

Fiscal Unit/Academic Org	School of Earth Sciences - D0656
Administering College/Academic Group	Arts and Sciences
Co-administering College/Academic Group	
Semester Conversion Designation	New Program/Plan
Proposed Program/Plan Name	Marine Science Certificate
Type of Program/Plan	Undergraduate certificate program
Program/Plan Code Abbreviation	MARINE
Proposed Degree Title	Certificate in Marine Science

Credit Hour Explanation

Program credit hour requirements		A) Number of credit hours in current program (Quarter credit hours)	B) Calculated result for 2/3rds of current (Semester credit hours)	C) Number of credit hours required for proposed program (Semester credit hours)	D) Change in credit hours
Total minimum credit hours required for completion of program				12	
Required credit hours offered by the unit	Minimum			3	
	Maximum			13	
Required credit hours offered outside of the unit	Minimum			0	
	Maximum			9	
Required prerequisite credit hours not included above	Minimum			0	
	Maximum			8	

Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

Program Learning Goals

- Upon completion of the academic certificate in Marine Science, students will be better prepared to
 - (1) integrate biological, geological, chemical, and physical datasets to test scientific hypotheses across the major disciplines of marine science.
 - (2) apply systems-level thinking to marine science question.
 - (3) continue in the field of marine science, well prepared to adapt to the rapidly changing field.

Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

Is this a degree program (undergraduate, graduate, or professional) or major proposal? No

Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

Pre-Major

Does this Program have a Pre-Major? No

Attachments

- Certificate Proposal Marine Science.pdf: program proposal, college letter, advising sheets
(Program Proposal. Owner: Panero, Wendy R)
- Completion Sheet for Marine Science Certificates.pdf: Completion sheet
(Other Supporting Documentation. Owner: Vankeerbergen, Bernadette Chantal)

Comments

- This is a certificate program, to be open to undergraduate and graduate students (see details in the proposal; this form's requirements do not permit indicating multiple types of certificates) *(by Panero, Wendy R on 08/30/2019 03:38 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Panero, Wendy R	08/30/2019 03:38 PM	Submitted for Approval
Approved	Panero, Wendy R	08/30/2019 03:39 PM	Unit Approval
Approved	Haddad, Deborah Moore	08/30/2019 03:46 PM	College Approval
Pending Approval	Vankeerbergen, Bernadette Chantal Oldroyd, Shelby Quinn Hanlin, Deborah Kay Jenkins, Mary Ellen Bigler	08/30/2019 03:46 PM	ASCCAO Approval

Proposal Submission Guidelines for Establishing a New Certificate

1. Required Information

- Name of proposed certificate. Identify certificate type from certificate grid (e.g., Type 2, standalone post-bachelor undergraduate certificate).

Marine Science, type 1 (undergraduate academic certificate, embedded)

Marine Science, type 3 (graduate academic certificate, embedded)

- Indicate whether the certificate will be delivered wholly on-line, wholly in-person, a combination, or with all hybrid courses.

In person delivery.

- Proposed implementation date.

Spring 2020

- Academic units (e.g., department, college) responsible for administering the certificate program.

Earth Sciences and EEOB, Arts and Sciences

2. Rationale

- Describe the rationale/purpose of the certificate.

Undergraduate demand: Many students majoring in Earth Science, EEOB, Zoology, Microbiology, Geography, Engineering, and SENR programs arrive at Ohio State with an interest in marine science. For example, Professor Grottoli in SES is a marine scientist who studies coral reefs. Since she arrived in 2005, she has mentored 69 undergraduate students in her lab as research assistants, interns and/or volunteers and been the major advisor to 22 senior theses. Her undergraduate students come from SES, EEOB, ENG, MICRO, ZOOL, GEOG, and SENR programs and she interfaces with students in the Marine Biology Club and the Under the Sea Club at OSU. Dr. Grottoli turns away about 50% of students who want to work in her lab because the demand far exceeds her capacity.

Thus, there is significant interest in marine science among undergraduate students, and significant expertise in marine science among the faculty at OSU (see list below). Since the faculty are dispersed across the university, there is no clear departmental home, but there is a clear center of gravity in ASC. This certificate will clarify to students, graduate schools, and employers that the student engaged in a coherent set of undergraduate coursework to prepare the student to pursue marine sciences as a career or in graduate school.

