

University of Toronto-Scarborough
Department of Physical and Environmental Sciences
EESC37H3 Structural Geology - Fall 2015

Instructor: Dr. Heidi Daxberger, EV 466, phone: 416-208-5136, heidi.daxberger@utoronto.ca

Office hours: Monday 10 am to 11 am, and by appointment

Teaching Assistant: Nahid Ruhi (Masters Program)

Lectures: **Tuesday, 10 am – 12 pm (Room HW 402)**

Labs: **Tuesday, 12 pm – 2 pm (Room BV 359) may change!!**

Overview:

Structural geology is the study of the deformation structures in Earth's lithosphere. Structures such as folds, faults, mineral fabrics, and the respective patterns occur at a variety of scales and led to changes in shape and configuration of rocks. The various approaches in 'Structural analysis':

- Geometric analysis – analysis of the geometry (patterns, shapes and mineral fabrics) of primary structures acquired while the rock was being deposited or emplaced, and secondary structures produced by subsequent deformation
- Kinematic analysis – analysis of the displacement and movements that lead to shape changes (deformation = strain) of rock bodies
- Mechanical and dynamic analyses – reconstruction of forces (stress e.g. magnitude, direction, duration) that led to deformation within a rock body

Help to describe deformation structures, delineate deformation conditions and better understand deformation processes.

Objectives of the course:

The objective of this course is to introduce at an beginners to intermediate level the fundamentals of structural geology and structural analysis, including:

- Construction and interpretation of geologic maps
- Descriptive, kinematic and dynamic analysis of structures
- An understanding of the fundamentals of the mechanics of brittle and ductile deformation of rocks
- Identification and interpretation of geologic structures in the field

Overall, the course is expected to contribute to inferring deformation processes from observed geologic structures. This bears not only on unravelling geodynamic processes which have shaped the Earth's crust, but also on understanding the formation of the natural resource deposits.

Readings:

Recommended text: **Structural Geology, 2011, Haakon Fossen, Cambridge Univ. Press**

Lecture & Lab Schedule - Subject to change:

Week	Date	Lecture	Lab	Notes
1	Sept. 8	Introduction, Stress & Strain	Lab intro!	
2	Sept. 15	Stress & Strain	Lab 1: geologic maps & cross sections (strike lines)	
3	Sept. 22	Changes with depth, brittle deformation (joints, fractures, faults)	Lab 2: geologic maps & cross sections	
4	Sept. 29	Brittle deformation (joints, fractures, faults)	Lab 3: Schmidt Net Projections (orientation of planes)	
5	Oct. 6	Ductile deformation (folds)	Lab 4: Schmidt Net (Folds), block diagram, cross section/map	Quiz 1
6	Oct. 13	Thanksgiving – Reading Week		
7	Oct. 20	Ductile deformation (folds, foliation/lineation)	Lab 5: Folding + rotations in the Schmidt Net	October 23 or 24 for 1-Day Field Trip
8	Oct. 27	Midterm		
9	Nov. 3	Ductile deformation (Shear zones)	Lab 6: Schmidt Net (Foliation, lineation, S-C fabric)	
10	Nov. 10	Deformation on various scales: Microscopic scale	Lab 7: Shear zones & Schmidt net	Quiz 2
11	Nov. 17	Deformation on various scales: Regional scale (Contractional regime)	Lab 8: Stress / Strain measurement interpretation, Mohr cycle	
12	Nov. 24	Deformation on various scales: Regional scale (extensional regime & strike-slip regime)	Lab 9: Analog models (orogenic wedge, indenter, flower structures)	Quiz 3
13	Dec. 1	Strike-slip regime, salt tectonics	Review - Questions	
14	Dec. 7	Study Break		
15	Dec. 15	Final Exams		Final Exam
16	Dec. 21	Final Exams		

Marking Scheme:

9 Lab assignments (each 4%)	36%
3 Online Quizzes (each 2%)	6%
Midterm (not in class, date to be announced)	20%
1-Day Field Trip	8%
Final Exam (date to be announced)	30%
Total	100%

Lectures and Lab exercises:

There will be one two-hour lecture and one two-hour lab period per week. Lecture slides will be posted on blackboard (-> course material)

ALL students are expected to attend ALL lectures. It is the responsibility of the student to ensure that notes are obtained for any classes missed.

