

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

### 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				13	
Required credit hours offered by the unit	Minimum			13	
	Maximum			15	
Required credit hours offered outside of the unit	Minimum			0	
	Maximum			0	
Required prerequisite credit hours not included above	Minimum			8	
	Maximum			11	

### 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 Petroleum Geology, students will be better prepared to
  - (1) Identify and evaluate the geological components of a subsurface petroleum system.
  - (2) Understand the state-of-the-art geological, geophysical, and geochemical methods for exploring and producing petroleum systems.
  - (3) Understand the importance of geology, geochemistry, geophysics, engineering, and business aspects of the petroleum industry

### 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**

- Completion Sheet for Petroleum Geology Certificates.pdf: Completion sheet  
*(Other Supporting Documentation. Owner: Vankeerbergen,Bernadette Chantal)*
- Certificate Proposal Petroleum.pdf: Proposal, advising materials, and letters  
*(Program Proposal. Owner: Panero,Wendy R)*

**Comments**

- This is a certificate program, to be open to undergraduate and graduate students (see details in the proposal).  
  
9/10: Done *(by Panero,Wendy R on 09/10/2019 03:00 PM)*
- Please upload latest version of full proposal and delete this one. *(by Vankeerbergen,Bernadette Chantal on 09/10/2019 02:40 PM)*

**Workflow Information**

Status	User(s)	Date/Time	Step
Submitted	Panero,Wendy R	08/30/2019 03:30 PM	Submitted for Approval
Approved	Panero,Wendy R	08/30/2019 03:38 PM	Unit Approval
Approved	Haddad,Deborah Moore	08/30/2019 03:54 PM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	09/10/2019 02:48 PM	ASCCAO Approval
Submitted	Panero,Wendy R	09/10/2019 03:00 PM	Submitted for Approval
Approved	Panero,Wendy R	09/10/2019 03:00 PM	Unit Approval
Approved	Haddad,Deborah Moore	09/10/2019 03:12 PM	College Approval
Pending Approval	Vankeerbergen,Bernadette Chantal Oldroyd,Shelby Quinn Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler	09/10/2019 03:12 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).

*Petroleum Geology, type 1b (undergraduate academic certificate, embedded), type 2 (Undergraduate academic certificate, post-bachelor degree) and 3 (graduate academic certificate, stand alone (3a) or embedded (3b))*

- 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, College of Arts and Sciences*

### 2. Rationale

- Describe the rationale/purpose of the certificate.

*With a Certificate in Petroleum Geology, students will have a competitive advantage for beginning a career in the oil and gas industry or pursuing entrance into a top graduate degree program within the field of petroleum geoscience. The certificate is designed to enhance both critical thinking and the technical skills for practicing petroleum geoscience.*

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

*Students majoring in these programs will be able to indicate their focus on Petroleum Geology with such a certificate with a minimum of additional courses. This certificate, together with either the revised Geological Sciences and Geophysics subprograms of the Earth Sciences BS, will replace the prior Petroleum Geology and Geophysics subprogram.*

*For example, an undergraduate student majoring in Earth Sciences on the Geological Sciences track will be able to combine their major coursework with this certificate after two additional classes and no additional prerequisites (e.g. EarthSci 5661 and an elective). A student on the Geophysics track will be able to complete the certificate through attendance at field camp. Both sets of students will then be well prepared to pursue a career in the oil and gas industry or a graduate program in energy-related disciplines.*

*A graduate student in Earth Sciences and Civil Engineering will be able to demonstrate that their graduate program had significant depth and breadth related in the discipline of petroleum geology, preparing them for careers in energy sectors.*

*In addition to students pursuing degrees within Earth Sciences, the certificate will support career development for students in Civil Engineering, in Environmental Engineering, and in Chemical Engineering.*

- 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 Petroleum Geology, students will be better prepared to*

*(1) Identify and evaluate the geological components of a subsurface petroleum system.*

*(2) Understand the state-of-the-art geological, geophysical, and geochemical methods for exploring and producing petroleum systems.*

*(3) Understand the importance of geology, geochemistry, geophysics, engineering, and business aspects of the petroleum industry*

### 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 complements the BS in Earth Sciences.*

- 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.

