

## Term Information

Effective Term Autumn 2018

## General Information

Course Bulletin Listing/Subject Area Earth Sciences  
Fiscal Unit/Academic Org School of Earth Sciences - D0656  
College/Academic Group Arts and Sciences  
Level/Career Graduate, Undergraduate  
Course Number/Catalog 5790.10  
Course Title Antarctica Study Abroad Seminar  
Transcript Abbreviation AntarcStdyAbrdSem  
Course Description Pre-departure preparation for Antarctica study abroad. Provides general introduction to the country so that learning opportunities in-country will be maximized  
Semester Credit Hours/Units Fixed: 1

## Offering Information

Length Of Course 14 Week  
Flexibly Scheduled Course Never  
Does any section of this course have a distance education component? Yes  
Is any section of the course offered Less than 50% at a distance  
Grading Basis Letter Grade  
Repeatable No  
Course Components Lecture  
Grade Roster Component Lecture  
Credit Available by Exam No  
Admission Condition Course No  
Off Campus Never  
Campus of Offering Columbus

## Prerequisites and Exclusions

Prerequisites/Corequisites Accepted into the Antarctica Study Abroad program.  
Exclusions Not open to students with credit for ENR 5790.10. Cannot be used to satisfy M.S. or Ph.D. requirements in Earth Sciences. Within the Earth Sciences B.S. degree, this course can only be used in the Earth System Science subprogram to meet the requirements for credits taken outside Earth Sciences. This course cannot be used to meet any other requirements within the Earth Sciences B.S.  
Electronically Enforced Yes

## Cross-Listings

Cross-Listings Cross-listed in ENR

## Subject/CIP Code

Subject/CIP Code 40.0601  
Subsidy Level Doctoral Course  
Intended Rank Junior, Senior, Masters, Doctoral

## Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

## Course Details

### Course goals or learning objectives/outcomes

- Develop an interdisciplinary understanding of the biophysical and human dimensions of life in Antarctica
- Develop specialized knowledge of the issues in a specific, chosen area of Antarctic inquiry
- Enhance intellectual maturity and confidence through teamwork, cross-cultural engagement, and self-reflection

### Content Topic List

- Gateway cities to Antarctica and ecotourism
  - History of Antarctic exploration
  - The Antarctic Treaty System
  - Antarctic biology
  - Antarctic geology and glaciology
  - Humans in the Antarctic environment
- No

### Sought Concurrence

## Attachments

- Earth Sci 5790.10 draft syllabus.docx: Syllabus  
*(Syllabus. Owner: Krissek, Lawrence Alan)*
- Curricular Map, Earth Sci B.S.\_July 2017.docx: Earth Sci B.S. Curricular Map  
*(Other Supporting Documentation. Owner: Krissek, Lawrence Alan)*
- Earth Sci 5790.10 draft syllabus\_v2.docx: Revised syllabus  
*(Syllabus. Owner: Krissek, Lawrence Alan)*

## Comments

- 21 March 2018 -- revised syllabus uploaded. All recommendations and contingencies from NMS panel (from ASCCAO e-mail of 9/14/17) have been made.

OSU's Antarctic Study Abroad Program was developed by SENR, with an agreement that its 2 courses would be cross-listed with Earth Sciences. In addition, SENR has had difficulty staffing the Antarctic Study Abroad Program, and has agreed to shift its oversight to ASC. That shift is now in-place for AU 2017, although the cross-listing of ENR and Earth Sci courses is not expected until AU 2018.

Students enrolled in both ENR 5790.10 and Earth Sci 5790.10 will meet in a regular class setting with the OSU instructors, in order to view and discuss the webcast lectures from NZ and other OSU-specific information. As a result, some content is presented via technology, but this is not a distance-learning course. *(by Krissek, Lawrence Alan on 03/21/2018 01:38 PM)*

- See 9-14-17 email to W Panero *(by Oldroyd, Shelby Quinn on 09/14/2017 12:10 PM)*

