Course Change Request

New Course Proposal

Date Submitted: 11/16/22 8:31 pm

Viewing: GEOL 508 : Igneous and Metamorphic Petrology

Last edit: 11/16/22 8:31 pm

Changes proposed by: ggilleau

Are you completing this form on someone else's behalf?

No

In Workflow

1. **AOES Chair**
2. **SC Curriculum Committee**
3. SC Associate Dean
4. Assoc Provost-Graduate
5. Registrar-Courses
6. Banner

Approval Path

1. 11/17/22 8:51 am Mark Uhen (muhen): Approved for AOES Chair

Effective Term:	Spring 2023		
Subject Code:	GEOL - Geology	**Course Number:**	508
Bundled Courses:			
Is this course replacing another course?	No		
Equivalent Courses:			
Catalog Title:	Igneous and Metamorphic Petrology		
Banner Title:	Igneous/Metamrphc Petrol		
Will section titles vary by semester?	No		
Credits:	4		
Schedule Type:	Lecture w/Lab		
Hours of Lecture or Seminar per week:	3		
Hours of Lab or Studio per week:	3		

Repeatable: May be only taken once for credit, limited to 3 attempts (N3)

Max Allowable Credits: 12

Default Grade Mode: Graduate Regular

Recommended Prerequisite(s):

Undergraduate courses in Physical Geology, Historical Geology, and Mineralogy at undergraduate institution

Recommended Corequisite(s):

Required Prerequisite(s) / Corequisite(s) (Updates only):

Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

Registration Restrictions (Updates only):

Registrar's Office Use Only - Registration Restrictions:

Field(s) of Study:

Class(es):

Level(s):

Degree(s):

School(s):

Catalog Description:

Practical and theoretical background for identifying, classifying and interpreting igneous and metamorphic rocks with emphasis on their petrogenesis and relationship to the tectonic context. Many include field trips.

Justification:

We are proposing to create a graduate section of GEOL 308 (Igneous and Metamorphic Petrology), which is a key course for undergraduate geology majors. The purpose of creating the graduate section is particularly to help students in the Bachelors Accelerated Masters (BAM) program, allowing them to take a course that

counts both towards their undergraduate geology major requirements and can be used as graduate credit towards their Earth Systems Science MS (ESS MS) degree. This course will be available to our advanced undergraduates who have been accepted into the BAM program.

Does this course cover material which crosses into another department? No

Learning Outcomes:

Attach Syllabus
Syllabus_IGMETPET_2023.pdf

Additional Attachments

Staffing:
Giuseppina Kysar

Relationship to Existing Programs:
This course will serve as an alternate to the GEOL 308 requirement for the Geology BA and BS degrees and will help satisfy elective requirements for the Earth Systems Science MS. It will help students who have entered the BAM program in ESS MS gain both undergraduate and graduate credit.

Relationship to Existing Courses:
This is a graduate section of the existing GEOL 308 (Igneous and Metamorphic Petrology).

Additional Comments:

Reviewer Comments

Key: 17966

INTRODUCTORY IGNEOUS AND METAMORPHIC PETROLOGY
GEOL 508 - Spring 2023

Syllabus for Lecture and Laboratory

Lecture room: Exploratory Hall L505 **Lecture time**: MW, 1:30-2:45 PM - Lab time: M 3 – 5:45 PM
Instructor: G. Mattietti, PhD **E-mail:** gkysar@gmu.edu
Office Hours: Wednesday 11 AM to 1 PM, or by appointment
Instructional Material: John D. Winter, principles of igneous and metamorphic petrology. The textbook is Available from the bookstore or from: https://www.pearson.com/us/higher-education/program/Winter-Principles-of-Igneous-and- Metamorphic- Petrology-2nd-Edition/PGM146492.html
Used textbook and/or sharing the textbook is fine. Make sure you are buying the book by Winter, there are Petrology textbook with the same title but by other authors.
Handouts and other course materials distributed through Blackboard
*This course meets concurrently with GEOL 308

Catalog Description: Practical and theoretical background for identifying, classifying and interpreting igneous and metamorphic rocks with emphasis on their petrogenesis and relationship to the tectonic context.

Course Objectives and Goals

This is an igneous and metamorphic petrology course, designed to give students the knowledge and skills for identifying and classifying igneous and metamorphic rocks, and interpreting their petrogenesis in the tectonics context.

By the end of this course, students who applied themselves to the study of Petrology should be able to:

- To identify and classify igneous and metamorphic rocks samples in macroscopic, microscopic and through geochemistry
- To relate the rocks to the geologic, tectonic, and structural framework
- To understand the general reactions that take place in the rocks, and place these reactions in a PTX context
- Use petrochemistry databases to collect and interpret analytical data in their tectonic context.

