2018–2019

M. S. Geoscience Handbook

Department of Earth and Space Sciences

WCU
WEST CHESTER UNIVERSITY

TABLE OF CONTENTS

MASTER OF SCIENCE (M.S.) IN GEOSCIENCE

Name:	**Date of Acceptance:** **Planned Graduation Date:**

ADMISSION REQUIREMENTS

1. Complete Application (GPA of 2.8 or higher)
2. Prerequisites
   - Completion of 4-yr undergraduate degree
   - ESS 101—Introduction to Geology
   - CHE & CRL 103 – General Chemistry I and Lab
   - PHY 130 – General Physics I
   - MAT 115 – College Algebra & Trigonometry
   - MAT 121 – Statistics I
3. Permission of graduate review committee

CORE REQUIREMENTS (19 CREDITS)

	CREDITS	COURSE	SEMESTER	GRADE
ESS 521 Geometrics	3			
ESS 523 Field Geology	3			
ESS 596 Earth Systems Science	3			
ESS 547 Geoscience Seminar (may be retaken)	1			
ESS 602 Directed Research	3			
Choose **2** of the following **4** courses: ESS 530 Oceanography ESS 536 Environmental Geology ESS 549 Advanced Hydrogeology ESS 570 Meteorology	3			
	3			

ELECTIVES (17 CREDITS)

ESS or SCE elective (500 or higher)	3			
ESS or SCE elective (500 or higher)	3			
ESS or SCE elective (500 or higher)	2			
Elective (ESS or other department) (500 or higher)	3			
Elective (ESS or other department) (500 or higher)	3			
Elective (ESS or other department) (500 or higher)	3			

Application for Degree Candidacy

After completing 12 credits, student must: a) form a 3-faculty graduate committee (which includes a research faculty advisor and the Graduate Coordinator), and b) submit to the committee a research proposal.

Title of Project _____ Date _____

Committee Chair _____ Pass Fail

Faculty Member 2 _____ Pass Fail

Faculty Member 3 _____ Pass Fail

After all committee members assign "Pass," student completes the online "Degree Candidacy Form" (https://www.wcupa.edu/_admissions/sch_dgr/forms/degCand_form.asp) to the Graduate Studies Office.

MS Geoscience Final Project

Date of Examination _____	**Written Report**	**Oral Presentation**
Committee Chair _____	Pass Fail	Pass Fail
Faculty Member 2 _____	Pass Fail	Pass Fail
Faculty Member 3 _____	Pass Fail	Pass Fail

SUGGESTED COURSE SEQUENCE

Starting: Fall Semester

Semester 1 (Fall)	Semester 2 (Spring)	Semester 3 (Summer Session I)
• ESS 521 (3) • ESS 570 or ESS 549 or ESS 5xx elective (3) • ESS 547 (1)	• ESS 530 or ESS 536 or ESS 5xx elective (3) • ESS 5xx elective (3)	• ESS 523 (3) • ESS 596 (3)
Semester 4 (Fall)	**Semester 5 (Spring)**	
• ESS 570 or ESS 549 or ESS 5xx elective (3) • ESS 5xx elective (3) • ESS 5xx elective (3)	• ESS 530 or ESS 536 or ESS 5xx elective (3) • ESS 5xx elective (2 or 3) • ESS 602 (3) **Present Final Project by first week of May**	

Starting: Spring Semester

Semester 1 (Spring)	Semester 2 (Fall)	Semester 3 (Summer Session I)
• ESS 530 or ESS 536 or ESS 5xx elective (3) • ESS 5xx elective (3)	• ESS 521 (3) • ESS 570 or ESS549 or ESS 5xx elective (3) • ESS 547 (1)	• ESS 523 (3)
Semester 4 (Spring)	**Semester 5 (Summer Session I)**	**Semester 6 (Fall)**
• ESS 530 or ESS 536 or ESS 5xx elective (3) • ESS 5xx elective (3)	• ESS 596 (3)	• ESS 570 or ESS 549 or ESS 5xx elective (3) • ESS 5xx elective (2 or 3) • ESS 602 (3) **Present Final Project by first week of December**