**COURSE REQUEST**  
5790.10 - Status: PENDING

Last Updated: Haddad,Deborah Moore  
03/21/2018

**Workflow Information**

Status	User(s)	Date/Time	Step
Submitted	Krissek,Lawrence Alan	07/29/2017 01:31 PM	Submitted for Approval
Approved	Krissek,Lawrence Alan	07/29/2017 01:44 PM	Unit Approval
Approved	Haddad,Deborah Moore	07/29/2017 03:39 PM	College Approval
Revision Requested	Oldroyd,Shelby Quinn	09/14/2017 12:10 PM	ASCCAO Approval
Submitted	Krissek,Lawrence Alan	03/21/2018 01:38 PM	Submitted for Approval
Approved	Panero,Wendy R	03/21/2018 02:03 PM	Unit Approval
Approved	Haddad,Deborah Moore	03/21/2018 03:16 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Oldroyd,Shelby Quinn Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler	03/21/2018 03:16 PM	ASCCAO Approval

**Study Abroad Antarctica: Humans and the Environment**  
*Earth Sciences 5790.10 (cross-listed with ENR 5790.10)*  
*and*  
*Earth Sciences 5797.10 (cross-listed with ENR 5797.10)*

## **OVERVIEW**

**Study Abroad Antarctica** includes 2 Autumn semester courses:

- 1) **Earth Sciences/ENR 5790.10 (Antarctica Study Abroad Seminar)** is a 1 credit course, and provides the background needed for the subsequent field experience and accompanying field research module;  
and
- 2) **Earth Sciences/ENR 5797.10 (Study at a Foreign Institution: Antarctica)** is the 3 credit field experience, completed during a two week field excursion to Antarctica via Ushuaia, Argentina, over Winter Break, with completion of the field research module and other assignments by ~10 January.

This program is a collaboration among The College at Brockport, State University of New York (SUNY), Virginia Tech, and The Ohio State University (with the option of other U.S. universities joining the consortium in the future), as well as American Universities International Programs (AUIP), University of Canterbury, New Zealand, and Gateway Antarctica: Centre for Antarctic Studies and Research. Lectures are webcast in real-time from New Zealand on Wednesdays [from 6-730pm](#) Eastern Standard Time during Autumn Semester. **Students and faculty in Earth Sciences/ENR 5790.10 meet together to view and discuss these lectures, as well as other OSU-specific material.** Course assignments are submitted via Carmen and are graded by the participating OSU faculty.

The field course (Earth Sciences/ENR 5797.10) begins with a group overnight flight from Miami, FL on December XX and culminates with an overnight flight landing in Miami early morning on December YY. Group flight and booking instructions are provided after a student has been accepted into the program and enrolled into these courses. Activities during the field course include several days investigating the natural history, human history, and ecotourism effects on Ushuaia and its surroundings, and an 11 day cruise to the Antarctic Peninsula aboard a commercial tourist vessel. During the cruise, students participate in structured learning activities, and collect data for a field-based research module. Students complete the research module after the cruise, with their completed assignments submitted by ~10 January.

### ***Responses to ASC Panel approval contingencies for Earth Sciences 5790.10:***

- 1) Statement has been added to “Class Attendance Policy”, describing grade deduction for each webcast lecture not viewed within 7 days of its original broadcast. AUIP, which coordinates the webcast lectures and maintains the archive of lecture recordings, can provide log-in information (date, time, duration) for each student for each lecture.
- 2) Section titled “Minimum Grade Required to Participate in Field Course” has been added, setting minimum grade of B- at the time of the semester “drop” deadline in order for the student to participate in the field experience.

**Earth Sciences 5790.10**  
**(Antarctica Study Abroad Seminar [cross-listed with ENR 5790.10])**  
**1 credit hour**

**Instructor: XXXXX**

**Office: YYYYY**

**E-mail: ZZZZZ**

**Phone: AAAAA**

**Office Hours: BBBB**

**Course Meeting Time & Location:** W, 600 – 730 p.m., Room CCCC

**Format of Instruction:** Instruction will take place in-person, with the class viewing lectures videocast in real-time from New Zealand. These lectures (60-75 minutes each) are coordinated by American Universities International Programs (AUIP) and delivered by experts from the University of Canterbury's Gateway Antarctica: Centre for Antarctic Studies and Research. Students have a “chat” utility, in order to be able to ask questions in real-time; questions will also be addressed by the participating OSU faculty, who will be present in the OSU classroom during these lectures.

Before the fall course begins, students will receive by email a username and password with instructions for logging into the online lecture site. A student log-in will only be needed to submit questions via the chat utility, or to view the archived lectures.

