

## ERTH 2406 Geology and Map Interpretation Winter 2019 Syllabus

### Course description:

ERTH 2406 [0.5 credit] Geology and Map Interpretation: Analysis and interpretation of geological features and processes using rocks, maps and cross sections. Introduction to computational methods. Prerequisites: ERTH 2102 and GEOM 2007. Lecture two hours a week and laboratory three hours a week.

This is a practical course based on rocks, maps and sections, and the analytical tools for interpreting them. There is a strong emphasis on “hands-on” learning. Please come to lectures and labs with the tools and resources needed to identify minerals and rocks, perform calculations and draw scaled drawings.

### Times and locations:

Lecture: Friday, 9:35 am – 11:25 am; HP 3120

Laboratory A01: Friday, 2:35 pm – 5:25 pm; HP 2130

### Professor, Guest Professor and Teaching Assistants:

Office hours to be determined

Sharon Carr ([sharon.carr@carleton.ca](mailto:sharon.carr@carleton.ca))

Geoff Pignotta ([geoff.pignotta@carleton.ca](mailto:geoff.pignotta@carleton.ca))

Chris Jenkins ([chrisjenkins@mail.carleton.ca](mailto:chrisjenkins@mail.carleton.ca))

Andréane Mitchell-Dupuis ([amitchelldupuis@mail.carleton.ca](mailto:amitchelldupuis@mail.carleton.ca))

Jacob VanderWal ([jacobvanderwal@mail.carleton.ca](mailto:jacobvanderwal@mail.carleton.ca))

### Course learning outcomes:

By the end of this course, students will be able to:

1. Create (by hand or computer) geological and subsurface maps, cross sections, 3D illustrations and legends from geological information. Apply fundamental concepts of cartography and geomatics to geological applications.
2. Identify and describe minerals, textures, and primary or secondary structures in rocks. Classify, name and interpret sedimentary, igneous and metamorphic rocks.
3. Read geologic maps, cross-sections, 3D illustrations and legends (i.e. recognize map patterns; assess contact relationships; evaluate sedimentary, igneous, metamorphic and/or structural history) and propose a geological history.
4. Interpret and evaluate structural and geological history from rocks, maps, geophysical information and reports.
5. Distinguish between observations and interpretations. Write and/or explain accurately and concisely about rocks, map areas and/or projects; justify and assess conclusions.

**Mark distribution:**

▪ Class participation & attendance	3%
▪ Laboratory assignments & attendance	45%
Labs	30%
Regional project report	10%
Computer mapping project	5%
▪ Term project: lab and field manual	7%
▪ Midterm test (combined laboratory & lecture)	20%
▪ Final exam (combined laboratory & lecture; scheduled during the exam period)	25%

To pass the course: 1) a passing grade is required for all term work (i.e. attendance, labs, projects and midterm); and 2) the final exam must be passed in order to pass the course. Note that a passing grade is required for all term work in order to be eligible to write the final exam.

**Course requirements:**

- Regularly check cuLearn webpage for lecture topics, homework, reading assignments, laboratory and pre-laboratory assignments, dates of exams, etc.
- Complete all readings and assignments.
- Come prepared to all lectures and laboratories (e.g. to discuss readings and exercises; equipped with appropriate tools & materials, laboratory exercises and lab manual, etc.)
- Laboratory exercises will only be available on cuLearn. Print the labs and bring them to lab periods or bring a computer and digital file.
- Attend, and arrive on time, for all lectures and laboratories.
- Email [sharon.carr@carleton.ca](mailto:sharon.carr@carleton.ca) to advise of absences due to illness or emergencies.
- Hand in laboratory and pre-laboratory assignments on time. Pre-laboratory assignments are due at the beginning of each lab. Unless otherwise noted, laboratory assignments are due 1 week after they are assigned, at the beginning of the laboratory period (e.g. Lab 1 is due at the beginning of Lab 2).
- Late labs will be accepted without penalty in the instance of illness or emergencies by consultation with S. Carr. Otherwise, for late labs, 10% per day will be deducted for each day late, and labs will not be accepted more than 6 days after the normal due date.