GRADUATE COURSE ROTATION

Every Semester

- ESS 513/301 Environmental Geochemistry
- ESS 531/331 Paleontology
- ESS 543/343 Geomorphology
- ESS 560 Internship
- ESS 591 Independent Studies, including Summer
- ESS 602 Directed Research, including Summer

Every Fall

- ESS 521/321 Geometrics
- ESS 547/447/347 Seminar
- ESS 550/450 Sedimentology & Stratigraphy

Every Spring

- ESS 502/302 Mineralogy
- ESS 505/405 Petrology
- ESS 520/420 Structural Geology
- ESS 536/336 Environmental Geology
- ESS 539/439 Hydrogeology

Every Summer (Session I)

- ESS 523 Field Studies of Southeast Pennsylvania (typically offered on Saturday)
- ESS 596 Earth Systems Science

Fall of Even Years

- ESS 530 Oceanography
- ESS542/442 Geophysics
- ESS 549 Advanced Hydrogeology
- ESS 562/362 History of Astronomy

Fall of Odd Years

- ESS 570 Meteorology
- ESS 590/490 Introduction to Soils

Spring of Even Years

- ESS 507/307 Geology of the Solar System
- ESS 535/435 Remote Sensing
- ESS 571/371 Advanced Meteorology

Spring of Odd Years

- ESS 532 Advanced Oceanography
- ESS 555/355 Intermediate Astronomy

Summer of Odd Years

- ESS 594/394 Geology of Northwestern National Parks, in rotation with
- ESS 595/395 Geology of Southwestern National Parks

Courses Offered Outside of Rotation

- ESS 544/344 Geomorphology II
- ESS 548/448 Int'l Geology Field Studies
- ESS 580 Special Topics

ADVISING NOTES, INCLUDING PG LICENSURE

1. ESS 591 (Independent Studies) – an elective course - can fulfill the 2-credit requirement. **See Page 12 for instructions on how to schedule ESS 591.**

2. ESS 602 (Directed Research) – a required course taken your final semester providing dedicated time to work on the final research project. **See Page 12 for instructions on to how to schedule ESS 602.**

3. Students seeking a career as a geoscientist are encouraged to earn **Professional Geologist (PG) licensure**. The following courses are highly recommended to achieve that goal:

    - ESS 502 (Mineralogy)
    - ESS 523 (Field Geology)
    - ESS 539 (Hydrogeology)
    - ESS 543 (Geomorphology) – **Has a prerequisite of ESS 204**
    - ESS 550 (Sedimentation and Stratigraphy)
    - ESS 505 (Petrology) – **Has a prerequisite of ESS 502**
    - ESS 520 (Structural Geology)

PG licensure is obtained by first passing the Fundamentals of Geology (FG) exam. **You must have taken ESS 523 (Field Geology) and ESS 520 (Structural Geology) to take the FG exam.** Upon successfully completion of the FG exam, you become a Geologist-in-Training (GIT).

After 5 years in a working environment (of which 1 year can include graduate school) as a GIT, you become eligible to take the Practice of Geology (PG) exam. **You must also have taken 30 credits of geology courses to take the PG exam.**

Graduate students interested in learning more about licensure may contact the State Registration Board for Professional Engineers, Land Surveyors and Geologists at www.dos.pa.gov/eng.

4. Recommended courses available outside the Department:

    - ENV 230 (HAZWOPR course). 40-hr course providing training required by OSHA and EPA to work sites where hazardous materials may be stored or used.
    - ENV 533 (Water Quality and Health)
    - ENV 545 (Risk Assessment)
    - ENV 547 (Environmental Regulations)
    - ENV 551 (Environmental Toxicology)
    - GEO 534 (Introduction to GIS)

ACCELERATED ("FAST-TRACK") OPTION FOR THE M.S. GEOSCIENCE DEGREE

Students earning a B.S. Geoscience degree from West Chester University have the option to complete the M.S. Geoscience degree during their 5th year.