Classes involve 1.5 hours of contact time/week.

**Course description**

Antarctica is a wondrous place- the “coldest, windiest, driest, highest, quietest, most remote, and least understood continent on earth.” It has been an object of human speculation for millennia and a prize for explorers, sealers and whalers, scientists, and geostrategists for more than two hundred years. The course examines this unique corner of the world and provides a broad overview of its human and natural history. Special attention is given to Antarctica’s physical and ecological systems as well as human activity in the region, sustainable tourism, and use of polar resources. Students attend weekly lectures, write 3 short essays, complete a midterm project and a final essay exam, and submit an annotated bibliography of their field course readings.

**Course objectives**

Students will:

1. Develop, through lectures and assigned readings, an interdisciplinary understanding of the biophysical and human dimensions of life in Antarctica, as well as its history and potential future.
2. Develop specialized knowledge, through independent study, of the issues in a specific, chosen area of Antarctic inquiry (e.g., history of science/exploration, environmental ethics, geology and global climate change, marine bird or southern forest conservation, etc.).

3. Enhance intellectual maturity and confidence through teamwork, cross-cultural engagement, and self-reflection.

### **Texts and Required Materials**

All readings and materials required for this course will be made available on the course Carmen webpage. See the list of assignments and of weekly lecture topics for readings and other materials.

### **Assignments and Exams**

#### ***1. Midterm assignment (30%) and final essay exam (30%)***

The midterm assignment and final essay exam are posted in the Carmen course page

- **Midterm assignment** submitted via the Carmen *midterm assignment* using filename “*student lastname midterm assignment*” is due **November XX**.
- **Final essay exam** submitted via the Carmen *final essay exam assignment* using filename “*student lastname final essay exam*” is due **December YY**.

Grades will be penalized for incorrect filenames and for late submission (10% loss/day late).

***2. Three short essays (30% total; 10% each essay):*** Each ~300 word essay, based on a prompt posted on Carmen, draws on course lectures and readings as well as potential student research (essays < 250 words or > 350 words will be returned for author revision).

- **Essay #1** submitted via the Carmen *Essay #1 assignment* using filename “*student lastname essay #1*” is due **September XX**.
- **Essay #2** submitted via the Carmen *Essay #2 assignment* using filename “*student lastname essay #2*” is due **October YY**.
- **Essay #3** submitted via the Carmen *Essay #3 assignment* using filename “*student lastname essay #3*” is due **October ZZ**.

Grades will be penalized for incorrect filenames and for late submission (10% loss/day late).

**Format of Essays:** Essays should be structured into four main parts.

*Introduction:* Outline background to the question and set out your framework for discussion (~ 50 words).

*Discussion:* Address 2-3 key issues from readings you think are the most important. The discussion should be thoughtful, well-written, and persuasive, supported by evidence from the literature. Be sure to clearly separate main discussion points (~ 200 words).

*Conclusion:* Sum up discussion and provide clear set of concluding points (~ 50 words).

*References:* These are not included in your word limit. You should use class readings and lectures, and cite these in the body of the essay and reference list, using the American Psychological Association citation guidelines mentioned below. You should also use at least one additional reference from the peer-reviewed literature, which you have found yourself. Please cite this/these and add to references at the end of the essay.

APA citation guideline example (author. (date). article title. *journal title*, volume #: pages.):

- Spiller, J. and Kissek, L. (2016). Traveling With Students to Antarctica. *Journal of Off-the-Wall Academics*, 30:692-703.

**3. Field course bibliography (10%):** In advance preparation for the Antarctic excursion, each student identifies a preferred field research module as part of the Midterm Assignment. After formal assignment by course instructors, each student completes the electronically reserved readings for that module (posted on Carmen) and submits an annotated bibliography (one paragraph description of the topic, arguments, and evidence of each source) via the Carmen *field bibliography assignment* using filename “*student lastname field bibliography*” by **December XX**. Grades will be penalized for incorrect filenames and for late submission (10% loss/day late).

### Grading Scale

The anticipated grading scale is as follows:

90 – 100 %	A or A-
80 – 89 %	B-, B, or B+
70 – 79%	C-, C, or C+
60 – 69%	D or D+
<60%	E

The instructor reserves the right to adjust these grade boundaries down, and to set the boundaries for specific grades (e.g., A vs. A-) within these general grade ranges.