Course Prerequisites

This is a course for graduate students that meets concurrently with GEOL 308, which is an upper-level geology class for geology, chemistry, chemical engineering majors. The topics discussed in this class require a basic solid knowledge of mineralogy and chemistry. The class covers a significant amount of material so you should not assume that topics will be reviewed starting at the basic level.

Course requirements and grading

While attendance is not mandatory, the course is intensive and missing class may result in falling behind the intense pace of this class.

Course Assessment is based on the results of three 3 lecture exams laboratory exercises. Each assessment component contributes as follows to the final grade:

- **3 lecture exams**, **each worth 25%** of the course for a total of 75% of the final grade. Exams are non-cumulative.
- **Lab portion: 25% of the course**. Laboratory exercises consists of a variety of exercises in petrography and chemical petrology, and collaboration is encouraged, but submissions is individual for each lab. The Laboratory portion of the class includes 2 laboratory exams on petrographic analysis of igneous and metamorphic rock specimens, Lab exams are non-cumulative.

Unless otherwise indicated, all laboratory assignments are due within 48 hours (that is at the beginning of Wednesday

lecture following the lab). Details of the laboratory assignments are distributed in class. Penalty for late submission is 10% of the score.

Final grade is assigned based on the following scale, with no exceptions:

A+≥ 99%, 94 ≥ A <99%, 90 ≥ A – < 94%; 85≥ B+ <90%; 80≥ B <85%; 77≥ B- <79%; 73≥ C+ <77%; 70 ≥ C <73%; 65≥ C- <70%; 50≥ D <65%; F<50%

- No lowest exam score dropped.
- No final curve, unless the end-of-semester final MEDIAN for the whole class (based on all lecture exams and lab scores) falls below 80%
- Absence/fail to submit an exam will result in a 0 (zero) score for that exam. No make-ups granted unless evidence of extenuating circumstances is provided. Make ups carry a 10% penalty.
- No Extra-credit available. Extra-credit based on individualized assignment is not available under any circumstance. The course is intensive and content heavy, there is no time for extra credit.

Taking this class for graduate credit as GEOL 508

This class is available for graduate credit as GEOL 508. To earn graduate credit, students will do:

- Four (4) additional readings from peer reviewed recent literature (journal of petrology, JGR, Volcanology, etc…) and chapters from graduate level textbook in petrology. Reading materials will be provided to the students. These will be assessed during the lecture exams as additional questions.
- Petrographic analysis of 1 suite of 6 samples (hand samples and thin sections) from a research collection. This is in addition to the standard petrographic work of the class, and it is calculated as part of the laboratory assessment to 7% of the total score
- Chemical petrology data analysis of a set of samples from a tectonic setting of choice (retrieved from databases). This assignment includes the production of graphs and their interpretation in the context of the tectonic setting. This project will count as 8% of the laboratory score.

Therefore the assessment for GEOL 508 is based on 3 lecture exams at 25%, 10 lab exercises at 10%, the petrographic analysis project 7%, the chemical petrology project at 8% of the total score.

Course Policies

Read CAREFULLY this syllabus. By staying enrolled in this course, you agree to the following course policies:

- **Attendance:** not mandatory, but highly recommended if you want to do well.
- **Communications: Email is the official way** of communicating with students. Any email from me will come from gkysar@gmu.edu or through blackboard. In accordance with protection of privacy best practices, I will not respond to email sent from non-GMU email accounts. It is your responsibility to make sure that your GMU email is set up properly and to check your email regularly. Your email must have a subject line because emails without subject are filtered as spam mail.
- **Class etiquette:** All students in attendance have the right to a safe and quiet learning environment. Respect all rules and regulations established by GMU (see university policies below). Come to class on time and if you must leave earlier do so in a way that will not disturb the other people present in the room. During class, mute your cell phones. Class disruption of any sort will not be tolerated.
- **Extenuating circumstances** might occur that prevent you from taking an exam. If such circumstances can be justified, a make-up session with no penalty is available. NOTE CAREFULLY THE DAY OF THE EXAMS; if you realize that you cannot take an exam as scheduled, inform the professor immediately. As per GMU policy on religious festivities, you must inform the instructor at the beginning of the semester if you will be absent to an exam if order to schedule a make-up.
- **Course materials:** all course material distributed to students is protected by U.S. copyright law and/or is intellectual property of the course instructor; you cannot repost this material on the web, on online study sites or distribute in any other format outside the class.

University policies

As a GMU student enrolled in this class, you must be aware of the following:

- **Health and safety protocols** established by the University, go to this link and scroll to Health and Safety https://www.gmu.edu/safe-return-campus

- **Privacy** is covered by the Family Educational Rights and Privacy Act (FERPA) and is an essential aspect of this course. Students must use their GMU email account to receive important University information, including communications related to this class. In accordance with FERPA regulation, I will not respond to messages sent from a non-GMU email address.