Graduate demand: There are 15 marine science faculty at OSU (see list below) and one research scientist, all with graduate students in their labs. The graduate students in their labs would greatly benefit from a certificate, as it would give them better training in their field, greater recognition for their expertise in marine science, and give them potential advantages when seeking employment after graduation.

The expertise: There are 15 tenure track faculty at OSU who are marine scientists or who study the oceans in some capacity. They include Andrea Grottoli, Derek Sawyer, Elizabeth Griffith, Ann Cook, CK Shum, and William B Lyons (SES, ASC), Meg Daly, Elizabeth Marshall, and James Bauer (EEOB, ASC), Matthew Sullivan (Micro, ASC), Mark Flint and Jaylene Flint (Vet Med), Rongjun Qin and Caglar Yardim (Engineering), and Tim Haab (CFAES). Research scientist Leonid Polyak (Byrd Polar) is also a marine scientist.

- Identify a likely source of student demand for the proposed certificate, and provide one or two examples.

Students majoring in Earth Sciences and Biology, SENR, CFAES, ENG, and MICRO will be able to indicate their focus on the marine sciences with such a certificate with a minimum of extra courses. The courses and prerequisites also offer synergies for majors in SENR, CFAES, ENG, and MICRO.

For example, a student majoring in Earth Sciences (Climate, Water, and Environment track) will be able to complete the certificate with 2 additional courses with strategic choices within the major.

- Provide the following statement: *Upon completion of the academic certificate in <specify title>, learners will be better prepared to . . .” <list a maximum of 3 outcomes>.*

Upon completion of the academic certificate in Marine Science, students will be better prepared to

(1) integrate biological, geological, chemical, and physical datasets to test scientific hypotheses across the major disciplines of marine science.

(2) apply systems-level thinking to marine science question.

(3) continue in the field of marine science, well prepared to adapt to the rapidly changing field.

3. Relationship to Other Programs / Benchmarking

- Identify any overlaps with other programs or departments within the university. Append letters of concurrence or objection from related units.

The certificate overlaps with the BS in Earth Sciences and BS in EEOB

- Indicate whether this certificate or a similar certificate was submitted for approval previously.

This is a new proposal, no such certificate proposal has been submitted for approval previously.

Explain at what stage and why that proposal was not approved or was withdrawn.

- Identify similar programs at other universities in Ohio or in the United States and their levels of success.

Bowling Green State University currently offers a Specialization in Marine and Aquatic Biology within their BS Biology degree (>100 students in the specialization of 700 Biology Majors). There is no program in Ohio for Marine Science at either the undergraduate or graduate level.

4. Student Enrollment

- Indicate the number of students you anticipate will choose to pursue this certificate.

We anticipate initial enrollment to be modest, about 10 for both undergraduate and graduate certificates. Growth will be facilitated with outreach to the relevant populations. The Undergraduate Studies Committees in Earth Sciences and EEOB, will advertise the certificate during student visit days, communicate the opportunity to advisors and the career center.

Growth among graduate students will be facilitated through direct emails to the marine science faculty on campus and to the graduate chairs in each department. It is expected the undergraduate and graduate enrollment will grow to at least 80 and 20, respectively, within 4 years.

5. Curricular Requirements

- Provide ASC certificate advising sheet (see Appendix 5).
- List the courses (department, title, credit hours, description) which constitute the requirements and other components of the certificate. If any courses have prerequisites, please indicate so. Indicate which courses are currently offered and which will be new. When new course requests are submitted through curriculum.osu.edu, indicate that those course requests are being submitted as part of a new certificate proposal. As much as possible, the curriculum committees will review the course requests in conjunction with the certificate proposal.

