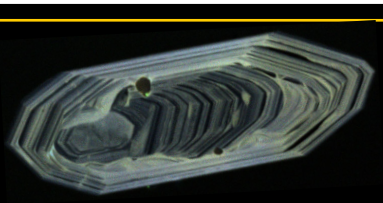
PETROLOGY
GEOS 320
Spring 2022



LECTURE: MWF (12:30 – 1:30pm) **LAB:** Thursday (12:40 – 3:30pm) **Room:** JSC 226

Instructor: Dr. Ken Brown **Email:** kennethbrown@depauw.edu **Phone:** 765.658.6767
Office: Julian 213 **Office Hours**: MWF (11am–12:30pm) or by appointment

Textbook: ***Essentials of Igneous and Metamorphic Petrology*;** 2nd ed., B.R. Frost & C.D. Frost
ISBN: 9781108710589

Minerals in Thin Section (recommended); 2nd ed., Perkins and Henke ISBN: 9780131420151

COURSE DESCRIPTION

This course is designed to provide students with practical and theoretical backgrounds for identifying, classifying, and interpreting igneous and metamorphic rocks. Emphasis is placed on the physical and chemical characterization and classification of these rocks. This course will utilize hand samples, petrographic analyses, mineral chemistry, and analytical methods to better understand rock petrogenesis. **Please note - this course has a weekend field trip and an associated lab fee**

PRIMARY COURSE OBJECTIVES: At the end of this course, students will be able to:

1. Characterize and identify common rock-forming minerals using a microscope and in hand specimen
2. Identify and interpret common macroscopic and microscopic properties of Igneous and metamorphic rocks
3. Characterize and classify common igneous and metamorphic rocks in hand specimen
4. Use analytical data/methods to understand the petrogenesis of igneous and metamorphic rocks
5. Outline and describe modern methods used to characterize minerals and rocks
6. Articulate course-specific concepts, ideas, and results through written, oral, and graphical means

BASIC STUDENT RESPONSIBILITIES - It is your responsibility to….

- Enjoy the learning process and keep an open mind
- Read, understand, and abide by all of the policies in this syllabus and the Student Handbook
- Know when all important assessments and exercises are due
- Complete assessment and assigned exercises by the due dates/ deadlines
- Attend class and participate in class activities
- Check your email DAILY for updates and announcements.
- Attend office hours and ask questions when you don't understand content or directions.

LAB FEE: You will be performing destructive tests on mineral/rock specimens as well as using expensive analytical instruments in this course. That said, a small lab fee ($25) will be charged to help offset costs associated with replacing samples and lab consumables.

GRADING

Lecture Component (~53%)

Exam 1	100 pts	(13%)
Exam 2	100 pts	(13%)
Exam 3	100 pts	(13%)
Geochem Problem Set	50 pts	(7%)
Field Trip (Notebook)	50 pts	(7%)

Lab Component (~47%)

Class Activities	8 @25pts = 200pts	(27%)
Petrology Project*	150pts	(20%)
Total points:	**750 pts****	

Letter Grade	Percent Range
A	100.00 - 93.00
A-	92.99 - 90.00
B+	89.99 - 87.00
B	86.99 - 84.00
B-	83.99 - 81.00
C+	80.99 - 78.00
C	77.99 - 75.00
C-	74.99 - 72.00
D+	71.99 - 69.00
D	68.99 - 66.00
D-	65.99 - 63.00
F	<62.99

**The petrology project has multiple components. Due dates are outlined in the lab calendar.*
***It is your responsibility to regularly check with your instructor about your progress in the course.*

STUDENT FEEDBACK: Timely and adequate feedback is essential to student learning. Thus, I will provide feedback on your submitted work, offering constructive comments and ways to improve.

ATTENDANCE: Regular attendance is required and is important for your success in this course. That said, students are expected to attend in-person class sessions. If you miss /skip class, you will be held responsible for all of the content (and announcements) that you missed during your absence. Please email and/or visit your instructor if you miss class. *Lectures & labs will not be recorded*. During course meetings, students are expected to participate and remain engaged; distracting behavior will not be tolerated. *Lecture slides are posted in Moodle for your convenience.*

EXAMS: Lecture exams assess your understanding of lecture concepts and vocabulary. Although exams are not comprehensive, the concepts found in one section/chapter may require you to have a working knowledge of previous concepts and vocabulary from earlier sections/chapters. If it is covered in lecture/lab – you are responsible for knowing it. During the semester, you will have three exams. All approved make-up exams are taken during office hours (see office hours) or by appointment.