Feel free to contact the instructor during the semester with any questions about your estimated grade.

### Class Attendance Policy

Viewing all lectures and active participation in online and in-class discussions is required. Students are **expected** to attend the regularly scheduled class in order to view the online lectures “live”; anyone who is unable to do so must receive prior permission from the instructor, and must subsequently view the archived copy of the lecture within 7 days of its original broadcast. Viewing of online lectures will be monitored using log-in data provided by AUIP; students will lose 1 point from their final total grade for each lecture not viewed within 7 days of its original broadcast (e.g., a decrease in final grade from 95% to 94% for 1 lecture not viewed within 7 days of its original broadcast; a decrease in final grade from 95% to 93% if 2 lectures are not viewed within 7 days of their original broadcasts).

### Minimum Grade Required to Participate in Field Course (Earth Sci 5797.10)

In order for a student to participate in the companion field experience course (Earth Sci 5797.10), a minimum grade of B- is required in this course (Earth Sci 5790.10) at the time of the Autumn Semester course “drop” deadline (as set by the University Registrar).

### Weekly Outline

**Week 1** -Wednesday XXXX (6 pm EST)

Presenter: \*\*\*\*\*, Course Introduction

Reading:

- Reflections at the End of the Earth. 9-51.

**Week 2-Wednesday XXXX (6 pm EST)**

Presenter: \*\*\*\*\*, Ushuaia and the Antarctic Peninsula

Reading: (Read one of the following):

- Bertram, E., Muir, S., & Stonehouse, B. (2007). Gateway ports in the development of Antarctic tourism. *Prospects for Polar Tourism*, 123-146.
- Elzinga, A. (2013). Punta Arenas and Ushuaia: early explorers and the politics of memory in constructing Antarctic gateway cities. *The Polar Journal*, 3(1), 227-256.

**Week 3- Wednesday XXXXX (6 pm EST)**

Presenter: \*\*\*\*\*, Ushuaia: Tourism destination or frontier town? The impacts of tourism at the end of the world

**Week 4- Wednesday XXXXX (6 pm EST)**

Presenter: \*\*\*\*\*, History of Antarctic Exploration

Reading:

- Martin, S. (1996). *A History of Antarctica*. Sydney: State Library of New South Wales Press. 17-31.
- Pyne, S. J. (1986). *The Ice: A Journey to Antarctica*. Iowa City: University of Iowa Press. 65-115.

**ASSIGNMENT DUE:** Short Essay Question #1 by Sunday September XX at 11:59 pm

**Week 5- Wednesday XXXXX (6 pm EST)**

Presenter: \*\*\*\*\*, Antarctic territorial claims and introduction to the Antarctic Treaty System

Reading:

- Dodds, K.J. (2010). Amongst the palm trees: ruminations on the 1959 Antarctic Treaty. *Polar Record*, 46(1), 1-2.
- Baker, F.W.G. (2010). Some reflections on the Antarctic Treaty. *Polar Record*, 46(1), 2-4.
- Beck, P.J. (2010). Fifty years on: putting the Antarctic Treaty into the history books. *Polar Record*, 46(1), 4-7.
- Berkman, P.A. (2010). Common interests in the international space of Antarctica. *Polar Record*, 46(1), 7-9.
- Bulkeley, R. (2010). The political origins of the Antarctic Treaty. *Polar Record*, 46(1), 9-11.
- Haward, M. (2010). Australia and the Antarctic Treaty. *Polar Record*, 46(1), 11-14.
- Joyner, C.C. (2010). The Antarctic Treaty and the law of the sea: fifty years on. *Polar Record*, 46 (1), 14-17.
- Rothwell, D.R. (2010). Sovereignty and the Antarctic Treaty. *Polar Record*, 46(1), 17-20.

**ASSIGNMENT DUE:** Short Essay Question #2 by Sunday October XX at 11:59 pm

**Week 6- Wednesday XXXXX (6 pm EST)**



Presenter: \*\*\*\*\*, Antarctic birds

Reading: (review list of birds at following website)

- [https://en.wikipedia.org/wiki/List\\_of\\_birds\\_of\\_Antarctica](https://en.wikipedia.org/wiki/List_of_birds_of_Antarctica)

**Week 7-** Wednesday XXXXX (6 pm EST)

Presenter: \*\*\*\*\*, Antarctic Marine Ecosystems

Reading:

- Barnes, D. and Clarke, A. (2011). Antarctic marine biology. *Current Biology*, 12(12), 451-457.

