Program Approval Form

For approval of new programs and deletions or modifications to an existing program.

Action Requested:

- [ ] Create New (SCHEV approval required except for minors)
- [ ] Inactivate Existing
- [x] Modify Existing (check all that apply)
  - [ ] Title (SCHEV approval required except for minors)
  - [ ] **Concentration** (Choose one): [ ] *Add* [ ] *Delete* [ ] *Modify*
  - [x] Degree Requirements
  - [ ] Admission Standards/ Application Requirements
  - [ ] Other Changes: _____

Type (Check one)**:**

- [ ] B.A. [x] B.S. [ ] Minor
- [ ] M.A. [ ] M.S. [ ] M.Ed.
- [ ] Ph.D.
- [ ] Undergraduate Certificate*
- [ ] Graduate Certificate*
- [ ] Other:

College/School:	College of Science	**Department:**	AOES		
Submitted by:	Jen Gettys	**Ext:**	3.5302	**Email:**	jbazaz@gmu.edu

Effective Term: Fall 2015

Please note: For students to be admitted to a new degree, minor, certificate or concentration, the program must be fully approved, entered into Banner, and published in the University Catalog.

Justification: (attach separate document if necessary)

Adding "Mason Core and Elective Credits" and "Mason Core" sections in order to have the catalog listing clearly show how the degree equals 120 credits and how the Mason Core requirements can be fulfilled.

	Existing	New/Modified
Program Title: (Required) Title must identify subject matter. Do not include name of college/school/dept.	Earth Science, BS	
Concentration(s):		
Admissions Standards / Application Requirements: (Required only if different from those listed in the University Catalog)		
Degree Requirements: Consult University Catalog for models, attach separate document if necessary using track changes for modifications	[Mason Core and Electives section not included]	See the bottom portion of the degree listing attached.
Courses offered via distance: (if applicable)		
TOTAL CREDITS REQUIRED:		

***For Certificates Only:** Indicate whether students are able to pursue on a [ ] **Full-time basis** [ ] **Part-time basis**

Approval Signatures

Department Date | College/School Date | Provost's Office Date

Required for Minors and Interdisciplinary Programs

If this program may impact another unit or is in collaboration with another unit at Mason, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

For Graduate Programs Only

Graduate Council Member | Provost Office | Graduate Council Approval Date

For Registrar Office's Use Only: Received_____Banner_____Catalog_____

revised 6/7/12

Program Proposal Submitted to the College of Science Curriculum Committee (COSCC)

The form above is processed by the Office of the University Registrar. This second page is for the COSCC's reference. Please complete the applicable portions of this page to clearly communicate what the form above is requesting.

FOR ALL PROGRAMS (required)

Program Title: Earth Science, BS

Date of Departmental Approval: 3/11/2015

FOR INACTIVATED PROGRAMS (required if inactivating a program)

- Reason for Inactivation:

FOR MODIFIED PROGRAMS (required if modifying a program)

- Summary of the Modification: Adding "Mason Core and Elective Credits" and "Mason Core" sections.
- Text before Modification (title, degree requirements, etc.): Sections weren't included.
- Text after Modification (title, degree requirements, etc.): See attached.
- Reason for the Modification: In order to have the catalog listing clearly show how the degree equals 120 credits and how the Mason Core requirements can be fulfilled.

FOR NEW PROGRAMS (required if creating a new program)

- Reason for the New Program:
- Relationship to Existing Programs:
- Relationship to Existing Courses:
- Semester of Initial Offering:
- Insert Tentative SCHEV Proposal Below

Acalog ACMS™ 2015-2016 University Catalog {working}

Earth Science, BS

Banner Code: SC-BS-ESCI

This program of study is offered by the Department of Atmospheric, Oceanic and Earth Sciences in the College of Science.