*There are no comparable programs in Ohio for undergraduate or graduate students.*

*At the graduate level, there are few certificate programs nationally, most notably UT Austin and Texas A&M University.*

#### 4. Student Enrollment

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

*The Petroleum Geology and Geophysics subprogram of the Earth Sciences BS has represented 25-35% of all undergraduate majors. Growth will be facilitated with outreach to the relevant populations including website. The Undergraduate Studies Committee, will advertise the certificate during student visit days, communicate the opportunity to advisors and the career center.*

#### 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.
All Students Complete:			
EARTHSCI 5661	<i>Petroleum Geology: The formation, accumulation, and trapping of oil and natural gas. Geologic source beds and traps; hydrocarbon flow; hydraulic properties of reservoirs and confining units; hydrocarbon chemistry; thin-section analysis of reservoir rocks.</i>	4	EARTHSC 4502; or written permission of instructor
EARTHSCI 5189.01	<i>Field Geology I: Concentrated training in the basic essentials of field observation and mapping; the work is done in central Utah, with headquarters in Ephraim. Requires full time of student.</i>	3	EarthSci 1100, 1121, or 1200; EarthSci 4530

Course Number	Course Name	Credit Hours	Prereqs.
Complete two additional courses from the list below:			
EARTHSCI 5189.02	<i>Field Geology II: Concentrated training in the basic essentials of field observation and mapping; the work is done in central Utah, with headquarters in Ephraim. Requires full time of student.</i>	3	EarthSci 4423 and EarthSci 5189.01
EARTHSCI 4560	<i>Applied Geophysics: Methods and techniques of pure and applied geophysics; geological interpretation of geophysical data.</i>	3	EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205; Math 1141/1151, Physics 1250

EARTHSCI 5687	<i>Borehole Geophysics</i> : Principles and applications of borehole geophysical practices in the energy industry and in scientific drilling.	3	EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205; Math 1151; Physics 1250
EARTHSCI 5751	<i>Quantitative Reservoir Modeling</i> : Principles of analytical and numerical techniques in modeling single- and multiphase flow in gas, oil, and water (aquifer) reservoirs. Development of Matlab code for two- and three-dimensional flow in porous media.	4	EarthSci 2245, Math 1152
EARTHSCI 5780	<i>Reflection Seismology</i> : Basics of reflection seismic data processing and interpretation, using petroleum industry standard seismic processing software, hardware, and data.	4	EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205; Math 1141/1151

- State the minimum number of credits required for completion of the certificate.

*Total 13-15 hours, where the range is a result of the variable credit hours of the electives.*

- 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.

*The certificate can be completed in one calendar year, including summer.*

- 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.

- .....
- 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.

*Sample program, Geophysics Subprogram*

*Year 1:*

*EarthSc 4560 (Spring, offered even springs) and EarthSc 4530 (Spring, offered annually)*

*Year 2:*

*EarthSc 5189.01 (Summer, offered annually)*

*EarthSc 5661 (Spring, offered annually)*

*Sample program, Geological Science Subprogram*

*Year 1:*

*EarthSc 4530 (Spring, offered annually)*

*Year 2:*

*EarthSc 5189.01 (Summer, offered annually)*

*EarthSc 5189.01 (Summer, offered annually)*

*EarthSc 5661 (Spring, offered annually)*

REQUIRED COURSES (7 CREDIT HOURS)	COURSE (CREDIT HOURS)	DESCRIPTION	PREREQUISITES
	<b>EARTHSCI 5661:</b> <i>Petroleum Geology</i> (4)	The formation, accumulation, and trapping of oil and natural gas. Geologic source beds and traps; hydrocarbon flow; hydraulic properties of reservoirs and confining units; hydrocarbon chemistry; thin-section analysis of reservoir rocks.	<del>4423 or 6423</del> ; and 4502 or 6502; or permission of instructor.
	<b>EARTHSC 5189.01:*</b> <i>Field Geology I</i> (3)	Concentrated training in the basic essentials of field observation and mapping; the work is done in central Utah, with headquarters in Ephraim. Requires full time of student.	<b>EARTHSC 1100, 1121 OR 1200, EARTHSC 4530</b>

