APPLIED SCIENCE AND MANAGEMENT DIVISION
SCHOOL OF MINING AND TECHNOLOGY
SCHOOL OF SCIENCE

COURSE OUTLINE

GEOL 111

STRUCTURAL GEOLOGY

81 HOURS
3 CREDITS

PREPARED BY: _____ DATE: December 19, 2013
Joel Cubley, Instructor

APPROVED BY: _____ DATE: December 19, 2013
Dave McCarty, Acting Dean

YUKON COLLEGE

Course Outline prepared by Joel Cubley, 19 December 2013.

Yukon College
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APPLIED SCIENCE AND MANAGEMENT DIVISION
GEOLOGY 111
3 Credit Course

STRUCTURAL GEOLOGY

INSTRUCTOR:	Dr. Joel Cubley
OFFICE HOURS:	Fridays, 1-2:30 p.m. (Cubley)
OFFICE LOCATION:	A2316
TELEPHONE/E-MAIL:	465-8605 (W) / jcubley@yukoncollege.yk.ca

COURSE OFFERING:	January 6 – April 25, 2014
DAYS & TIMES:	Lectures: Tuesdays and Thursdays, 1:00-2:30pm (A2210) Laboratory: Thursdays, 9:00am-12:00pm (A2801)

COURSE DESCRIPTION

This course addresses the fundamental techniques in structural geology, including the mechanics of rock deformation, classification of tectonic structures in stratified and non-stratified rocks, and manipulation of structural data and its predictive use. The links between geological structures, mineral deposits, and exploration and mining practices are examined throughout the course, as is the interplay between deformation and plate tectonics. Students will spend considerable time learning how to understand structural data presented in geological maps and cross sections, as well as eventually developing those materials from their own data.

LEARNING OUTCOMES

Upon successful completion of the course, students will have demonstrated the ability to

- Accurately describe all types of common structures exposed at the earth's surface.
- Measure a variety of geologic structures in the field (planes, lineations, fold axes, etc.).
- Analyze the geometry of structures using stereographic and orthographic projections.
- Interpret geological maps in 3D using cross sections and block diagrams.

- Make informed interpretations of structural evolution, based on structural geometry, kinematics and mechanical principles.
- Correlate small scale structures with the regional tectonic framework.

DELIVERY METHODS/FORMAT

This course consists of three 50-minute lectures and one lab period per week. The lecture schedule included in this course outline details the major topics covered and when those topics will be presented throughout the course. Please note that this schedule will likely be modified throughout the term, as some topics may not be finished within the predicted lecture time. Laboratory exercises will be conducted in both laboratory and field settings.

PREREQUISITES

Successful completion of GEOL105 and/or permission from the instructor.

COURSE REQUIREMENTS/EVALUATION

Attendance and Participation

Students are strongly encouraged to attend all lectures and laboratory exercises. Lab exercises can be completed only during lab periods and materials will not be available outside these hours. Off-campus field exercises must be completed during the allocated time with the instructor present.

Assignments

Weekly lab exercises will be due at the start of the following lab section. In addition to these exercises, students will be assigned a number of short theory assignments for the lecture segment of the course. All students will be required to hand in a semester-long research (review) paper on a topic of their choice. The minimum length for this paper is 10 pages, not including the bibliography. Paper topics must be approved by the course instructor. Additional details will be provided at the start of the course.

Tests/Exam

Any student who is absent from a test or exam for legitimate reasons will be eligible to write a deferred exam. Please note that excuses such as car trouble, vacation travel, oversleeping, and misreading the test schedule are not considered legitimate reasons and do not qualify the student for a deferred exam. For missed exams, the student must contact the instructor within 48 hours of the missed exam by phone or email. For missed final exams, students must contact the instructor to discuss an appropriate course of action. Any deferred exams will be scheduled by the Chair.

Evaluation

Tests and Assignments	***Weight***	***Dates***
Weekly Lab Assignments	40% (4% each)	Due at the start of each subsequent lab section.
Lab Final Exam	20%	During scheduled lab time in the final week of classes.
Lecture Final Exam	20%	During the final exam period.
Lecture Theory Assignments	10% (2.5% each)	To be determined.
Research/Review Paper	10%	Due April 1, 2014.
Total	100%	

The letter-grading scheme used in this course is the standard college scheme. Final grades will be rounded up to the nearest decimal place and assigned a letter grade based on this scheme. Grades will not be raised in order to facilitate a better overall grade standing at the end of the course. Final grades will be changed in the event that an error in grade addition or entry occurs. In such a case, students are asked to contact the instructor immediately. The College policy on grading and related matters is described in the "Student Evaluation, Grades, and Records" section of the current College Calendar.