Program Overview:

1. Enroll in the B.S. Geoscience "Accelerated" program your junior year. Directions on how to apply are given below. **You must have a minimum cumulative GPA of 3.0 to be accepted.**
2. Take up to 9 credits of graduate substitution courses (a list is included in the B.S. Geoscience Accelerated program advising sheet) during your 3rd and/or 4th years. These courses will count toward your 120-credit B.S. Geoscience degree.
3. Undergraduates pay undergraduate tuition and applicable fees for graduate substitution courses, and are bound by the undergraduate academic policies and regulations.
4. The semester before completion of your B.S. degree, you will have the opportunity, through myWCU, to indicate your intent to continue in the M.S. Geoscience program. **Note that enrollment in the accelerated option does not in any way obligate you to continue in the M.S. Geoscience program.**
5. The 9 credits of graduate substitution courses you took as an undergraduate will now count toward your M.S. Geoscience degree.
6. Therefore, you will have 36 – 9, or 27, outstanding graduate credits -- plus the final project -- to complete in the forthcoming year (i.e., Year 5).

This template on the next page is intended to aid in planning a course completion sequence for those students intending to pursue both a B.S. and M.S. Geoscience degree at WCU. There are many other options you can pursue. The Graduate Coordinator can help you select specific electives and courses.

To Enroll in the Accelerated Program:

In your junior year, obtain the necessary signatures on the form below, and submit to the Graduate Studies, 102 West Rosedale Avenue.

- https://wcupa.edu/registrar/documents/AcceleratedProgramEnrollmentRequestForm_June17_EN.pdf

Additional Details:

For additional policies and information regarding the accelerated program, go to:

- http://catalog.wcupa.edu/undergraduate/accelerated-programs/

FIVE-YEAR ACCELEARTED ("FAST-TRACK") OPTION SUGGESTED COURSE SEQUENCE

- **Years 1-4:** Consult the "Accelerated B.S./M.S. Geoscience Program" advising sheet

- **Year 5**: See matrix below.

<table>
<tr><th>Years 1-3
(Fall and Spring)</th><th>Year 4
(Fall)</th><th>Year 4
(Spring)</th></tr>
<tr><td rowspan="2">SEE "ACCELERATED B.S./M.S. GEOSCIENCE PROGRAM" ADVISING SHEET</td><td rowspan="2">SEE "ACCELERATED B.S./M.S. GEOSCIENCE PROGRAM" ADVISING SHEET</td><td>SEE "ACCELERATED B.S./M.S. GEOSCIENCE PROGRAM" ADVISING SHEET</td></tr>
<tr><td>Graduate with B.S. Geoscience in May</td></tr>
<tr><th>Year 4-5
(Summer)</th><th>Year 5
(Fall)</th><th>Year 5
(Spring)</th></tr>
<tr><td rowspan="2">ESS 523 (3)
ESS 596 (3)</td><td rowspan="2">ESS 547 (1)
ESS 521 (3)
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ESS 5xx elective (3)
ESS 5xx elective (3)
ESS 602 (3)</td></tr>
<tr><td>Present Final Project by first week of May</td></tr>
</table>

FINAL PROJECT INFORMATION

To graduate, all Masters students must complete a final project with the guidance of a faculty research advisor. The project consists of three required elements: a) proposal, b) professional report, and c) oral presentation to a 3-faculty graduate committee.

The project, typically carried out the last semester of study, is an:

- **Original *scientific* research project** that employs the scientific method – i.e., states a geoscience issue, provides a literature review, purports a hypothesis, tests that hypothesis using collected/retrieved data, and reveals conclusions that support or reject the hypothesis.

- Educators may submit **an original *education* research project** on a geoscience-related topic (e.g., plate tectonics, meteorology). Example research ideas can be found in the *Journal of Geoscience Education.*

Question: How do I get a research project?