This degree is intended for students interested in studying the Earth and its processes. Students receive a broad background in the Earth sciences and select one of five specialty concentrations. The concentrations in Earth science education, Earth surface processes, environmental geoscience, and geology are solely offered by the Department of Atmospheric, Oceanic and Earth Sciences. The concentration in oceanography and estuarine science is offered jointly with the Department of Environmental Science and Policy, where specific advising is also available.

Students must fulfill all requirements for bachelor's degrees including the Mason Core. In addition, students must complete the following coursework with a minimum GPA of 2.00. Through the coursework below, Earth science majors satisfy the Mason Core requirements in 'Natural Science' and 'Quantitative Reasoning'.

GEOL 317 fulfills the writing intensive requirement for this major- with the exception of the environmental geoscience concentration, whereby GEOL 305 fulfills the writing intensive requirement.

This undergraduate program offers students the option of applying to the accelerated master's degree program in Curriculum and Instruction (Secondary Education Earth Science Concentration).

This has been designated a Green Leaf program. For further information, please visit Green Leaf Programs and Courses.

Degree Requirements

32-33 Credits of Core Science and Mathematics

- GEOL 101 - Introductory Geology I Credits: 4 (Mason Core: Natural Science course)
- GEOL 309 - Introduction to Oceanography Credits: 3 **or** BIOL 309 - Introduction to Oceanography Credits: 3
- GEOL 406 - Seminar in Earth and Environmental Science Credits: 3 **or** GEOL 420 - Earth Science and Policy Credits: 3
- CHEM 211 - General Chemistry Credits: 4 (Mason Core: Natural Science course)
- CHEM 212 - General Chemistry Credits: 4 (Mason Core: Natural Science course)
- MATH 113 - Analytic Geometry and Calculus I Credits: 4 (Mason Core: Quantitative Reasoning course)
- MATH 114 - Analytic Geometry and Calculus II Credits: 4
- STAT 250 - Introductory Statistics I Credits: 3 (Mason Core: Quantitative Reasoning course)

Choose one of the following options:

Option A (Mason Core: Natural Science courses)

- CLIM 111 - Introduction to the Fundamentals of Atmospheric Science Credits: 3
- CLIM 112 - Introduction to the Fundamentals of Atmospheric Science Lab Credits: 1

Option B (Mason Core: Natural Science courses)

- PHYS 111 - Introduction to the Fundamentals of Atmospheric Science Credits: 3
- PHYS 112 - Introduction to the Fundamentals of Atmospheric Science Lab Credits: 1

Option C

- GGS 309 - Meteorology and Climate Credits: 3

8 Credits of Physics

Choose one 8-credit sequence from the following Mason Core: Natural Science courses, either:

- PHYS 160 - University Physics I Credits: 3
- PHYS 161 - University Physics I Laboratory Credits: 1
- PHYS 260 - University Physics II Credits: 3
- PHYS 261 - University Physics II Laboratory Credits: 1

Or

- PHYS 243 - College Physics Credits: 3
- PHYS 244 - College Physics Lab Credits: 1
- PHYS 245 - College Physics Credits: 3
- PHYS 246 - College Physics Lab Credits: 1

Concentrations (29-50 credits)

Each student must choose a concentration from: Earth science education, Earth surface processes, environmental geoscience, geology, or oceanography and estuarine science. For students who choose Earth science education, the option of teacher licensure is available with an additional 21 credits of coursework (outlined below). The credit requirements for each are noted below.

▲ Earth Science Education (ESE)

This concentration is for students intending to pursue secondary school teaching in earth science. Students are advised from both the geology faculty and the Graduate School of Education. The concentration requires 29 credits of coursework. An additional 21 credits can be earned in order to satisfy the optional teaching licensure requirement.