- **The Honor Code** is an integral part of the educational process, and GMU takes these matters very seriously. Violations of academic integrity occur when students fail to cite research sources properly, engage in unauthorized collaboration, falsify data, cheat during exams and in other ways outlined in the Honor Code. Students accused of academic integrity violations should contact the Office of Academic Integrity to learn more about their rights and options in the process. Outcomes can range from failure of assignment to expulsion from the University, including a transcript notation. The Office of Academic Integrity maintains a permanent record of the violation. For more information, please refer to the Office of Academic Integrity website.

- Be aware of the issues related to the use of study sites, refer to the instruction from the **Office of Academic Integrity** with important information about study sites. All students must watch this video: https://youtu.be/oKbTrgBCN7c

- **TITLE IX** As a faculty member, I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to GMU-Title IX coordinator at https://diversity.gmu.edu/title-ix If you wish to speak with someone confidentially, contact the Title IX office athttps://diversity.gmu.edu/title-ix/who-can-i-call

- **Disability Services.** https://ds.gmu.edu/ Any student who may need an accommodation based on the potential impact of a disability should contact Disability Services ods@gmu.edu to establish eligibility and to coordinate reasonable accommodations. In order to receive accommodation for exams students must submit their DS paperwork before the exam.

- **Counseling and Psychological Services** https://caps.gmu.edu/ GMU offers counseling and psychological services, supporting mental health and personal development by collaborating directly with students to overcome challenges and difficulties that may interfere with academic, emotional, and personal success.

- **Diversity and Inclusion:** https://diversity.gmu.edu/diversity Faculty, staff and students in this course welcome and value individuals and their differences including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and disability.

- **Observance of religious holidays**. In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance if that should coincide with an exam. For details and policy, see: https://ulife.gmu.edu/religious-holiday-calendar/

Course Calendar*

- This calendar displays dates of lectures and labs only. See Academic Calendar for standard holidays.
- Notes and reading assignments for each lecture/lab are posted on blackboard the day before class

Date	Lecture topic	Laboratory
Jan 23	Igneous structures and field relationships I	Lab 1 - What previous knowledge and skills do you need for this course, review of nomenclature and basic skills
Jan 25	Igneous structures and field relationships II	
Jan 30	Igneous structures and field relationships III	Lab 2 – intrusive rocks (hand sample and thin section) mafic and ultramafic
Feb 1	Phase diagrams, single and two components. Solid solution, Eutectic, Peritectic and Solvus	
Feb 6	Phase diagrams - multiple components	Lab 3 – intrusive rocks (hand sample and thin section) intermediate and felsic composition
Feb 8	Modal and chemical classification of igneous rocks. Normative classification CIPW and Major elements oxides.	
Feb 13	Chemical petrology of trace elements	Lab 4: volcanic rocks (hand sample and thin section) aphanitic and porphyritic textures
Feb 15	Chemical petrology of isotopes	
Feb 20	Q&A for exam 1/ Study day	Lab 5: volcanic rocks (hand sample and thin section) pyroclastic rocks
Feb 22	**LECTURE EXAM 1**	
Feb 27	Origin of Magma	Review and lab exam preparation
March 1	Variety of Oceanic Basalts: Ridges and Rises	
March 6	Convergent plate boundary magmatism	**LAB EXAM 1**
Mar 8	Hot spot magmatism: oceanic	

Mar 20	Lecture/Lab mash up: self-guided tour of the Petrology Exhibit at the Smithsonian museum of Natural History. (a.k.a. lab 6)	
Mar 22	Hot-spot related rocks mantle plumes CRB-Yellowstone	
Mar 27	Continental magmatism: kimberlites - Carbonatites	Lab 7: IgPet software and databases
Mar 29	Granitoids	
Apr 3	Layered Mafic intrusions	Lab 7: continued chemical petrology diagrams
Apr 5	Q&A for exam 2	
Apr 10	**LECTURE EXAM 2**	Lab 7 continued chemical petrology diagrams
Apr 12	Metamorphic phase diagrams Thermobarometry	
Apr 17	Metamorphism of mafic and ultramafic rocks	Lab 8: introductions to petrographic analysis of metamorphic rocks – Metamorphic minerals
Apr 19	Metamorphism of Pelitic Rocks	
Apr 24	Metamorphism of Carbonates	Lab 9: Metamorphic textures
Apr 26	The role of fluids, metasomatism	
May 1	Metamorphic Associations	Lab 10: metamorphic grade
May 3	Q&A for exam 3	
May 10	**FINAL LECTURE AND LAB EXAM 1:30 to 4:15 PM**	

**Lecturer reserves the right to change lecture topics to fit class needs and learning objectives*