A list of available faculty members and research topics is available at ***https://wcupa.edu/sciences-mathematics/earthSpaceSciences/facultyStaff.aspx*****.**
Communicate with that faculty member to confirm the working relationship. You must also:

- Form a 3-faculty member graduate committee, of which: a) the faculty member directing the project (he/she also serves as the ESS 602 instructor), and b) the Graduate Coordinator serve as committee members. For educators, the Department's Education Coordinator will direct the project (he/she also serves as the ESS 602 instructor) and will serve on the committee with the Graduate Coordinator. You are welcome to include a faculty member outside the Department.

- Submit a project **proposal form** to each member of the graduate committee. The form can be accessed by clicking the Graduate Resources tab on the ***Current Students page***.

Question: When must I have a project topic?

Upon completing 12 credits. After all committee members approve the proposal, the Graduate Coordinator will ask you to complete the online "Degree Candidacy Form" (***https://www.wcupa.edu/_admissions/sch_dgr/forms/degreeCandidacy/***). **YOU WILL NOT BE ABLE TO SCHEDULE CLASSES IF THIS REQUIREMENT IS NOT MET.**

Question: When do I enroll in ESS 602 (Directed Research)?

You are welcome to work on your research project after reaching 12 credits, although enroll in ESS 602 the same semester you plan to devote time to the project, typically your final semester before graduation. ***You must inform the Graduate Coordinator your intention to enroll in ESS 602 before that semester begins*****. YOU WILL NOT BE ABLE TO GRADUATE IF THIS REQUIREMENT IS NOT MET.**

A. Proposal

- Proposal elements are assessed using the following rubric:

MS Geoscience - Proposal Rubric			
	2-Target	**1-Acceptable**	**0-Unacceptable**
1a. Title	Title is concise and thoroughly describes the work to be completed.	Title is concise but doesn't describe all aspects of work to be completed.	Title describes few aspects of the work to be completed.
1b. Project Description	Project outcomes efficiently and thoroughly summarized, and include relevance of the work to career of writer and importance to the local community.	Project outcomes are summarized, relevance to career of writer and/or importance to the local community is weakly developed.	Project outcomes are incompletely summarized, does not describe relevance to career of writer and importance to local community.
1c. Methods	Project proposes thorough and multiple quantitative metrics and appropriate analyses to measure all outcomes.	Project proposes quantitative metrics and analyses to measure outcomes.	Project proposes metrics that are incomplete and/or analyses not most appropriate to measure outcomes.
1d. Expected Outcomes	Expected outcomes are thoroughly described, including multiple methods to be used by writer to self-assess.	Expected outcomes are described, and include a method to be used by writer to self-assess.	Expected outcomes not well described, and do not discuss methods to assess achievement of the outcomes.
1e. References	References are thorough, up to date, and appropriately formatted.	References are thorough, mostly up to date, and consistently formatted.	References are incomplete, do not include recent works, and are not consistently formatted.

B. Professional Report

- 20-40 pages, double-spaced, manuscript including figures and supporting data (or 20-pages written in the form of a manuscript to be submitted to a scientific journal).
- Include the following sections: a) title, b) abstract, c) introduction/motivation with literature review, d) methodology/data, e) results, f) conclusions, and g) references
- The report must be sent to your committee members at least **1 week before your oral presentation**.
- Example research manuscripts can be accessed by clicking the Graduate Resources tab on the ***Current Students page*** of the ESS website.
- Professional report elements are assessed using the following rubric:

