Credit Course
Winter, 2022

COURSE OUTLINE

GEOL 216

GEOLOGICAL FIELD METHODS AND MAPPING II

3 CREDITS

PREPARED BY: Joel Cubley, Instructor/Coordinator, Earth Sciences
DATE: February 18, 2020

APPROVED BY: Stephen Mooney, Acting Dean, Applied Science & Management
DATE: February 18, 2020

APPROVED BY ACADEMIC COUNCIL: March 11, 2020
RENEWED BY ACADEMIC COUNCIL: Click or tap to enter a date

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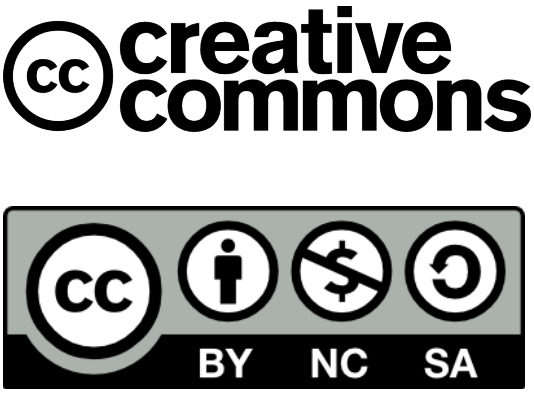

Version 1.2 revised and approved by Academic Council: April 17, 2019
Academic Council, Governance Office
Academic Council MyYC: Policies, Procedures and Forms

GEOLOGICAL FIELD METHODS AND MAPPING II

INSTRUCTOR:	**OFFICE HOURS:**
OFFICE LOCATION:	**CLASSROOM:**
E-MAIL:	**TIME:**
TELEPHONE:	**DATES:**

COURSE DESCRIPTION

GEOL 216 provides an in-depth field geology experience focused on building competencies in detailed mapping of both bedrock and surficial geology. Additional emphasis is placed on the structural analysis of rock units and collecting and incorporating remote sensing and geophysical datasets to help inform map patterns. Students are expected to interpret their geologic observations and map patterns to understand how those patterns might reflect underlying plate tectonic controls and settings, original depositional environments, mountain-building events and the interaction of geologic materials with surface processes.

Students are introduced to current best practices for conducting field geology in the traditional territories of Yukon First Nations, and how the engagement and consultation processes shape how geological research and mineral exploration are done in the North.

PREREQUISITES

Successful completion of GEOL 107 (Geological Field Methods and Mapping I), GEOL 200 (Mineralogy), GEOL 206 (Sedimentology and Stratigraphy) and GEOL 208 (Structural Geology); or with permission of the instructor.

EQUIVALENCY OR TRANSFERABILITY

This course has been recently redeveloped, and its transferability is still being evaluated. Receiving institutions always determine course transferability. Further information and assistance with transfers may be available from the School of Science.

LEARNING OUTCOMES

Upon successful completion of the course, students will be able to

- construct bedrock geology maps at a variety of scales. Record basic geologic relationships by plotting contact and structural data on maps produced by hand and by using standard GIS software.

- use a combination of air photo analysis, publicly available remote sensing data, and field validation to construct surficial geology maps and relate those map features to potential geologic hazards in a given area.

- accurately collect structural measurements from deformed geologic units and construct a deformational history for the area. This includes an ability to display structural and convey analysis results using stereonets and statistical plots.

- create geologic cross sections to show interpreted subsurface lithologies derived from plan map patterns and structural measurements. This includes the collection of accurate topographic data from UAV surveys and publicly available digital elevation datasets.

- conduct preliminary ground-based geophysical surveys to better understand the extents and attitudes of mapped bedrock units and permafrost bodies under cover and, where feasible, reconcile this data with regional airborne geophysical datasets.

- describe economic mineral showings with respect to their mineralogy, host lithologies and structural controls, and be able to postulate hypotheses for the genesis of that mineralization given the area's geologic history and mapped bedrock geology.

- describe the First Nations governance and land claims frameworks relevant to the project areas and how the mineral engagement and consultation strategies for each First Nation govern mineral exploration and geological fieldwork on their traditional territory.

COURSE FORMAT

This 14-day field school is not conducted on the Yukon College Ayamdigut (Whitehorse) campus but at multiple off-site locations in southwestern Yukon. Accommodation will be at a Yukon field research institute (the Arctic Institute of North America (AINA)), and students will not return to Whitehorse for the duration of the course. Students will be expected to be in the field actively participating during the day, and completing wrap-up discussions, cartography, and data analysis in the evenings. All deliverables will be completed prior to returning to Whitehorse on the final day of the course.

