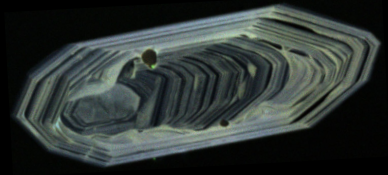


PETROLOGY

GEOS 320

Spring 2025



LECTURE: MWF (12:30 – 1:30pm)

LAB: Tuesday (9:40 – 11:30pm)

Room: JSC 226

Instructor: Dr. Ken Brown

Email: kennethbrown@depauw.edu **Phone:** 765.658.6767

Office: Julian 213

Office Hours: MWF (11:30am–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; **OPEN SOURCE TEXTBOOK:** <https://opengeology.org/petrology/>

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/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

Exam 1	100 pts	(18%)
Exam 2	100 pts	(18%)
Exam 3	100 pts	(18%)

Lab Component

Geochem Problem Set	50 pts	(10%)
Field Trip Notebook	50 pts	(10%)
Lab Exercises	6@25pts =	150pts (26%)

Total points: 550 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

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 feedback is essential to student learning. Thus, I will strive to provide feedback on your submitted work, offering constructive comments and ways to improve.

ATTENDANCE: Attendance is required and is important to your success in this course. Students are expected to attend class, and while in class, refrain from any activity that could interfere with the learning experience of others. It is common for students to face challenges (e.g., academic, medical, spiritual, or emotional) that result in absences. *If you have to miss class, please let me know. You will be responsible for all of the content (and announcements) that you missed during your absence.* Course slides are posted in Moodle for your convenience.

EXAMS: *Exams evaluate your understanding of fundamental concepts/vocabulary and your ability to apply these to solve applied problems.* 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. If it is covered in the lecture slides, reading assignments, or class discussions/activities, you are responsible for knowing it. No make-up exams will be given without proper approval. Approved make-up exams are taken during office hours. *Exam dates are outlined in the calendar.*

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 southeastern Missouri. This trip is scheduled for Friday, April 4th – Sunday, April 6th 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.* Students that cannot attend the field trip will be required to complete an equivalent exercise.

LAB EXERCISES: To help you become familiar with common igneous and metamorphic rocks, we will examine the mineralogical and textural properties of these rocks in lab each week. These hands-on exercises allow you to demonstrate concept mastery and help you gain an appreciation for the diversity of these rocks. These exercises address primary *course objectives #1 - #3.* ***NOTE:*** *These activities require effort outside of class. It is your responsibility to access these lab materials on your own in order to complete the assignments. Late submissions will be penalized 25% for each day late.* Each week, you will need to bring your hand Lens, calculator, and drawing supplies to lab.

ADDITIONAL COURSE POLICIES AND INFORMATION:

EMAIL: Please email your instructor if you have questions or would like to meet during office hours. *Emails sent after 5pm may not receive a response until the next day. Emails sent after 5pm on Friday 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.

Diversity, Equality, & Inclusivity:

“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 and its instructor to create a welcoming environment for all students as well as to address students in accordance with their personal identities. 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 Accommodations:

It is the policy and practice of DePauw University (and this instructor) to strive to support the student experience and to provide reasonable accommodations for all students. 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).

Inclusivity in the Geosciences:

Geoscientists address increasingly challenging problems that confront a growing human population: climate change, dwindling resources, earthquake prediction and natural hazard identification, environmental concerns, and safe disposal of waste materials. Because the Earth is our only home, the geosciences promote stewardship of the environment and Earth’s finite natural resources, therein creating a deeper sense of social/civic responsibility that transcends all races, cultures, ages, and identities. As such, there are many professional communities that support the intersectionality of students within the geosciences. I would be happy to connect you with these communities.

ACADEMIC INTEGRITY STATEMENT

The use of AI in any form is not acceptable in this class. 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:
<ol style="list-style-type: none"> 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). 3. To accept questions before/after the class period and to respond to these accordingly. 4. To promptly notify students of any change made to the course. 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 Geoscience careers 9. To have fun while teaching this course! 	<ol style="list-style-type: none"> 1. Remain open-minded about course content 2. Attend our class meetings and be prepared for class activities/discussions 3. Refrain from any disruptive behavior (talking, texting, phone use, laptop use, etc.). 4. Email/visit your instructor if have questions. 5. Abide by all of the policies outlined in this syllabus and in-class. 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 your email daily for class announcements 9. Enjoy how cool science can be!

Teaching and Office Hours Schedule for Spring 2025 – Subject to Change

Dept. of Geology & Env. Geoscience; Spring 2025 Teaching/ Office Hour Schedule					
	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
9:00 AM					
9:10 AM 9:20 AM 9:30 AM 9:40 AM 9:50 AM					
10:00 AM					
10:10 AM 10:20 AM 10:30 AM 10:40 AM 10:50 AM	GEOL 105 LECTURE 10:20 - 11:20 AM	GEOS 320 LECTURE 9:40- 11:30 AM	GEOL 105 LECTURE 10:20 - 11:20 AM		GEOL 105 LECTURE 10:20 - 11:20 AM
11:00 AM					
11:10 AM 11:20 AM 11:30 AM 11:40 AM 11:50 AM	OFFICE HOURS 11:30 - 12:30 PM (or by appointment)		OFFICE HOURS 11:30 - 12:30 PM (or by appointment)		OFFICE HOURS 11:30 - 12:30 PM (or by appointment)
12:00 PM					
12:10 PM 12:20 PM 12:30 PM 12:40 PM 12:50 PM	GEOS 320 LECTURE 12:30- 1:30 PM		GEOS 320 LECTURE 12:30- 1:30 PM		GEOS 320 LECTURE 12:30- 1:30 PM
1:00 PM					
1:10 PM 1:20 PM 1:30 PM 1:40 PM 1:50 PM					
2:00 PM					
2:10 PM 2:20 PM 2:30 PM 2:40 PM 2:50 PM					
3:00 PM					
3:10 PM 3:20 PM 3:30 PM 3:40 PM 3:50 PM					
4:00 PM					