PATHWAY FOR GEOPHYSICS SUBPROGRAM STUDENTS	COURSE (CREDIT HOURS)	DESCRIPTION	PREREQUISITES	
	<b>EARTHSCI 5661:</b> <i>Petroleum Geology</i> (4)	The formation, accumulation, and trapping of oil and natural gas. Geologic source beds and traps; hydrocarbon flow; hydraulic properties of reservoirs and confining units; hydrocarbon chemistry; thin-section analysis of reservoir rocks.	<del>4423 or 6423</del> ; and 4502 or 6502; or permission of instructor.	
	<b>EARTHSC 5189.01:*</b> <i>Field Geology I</i> (3)	Concentrated training in the basic essentials of field observation and mapping; the work is done in central Utah, with headquarters in Ephraim. Requires full time of student.	<b>EARTHSC 1100, 1121 OR 1200, EARTHSC 4530</b>	
	<b>EARTHSCI 4560:</b> <i>Applied Geophysics</i> (3)	Methods and techniques of pure and applied geophysics; geological interpretation of geophysical data.	<b>EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205, Math 1151 &amp; Physics 1250</b>	
	<b>AND ONE MORE COURSE FROM THE FOLLOWING LIST:</b>			
	<b>EARTHSCI 5687:</b> <i>Borehole Geophysics</i> (3)	Principles and applications of borehole geophysical practices in the energy industry and in scientific drilling.	<b>EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205; Math 1141 or 1151 or above, and Physics 1250 or above.</b>	
	<b>EARTHSC 5189.02:*</b> <i>Field Geology II</i> (3)	Concentrated training in the basic essentials of field observation and mapping; the work is done in central Utah, with headquarters in Ephraim. Requires full time of student	EarthSci 4423 and EarthSci 5189.01	
	<b>EarthSci 5751:</b> <i>Quantitative Reservoir Modeling</i> (4)	Principles of analytical and numerical techniques in modeling single- and multiphase flow in gas, oil, and water (aquifer) reservoirs. Development of Matlab code for two- and three-dimensional flow in porous media.	EarthSci 2245, Math 1152	
<b>EarthSci 5780:</b> <i>Reflection Seismology</i> (4)	Basics of reflection seismic data processing and interpretation, using petroleum industry standard seismic processing software, hardware, and data.	<b>EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205; Math 1141/1151</b>		

\* Students with prior comparable field geology coursework may substitute an additional elective in place of EARTHSC 5189.01.

PAT HWA Y FOR	COURSE (CREDIT HOURS)	DESCRIPTION	PREREQUISITES
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<b>EARTHSCI 5661:</b> <i>Petroleum Geology (4)</i>	The formation, accumulation, and trapping of oil and natural gas. Geologic source beds and traps; hydrocarbon flow; hydraulic properties of reservoirs and confining units; hydrocarbon chemistry; thin-section analysis of reservoir rocks.	4423 or 6423; and 4502 or 6502; or permission of instructor.
<b>EARTHSC 5189.01:*</b> <i>Field Geology I (3)</i>	Concentrated training in the basic essentials of field observation and mapping; the work is done in central Utah, with headquarters in Ephraim. Requires full time of student.	<b>EARTHSC 1100, 1121 OR 1200, EARTHSC 4530</b>
<b>EARTHSC 5189.02:*</b> <i>Field Geology II (3)</i>	Concentrated training in the basic essentials of field observation and mapping; the work is done in central Utah, with headquarters in Ephraim. Requires full time of student	EarthSci 4423 and EarthSci 5189.01
<b>AND ONE MORE COURSE FROM THE FOLLOWING LIST:</b>		
<b>EARTHSCI 5751:</b> <i>Quant Reservoir Modeling (4)</i>	Principles of analytical and numerical techniques in modeling single- and multiphase flow in gas, oil, and water (aquifer) reservoirs. Development of Matlab code for two- and three-dimensional flow in porous media.	2245 and Math 1152, or permission of instructor.
<b>EARTHSCI 5780:</b> <i>Reflection Seismology (4)</i>	Basics of reflection seismic data processing and interpretation, using petroleum industry standard seismic processing software, hardware, and data.	<b>EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205; Math 1141 or 1151 or above, and Physics 1250 or above</b>
<b>EARTHSCI 4560:</b> <i>Applied Geophysics (3)</i>	Methods and techniques of pure and applied geophysics; geological interpretation of geophysical data.	<b>EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205, Math 1151 &amp; Physics 1250</b>
<b>EARTHSCI 5687:</b> <i>Borehole Geophysics (3)</i>	Principles and applications of borehole geophysical practices in the energy industry and in scientific drilling.	<b>EARTHSC 1100, 1105, 1108, 1121, 1151, 2203, OR 2205; Math 1141 or 1151 or above, and Physics 1250 or above</b>