It is mandatory that students take college transportation to and from the field areas, as use of personal vehicles is not permitted for liability reasons.

ASSESSMENTS:

Attendance & Participation

Students are required to attend the field camp in its entirety. If extenuating circumstances arise, a course of action will be decided upon by the instructor and the Dean of Applied Science & Management. The instructor MUST be informed prior to absence. Field exercises must be completed during class hours, with the instructor present. Participation accounts for 10% of the course grade, and grades will reflect the judgment of the field school instructor(s).

Students are required to come to field camp each day alert, engaged, and open to actively participating in activities. In addition, students must be prepared for inclement weather. In the case of severe weather (e.g. lightning), appropriate safety precautions will be taken.

Daily safety meetings will be held each morning prior to commencing the scheduled activity.

Assignments

Students will be required to keep daily field notes throughout the field course, and these notes will be critically examined and commented upon at regular intervals. The quality of notetaking is expected to improve over the duration of the course and will be marked accordingly.

The course focuses on the successful completion of individual modules that relate to specific field geology skill sets (e.g. bedrock mapping, surficial mapping, structural analysis, etc.). These individual modules last 1-5 days in duration, and students will be required to prepare a final deliverable (e.g. report, map, etc.) at the conclusion of each module. It is important that students work diligently on module deliverables *throughout* the duration of that module, instead of leaving all analysis and discussion to the end of the activity.

Late assignments will not be accepted. If it is anticipated a deadline will not be met, please talk to your instructor as soon as possible about any available alternative submission options.

Examinations

At the conclusion of the course, each individual student will be required to complete a 30-minute oral exam administered by the instructor and teaching assistant. This exam tests students on their knowledge of concepts presented within the course – no outside material will be incorporated. An oral exam serves to separate the skills of the individual from those of the group as a whole.

EVALUATION:

Tests and Assignments	*Weight*	*Dates*
Participation	10%	Participation will be assessed daily by the instructor and teaching assistant over the course of the field school. Ability to work with a team to achieve a collective goal will be a primary consideration.
Oral examination	20%	Oral examinations will be scheduled for the final day of the field camp.
Field notebooks	10%	Field notebooks will be assessed throughout the field school, but marks will be primarily derived from the final versions during the last stages of fieldwork.
Module map and survey products	60%	Final mapping products and/or survey data for each module are due during the course on dates set at the discretion of the instructor. A detailed breakdown of module deliverables (e.g. maps, reports, stereonets, etc.) will be provided on the first day of the field school.
Total	100%	

REQUIRED TEXTBOOKS AND MATERIALS
No textbook purchase is required for this class, though a field geology textbook is a useful reference that will aid in data description, analysis and map cartography. Recommended textbooks currently available for purchase include:

Coe, Angela L. 2010. Geological Field Techniques. Wiley-Blackwell. 336 p.

Compton, Robert R. 2017. Geology in the Field. CreateSpace Independent Publishing Platform. 412 p.

Lisle, Richard J. et al. 2011. Basic Geological Mapping (5th ed.). Wiley. 230 p.

It is recommended that students bring their mineralogy and structural geology textbooks to field school as reference materials.

Each student must bring his or her own basic field equipment: hiking boots, gaiters, outdoor clothing, rain gear, day pack, hammer, hand lens, clipboard, and writing tools. Other required equipment will be identified in a pre-course meeting held in the preceding winter semester. Accommodation, food and transportation will be covered by the supplementary course fee.

ACADEMIC AND STUDENT CONDUCT

Information on academic standing and student rights and responsibilities can be found in the current Academic Regulations that are posted on the Student Services/ Admissions & Registration web page.

PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when a student submits work for credit that includes the words, ideas, or data of others, without citing the source from which the material is taken. Plagiarism can be the deliberate use of a whole piece of work, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Students may use sources which are public domain or licensed under Creative Commons; however, academic documentation standards must still be followed. Except with explicit permission of the instructor, resubmitting work which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the College.

YUKON FIRST NATIONS CORE COMPETENCY

Yukon College recognizes that a greater understanding and awareness of Yukon First Nations history, culture and journey towards self-determination will help to build positive relationships among all Yukon citizens. As a result, to graduate from ANY Yukon College program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukoncollege.yk.ca/yfnccr.