- GEOL 102 - Introductory Geology II Credits: 4 (Mason Core: Natural Science course)
- GEOL 302 - Mineralogy Credits: 4
- GEOL 303 - Field Mapping Techniques Credits: 3
- GEOL 408 - Practicum for Geology Laboratories Credits: 1
- GEOL 409 - Practicum for Geology Laboratories Credits: 1
- ASTR 111 - Introductory Astronomy: The Solar System Credits: 3 (Mason Core: Natural Science course)
- ASTR 112 - Introductory Astronomy Lab: The Solar System Credits: 1 (Mason Core: Natural Science course)

Choose 12 credits from the following:

* Prerequisite requires a grade of 'C' or better in GEOL 302 - Mineralogy

- GEOL 304 - Sedimentary Geology Credits: 4 *
- GEOL 308 - Igneous and Metamorphic Petrology Credits: 4 *
- GEOL 312 - Invertebrate Paleontology Credits: 4
- GEOL 317 - Geomorphology Credits: 4 (fulfills writing intensive requirement)
- GEOL 363 - Coastal Morphology and Processes Credits: 4
- GEOL 401 - Structural Geology Credits: 4
- EVPP 110 - The Ecosphere: An Introduction to Environmental Science I Credits: 4 (Mason Core: Natural Science course)

ESE Concentration Total: 29 credits

Optional Teacher Licensure Requirement (21 credits)

A grade of 'C' or better is required for all licensure coursework.

- EDUC 372 - Human Development, Learning, and Teaching Credits: 3 (Mason Core: Social & Behavioral Sciences course)
- EDUC 422 - Foundations of Secondary Education Credits: 3
- EDCI 473 - Teaching Science in the Secondary School Credits: 3
- EDCI 483 - Advanced Methods of Teaching Science in Secondary School Credits: 3
- EDCI 490 - Student Teaching in Education Credits: 6 (Mason Core: Synthesis course)
- EDRD 419 - Literacy in the Content Areas Credits: 3

ESE Concentration with Licensure Total: 50 credits

▲ Earth Surface Processes (EP)

This concentration focuses on a broad understanding of the physical processes and natural materials found at or near the earth's surface that have produced the primary landforms and landscapes observed today. Fundamental concepts, methods and techniques of landscape analysis are also examined. Students choosing this concentration must complete the following coursework:

- GEOL 102 - Introductory Geology II Credits: 4 **or** EVPP 110 - The Ecosphere: An Introduction to Environmental Science I Credits: 4 (Mason Core: Natural Science courses)
- GEOL 302 - Mineralogy Credits: 4
- GEOL 303 - Field Mapping Techniques Credits: 3
- GEOL 306 - Soil Science Credits: 3
- GEOL 317 - Geomorphology Credits: 4 (fulfills writing intensive requirement)
- GGS 311 - Introduction to Geographic Information Systems Credits: 3

Choose 10-15 credits from the following courses:

* Prerequisite requires a grade of 'C' or better in GEOL 302 - Mineralogy

- GEOL 304 - Sedimentary Geology Credits: 4 *
- GEOL 305 - Environmental Geology Credits: 3
- GEOL 313 - Hydrogeology Credits: 3

- GEOL 315 - Topics in Geology II Credits: 1-3
- GEOL 363 - Coastal Morphology and Processes Credits: 4
- GEOL 401 - Structural Geology Credits: 4
- GEOL 403 - Geochemistry Credits: 3
- GEOL 417 - Geophysics Credits: 3

EP Concentration Total: 31-36 credits

▲ Environmental Geoscience (EVGS)

This concentration provides the tools for applying geologic information (on soils, rocks, water, weather, and landscapes) to contemporary environmental problems (including: pollution, waste management, resource extraction, natural hazards, land-use, habitat restoration, species preservation, and human health). Environmental geoscience studies the physical environment in which biological interactions take place, whereby aiding the understanding of ecology. Students choosing this concentration must complete the following coursework:

- GEOL 102 - Introductory Geology II Credits: 4 (Mason Core: Natural Science course)
- GEOL 302 - Mineralogy Credits: 4
- GEOL 305 - Environmental Geology Credits: 3 (fulfills the writing intensive requirement for only the EVGS concentration)
- GEOL 306 - Soil Science Credits: 3
- GEOL 313 - Hydrogeology Credits: 3
- GEOL 320 - Geology of Earth Resources Credits: 3
- GEOL 321 - Geology of Energy Resources Credits: 3