**Week 8-** Wednesday XXXXX (6 pm EST)

Presenter: \*\*\*\*\*, Glaciology and Ice

Reading:

- Paolo, F. et al. (2015). Volume loss from Antarctic ice shelves is accelerating. *Science*, 348(6232), 327-330.

**Week 9-** Wednesday XXXXX (6 pm EST)

Presenter: \*\*\*\*\*, Terrestrial Ecosystems in Antarctica

Reading:

- Convey, P. (2010). Terrestrial biodiversity in Antarctica- Recent advances and future challenges. *Polar Science*, 4, 135-147.

**ASSIGNMENT DUE:** Short Essay Question #3 by Sunday October XX at 11:59 pm

**Week 10-** Wednesday XXXXX (6 pm EST)

Presenter: \*\*\*\*\*, Antarctic Geology

Reading:

Four short, non-peer reviewed entries in The Antarctic Sun (<http://antarcticsun.usap.gov/>), an online newspaper funded by the U.S. National Science Foundation Office of Polar Programs to raise awareness of publicly-funded Antarctic research and other related happenings.

- Continental connection: Research paper suggests East Antarctica and North America once linked: <http://antarcticsun.usap.gov/science/contenthandler.cfm?id=2497>
- Tectonic evolution: Geologists study ancient Antarctic landscape as possible influence on climate: <http://antarcticsun.usap.gov/science/contenthandler.cfm?id=2415>
- Turning over an old leaf: Paleobotanists reconstruct Triassic with fossilized plant material: <http://antarcticsun.usap.gov/science/contenthandler.cfm?id=2412>
- Warmer continent: Newly published study finds Antarctica a hotter place 14 million years ago: <http://antarcticsun.usap.gov/science/contenthandler.cfm?id=1510>

**ASSIGNMENT DUE:** Midterm Assignment by Sunday November XX at 11:59 pm

**Week 11-** Wednesday XXXXX (6 pm EST)

Presenter: \*\*\*\*\*, Antarctic Psychology

Reading:

- Norris, K. et al. (2010). Future directions in Antarctic psychology research. *Antarctic Science*, 22(4), 335-342.

**Week 12- Wednesday XXXXX (6 pm EST)**

Presenter: \*\*\*\*\*, Environmental Management, Environmental Protocol, and the CEP

Reading:

- Chown, S. et al (2012). Challenges to the Future Conservation of the Antarctic. *Science*, 337, 158-59.
- Tin, T. et al (2009). Impacts of local human activities on the Antarctic environment. *Antarctic Science*, 21(1), 3-33.

**Week 13- NO CLASS PRESENTATION- THANKSGIVING BREAK**

**Week 14- Wednesday XXXXX (6 pm EST)**

Presenter: \*\*\*\*\*, Antarctic Research: Exploring the BIG questions

Reading:

- Bentley, M. (2015). Recent Climate Change: Causes and Impacts of Climate Change in Antarctica. *Exploring the Last Continent*. Switzerland: Springer Int. Pub., 505-520
- International Association Antarctica Tour Operators (IAATO). *Climate Change in Antarctica: Understanding the Facts*.

**ASSIGNMENT DUE:** Final Essay Exam by Sunday December XX at 11:59 pm

**Week 15- Wednesday XXXXX (6 pm EST)**

Presenter: \*\*\*\*\*, Antarctic Field Excursion Orientation

**ASSIGNMENT DUE:** Field Course Annotated Bibliography. by Sunday December XX at 11:59 pm

**Academic Misconduct**

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

**Disability Services**

Students with disabilities (including mental health, chronic or temporary medical conditions) that have been certified by the Office of Student Life

Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office of Student Life Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614- 292-3307, [slds@osu.edu](mailto:slds@osu.edu); [slds.osu.edu](http://slds.osu.edu).