ACADEMIC ACCOMMODATION

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds

specified in section 8.0 of the Yukon College Academic Regulations (available on the Yukon College website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC): lac@yukoncollege.yk.ca.

TOPIC OUTLINE

Module	Tentative Date(s)	Topic	Recommended resources*
1	**April 27**	***Morning*** 8 AM: Meet at Earth Sciences laboratory to sign waivers and distribute personal equipment. Depart Whitehorse and travel to field accommodation in the Kluane Lake Region (KLR). ***Afternoon/Evening*** *Guest speaker:* Introduction to geological fieldwork and mineral exploration in First Nations traditional territory *Faculty lecture:* Regional geology overview	Champagne and Aishihik First Nations (2013) – Mineral Industry Code for Quartz and Coal Activities or the Kluane First Nation Proponent's Guide
2 & 3	**April 28**	***Morning*** Field Safety Plan discussion and finalization ***Late morning/afternoon*** *Structural analysis deformed turbidites in the Dezadeash Fm. (Haines Junction, YT)* Measurement of folded planar and linear features, stereonet analysis, lithological descriptions and fault analysis. ***Evening*** Methods of structural analysis and data presentation	PDAC's e3 Plus Health and Safety in Exploration Toolkit Compton – *Geology in the Field* Davis et al. – *Structural Geology of Rocks and Regions*

4	**April 29 – May 4**	*Bedrock mapping of the Bear Creek assemblage (Haines Junction, YT)* **Day 1 (weather permitting):** Delineation of field area and determination of an appropriate map scale; UAV survey for photogrammetry. Establishment of base station and ground control points with dGPS/RTK-GPS. Return to field station for data processing and creation of orthoimagery/DEM /contour map. **Days 2-4:** Bedrock mapping of metamorphosed basalts, ultramafics, and volcaniclastics of the Triassic Bear Creek assemblage. Structural analysis, cross-section construction and digital cartography using ArcGIS and/or QGIS. **Day 5**: Total field magnetic survey focused on extending map units under cover to outcrops on adjacent hillslope. Collection of base station and rover data, with corrections and filtering. Data paired with magnetic susceptibility measurements from students' bedrock units to aid in interpretations. **Day 6:** Work day in camp focused on cartography and drafting of mapping report.	Davis et al. – *Structural Geology of Rocks and Regions* Klein and Philpotts – *Earth Materials* Lisle et al. – *Basic Geological Mapping* Ormsby – *Getting to Know ArcGIS*
5	**May 5-7**	*Terrain classification and surficial mapping (Burwash Landing/Destruction Bay)* Surficial geology mapping using aerial photographs, field	Bierman and Montgomery – *Key Concepts in Geomorphology*

		identification of surficial deposits, and publicly available remote sensing data. Focus on surficial deposit description and proper map notation. Creation of final map products using ArcGIS/QGIS. Electrical resistivity tomography (ERT) survey to image permafrost in areas of recent permafrost degradation near Kluane Lake.	Trenhaile – *Geomorphology: A Canadian Perspective*
6	**May 8**	*Geological characterization of the Hayden molybdenite showing (Silver City, YT)* Mapping and description of exposed intrusive phases within a pluton of the Eocene Hayden Lake suite. Characterization of mineralization and analysis of vein structures hosting mineralization. Introduction to the application of hyperspectral analysis to characterize alteration mineralogy in vein haloes. Activity planning a mock exploration program to explore the property given observed geology and regional framework. Includes consideration of claim staking requirements, soil sampling/prospecting, geophysical/geological methods and survey design; permitting and consultation submissions.	Majoribanks – *Geological Methods in Mineral Exploration and Mining* Stevens – *Mineral Exploration and Mining Essentials*
7	**May 9**	*Site visit to a local exploration project or operating mine* In the KLR, it is most likely that a site visit will be to either 1) the	Recent NI-43-101 reports and or property assessments (to be distributed by the

		Nickel Shäw Ni-Cu-PGE magmatic sulphide project near Burwash Landing (Nickel Creek Platinum), or 2) the Hopper Cu-Au skarn property near Aishihik Lake (Strategic Metals).	course instructor)
	May 10	Oral exams Work day and submission of final reports Travel to Whitehorse, returning at~6 PM	

*Textbooks are those brought to field school by course instructors to act as resource materials. Many of these textbooks are those used for previous Earth Sciences courses.