GEOCHEMICAL PROBLEM SET: This exercise is designed to help you apply knowledge and demonstrate mastery of key geochemical concepts related to petrology (geochemical analyses, modeling, isotopes, geochronology). This assignment requires calculations using a spreadsheet program and typed responses. The due date is outlined in the lecture calendar. This homework assignment addresses *course objectives #4, #5, and #6*. *Late submissions will be penalized 25% for each day late.*

FIELD TRIP: We will be taking a field trip to examine the Precambrian geology of the St. Francois Mountains in sourtheastern Missouri. This trip is scheduled for April 21st- 24th and is an important component of this course (please plan accordingly). During this field trip, you will be expected to record field observations, collect data, and make sketches within a field notebook (notebooks will be evaluated). This assignment partially satisfies the 'WD' requirement for this course and addresses *course objectives #2, #3, and #6*.

CLASS ACTIVITIES: To help you become familiar with common igneous and metamorphic rocks, we will examine the mineralogical and textural properties of a suite of rocks each week. These hands-on activities allow you to demonstrate your understanding of lecture/lab concepts and help you gain an appreciation for the diversity of igneous/metamorphic rocks. These lab exercises address primary *course objectives #1 - #3*. *NOTE: These activities require effort outside of class. That said, it is your responsibility to access the class materials on your own in order to complete the assignments (these are not labs). Late submissions will be penalized 25% for each day late*.

LAB EQUIPMENT: Each week, you will need to bring the following lab materials to class: 1) your notebook; 2) hand Lens, 3) calculator, and 4) drawing supplies (color pencils, pens, compass, protractors).

PETROLOGY RESEARCH PROJECT: To better help you apply lecture content, you will be asked to complete an experiential research project. This project will require you to: 1) locate, read, summarize primary peer-reviewed literature, 2) prepare thin sections, 3) collect observations and data, 4) classify samples, and 5) interpret relevant geochemical data. At the end of the semester, you will present your project during a three-hour poster session (modeled after a GSA conference). This project partially satisfies the 'WD' requirement for this course and addresses *course objectives #1 - #6*. *NOTE: These projects require a significant effort inside/outside of class. We will use portions of our lab meeting time to work on these projects. These projects make up a 20% of your grade. Late submissions will be penalized (25%/day late).*

ADDITIONAL COURSE POLICIES AND INFORMATION:

EMAIL: If you cannot meet during office hours, please email your instructor. *Emails sent after 5pm may not receive a response until the next day. Emails sent over the weekend may not receive a response until the following weekday (Monday). Please respect this policy and plan accordingly.*

COPYRIGHT POLICY

All materials provided to you in this course are copyrighted. None of the course materials may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without prior written permission.

INCLUSIVITY STATEMENT:

"A university is a place where the universality of the human experience manifests itself" – Albert Einstein. In keeping with Einstein's viewpoint, the Geosciences program at DePauw is committed to providing an inclusive environment of learning and living that is open to all people and perspectives. It is the policy and practice of this course to create a welcoming environment for all students as well as to address students in accordance with their personal identity. In this course, you will be encouraged to remain open to information, ideas, and experiences shared by other students. For more information about diversity and inclusion at DePauw, please use the following link: https://www.depauw.edu/studentacademiclife/cdi/

ADA ACCOMODATIONS:

It is the policy and practice of DePauw University to strive to support the student experience and to provide reasonable accommodations for students with properly documented disabilities. If you are eligible to receive an accommodation and would like to request it for this course, please contact student disability services. Allow one week advance notice to ensure enough time for reasonable accommodations to be made. Accommodations are not retroactive. Students who have questions about student disability services or who have, or think they may have, a disability (psychiatric, attentional, learning, vision, hearing, physical, medical, etc.) are invited to contact student disability services for a confidential discussion in union building suite 200 or by phone at 765-658-6267 (studentaccessibility@depauw.edu).