The purpose of the weekly lab period is to demonstrate practical methods for analysis of structural data and interpretation of geologic maps. **Labs are mandatory for all students and the respective assignments are graded.** During lab you will have a chance to work more independently in order to strengthen your knowledge; during the lectures you'll receive more guidance throughout the material. **Lab assignments are to be completed in one week and submitted in the following week's lab.**

The knowledge acquired during the laboratory exercises can also be tested in the **3 Online Quizzes.**

Required lab materials:

- Protractor (drawing circles, measuring angles), calculator with trig function
- A drafting ruler (inches and centimeters), small scissors, pencils, eraser, coloured pencils
- Graph paper (in millimeters), tracing paper -> can be bought in groups (2-3 students)
- A notebook for tutorials and practice (having some simple drafting paper, without lines or squares, useful for this course)

Study Questions:

I will post a set of study questions on each course topic, which should help you to identify the important course information, study for the quizzes and exams, prepare you for the field trip and to keep on top of the material.

Midterm / Final Examination:

The midterm / final examination is cumulative and will be scheduled by the University and held during the December examination period. The exam will contain multiple choice, true and false, matching task, short answer questions, various drawings or constructions (geologic maps & cross sections, Schmidt Net projections, and interpretation of given data). Figures, movies and animations are examinable, as are in-class participation/lab type exercises.

Missed academic work:

If you know that you will miss a deadline then please let me know in advance, as we might be able to work something out. Should you miss a deadline for any term work you will be automatically penalized **10% per day (including weekends)** if you do not follow the following procedure and receive consideration. Within **one week** of the missed deadline you must submit a completed **University of Toronto medical certificate** (available on BB in Course Documents) as well as a **letter from you** describing when you fell ill, how it prevented you from making the deadline and when you returned to school as well as your name and student number and the course code. Submit the certificate and the letter to the secretary in EV – Building (room number: TBA) Mon-Fri 9 am - 4.30 pm (lunch 1-2) jterakita@utsc.utoronto.ca. Joanne Terakita collects these, but will not make a decision on the cases. Carefully

following this process will allow us to properly consider you for consideration regarding your late/missed work for EESB15.

Library Service:

Research Help: University of Toronto Scarborough Library

Staff at the UTSC Library will be happy to help you find the resources you need for your assignments, and learn the research skills you will need for success at university.

Research help is available by phone, e-mail, chat, or in-person in the Library.

For more information, please see the Library's Help Guide for UTSC

Students: http://guides.library.utoronto.ca/utsc_help

Need in-depth or department specific assistance? Contact Sarah Forbes, Liaison Librarian for Physical and Environmental Sciences: <http://uoft.me/smforbes>

Blackboard:

Lecture and lab material will be posted on and Online Quizzes will be done through blackboard. Please check daily for updates (e.g. assignments, announcements etc.).

Blackboard: <https://portal.utoronto.ca>

Academic Integrity Statement:

Academic integrity is one of the cornerstones of the University of Toronto. It is critically and important both to maintain our community which honours the values of honesty, trust, respect, fairness and responsibility and to protect you, the students within this community, and the value of the degree towards which you are all working so diligently. According to Section B of the University of Toronto's Code of Behaviour on Academic Matters which all students are expected to know and respect, it is an offence for students:

- To use someone else's **ideas or words** in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.
- To include false, misleading or concocted **citations** in their work.
- To obtain **unauthorized assistance** on any assignment.
- To provide **unauthorized assistance** to another student. This includes showing another student completed work.
- To submit their own work for credit in **more than one course** without the permission of the instructor.
- To falsify or alter any **documentation** required by the University. This includes, but is not limited to, doctor's notes.
- To use or possess an **unauthorized aid** in any test or exam.

There are other offences covered under the Code, but these are by far the most common. Please respect these rules and the values which they protect. It is your responsibility to ensure that your work maintains academic integrity. If you have any concerns please see the instructor before a potential problem arises. Please familiarize yourself with the Code (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) and also with the handout "How not to

plagiarize”, available in the Course Documents section on BB. At the University of Toronto academic dishonesty can result in a *mark of zero, a reduction in final grades, denial of privileges, a monetary fine, failure in the course, suspension, permanent record, a recalling of degrees/diplomas and certificates, or expulsion.*

Accessibility Needs:

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services as soon as possible: UTSC campus AccessAbility <http://www.utsc.utoronto.ca/~ability/> or St. George Campus DisAbility disability.services@utoronto.ca or <http://studentlife.utoronto.ca/accessibility>.