UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF GEOSCIENCE
COURSE OUTLINE
WINTER 2016

1. **Course:** Geology 523, Advanced Mineralogy

   Lecture Sections:

   L01: TuTh, 09:30-10:45, ST 027
   For a listing of all lab sections corresponding with this course, please see the following link:
   http://geoscience.ucalgary.ca/geoscience_info/courses/w16

   Instructor, Dr. S. Antao, Office ES 532, Tel. No. 403-220-3083, e-mail address, antao@ucalgary.ca,
   Office Hours: TuTh 11-12pm

   Geoscience Department ES 118, 403-220-5841, geoscience.ucalgary.ca, geoscience@ucalgary.ca

2. **Prerequisites:** Geology 313 or 423 and completion of at least 78 units (13 full-course equivalents)
   See section 3.5.C in the Faculty of Science section of the online Calendar
   (www.ucalgary.ca/pubs/calendar/current/sc-3-5.html)

3. **Grading:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Lab. Assignments	40%
Midterm (March 4)	10%
Project (report-30%, seminar-20%)	50%

Each piece of work (assignment, laboratory report, midterm test or final examination) submitted by the student will be assigned a percentage score. The student's average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

Letter Grade	Percent	Letter Grade	Percent
A+	95-100	C+	64-67
A	89-94	C	60-63
A-	84-88	C-	56-59
B+	78-83	D+	50-55
B	73-77	D	46-49
B-	68-72	F	0-45

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in Section 3.6. It is the student's responsibility to familiarize himself/herself with these regulations. See also Section E.6 of the University Calendar

5. **Course Materials:** The course blackboard site contains all of the handouts for labs, and lectures, as well as other resource material that you might find useful. Students are advised that reading the course blackboard page is not a substitute for attendance at lectures. The lectures provide an interactive environment that embellishes on, and provides a context for, the material in the textbook, whereas blackboard is a live site that allows for tailoring and updating of the course material during the term. A few short movies on Mineralogy shown in class will not be posted on blackboard because of copyright issues.

   Recommended reference books (available in the Gallagher Library):

   Klein, C. and Dutrow, B. (2007) Manual of Mineral Science (23rd edition). John Wiley and Sons, Inc., New York, NY.

Klein, C. and Hurlbut, C.S. (1998) Manual of Mineralogy (revised 21st edition). John Wiley and Sons, Inc., New York, NY.
Cullity, B.D. (1978) Elements of X-ray Diffraction. Addison-Wesley Publishing Company, Inc., USA.
Parise, J.B. (2006) Introduction to Neutron Properties and Applications. In Neutron Scattering in Earth Sciences (H-R Wenk, ed.). Reviews in Mineralogy and Geochemistry, 63, 1-25.

6. Examination Policy: No electronic or written aids (e.g. cell phones, tablets, computers, PDAs, notes, textbooks) will be allowed during writing of any exams. Non-programmable calculators will be permitted to answer quantitative questions on exams, if applicable, and permission to do this will be clearly indicated on the examination paper. Students should also read the Calendar, Section G, on Examinations.

7. OTHER IMPORTANT INFORMATION FOR STUDENTS:

(a) Academic Misconduct: (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties

(b) Assembly Points: In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points.

(c) Student Accommodations: Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf. Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Geoscience, Dr. E.S. Krebes by email krebes@ucalgary.ca or phone 403-220-5850.

(d) Safewalk: Campus Security will escort individuals day or night (http://www.ucalgary.ca/security/safewalk/). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

(e) Freedom of Information and Privacy: This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also http://www.ucalgary.ca/secretariat/privacy.

(f) Student Union Information: VP Academic Phone: 403 220-3911 Email: suvpaca@ucalgary.ca
SU Faculty Rep. Phone: 403 220-3913 Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca;
Student Ombuds Office: 403-220-6420 Email: ombuds@ucalgary.ca; http://ucalgary.ca/provost/students/ombuds

(g) Internet and Electronic Device Information: You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

(h) U.S.R.I.: At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference – please participate in USRI Surveys.

Department Approval: ORIGINAL SIGNED Date: December 18, 2015

Associate Dean's Approval for
Alternate final examination arrangements: ORIGINAL SIGNED Date: December 20, 2015

Tentative Lecture and Lab. Schedule

Week	Lecture topics	Lab. topics
1	Lattices (1 and 2 dimensions)	No Lab.
2	Lattices (3 dimensions), symmetry elements I, introduction to "Powder Cell" for XRD and neutron traces	Lab 1: X-ray and Neutron Powder Diffraction Traces (Calculations)
3	Unit-cell indexing, symmetry elements II, space groups	Lab 2: Bravais Lattices, Unit-Cell Parameters, and Indexing Powder XRD Traces
4	Data collection by diffraction methods	Lab 3&4: X-ray Data Collection and Mineral Identification
5	Mineral identification using XRD data, introduction to cell and structure refinement methods	Lab 3&4: X-ray Data Collection and Mineral Identification
6	LeBail and Rietveld refinements, introduction to "GSAS" for structure refinement	Lab 5&6: LeBail and Rietveld Refinement using Conventional X-ray Diffraction Data
7	READING WEEK	READING WEEK
8	Structure refinement and the use of constraints	Lab 5&6: LeBail and Rietveld Refinement using Conventional X-ray Diffraction Data
9	MIDTERM, introduction to "Crystal Maker" and "GRETEP"	Lab 7: Two-Phase Rietveld Refinement using Synchrotron High Resolution Powder X-ray Diffraction (HRPXRD) Data
10	Understanding crystal structure data and presentation of mineralogical results	Lab 8: Rietveld Refinement Using Constant Wavelength and Time-of-flight Neutron Diffraction Data
11	Seminar: Students present their original data and analyses on different minerals	Lab 9: Visualizing and Displaying Crystal Structure
12	Seminar: Students present their original data and analyses on different minerals	Lab 10: *Farbenzentre* in Alkali Halides and the Sample Displacement Effect
13	Seminar: Students present their original data and analyses on different minerals	No Lab.