**Tools (for in-class and laboratory exercises):**

- Mineral identification: hand lens, scratching tool of the correct hardness, and reference material of mineral properties. Acid will be provided as needed.
- Drafting: scale (ruler), protractor (square Douglass protractor available at Stores), drawing compass, 2H pencils (i.e. hard pencil leads), eraser, colored pencils, graph paper, and tracing paper.
- Calculator and stereonet.

- Appropriate note book for term lab and field manual project. Compile and organize your own laboratory and field manual, in a field notebook, using laboratory handouts and resource materials. This manual will be useful during this course as well as future courses and field work and is required for EARTH 2802. Include the Geological Time Scale, mineral abbreviations, modal percent estimation charts, grain size and shape classifications, rock and structural naming classifications, and geological symbols, etc.

**Reference materials** (many of these books are on reserve in the library):

1. **Required lab book:**

Rowland, Duebendorfer and Schiefelbein. 2007. Structural Analysis and Synthesis, A Laboratory Course in Structural Geology. Third Edition. (Available digitally from the library (pdf file) and may be purchased online.) *In EARTH 2406 we will cover the first five chapters of this book, and the remainder of the book will be covered in EARTH 3806 next year. It is well worth having a copy.*

2. **Recommended books for specific topics covered in EARTH 2406 (on reserve in the library):**

Davis, G.H., Reynolds S.J. and Kluth, C. F. 2012. Structural Geology of Rocks and Regions, 3<sup>rd</sup> edition, Wiley Press. (Available in hard cover, second hand and e-book in bookstore and online.) *In EARTH 2406 and 2802 we will cover much of the material presented in Section III, Descriptive Analysis: How to function in the field and how to reduce the data.*

3. **Recommended books on field geology (on reserve in the library):**

Bevier, Mary Lou, 2005. Introduction to Field Geology. McGraw-Hill Ryerson, ISBN 0-07-093109-7. (*Great maps – many are used in EARTH 2406 lab exercises; very useful for both EARTH 2406 and 2802*)

or

Coe, Angela L. 2010. Geological Field Techniques. Wiley-Blackwell, ISBN 978-1-4443-3062-5. (*Good chapters on rocks and structures – very useful book for EARTH 2406 and 2802; student companion site at <http://bcs.wiley.com/he-bcs/Books?action=index&bcsId=6048&itemId=1444330624>*)

or

Compton, Robert R. 2017. Geology in the Field. John Wiley and Sons. ISBN 0-471-82902-1 (*A classic with great information; very descriptive. This is a reprint of a “pre-digital age” 1985 vintage book with some out-dated classification schemes, but the descriptive information is great.*) Paperback and e-book are available.

4. **Useful for specific topics covered in EARTH 2406 (on reserve in the library):**

Lisle, Richard J. 2004. Geological Structures and Maps, A Practical Guide. Elsevier. 0750625880 (pbk.) QE601.3.S83 L49 2004

Lisle, Richard J. and Leyshon, Peter R. 2004 Stereographic projection Techniques for Geologists and Civil engineers. 2004. Cambridge University Press ISBN-13: 9780521535823 | ISBN-10: 0521535824. QE601.3.S83 L49 2004.

The Geoscience Handbook: AGI Data Sheets 5th edition. Edited by Mark Carpenter and Christopher M. Keane. ISBN: 978-0-913312-47-6. *The Geoscience Handbook provides quick reference for key metrics and concepts, from geophysics to geologic map symbols, the geological time scale to GPS usage, rock classification schemes, and everything in between. Great practical reference for labs, field work and research projects.*

**5. Build a library of books you will use throughout your program:**

Copeland, Peter. 2012. *Communicating Rocks: Writing, Speaking and Thinking About Geology*. Pearson Education, Inc. .

