



in mind it still gets quite cold at night in this part of the world during late April and early May. Those of you that choose not to participate will be given a challenging assignment in lieu of making the trip.

Oral tray reports can be completed during the course of the semester. Tray reports consist of individual efforts identifying unknown mineral and/or rock samples. The tray reports essentially provide you with an opportunity to obtain a limited number of additional points in the course. There will be a limit of 8 tray reports per person (160 points) during the semester, so to perform well, lab and lecture exams will be extremely important! There will be a sliding scale in terms of the points available for each tray report. The following sliding scale will be used:

Tray Reports 1, 2, and 3	15 points each
Tray Reports 4 and 5	20 points each
Tray Reports 6, 7, 8	25 points each

The purpose of the sliding scale is to emphasize the importance of understanding and applying the materials covered in the lecture and lab parts of this course. The more of these you complete, the more points the tray reports are worth! **You must successfully complete at least two tray reports during the semester to pass the course (there will be absolutely no exceptions).**

**Total Points:** A summary of the total points possible in this course, based on the materials covered in the previous section of this syllabus, is summarized below:

		<u>Points</u>
Lecture Exams	4 exams @ 150 points each	600
Weekly Reading Reports	3 @ 40 points/ 3 @ 60 points	300
Weekly Rock/Mineral Lab quizzes	11 quizzes @ 50 points each	550
Laboratory Projects	10 projects	250
Field Trip Field Book	1 @ 50 points	50
Final Lab Exam	1 exam @ 100 points	100
	<i>Total</i>	<b>1850</b>

**Grades:** Your grade is based on your *total points* earned in the course. The grade is weighted approximately 49% on lecture materials 49% on lab materials, and 2% on your field trip notebook. Tray reports give you an opportunity to gain up to 9.0% of the possible points in the class. Grades for this course will be given for achieving the following point totals:

- A = 95% and above
- AB = 90% and above
- B = 85% and above
- BC = 80% and above
- C = 75% and above
- CD = 70% and above
- D = 60% and above
- F = less than 60%

**Laboratories:** Lithology, by nature, is a very laboratory intensive course. **Considerable amounts of lab time will be necessary to evaluate and comprehend the materials presented in this course.**

The laboratory phase of this course is essentially broken into three topics: a) igneous rocks; b) sedimentary rocks; and c) metamorphic rocks. A tentative schedule for the subjects that I will cover in lab is listed on the attached topical outline.

Reference collections for you to study are located in the metal cabinets in the lab marked **ROCKS**. A guide to the locations of the various rock samples will be kept in the Mineralogy/ Lithology Lab List and Database that will be stored in a red three-ring binder in the lab. This guide will also direct you to the correct locations for the mineral samples you will also need to study.

**Due Dates:** All assignments are due on the dates that I have assigned as the due date. **Late assignments will not be accepted unless individual arrangements have been made with me prior to the due date. Assignments turned in late will be given a "0" (no exceptions).**

**LITHOLOGY 51- 206  
Topical Outline - 2006**

<b><i>Week Beginning</i></b>	<b><i>Lecture Topics</i></b>	<b><i>Reading Assignments</i></b>	<b><i>Lab Topics</i></b>
Jan. 30	Introduction, Igneous Environments, Igneous Minerals, Structures & Textures	Ch. 1, 2	Mineral Review/ IGPET
Feb. 6	Igneous Geochemistry, Igneous Classification, Phase Diagrams, Igneous Processes	Ch. 3, 4, 5	Igneous Textures*
Feb. 13	Plutonic Rocks: Ultramafic to Felsic	Ch. 9, 10, 11	Plutonic Rocks*
<b><i>FIRST MID-SEMESTER EXAM, IGNEOUS ROCKS, FRIDAY FEBRUARY 17, 150 points</i></b>			
Feb. 20	Plutonic Rocks (cont.): Volcanic Rocks: Ultramafic to Felsic	Ch. 10, 11, 6, 8	Volcanic Rocks*
Feb. 27	Volcanic Rocks and Physical Volcanology	Ch. 7, CW13, EJ1	<b><i>Igneous Project (due 3/28)*</i></b>
March 6	Plate Tectonics and Igneous Suites	BT96 Ch. 8, 9, 10	Ig. Project (cont.)*
<b><i>SECOND MID-SEMESTER EXAM, IGNEOUS ROCKS, FRIDAY MARCH 10, 150 points</i></b>			
March 13	Spring Break	<i>Don't forget the sunscreen!</i>	
March 20	Introduction to Sediments, Sedimentary Rocks, Weathering, Clastic Sedimentary Rocks	Ch. 12, 13, 14	Clastic Seds (breccias/sandstones mudrocks)
March 27	Clastic Sedimentary Rocks, Carbonate Rocks	Ch. 16, 17, 18	Carbonates/ Chemical Sediments*
April 3	Carbonate and Other Chemical Rocks	Ch. 19, 20	<b><i>Sedimentary Project* (due 4/18)</i></b>
<b><i>THIRD MID-SEMESTER EXAM, SEDIMENTARY ROCKS, FRIDAY APRIL 7, 150 points</i></b>			
April 10	Metamorphic Textures/Structures Metamorphic Facies	Ch. 21, 22	Contact & Regional Metamorphic Rocks <sup>*,1</sup>
April 17	Metamorphic Phase Diagrams, Contact Metamorphism	Ch. 23, 24	Contact & Regional Metamorphic Rocks*
April 24	Low & High Grade Regional Metamorphism	Ch. 25, 26, 27	Field Trip to Northern Minnesota*
<b><u>Field Trip April 29 – May 2 (more details later)</u></b>			
May 1	Dynamic Metamorphism/Metasomatism	Ch. 28	Dynamic Meta./ Rock Descriptions*
May 8	Institute on Lake Superior Geology Meeting	B5	<b><u>Final Lab Exam (May 9)</u></b>