RESOURCES FOR STUDENTS OF COLOR IN STEM:

Students of Color in STEM (SoCiS) is a student organization aimed at supporting STEM students who identify as students of color and members of diverse underrepresented identities on campus. This organization provides these students with a network of students in or interested in a similar major that could be a support system for them academically (tutoring) and socially (mentoring). Please let me know if you would like more information about SoCiS. Join their e-mail list at: (SoCiS_list@depauw.edu).

ACADEMIC INTERGRITY STATEMENT

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. Cheating, plagiarism, submission of the

work of others, etc. violates DePauw's policy on academic integrity. Lapses of academic integrity will be dealt with according to the policies set forth in the student handbook. If you are not sure what constitutes dishonest academic activities, please make sure you discuss any questions you may have with me. The policy is also available at: http://www.depauw.edu/handbooks/academic/#Toc459018101

As the instructor, I agree:	Your basic responsibilities as the student:
1. To begin and end class at its scheduled time. 2. To respectfully answer questions about the subject matter (i.e. to respect all questions and students). 3. To accept questions before/after the class period and to respond to these accordingly. 4. To promptly notify students of course changes. 5. To be approachable and respectful to students. 6. To provide timely and adequate feedback. 7. To meet with students that schedule office appointments. 8. To teach you fundamental geologic concepts and vocabulary relevant to a career in the Geosciences. 9. To have fun while teaching this course!	1. Remain open-minded about course content 2. Attend our regular class meetings and be prepared for class/lab activities 3. Refrain from any disruptive behavior (talking, texting, phone calls, laptop use). 4. Email/visit your instructor if have questions. 5. Abide by all policies outlined in the syllabus. 6. Respect the opinions, ideas, and experiences shared by other students. 7. Complete all assignments and assessments by their respective due dates/ times. 8. Check email daily for class announcements. 9. Enjoy how cool science can be!

Dr. Ken Brown

Dr. Ken Brown; SPRING 2022 Teaching/ Office Hour Schedule

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00 AM 8:15 AM 8:30 AM 8:45 AM		GEOS 110 A LAB 8:00 - 9:50			
9:00 AM 9:15 AM 9:30 AM 9:45 AM					
10:00 AM 10:15 AM 10:30 AM 10:45 AM					
11:00 AM 11:15 AM 11:30 AM 11:45 AM	OFFICE HOURS 11:00 - 12:30 (or by appointment)		OFFICE HOURS 11:00 - 12:30 (or by appointment)		OFFICE HOURS 11:00 - 12:30 (or by appointment)
12:00 PM 12:15 PM 12:30 PM 12:45 PM	GEOS 320 Petrology LECTURE 12:30 - 1:30		GEOS 320 Petrology LECTURE 12:30 - 1:30	GEOS 320 Petrology LAB. 12:30 - 3:30	GEOS 320 Petrology LECTURE 12:30 - 1:30
1:00 PM 1:15 PM 1:30 PM 1:45 PM					
2:00 PM 2:15 PM 2:30 PM 2:45 PM		GEOS 110 B LAB 2:50 - 3:50			
3:00 PM 3:15 PM 3:30 PM 3:45 PM	GEOS 110A & B LECTURE 2:50 - 3:50		GEOS 110A & B LECTURE 2:50 - 3:50		GEOS 110A & B LECTURE 2:50 - 3:50
4:00 PM 4:15 PM 4:30 PM 4:45 PM	DEPT MEETINGS				

Teaching and Office Hours Schedule for Spring 2022

LECTURE CALENDAR (subject to change)