Kruhl, J. H. 2017. *Drawing Geological Structures*. Wiley. The Geological Field Guide Series. ISBN: 978-1-405-18232-4.

**6. ERTH 2406 is an interdisciplinary course draws and builds on knowledge presented in other Earth Sciences courses; keep your text books from other courses at hand.**

Dyar, M.D., Gunter, M. E. & Tasha, D. 2008. *Mineralogy and Optical Mineralogy*. Mineralogical Society of America. ISBN 978-0-939950-81-2. Required text for "ERTH 2102 Mineralogy to Petrology"

Miall, A.D., 2016. *Stratigraphy: A Modern Synthesis*. Springer ISBN 978-3-319-24304-7. Recommended text for "ERTH 2314 Sedimentation and Stratigraphy".

**7. Looking ahead to third year, we draw on structure and metamorphic text books from EARTH 3806 Structural Geology and EARTH 3207 Metamorphic Petrology and Processes.**

Fossen, Haakon. 2016. *Structural Geology*, 2<sup>nd</sup> edition, Cambridge University Press. Required text book for EARTH 3806 Structural Geology. (Available in hard cover, second hand and e-book in bookstore and online.)

Winter, John D. 2003. *An introduction to igneous and metamorphic petrology*. Prentice Hall ISBN: 0132403420. *Text for "ERTH 3202 Igneous and Metamorphic Petrology"*.

Yardley, B. W. D. 1989. *An introduction to metamorphic petrology*. Longman. *This is a classic text of and a good introduction to metamorphic petrology. It is out of print but available through Amazon, etc. This textbook is recommended for "ERTH 3207 Metamorphic Petrology and Processes."*

Best, M. G. 2003. *Igneous and metamorphic petrology*. Blackwell. *This very good introductory book to both igneous and metamorphic petrology is recommended for "ERTH 3207 Metamorphic Petrology and Processes"*.

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and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder.

### **ACADEMIC INTEGRITY AND PLAGERISM**

Please review and familiarize yourselves with Carleton's Student Academic Integrity Policy: <https://carleton.ca/secretariat/wp-content/uploads/Academic-Integrity-Policy.pdf>

The University has adopted a policy to deal with allegations of academic misconduct. The Academic Integrity Policy:

- describes those actions and behaviors which violate Carleton University's standards of academic integrity;
- defines the responsibilities of various offices and individuals in upholding the policy;
- specifies the procedures and processes to be followed when an allegation of violating these standards has been made against a student;
- specifies the sanctions that may be applied to a student who has been found to have violated these standards; and,
- describes the appeal and petition processes open to students who feel they have not been treated fairly under this policy.

The Policy is strictly enforced and is binding on all students.

The instructor is required to report all incidents (or suspected incidents) in violation of the policy directly to the Dean. All work handed in must be your own work. Plagiarism (i.e. presenting another's ideas, arguments, words or images as your own), violation of exam rules, misrepresentation of facts for any academic purpose, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized co-operation or collaboration, or completing work for another student are viewed as being particularly serious, and the sanctions imposed are accordingly severe. Students who infringe the Policy may be subject to one of several penalties including: suspension from a program; withdrawal from courses; a grade of zero, a failure or a reduced grade for a piece of academic work; completion of a remediation process, etc.

### **ACADEMIC ACCOMMODATIONS**

#### **Requests for Academic Accommodation**

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

#### **Pregnancy obligation**

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: [carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf](https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf)

### **Religious obligation**

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: [carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf](https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf)

### **Academic Accommodations for Students with Disabilities**

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made.  
[carleton.ca/pmc](https://carleton.ca/pmc)

### **Survivors of Sexual Violence**

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and is survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: [carleton.ca/sexual-violence-support](https://carleton.ca/sexual-violence-support)

### **Accommodation for Student Activities**

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit: [students.carleton.ca/course-outline](https://students.carleton.ca/course-outline)