Plagiarism

Plagiarism involves representing the words of someone else as your own, without citing the source from which the material is taken. If the words of others are directly quoted or paraphrased, they must be documented according to recommended document style. The resubmission of a paper for which you have previously received credit is considered a form of plagiarism.

Plagiarism is academic dishonesty, a serious academic offence, and will result in you receiving a mark of zero (F) on the assignment or the course. In certain cases, it can also result in dismissal from the College.

Writing Centre

All students are encouraged to make the Writing Centre a regular part of the writing process for coursework. Located in C2231 (adjacent to the College Library), the Writing Centre offers half-hour writing coaching sessions to students of all writing abilities. Coaching sessions are available in person and through distance technologies (e.g. Skype or phone plus email). For further information or to book an appointment, visit the Centre's website: dl1.yukoncollege.yk.ca/writingcentre.

STUDENTS WITH DISABILITIES OR CHRONIC CONDITIONS

Reasonable accommodations are available for students with a documented disability or chronic condition. It is the student's responsibility to seek these accommodations. If a student has a disability or chronic condition and may need accommodation to fully participate in this class, he/she should contact the Learning Assistance Centre (LAC) at (867) 668-8785 or lassist@yukoncollege.yk.ca.

REQUIRED TEXTBOOKS/MATERIALS

Davis, G.H., Reynolds, S.J. and Kluth, C.F. 2012. Structural Geology of Rocks and Regions (3rd ed.). Wiley, Mississauga, ON. 864 p.

EQUIVALENCY/TRANSFERABILITY

No transfer agreements have yet been established for GEOL111.

STRUCTURAL GEOLOGY LECTURE TOPICS

Week	Topic
1	**Introduction to structural geology**; primary and non-tectonic structures; unconformities.
2	**Force, stress, deformation and strain** in geological materials; Mohr diagrams.
3	**Factors affecting deformational behaviour**: composition, lithostatic pressure, porewater pressure, temperature, time strain rate, strength anistropy, etc. Experimental and field examples.
4	**Brittle deformation**: tensile cracking and shear fractures; joint and vein sets and systems.
5	**Ductile deformation**: simple shear, pure shear; homogenous and heterogeneous deformation processes and microstructures.
6	**Faults:** fault nomenclature, net slip, apparent movement, classification schemes. Normal faults, thrust faults, strike slip faults. Repetition and omission of strata. Fault plane features and physiographic features associated with faulting. Stable sliding and stick-slip fault mechanisms and earthquakes.
7	**Folds:** fold nomenclature, classification based on closure, symmetry, orientation and style. Mechanisms of folding. Small scale structures associated with folds. Fold systems. Introduction to polyphase folding.
8	**Cleavage:** penetrative cleavage, spaced cleavage, microlithons. Schistosity, slatey cleavage, fracture cleavage, strain slip cleavage, pressure solution cleavage. Cleavage refraction. Relation to other structures.
9	**Lineations:** mineral lineations, mineral aggregate lineations, S-intersection lineations, crenulation lineations, fold axis lineations. Relation to other structures.
10	**Structural controls** on ore deposits; fracture systems and reservoir characterization.

TENTATIVE STRUCTURAL GEOLOGY LABORATORY TOPICS

Week	Topic
1	**Orientation of planar and linear geologic features:** definitions of strike (strike lines), true dip (true dip lines), and apparent dip (apparent dip lines) of planar features; plunge and pitch of linear features. Includes orthographic and trigonometric relationships of the above features.
2	**Plotting of orientation data on stereonet diagrams.**
3	**Stereonet solutions to angular problems** involving apparent and true dip, orientations of lines of intersection between two planes, dihedral angles between two planes.
4	**Plotting and interpreting fold information** on the stereonet.
5	**Fracture measurements and stereonet contouring techniques**.
6	**Stereonet drill hole problems**.
7	**Principal stresses and the Mohr circle**; Coulomb failure envelope.
8	**Structural data and geologic maps**: understanding subsurface structure from surface information. Outcrop patterns produced by dipping layered sequences, faulting sequences, angular unconformities, and folds. Three point problems.
9	**Cross sections I**. Introduction to cross section construction from field and map data.
10	**Cross sections II:** Projections and right sections. Introduction to cross section-balancing techniques.