

EAS 536
Mineralogy – Petrology - Geochemistry
Thermodynamics
Course Outline Winter Term 2013

Instructor:

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Course Objectives:

To provide background in thermodynamics and its applications in igneous and metamorphic petrology.

Class times:

To be arranged at the organizational meeting, January 9 2013, ESB 1-23, noon.

Required Text:

Anderson, Greg (2005) Thermodynamics of Natural Systems. Second Edition (much expanded from the First Edition, which is not an acceptable substitute). Cambridge University Press. This book is available as an eBook – check the Cambridge University Press website (<http://www.cambridge.org/ca/knowledge/isbn/item1110224>) for details. That website also has a link to the ancillary materials that the author provided for this text – the corrections (http://www.cambridge.org/servlet/file/2860_corrections.pdf?ITEM_ENT_ID=5946722&ITEM_VERSION=1&COLLSPEC_ENT_ID=842&download=1) will be of particular use (the version current at the time of writing of this outline is dated June 19, 2010).

There will have to be supplemental readings on Schreinemaker's analysis, which will be provided to the students at the appropriate time.

Topics to be discussed:

- 1) Introduction and basic terminology (Ch. 1, 2)
- 2) First Law (Ch. 3)
- 3) Second Law (Ch. 4)
- 4) Initial applications (Ch. 5, 6)
- 5) Solutions:
 - a) Ideal (Ch. 7)
 - b) Non-ideal I (Ch. 8)
- 6) Reactions (Ch. 9)
- 7) Non-ideal solutions II (Ch. 10)
- 8) The phase rule (Ch. 11)
- 9) Redox reactions (Ch. 12; selected parts)
- 10) Equations of state (Ch. 13)
- 11) Solid solutions (Ch. 14)
- 12) Phase equilibria (Ch. 17)
- 13) Schreinemaker's analysis; applications to phase equilibria and mineral reactions.

Disclaimer:

How much, and how in-depth, we consider the material will depend on how well the students understand the material, as gauged by your performance on the problem sets. I would rather cover less material than sacrifice comprehension.

Problem Sets:

There will be weekly or biweekly problem sets assigned.

Term Projects:

The course will end with poster presentations by the students that summarize the current “state-of-the-art” on solution models for specific minerals. Each student will select a mineral group to examine in consultation with me. In addition, the students will be responsible for a short paper summarizing their findings on the same subject, which will be distributed to the other students for future reference.

Grading Scheme:

Problem Sets:	50 %
Term Project:	15 %
Final Exam:	35 %

Evaluation:

All assignments and examinations in this course will be given a numerical score. A cumulative course mark will be calculated from those scores, weighted as tabulated above. A final letter grade will be assigned based upon your cumulative mark and my analysis of the class’s cumulative mark distribution. Where possible, natural breaks in the cumulative mark distribution will be used in assigning grades, but no pre-determined distribution of grades will be imposed on the class. Your grade will reflect a combination of your absolute achievement and relative standing in the class. In past years, the mean grade in this course has been in the A to B+ range. The mean grade this year will be based on my judgement of the overall calibre of this class relative to past cohorts.

Verbiage required by GFC Policy:

Policy about course outlines can be found in section 23.4(2) of the University Calendar.

ACADEMIC INTEGRITY: "The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at <http://www.governance.ualberta.ca/en/CodesofConductandResidenceCommunityStandards/CodeofStudentBehaviour.aspx>) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University."

All forms of dishonesty are unacceptable at the University. Any offence will be reported to the Senior Associate Dean of Science who will determine the disciplinary action to be taken. Cheating, plagiarism and misrepresentation of facts are serious offences. Anyone who engages in these practices will receive [at minimum](#) a grade of zero for the exam or paper in question and no opportunity will be given to replace the grade or redistribute the weights. As well, in the Faculty of Science the sanction for **cheating** on any examination will include **a disciplinary failing grade** (no exceptions) and senior students should expect a period of suspension or expulsion from the University of Alberta.

STUDENTS WITH DISABILITIES: Students who require accommodation in this course due to a disability are advised to discuss their needs with Specialized Support & Disability Services (2-800 Students' Union Building).

Note: Recording is permitted only with the prior written consent of the professor or if recording is part of an approved accommodation plan.

Disclaimer: Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this syllabus.