**Sexual Misconduct/Relationship Violence Statement**

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at [titleix@osu.edu](mailto:titleix@osu.edu)

**Diversity Statement**

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

**CURRICULAR MAP OF COURSES AVAILABLE IN EARTH SCIENCES B.S.**  
**Revised July 2017 to include Earth Sci 4798 & proposed Earth Sci 5790.10 and 5797.10**

	Course Number	Course Title	Read/ evaluate Earth Sci literature	Present Earth Sci info	Apply Earth Sci data	Apply appropriate techniques/ methods	Identify Earth Sci problems, develop solutions	Apply other sciences
Preparation for the Major								
Earth Sciences	1121	The Dynamic Earth	B	B	B	B	B	B
Earth Sciences	1122	Earth through Time	B	B	B	B	B	B
Earth Sciences	2245	Introductory Data Analysis for Earth and Environmental Sciences		B	B	B	B	B
Major Program								
Earth Sciences	4194	Group Studies	I	I	I	I	I	I
Earth Sciences	4194H	Honors Group Studies	I	I	I	I	I	I
Earth Sciences	4310	Remote Sensing in the Earth Sciences	I	I	I	I	I	I
Earth Sciences	4421	Earth Materials	I	I	I	I	I	I





	Course Number	Course Title	Read/ evaluate Earth Sci literature	Present Earth Sci info	Apply Earth Sci data	Apply appropriate techniques/ methods	Identify Earth Sci problems, develop solutions	Apply other sciences
Earth Sciences	5194	Group Studies	I - A	I - A	I - A	I - A	I - A	I - A
Earth Sciences	5203	Geo-environment and Human Health	A	A	A	A	A	A
Earth Sciences	5206	Advanced Oceanography	A	A	A	A	A	A
Earth Sciences	5550	Geomorphology	I-A	I-A	I-A	I-A	I-A	I-A
Earth Sciences	5600	Siliciclastic Depositional Systems	A	A	A	A	A	A
Earth Sciences	5601.01	Sedimentary Petrology: Sandstones	A	A	A	A	A	A
Earth Sciences	5601.02	Sedimentary Petrology: Carbonate Rocks and Shales	A	A	A	A	A	A
Earth Sciences	5602.01	Carbonate Depositional Systems I	A	A	A	A	A	A
Earth Sciences	5602.02	Carbonate Depositional Systems II	A	A	A	A	A	A
Earth Sciences	5603	Stratigraphy	A	A	A	A	A	A
Earth Sciences	5604	Sequence Stratigraphy	A	A	A	A	A	A

	Course Number	Course Title	Read/ evaluate Earth Sci literature	Present Earth Sci info	Apply Earth Sci data	Apply appropriate techniques/ methods	Identify Earth Sci problems, develop solutions	Apply other sciences
Earth Sciences	5605	Paleoceanography	A	A	A	A	A	A
Earth Sciences	5613	Micropaleontology	A	A	A	A	A	A
Earth Sciences	5614	Paleobiology	A	A	A	A	A	A
Earth Sciences	5615	Paleoecology	A	A	A	A	A	A
Earth Sciences	5617	Petrology of Earth and Planets	A	A	A	A	A	A
Earth Sciences	5618	Advanced Historical Geology	A	A	A	A	A	A
Earth Sciences	5621	Introduction to Geochemistry	A	A	A	A	A	A
Earth Sciences	5622	Stable Isotope Biogeochemistry	A	A	A	A	A	A
Earth Sciences	5625	Igneous Petrology	A	A	A	A	A	A
Earth Sciences	5627	Global Biogeochemical Cycles	A	A	A	A	A	A
Earth Sciences	5628	Environmental Isotope Geochemistry	A	A	A	A	A	A



	Course Number	Course Title	Read/ evaluate Earth Sci literature	Present Earth Sci info	Apply Earth Sci data	Apply appropriate techniques/ methods	Identify Earth Sci problems, develop solutions	Apply other sciences
Earth Sciences	5629	Principles of Petrology	A	A	A	A	A	A
Earth Sciences	5636	Advanced Topics in Mineralogy and Crystallography	A	A	A	A	A	A
Earth Sciences	5641	Geostatistics	A	A	A	A	A	A
Earth Sciences	5642	Geomathematical Analysis	A	A	A	A	A	A
Earth Sciences	5644	Tectonic Evolution of Continents	A	A	A	A	A	A
Earth Sciences	5645	Advanced Structural Geology	A	A	A	A	A	A
Earth Sciences	5646	Geodynamics	A	A	A	A	A	A
Earth Sciences	5650	Glaciology	A	A	A	A	A	A
Earth Sciences	5651	Hydrogeology	A	A	A	A	A	A
Earth Sciences	5655	Land Surface Hydrology	A	A	A	A	A	A
Earth Sciences	5660	Geology of Metallic Deposits	A	A	A	A	A	A