Course number	Course name	Credit hours	Prereqs.
Everyone takes (3 credit hours)			
EARTHSC 5206	<i>Advanced Oceanography:</i> Advanced study of geological, chemical, physical, and biological oceanography; their interactions; and their interactions with relevant current issues such as global change modeling, fisheries management, and energy exploration.	3	Junior standing or higher in any STEM major discipline; or Grad Standing; or permission of instructor
Plus at least 9 credit hours from the options below			
EARTHSC 4450	<i>Water, Ice and Energy in the Earth System:</i> Earth's energy budget and the transfer of water between reservoirs. Processes that regulate water transfer, common measurement approaches, and the importance of water in geological processes, global change, and as a resource.	3	EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, 2204, 2205, GEOG 3901, OR GEOG 5900; or permission of instructor
EARTHSC 5622	<i>Stable Isotope Biogeochemistry:</i> Focus on theoretical and applied aspects of stable isotope biogeochemistry in the natural environment with emphasis on carbon, oxygen and nitrogen.	3	Major standing in any STEM major
EARTHSC 5602.02	<i>Carbonate Depositional Systems:</i> The field study of carbonates in a modern setting such as the Bahamas or southern Florida. 7-day field trip preceding or following the semester.	3	---
EARTHSC 5780	<i>Reflection Seismology:</i> Basics of reflection seismic data processing and interpretation, using petroleum	4	EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205; Math 1141 or 1151 or

	industry standard seismic processing software, hardware, and data.		above, and Physics 1250 or above
GEOG 5900	<i>Climatology</i> : An introduction to the fundamental physical and mathematical principles governing both day-to-day weather and the average of weather, or climate. Objectives are to understand the physical processes of the earth-atmosphere system, describe its weather features and climate characteristics today, and outline how they might change in the future as a result of global warming.	3	---
EEOB 5410	<i>Ocean Ecology</i> : Diversity and distribution of marine organisms; population dynamics, productivity, and structure of marine ecosystems; human impact on ocean resources.	1.5	EEOB 3410 or grad standing
EEOB 5430	<i>Fish Ecology</i> : Lecture emphasis on the behavior, migration, distribution, and evolution of fish; laboratory emphasis on ecological and systematic ichthyology. Lab fee required.	3	EEOB 3410 or grad standing
EEOB 4230	<i>Focused study on ecology and evolution of invertebrates</i> : Analysis of the anatomical, physiological, behavioral and ecological characteristics of the major invertebrate groups.	2	EEOB 3410
ENR 5614	Marine and aquatic education (Limbo)	2	15 cr hrs of social, physical, and/or biological sciences, or teacher certificate; and permission of instructor
The 9 credit-hour requirement may include at most one of the following.			
GEOG 5210	<i>Fundamentals of Geographic Information Systems</i> : Basic principles of geographic and land information systems and their use in spatial analysis and information management.	3	
EARTHSC 5310	<i>Remote Sensing in the Earth Sciences</i> : The overall learning of geodetic (active) and passive remote sensing technologies and in-depth data analytics of their processing to apply to research in Earth sciences and engineering. This course is focused on students learning the theory and data processing methods to enable the use of contemporary satellite or airborne platform-equipped observations for science and engineering applications.	3	EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205; and MATH 1141 or 1151 or above, and Physics 1250 or above; or grad standing; or permission of instructor
CIVILEN 5001	<i>Introduction to Geographic Information Systems</i> : Introduction to the basic principles of geographic	4	CivEng 2050, for CivilEn and EnvEng majors only

	information systems and their use in spatial analysis and information management		
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- State the minimum number of credits required for completion of the certificate.

Total 12-13.5 hours. (Range due to varied credit hours of the disciplinary courses)

- Indicate the number of semesters expected to complete the certificate. Confirm that courses are offered frequently enough and have the capacity to meet this expectation.

While intended to be completed in two years, the certificate may be completed in as little as 2 semesters due to the frequency of course offerings.

- If applicable, describe existing facilities, equipment, and off-campus field experience and clinical sites to be used. Indicate how the use of these facilities, equipment, etc., will impact other existing programs.

None.

- For interdisciplinary certificates, describe the way in which advising and other student support will be provided.

Earth Science and Biology Advisors will advise Marine Science Certificate students, consulting with DUG's as necessary

- If applicable, describe additional university resources (including advisors and libraries) that will be required for the new certificate.

None.

- Provide ASC completion sheet for certificates.
- Provide semester-by-semester sample program.

Example program for an Earth Science student, two years:

Fall: EarthSc 5206 (offered annually)

Spring: EarthSc 4450 (offered even-year springs) or EarthSc 5622 (offered even-year springs)

Fall: Geog 5900 (offered annually)

Spring: EarthSc 5780 (offered odd-year springs) or EarthSc 4450 (offered even-year springs)

Note that a student planning this program with their BS program (CWE track) will “double count” EarthSc 5206 (3 credit hours) and 4450 (3 credit hours).