LECTURE CALENDAR (subject to change)

MONTH	WEEK	DAY	TOPIC	Reading /Event		
Jan.	Week 1	-	-	-		
FEBRUARY	Week 2	3-Feb	Course Intro & Syllabus	-	Igneous Classification, Processes, & Properties	
		5-Feb	Earth's Structure & Composition (Part I)	Chapters 1		
		7-Feb	Earth's Structure & Composition (Part II)	Chapters 1		
	Week 3	10-Feb	Mineralogy Review & Rock/Mineral Associations Activity	Chapter 2		
		12-Feb	Ig Classification & Nomenclature (Part I): Basics	Chapter 2		
		14-Feb	Ig Classification & Nomenclature (Part II): IUGS	Chapter 2		
	Week 4	17-Feb	Ig Classification & Nomenclature (Part III): Chemical	Chapter 2		
		19-Feb	Ig Classification & Nomenclature Activity	Chapter 3		
		21-Feb	Melt-Forming Processes & Tectonic Environments	Chapter 3		
	Week 5	24-Feb	Properties of Silicate Melts & Magmas	Chapter 3		
26-Feb		Properties of Silicate Melts & Magmas (cont)	Chapter 3			
28-Feb		REVIEW SESSION				
MARCH	Week 6	3-Mar	EXAM #1		Chemical Petrology	
		5-Mar	Chemical Petrology: Major Element Chemistry	-		
		7-Mar	Chemical Petrology: Trace Elements Chemistry (Part I)	-		
	Week 7	10-Mar	Chemical Petrology: Trace Elements Chemistry (Part II)	-		
		12-Mar	Chemical Petrology: Trace Element Chemistry (Part II) Cont.	-		
		14-Mar	Chemical Petrology: Geochemical Modeling	-		
	Week 8	17-Mar	SPRING BREAK - NO CLASS			
		19-Mar				
		21-Mar				
	Week 9	24-Mar	Isotopic Applications in Petrology			
26-Mar		Geochronology Applications in Petrology				
28-Mar		NO CLASS - GSA MEETING		GEOCHEM PROBLEM SET DUE		
APRIL	Week 10	31-Mar	Chemical Petrology: Tectonic Settings			
		2-Apr	Diversification of Magmas			
		4-Apr	FIELD TRIP TO ST. FRANCOIS MTNS, MISSOURI			
	Week 11	7-Apr	REVIEW SESSION		FIELD NOTEBOOK DUE	
		9-Apr	EXAM #2			
		11-Apr	Intro to Metamorphic Rocks	Chapter 9		
	Week 12	14-Apr	Agents of Metamorphism	Chapter 9		
		16-Apr	Types of Metamorphism	Chapter 9		
		18-Apr	Metamorphic Classification & Nomenclature (Part I)	Chapter 10		
	Week 13	21-Apr	Metamorphic Textures & Structures (Part I)	Chapter 10		
23-Apr		Metamorphic Textures & Structures (Part II)	Chapter 10			
25-Apr		Metamorphic Textures & Structures Activity	Chapter 10			
Week 14	28-Apr	Metamorphic Facies & Index Minerals	Chapter 10			
	30-Apr	Meta Facies & Index Minerals: Pelitic Protoliths				
	2-May	Meta Facies & Index Minerals: Mafic Protoliths	Chapter 13			
MAY	Week 15	5-May	Meta Facies & Index Minerals: Calcareous Protoliths	Chapter 14		
		7-May	Meta Facies & Index Minerals: Other Protoliths	Chapter 15		
		9-May	WRAP UP & REVIEW SESSION			
Week 16	13-May	EXAM #3 (Tuesday, May 13th; 8:30am - 11:30am)				

LAB CALENDAR (subject to change)

MONTH	WEEK	DAY	TOPIC	Due Dates	
JAN.	Week 1	28-Jan	-	-	
FEBRUARY	Week 2	4-Feb	<i>Lab #1: Common Rock-Forming Minerals</i>	-	Mineralogy
	Week 3	11-Feb		-	
	Week 4	18-Feb		-	
	MARCH	Week 5	25-Feb	<i>Lab #2: Ultramafic & Mafic Igneous Rocks</i>	LAB #1
Week 6		4-Mar	-		
Week 7		11-Mar	<i>Lab #3: Intermediate Igneous Rocks</i>	LAB #2	
Week 8		18-Mar		-	
Week 9		25-Mar	SPRING BREAK		
APRIL	Week 10	1-Apr	<i>Lab #4: Felsic Igneous Rocks</i>	LAB #3	Metamorphic Petrology
	Week 11	8-Apr		-	
	Week 12	15-Apr	<i>Lab #5: Quartz-rich & Calcareous Protoliths</i>	LAB #4	
	Week 13	22-Apr		-	
MAY	Week 14	29-Apr	<i>Lab #6: Pelitic & Mafic Protoliths</i>	LAB #5	
	Week 15	6-May		-	
				-	LAB #6