MONTH	WEEK	DAY	TOPIC	Reading /Event
FEBRUARY	Week 1	4-Feb	Intoduction, Projects, Class Expectations	-
	Week 2	7-Feb	Petrology - Earth's Structure & Composition	-
		9-Feb	Ig Classification & Nomenclature (Part I): Basics	Chapter 1
		11-Feb	Mafic Plutonic Rocks	
	Week 3	14-Feb	Ig Classification & Nomenclature (Part II): IUGS	Chapter 1
		16-Feb	Ig Classification & Nomenclature (Part III): Chemical	Chapter 1
		18-Feb	Intermediate Plutonic Rocks	
	Week 4	21-Feb	Silicate Melt-Forming Processes & Tectonics	Chapter 3
		23-Feb	Physical Properties of Silicate Melts & Magmas	Chapter 3
		25-Feb	Felsic Plutonic Rocks	
MARCH	Week 5	28-Feb	Common Igneous Rock - Plate Tectonic Associations	Chapters 7, 8, and 9
		2-Mar	***REVIEW SESSION***	
		4-Mar	***EXAM #1***	
	Week 6	7-Mar	Chemical Petrology: Major Element Chemistry	Chapter 4
		9-Mar	Chemical Petrology: Trace Elements Chemistry (Part I)	Chapter 4
		11-Mar	Mafic Volcanic Rocks	
	Week 7	14-Mar	Chemical Petrology: Trace Element Chemistry (Part II)	Chapter 4
		16-Mar	Chemical Petrology: Geochemical Modeling	Chapter 4
		18-Mar	Intermediate Volcanic Rocks	
	Week 8	21-Mar	Isotopic Applications in Petrology	Chapter 5
		23-Mar	Geochronology Applications in Petrology	Chapter 5
		25-Mar	Felsic Volcanic Rocks	**GEOCHEM PROBLEM SET DUE**
	Week 9	28-Mar	***SPRING BREAK - NO CLASS***	
		30-Mar		
		1-Apr		
APRIL	Week 10	4-Apr	Diversification of Magmas	
		6-Apr	***GSA MEETING***	
		8-Apr		
	Week 11	11-Apr	***EXAM #2***	
		13-Apr	Intro to Metamorphic Rocks	Chapter 12
		15-Apr	Pelitic Protoliths	Chapter 16
	Week 12	18-Apr	Agents of Metamorphism	Chapter 12
		20-Apr	Types of Metamorphism	Chapter 12
		22-Apr	**FIELD TRIP TO ST. FRANCOIS MTNS, MISSOURI**	
	Week 13	25-Apr	Metamorphic Classification & Nomenclature	**FIELD TRIP NOTEBOOK DUE**
		27-Apr	Metamorphic Textures & Structures	
		29-Apr	Mafic & Calcareous Protoliths	Chapters 15 & 17
MAY	Week 14	2-May	Metamorphic Facies & Index Minerals	Chapter 14
		4-May	***REVIEW SESSION***	
		6-May	***EXAM #3***	
	Week 15	9-May	***PETROLOGY PROJECT WORK DAY***	
		11-May	***PETROLOGY PROJECT WORK DAY (Poster Printing)***	

LAB CALENDAR (subject to change)

MONTH	WEEK	DAY	LAB/CLASS WORK	PROJECT ASSIGNMENT
JAN.	Week 1	3-Feb	-	-
FEBRUARY	Week 2	10-Feb	*Intro to Igneous Minerals & Textures*	
	Week 3	17-Feb	*Mafic Plutonic Rocks*	***Annotated Bibliography Due***
	Week 4	24-Feb	*Thin Section Prep; Intermediate Plutonic Rocks*	
MARCH	Week 5	3-Mar	*Thin Section Prep; Felsic Plutonic Rocks*	***Project Proposal Due***
	Week 6	10-Mar	*Thin Section Prep & Descriptions*	
	Week 7	17-Mar	*Mafic Volcanic Rocks; Analytical Session*	***Intro & Background Due***
	Week 8	24-Mar	*Intermediate Volcanic Rocks; Analytical Session*	
	Week 9	31-Mar	***SPRING BREAK***	
APRIL	Week 10	7-Apr	*Felsic Volcanic Rocks; (GSA Meeting)*	***Methods Section Due***
	Week 11	14-Apr	*Intro to Metamorphic Minerals & Textures*	
	Week 12	21-Apr	***FIELD TRIP TO ST. FRANCOIS MTNS, MISSOURI***	
	Week 13	28-Apr	*Pelitic Protoliths; Analytical Session*	***Results Section Due***
MAY	Week 14	5-May	*PETROLOGY PROJECT WORK DAY; Mafic & Calcareous Protoliths*	
	Week 15	12-May	***PETROLOGY PROJECT POSTER PRESENTATIONS***	