	Course Number	Course Title	Read/ evaluate Earth Sci literature	Present Earth Sci info	Apply Earth Sci data	Apply appropriate techniques/ methods	Identify Earth Sci problems, develop solutions	Apply other sciences
Earth Sciences	5661	Petroleum Geology	A	A	A	A	A	A
Earth Sciences	5663	Global Change and Sustainability in the Earth System	A	A	A	A	A	A
Earth Sciences	5670	General and Economic Geology of Selected Areas	A	A	A	A	A	A
Earth Sciences	5676	Elemental Chemical Analysis using Inductively Coupled Plasma Optical Emission and Mass Spectrometry	A	A	A	A	A	A
Earth Sciences	5680	Deep Earth Geophysics	A	A	A	A	A	A
Earth Sciences	5687	Borehole Geophysics	A	A	A	A	A	A
Earth Sciences	5703	Principles of Biostratigraphy	A	A	A	A	A	A
Earth Sciences	5713	Taxonomy and Phylogeny in the Fossil Record	A	A	A	A	A	A

	Course Number	Course Title	Read/ evaluate Earth Sci literature	Present Earth Sci info	Apply Earth Sci data	Apply appropriate techniques/ methods	Identify Earth Sci problems, develop solutions	Apply other sciences
Earth Sciences	5714	Biometry	A	A	A	A	A	A
Earth Sciences	5717	Critical Issues in World Freshwater Resources	A	A	A	A	A	A
Earth Sciences	5718	Aquatic Geochemistry	A	A	A	A	A	A
Earth Sciences	5719	Environmental Organic Geochemistry	A	A	A	A	A	A
Earth Sciences	5746	Seminar in Rheological Properties of Solids	A	A	A	A	A	A
Earth Sciences	5751	Quantitative Reservoir Modeling	A	A	A	A	A	A
Earth Sciences	5752	Contaminants in Aqueous Systems	A	A	A	A	A	A
Earth Sciences	5754	Risk Assessment and Management in Earth Systems	A	A	A	A	A	A
Earth Sciences	5779	Seminar in Physical Properties of Minerals and Rocks	A	A	A	A	A	A
Earth Sciences	5780	Reflection Seismology	A	A	A	A	A	A

	Course Number	Course Title	Read/ evaluate Earth Sci literature	Present Earth Sci info	Apply Earth Sci data	Apply appropriate techniques/ methods	Identify Earth Sci problems, develop solutions	Apply other sciences
Earth Sciences	5781	Gravity Exploration	A	A	A	A	A	A
Earth Sciences	5782	Magnetic Exploration	A	A	A	A	A	A
Earth Sciences	5790.10	Antarctica Study Abroad Seminar	I		I	I	I	I
Can only be used in the Earth System Science track of the B.S.								
Earth Sciences	5797.10	Study at a Foreign Institution: Antarctica	I	I	I	A	I	A
Can only be used in the Earth System Science track of the B.S.								
Geod Sci	5781	Geodesy and Geodynamics	A	A	A	A	A	A

	Course Number	Course Title	Read/ evaluate Earth Sci literature	Present Earth Sci info	Apply Earth Sci data	Apply appropriate techniques/ methods
Electives from other departments (Geog, AtmosSC, EEOB, ENR, Chem, Math, etc.)						I-A

Program Learning Goals:

A) Students critically read and evaluate Earth Science literature

B) Students present Earth Science information in a clear and logical manner, both orally and in writing.

C) Students apply knowledge of Earth Science data to understand the dynamic physical, chemical, and biological processes of the Earth and its history.

D) Students apply knowledge of appropriate techniques, field methods, field mapping, and numerical methods to measure, portray, analyze, and interpret Earth Science data in specific subdisciplines.

E) Students identify Earth Science problems and develop solutions.

F) Students apply knowledge of modern applications from chemistry, physics, biology, mathematics, statistics, and computing to the solution of Earth Science problems.

Key: B = Beginning level; I = Intermediate level; A = Advanced level