***FOURTH MID-SEMESTER EXAM, METAMORPHIC ROCKS, MONDAY MAY 8, 150 points***

Note: \* indicates 50 point mineral ID quiz to start lab.  
 \*\* indicates no quiz because of weekend field trip  
<sup>1</sup> Indicates 2 week long lab assignment

### Important Due Dates for Course Assignments

<u>Assignment</u>	<u>Date Given</u>	<u>Date Due</u>
Homework 1 - Phase Diagrams	February 1	February 15
Homework 2 - Igneous Classification	February 8	February 22
Homework 3 – IGPET Project	February 15	March 1
IGNEOUS EXAM 1	February 17	February 17
<i>Igneous Project</i>	<i>February 28</i>	<i>March 28</i>
IGNEOUS EXAM 2	March 10	March 10
SPRING BREAK		
Homework 4 – Sedimentary Classification	March 20	March 27
Homework 5 – Sedimentary Processes	March 27	April 3
<i>Sedimentary Project</i>	<i>April 4</i>	<i>April 18</i>
SEDIMENTARY EXAM	April 7	April 7
Homework 6 – Metamorphic Rocks	April 10	April 17
MINNESOTA FIELD TRIP	April 28	April 30
METAMORPHIC EXAM	May 8	May 8
FINAL LAB EXAM	May 9	May 9

### Additional Readings Sources

- B5 Barnes, H. L., 1975. Chapter 5 – “Hydrothermal Alteration” (pages 173-235), *in* Barnes, H. L., 1975, Geochemistry of Hydrothermal Ore Deposits: John Wiley and Sons, New York, 798 pages.
- B95 Best, M. G., 1995, Igneous and Metamorphic Petrology: Blackwell Science, Cambridge, MA, 630 p.
- BT96 Blatt, H. and Tracy, R. J., 1996. Petrology: Igneous, Sedimentary and Metamorphic Rocks, 2<sup>nd</sup> Edition: W. H. Freeman and Co., New York, 529 pages.
- CW13 Cas, R. A. F., and Wright, J. V., 1987. Chapter 13 – Modern Volcanoes and Volcanic Centres (pages 363-412), *in* Cas, R. A. F., and Wright, J. V., 1987, Volcanic Successions: Allen & Unwin Publishing, London, 528. Pages.
- EJ1 Easton, R. M., and Johns, G. W., 1986. Volcanology and Mineral Exploration: The Application of Physical Volcanology and Facies Studies: Ontario Geological Survey Special Paper 129, p. 2-40.
- W01 Winter, J. D., 2001. An Introduction to Igneous and Metamorphic Petrology: Prentice Hall, Upper Saddle River, N. J., 697 p.

### Other Useful References

- BF94 Bucher, K., and Frey, M., 1994. Petrogenesis of Metamorphic Rocks: Springer – Verlag, Berlin, 318 pages.
- K01 Klein, C., 2001. The 22<sup>nd</sup> Edition of the Manual of Mineral Science: John Wiley and Sons, New York, 641 pages.
- M94 Miyashiro, A., 1994. Metamorphic Petrology: Oxford University Press, New York, 404 pages (specifically see Appendix 3 – Glossary of Metamorphic Petrogenesis).
- R95 Raymond, L. A., 1995. Petrology – The Study of Igneous, Sedimentary, and Metamorphic Rocks: Wm. C. Brown Publishing, Dubuque, IA, 742 pages.

### Other Useful References

Hudak, G. J., Lithology Lecture Notes, Spring Semester, 2006 (kept in Mineralogy/Lithology Lab).

*A liberal arts education allows people to carefully observe, evaluate, interpret, and improve their world.*