Choose 3 credits from the following:

- GEOL 403 - Geochemistry Credits: 3
- CHEM 427 - Aquatic Environmental Chemistry Credits: 3

Choose 3 credits from the following:

- EVPP 336 - Human Dimensions of the Environment Credits: 3
- EVPP 361 - Introduction to Environmental Policy Credits: 3

Choose 6-12 credits from the following:

- CLIM 101 - Global Warming: Weather, Climate, and Society Credits: 3 (Mason Core: Natural Science course)
- CLIM 412 - Physical Oceanography Credits: 3
- GEOL 304 - Sedimentary Geology Credits: 4
- EVPP 201 - Environment and You: Issues for the Twenty-First Century Credits: 3
- EVPP 336 - Human Dimensions of the Environment Credits: 3
- EVPP 361 - Introduction to Environmental Policy Credits: 3
- EVPP 432 - Energy Policy Credits: 3
- EVPP 436 - The Human Dimensions of Global Climate Change Credits: 3
- GGS 302 - Global Environmental Hazards Credits: 3

- GGS 311 - Introduction to Geographic Information Systems Credits: 3
- GGS 322 - Issues in Global Change Credits: 3
- PHYS 331 - Fundamentals of Renewable Energy Credits: 3
- CONF 101 - Conflict and Our World Credits: 3
- NCLC 211 - Introduction to Conservation Studies Credits: 3-6
- NCLC 220 - Energy and Environment Credits: 3-6
- PRLS 300 - People with Nature Credits: 3
- PRLS 402 - Human Behavior in Natural Environments Credits: 3

EVGS Concentration Total: 35-41 credits

▲ Geology (GEOL)

This concentration is fashioned after traditional geology bachelor's degrees. It allows graduates to be employed as geologists in the field or to pursue graduate studies in geology. Students choosing this concentration must complete the following coursework:

* Prerequisite requires a grade of 'C' or better in GEOL 302 - Mineralogy

- GEOL 102 - Introductory Geology II Credits: 4 (Mason Core: Natural Science course)
- GEOL 302 - Mineralogy Credits: 4
- GEOL 304 - Sedimentary Geology Credits: 4 *
- GEOL 308 - Igneous and Metamorphic Petrology Credits: 4 *
- GEOL 312 - Invertebrate Paleontology Credits: 4
- GEOL 317 - Geomorphology Credits: 4 (fulfills writing intensive requirement)
- GEOL 401 - Structural Geology Credits: 4
- GEOL 404 - Geological Field Techniques Credits: 1-6 (6 credits required. A 6-credit geology field camp may be substituted for this requirement, see advisor for details)

GEOL Concentration Total: 34 credits

▲ Oceanography and Estuarine Science (OEST)

This concentration provides students with a comprehensive knowledge of oceanography. Additional coursework in physical and chemical oceanography give insight into the aquatic environment and its link to both ecosystems and climate. Within the concentration, students can choose an open ocean or coastal option. The curriculum will emphasize local and regional case studies, in particular the Chesapeake Bay. The program will provide students with the basic training required to allow them to obtain entry level positions in oceanographic and estuarine career tracks or an appropriate graduate degree program. Students choosing this concentration must complete the following coursework:

- CLIM 412 - Physical Oceanography Credits: 3 **or** GEOL 412 - Physical Oceanography Credits: 3
- GEOL 102 - Introductory Geology II Credits: 4 (Mason Core: Natural Science course)
- GEOL 458 - Chemical Oceanography Credits: 3 **or** CHEM 458 - Chemical Oceanography Credits: 3

Choose one of the following 8-credit sequences:

- BIOL 103 - Introductory Biology I Credits: 4 (Mason Core: Natural Science course)
- BIOL 104 - Introductory Biology II Credits: 4 (Mason Core: Natural Science course)