MS Geoscience - Professional Report Rubric			
	2-Target	**1-Acceptable**	**0-Unacceptable**
2a. Title	Title is concise and thoroughly describes the work to be completed	Title is concise but does not describe all aspects of work to be completed	Title describes few aspects of the work to be completed
2b. Organization	Project is organized into logical sections with headings and subheadings.	Project is organized into sections with headings.	Project organization is not logically developed and/or well organized into sections and headings.
2c. Abstract	Efficiently and thoroughly describes the entire project and outcomes	Efficiently describes most of project and outcomes	Does not clearly and effectively describe the project and/or outcomes
2d. Introduction	Clearly describes the problem, its relevance to community, thorough treatment of previous and related work, and the objectives for the study	Describes the problem, its relevance to community, most previous and related work, and the objectives for the study	Incomplete description of the problem, relevance to community, incomplete treatment of previous works, and objectives are not clearly stated.
2e. Graphics	Graphics are well developed and effective in illustrating the aspects of the project. Captions are clearly written and describe the point(s) of graphic to the project.	Graphics are mostly effective in illustrating aspects of the project. Captions relate the purpose of the graphic to the project.	Graphics are not effective in illustrating the project (may be too few and/or poorly constructed). Figure captions poorly constructed.
2f. Quantitative Analyses	Data is presented in an organized fashion, data analyses and their results are appropriate and clearly described. Results related to project objectives.	Data presentation is present but could be clearer. Data analyses are not well described, and/or are related to most of the objectives of the project	Data presentation is lacking. Analyses are poorly described or not appropriate. Data analyses relate to few of the objectives of the project

2g. Relevance to Community	The project outcomes identify 2 or more objectives that are of importance to the community	The project outcomes identify 1 objective that is of importance to the community.	The project outcomes do not identify any objectives that are of importance to the community
2h. Conclusions	Outcomes are thoroughly described, including multiple methods to be used by writer to assess achievement of each objective of the project	Outcomes are described, and include one method to assess achievement of each of the objectives of the project	Outcomes are not well described, and writer does not demonstrate that all objectives of the project have been achieved.
2i. References	References are thorough, up to date, and appropriately formatted	References are thorough, mostly up to date, and consistently formatted	References are incomplete, do not include recent works, and are not consistently formatted

C. Oral Presentation (defense)

- Send an e-mail to your committee members **several months in advance** to coordinate a time and date for your defense. Plan on about 1 hour.
- To graduate in May or December, you must successfully defend by the Friday before graduation. (For a degree conferred in August, you must defend by the Friday at the end of Summer Session III.)
- The defense will begin with your 15- to 20-min *Powerpoint* presentation. Its format should parallel the report (minus the abstract). Example presentations can be accessed by clicking the Graduate Resources tab on the ***Current Students page*** of the ESS website.
- The next 20- to 30-min will consist of questions, comments, and discussion from the committee members
- The final 10-min will be used for the committee to render a verdict. It is a pass/fail system.
- Rubric for evaluating the oral presentation is below.

MS Geoscience -- Oral Presentation Rubric			
	2-Target	**1-Acceptable**	**0-Unacceptable**
3a. Title	Title is concise and thoroughly describes the work to be completed	Title is concise but does not describe all aspects of work to be completed	Title describes few aspects of the work to be completed
3b. Introduction	Clearly describes the problem, its relevance to community, thorough treatment of previous and related work, and the objectives for the study	Describes the problem, its relevance to community, most previous and related work, and the objectives for the study	Incomplete description of the problem, relevance to community, incomplete treatment of previous works, and objectives are not clearly stated.
3c. Evidences-Quantitative analyses	Data is presented in an organized fashion, data analyses and their results are appropriate and clearly described. Results are related to the objectives of the project	Data presentation is present but could be clearer. Data analyses are not well described, and/or are related to most of the objectives of the project	Data presentation is lacking. Analyses are poorly described or not appropriate. Data analyses relate to few of the objectives of the project
3d. Evidences-Graphics	Graphics are well developed and effective in illustrating the aspects of the project.	Graphics are mostly effective in illustrating aspects of the project.	Graphics are not effective in illustrating the project (may be too few and/or poorly constructed).
3e. Conclusions	Outcomes are thoroughly described, including multiple methods to be used by writer to assess achievement of each objective of the project	Outcomes are described, and include one method to assess achievement of each of the objectives of the project	Outcomes are not well described, and writer does not demonstrate that all objectives of the project have been achieved.
3f. Timing	Completes the presentation in the appropriate amount of time. Uses time effectively.	Finishes the presentation in either too short or too long of time (within 5-10 minutes of target time), most of time used effectively.	Presentation is much too short or long (more than 10 minutes from target time). Time was not effectively used.
3g. Mechanics (e.g., volume, mannerisms)	Oral communication skills very well developed, appropriate volume, pace, with very few verbal crutches.	Oral communication skills well developed. Mostly appropriate volume and pace, with some verbal crutches	Oral communication skills weakly developed. Volume and pace of presentation often inappropriate, with distracting verbal crutches
3h. Handling of questions	Understands and effectively answers questions from audience	Mostly understands, and effectively answers most questions from the audience	Misunderstands many questions, and answers to questions are ineffectual or incomplete