Example program for a Biology student, two years:

Fall: EarthSc 5206 (offered annually) and/or EEOB 4230 (offered even-year fall)

Spring: Geog 5900 (offered every semester)

Fall: EEOB 5430 (offered fall) and/or EEOB 4230 (offered even-year fall)

Spring: EEOB 5410 (offered spring)

Note that a student planning this program with their BS program will “double count” two of EEOB 5430, 5410, and 4230 (3.5-5 credit hours).

Additional Graduate School Guidelines

- Students must be admitted into a graduate certificate program.
- Admitted students must meet the minimum admission requirements of the Graduate School.
- Certificates are administered by a graduate studies chair and committee that are responsible for admission decisions.
- Proposals originate in a TIU following the TIU's curricular approval process. Once submitted in curriculum.osu.edu and approval by the college, proposals will be routed automatically to the Graduate School for review. Once approved by the Graduate School, proposals are review by the Council on Academic Affairs (CAA).
- A letter of support from the college dean or associate executive dean must accompany the proposal.
- *If a graduate non-degree student is admitted to a graduate certificate program, no more than four hours of semester graduate credit accumulated while in this non-degree classification may be counted toward the certificate.*

COLLEGE OF ARTS AND SCIENCES
THE OHIO STATE UNIVERSITY

TYPE 1B & 3 MARINE SCIENCE CERTIFICATE (MARINE-CT)

Coordinating Advisor: Professor Ashley Griffith, 381 Mendenhall Labs, Columbus, OH 43210; griffith.233@osu.edu

The 12-13.5 credit hour Marine Science Certificate will provide students with a competitive advantage in pursuing careers in marine science in the private and public sectors or pursuing entrance into a graduate degree program in marine science. The certificate is designed to enhance both critical thinking and the technical skills in marine science.

Required core course (3 credits):

- **EARTHSC 5206:** Advanced Oceanography (3)

Elective courses (9 credits):

In addition, students will select from the courses listed below.

- **EARTHSC 4450:** Water, Ice and Energy in the Earth System (3)
 - **EARTHSC 5622:** Stable Isotope Biogeochemistry (3)
 - **EARTHSC 5602.02:** Carbonate Depositional Systems (3)
 - **EARTHSC 5780:** Reflection Seismology (4)
 - **GEOG 5900:** Climatology (3)
 - **EEOB 5410:** Ocean Ecology (1.5)
 - **EEOB 5430:** Fish Ecology (3)
 - **EEOB 4230:** Focused study on ecology and evolution of invertebrates (2)
 - **ENR 5614:** Marine and aquatic education ()
- Of these electives, no more than one of:**
- **GEOG 5210:** Fundamentals of Geographic Information Systems (3)
 - **EARTHSC 5310:** Remote Sensing in the Earth Sciences (3)
 - **CIVILEN 5001:** Introduction to Geographic Information Systems (4)

Marine Geology Certificate program guidelines

The following guidelines govern the Marine Geology Certificate. Required for certificate:

Credit hours required: 12-13.5 credit hours.

Overlap with a major

- Max 50% overlap with major program courses.

Grades required

- Minimum C- for a course to be listed on the certificate.
- Minimum 2.00 cumulative point-hour ratio required for the certificate.

X193 credits: Not permitted.

Certificate Completion: If the certificate is not complete on the DAR, the student must consult with the College of Arts and Sciences Coordinating Advisor.

Filing the certificate program form: The certificate program form must be filed at least by the time the graduation application is submitted to a college/school counselor.

Changing the certificate: Once the certificate program is filed in the college office, any changes must be approved by the College of Arts and Sciences Coordinating Advisor.