\* Students with prior comparable field geology coursework may substitute an additional elective in place of EARTHSC 5189.01.

### 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, 2, 3 PETROLEUM GEOLOGY CERTIFICATE (PETRGeo-CT)

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

School of Earth Sciences undergraduate advisor  
Dr. Karen Royce [royce.6@osu.edu](mailto:royce.6@osu.edu) 614-292-6961

The 13-15 credit hour Petroleum Geology Certificate will provide students with a competitive advantage in beginning a career in the oil and gas industry or pursuing entrance into a graduate degree program within the field of petroleum geoscience. The certificate is designed to enhance both critical thinking and the technical skills for practicing petroleum geoscience.

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

**Required core courses (7 credits):**

- **EARTHSC 5661:** Petroleum Geology (4)
- **EARTHSC 5189.01:** Field Geology I (3) Summer term

**Elective courses (6-8 credits):**

In addition, students will select two more courses (6-8 credits) listed below.

- **EARTHSC 5189.02:** Field Geology II (3) Summer term
- **EARTHSC 4560:** Applied Geophysics (3)
- **EARTHSC 5687:** Borehole Geophysics (3)
- **EARTHSC 5751:** Quantitative Reservoir Modeling (4)
- **EARTHSC 5780:** Reflection Seismology (4)

Students with prior comparable field geology coursework may substitute an additional elective in place of EARTHSC 5189.01.

**Petroleum Geology Certificate program guidelines**

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

Credit hours required: 13-15 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.



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

**TYPE 1B, 2, 3 PETROLEUM GEOLOGY CERTIFICATE (PETRGeo-CT)**

Student: \_\_\_\_\_

Course	Credit Hours	Semester Completed	Overlap with major?
<i>Required Courses</i>			
EARTHSC 5661	4		
EARTHSC 5189.01	3		
<i>Elective Courses (6-8 credit hours)</i>			

Total Credit hours: \_\_\_\_\_ (minimum 12)

Credits double counted with major: \_\_\_\_\_ (maximum 50%)

Advisor's signature \_\_\_\_\_

**Required core courses (7 credits):**

- **EARTHSC 5661:** Petroleum Geology (4)
- **EARTHSC 5189.01:** Field Geology I (3) Summer term

**Elective courses (6-8 credits):**

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- **EARTHSC 5189.02:** Field Geology II (3) Summer term
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- **EARTHSC 5780:** Reflection Seismology (4)

Students with prior comparable field geology coursework may substitute an additional elective in place of EARTHSC 5189.01.



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

114 University Hall, 234 North Oval Mall, Columbus, OH 43210  
614.292.6868 Office / 614.247.7498 Fax

[Fink.5@osu.edu](mailto:Fink.5@osu.edu)

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

**TYPE 1B, 2, 3 PETROLEUM GEOLOGY CERTIFICATE (PETRGeo-CT)**

Student: \_\_\_\_\_

Course	Credit Hours	Semester Completed	Overlap with major?
<i>Required Courses</i>			
EARTHSC 5661	4		
EARTHSC 5189.01	3		
<i>Elective Courses (6-8 credit hours)</i>			

Total Credit hours: \_\_\_\_\_ (minimum 12)

Credits double counted with major: \_\_\_\_\_ (maximum 50%)

Advisor's signature \_\_\_\_\_

**Required core courses (7 credits):**

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Students with prior comparable field geology coursework may substitute an additional elective in place of EARTHSC 5189.01.