Or

- BIOL 213 - Cell Structure and Function Credits: 4 (Mason Core: Natural Science course)
- BIOL 303 - Animal Biology Credits: 4

Or

- EVPP 110 - The Ecosphere: An Introduction to Environmental Science I Credits: 4 (Mason Core: Natural Science course)
- EVPP 111 - The Ecosphere: An Introduction to Environmental Science II Credits: 4 (Mason Core: Natural Science course)

Choose one of the following options:

Open Ocean Option

- GEOL 364 - Marine Geology Credits: 3
- BIOL 449 - Marine Ecology Credits: 3
- Choose three additional courses from the electives list below (minimum of 9 credits)

Coastal Ocean Option

- GEOL 363 - Coastal Morphology and Processes Credits: 4
- EVPP 581 - Estuarine and Coastal Ecology Credits: 3
- Choose three additional courses from the electives list below (minimum of 9 credits)

Electives List

- GEOL 302 - Mineralogy Credits: 4
- GEOL 304 - Sedimentary Geology Credits: 4
- GEOL 308 - Igneous and Metamorphic Petrology Credits: 4
- GEOL 312 - Invertebrate Paleontology Credits: 4
- GEOL 363 - Coastal Morphology and Processes Credits: 4
- GEOL 364 - Marine Geology Credits: 3
- GEOL 565 - Paleoceanography Credits: 3
- BIOL 440 - Field Biology Credits: 0-4 (when topic is Coral Reef Ecology)
- BIOL 449 - Marine Ecology Credits: 3
- BIOL 536 - Ichthyology Credits: 4
- EVPP 350 - Freshwater Ecosystems Credits: 4
- EVPP 377 - Applied Ecology Credits: 3
- EVPP 419 - Marine Mammal Biology and Conservation Credits: 3
- EVPP 581 - Estuarine and Coastal Ecology Credits: 3
- EVPP 582 - Estuarine and Coastal Ecology Laboratory Credits: 1
- NCLC 395 - Field-Based Work Credits: 1-18 (when topic is Exploring Underwater Ecology)

  Additional recommended course:
- PHED 255 - Basic Scuba Diving Credits: 2

OEST Concentration Total: 33-37 credits

Mason Core and Elective Credits (29-51 credits)

The remaining credits (see below for specific credit counts by concentration) are available to fulfill any remaining Mason

Core requirements (outlined below). Once those and all requirements for bachelor's degrees are met, any remaining credits may be completed by elective courses. Students are strongly encouraged to consult with their advisor to ensure that they fulfill all requirements.

- ESE concentration without Teacher Licensure: 50-51 credits
- ESE concentration with Teacher Licensure: 29-30 credits
- EP concentration: 43-49 credits
- EVGS concentration: 38-45 credits
- GEOL concentration: 45-46 credits
- OEST concentration: 42-47 credits

Mason Core

Please note that some Mason Core requirements may already be fulfilled by the major requirements listed above.

Expand each item below for a link to specific course lists for each category:

Foundation Requirements (15-19 credits)

- Mason Core UWCU - Written Communication Credits: 6
- Mason Core UOC - Oral Communication Credits: 3
- Mason Core UQR - Quantitative Reasoning Credits: 3
- Mason Core UITC - Information Technology Credits: 3-7

Core Requirements (22 credits)

- Mason Core UFA - Arts Credits: 3
- Mason Core UGU - Global Understanding Credits: 3
- Mason Core ULIT - Literature Credits: 3
- Mason Core UNSL - Natural Science Credits: 7
- Mason Core USBS - Social and Behavioral Sciences Credits: 3
- Mason Core UWC - Western Civilization/Western History Credits: 3

Synthesis/Capstone Requirement (minimum 3 credits)

- Mason Core USYN - Synthesis/Capstone Credits: minimum 3

Degree Total: Minimum 120 credits