School of Earth Sciences undergraduate advisor
Dr. Karen Royce royce.6@osu.edu 614-292-6961

School of Earth Sciences graduate advisor
Professor Steve Lower, 084 Orton Hall, lower.9@osu.edu; 614-292-1571



August 30, 2019

To ASCC and CAA members:

I am writing to document the School of Earth Science's strong endorsement of five new certificate programs proposed as part of their substantial revision of the Earth Sciences BS program:

- Certificate in Natural History Museum Curation (certificate types 1, 2, and 3: embedded undergraduate; post-bachelor undergraduate; and graduate certificate (both embedded and stand-alone)).
- Certificate in Petroleum Geology (certificate types 1, 2, and 3, as above).
- Certificate in Hydrology (certificate types 1, 2, and 3, as above).
- Certificate in Marine Science (certificate types 1 and 3, as identified above).
- Certificate in Planetary Science (certificate type 1, as identified above).

All five of these certificates have been designed for in-person delivery at this time. Each certificate proposal (as well as the redesign of the Earth Sciences BS program) is the result of thoughtful and extensive assessment of the curriculum, student interest, and market appeal. These certificates are designed to complement a number of existing natural science programs (both graduate and undergraduate—so they utilize 5000-level dual-career courses), and they should also, in distinct ways, appeal to individuals who are in the workforce and have already earned Bachelor's degrees, to advance their careers and expand career opportunities.

Please feel free to contact me if you have any additional questions.

Sincerely,

Matthew R. Saltzman
Professor and Director
School of Earth Sciences



August 29, 2019

To ASCC and CAA members:

I am writing to document the College of Arts and Sciences' strong endorsement of four new certificate programs coming out of the School of Earth Sciences as part of their substantial revision of the Earth Sciences BS program:

- Certificate in Natural History Museum Curation (certificate types 1, 2, and 3: embedded undergraduate; post-bachelor undergraduate; and graduate certificate (both embedded and stand-alone)).
- Certificate in Petroleum Geology (certificate types 1, 2, and 3, as above).
- Certificate in Hydrology (certificate types 1, 2, and 3, as above).
- Certificate in Marine Science (certificate types 1 and 3, as identified above).

All four of these certificates have been designed for in-person delivery at this time. Each certificate proposal (as well as the redesign of the Earth Sciences BS program) is the result of thoughtful and extensive assessment of the curriculum, student interest, and market appeal. These certificates should complement a number of existing natural science programs (both graduate and undergraduate—so they utilize 5000-level dual-career courses), and they should also, in distinct ways, appeal to individuals who are in the workforce and have already earned Bachelor's degrees, to advance their careers and expand career opportunities.

The college of Arts and Sciences—as well as the Ohio Department of Higher Education and the State legislature—have been encouraging our departments to explore opportunities to develop certificate programs, and the School of Earth Sciences' proposals are exemplary. They address both our college's enrollment goals and our state's workforce enhancement goals.

Sincerely,



THE OHIO STATE UNIVERSITY

Steven Fink

Associate Executive Dean, College of Arts and Sciences

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**COLLEGE OF ARTS AND SCIENCES
THE OHIO STATE UNIVERSITY**

TYPE 1B & 3 MARINE SCIENCE CERTIFICATE (MARINE-CT)

Student: _____

Course	Credit Hours	Semester Completed	Overlap with major?
<i>Required</i>			
EARTHSC 5206	3		
<i>Electives (minimum 9 credit hours)</i>			

Total Credit hours: _____ (minimum 12)

Credits double counted with major: _____ (maximum 50%)

Advisor's signature: _____

Required core course (3 credits):

- **EARTHSC 5206:** Advanced Oceanography (3)

Elective courses (9 credits):

In addition, students will select from the courses listed below.

- **EARTHSC 4450:** Water, Ice and Energy in the Earth System (3)
 - **EARTHSC 5622:** Stable Isotope Biogeochemistry (3)
 - **EARTHSC 5602.02:** Carbonate Depositional Systems (3)
 - **EARTHSC 5780:** Reflection Seismology (4)
 - **GEOG 5900:** Climatology (3)
 - **EEOB 5410:** Ocean Ecology (1.5)
 - **EEOB 5430:** Fish Ecology (3)
 - **EEOB 4230:** Focused study on ecology and evolution of invertebrates (2)
 - **ENR 5614:** Marine and aquatic education ()
- Of these electives, no more than one of:**
- **GEOG 5210:** Fundamentals of Geographic Information Systems (3)
 - **EARTHSC 5310:** Remote Sensing in the Earth Sciences (3)
 - **CIVILEN 5001:** Introduction to Geographic Information Systems (4)