IMPORTANT ACADEMIC NOTES

1. The following will result in **dismissal** from the program:

   - A cumulative GPA lower than 2.00.
   - One semester after academic probation if the cumulative GPA falls below 3.00.
   - Not completing the degree within 6 years.

2. You are allowed a maximum of 2 semesters (not including summer) of non-enrollment before you must enroll or request a leave of absence. The leave-of-absence form is available on the Graduate Studies homepage.

3. You can transfer up to 9 graduate credits from other schools. Transfer credit forms are also available on the Graduate Studies homepage.

Additional information relating to academic policy can be accessed at:

http://www.wcupa.edu/_INFORMATION/OFFICIAL.DOCUMENTS/GRADUATE.CATALOG/gdstndg.htm

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GRADUATE ASSISTANTSHIPS (GAs)

- GA notifications are disseminated once a year via e-mail from the Graduate Coordinator toward the end of the spring semester. Advertisements are also posted in the second floor Merion hallway.

- GAs include a 3, 6-, 9-, or 12-credit tuition reimbursement and a stipend.

- GAs are also available University-wide. Additional information can be found at:

  http://www.wcupa.edu/_admissions/sch_dgr/assistantships.aspx

FREQUENTLY ASKED QUESTIONS (FAQs)

1. How do I register for ESS591 (Independent Studies)?

You cannot schedule ESS591 on you own. Solidify a topic and # of credits (1-3) with a faculty advisor. Then, go to: ***https://www.wcupa.edu/registrar/documents/independentStudyIndivInstructionEN.pdf*** and give the Graduate Coordinator (GC) the completed form. Place the # of credits on the form's top.

2. How do I schedule ESS602 (Directed Research)?

You cannot schedule ESS602 on you own. The semester before you plan on working on your final project, contact the GC to express your desire to take ESS 602, and include which faculty member with whom you are collaborating.

3. How do I transfer courses?

After the course is completed, fill out a transfer credit form (available via the Grad Studies homepage) and send your transcript to Graduate Studies for verification.

4. Can I take an undergraduate course for graduate credit?

No, unless given extenuating circumstances. Contact the GC for more details.

5. Can I take a semester off?

Yes! You are allowed up to a 2-semester hiatus, after which you will be dropped as a student. To avoid petitioning Grad Studies for a reinstatement, fill out a "leave-of-absence" form, available on the Grad Studies website, beforehand.

6. I'm ready to graduate. What do I do?

Apply online through myWCU. Click on the "Apply for Graduation link." August graduates may participate in the May ceremony. If you have already applied to graduate using myWCU, and need to change your graduation term, you can also do this in myWCU. Deadline to apply to graduate is October 1 for a December graduation, February 1 for a May graduation, and June 1 for an August graduation.

7. Can I still 'walk' in May even though I still need to take courses and/or finish my project in the summer?

Absolutely!

8. Where do I get my cap and gown?

At the Graduate Studies office, located in McKelvie Hall. McKelvie Hall is near the intersection of Church Street and Rosedale Avenue, on the same side of the street as Sykes Building.

9. I have other questions not found here. What resources do I have?

Contact the Department's Graduate Coordinator, or The Graduate Studies office at (610) 436-2943 and **gradstudy@wcupa.edu.** Their website is: ***http://www.wcupa.edu/_admissions/sch_dgr/***