The Arctic: Changing Ecosystems and Resilience

ENVI 3000 (3 credits / 45 hours)

SIT Study Abroad Program:
Iceland and Greenland: Climate Change and The Arctic

PLEASE NOTE: This syllabus represents a recent semester. Because courses develop and change over time to take advantage of unique learning opportunities, actual course content varies from semester to semester.

Course Description
Gradual and rapid shifts are occurring in ecosystems worldwide. The Arctic, a region of major importance to the world, is changing rapidly. This seminar makes the effects of climate change in this unique part of the world, and the rest of the world, a subject of discussion. It addresses the conditions of change in the Arctic, spanning ecological, social, and political-economic contexts. The seminar also considers community adaptation to the changing environment. Sessions will take place in different parts of Iceland in cooperation with program partners and working groups of the Arctic Council, as well as in Nuuk, Greenland, at the Greenland Institute of Natural Science. Students will learn from experienced scientists, competent instructors, and experts of the Arctic Council.

Learning Outcomes
The Arctic: Changing Ecosystems and Resilience course comprises 45 hours of instruction (3 credits). Upon completion of this course, students will be able to:

- Summarize the physical processes of climate forcings and generate potential feedback loops under various climate scenarios;
- Determine the main ways ecosystems may change under different climate scenarios;
- Judge the efficacy and limitations of climate-driven ecosystem impact research.

Language of Instruction
This course is taught in English, but students will be exposed to vocabulary related to course content through in-country expert lectures and field visits in a wide range of venues and regional locales.
Course Schedule

"Please be aware that topics and excursions may vary to take advantage of any emerging events, to accommodate changes in our lecturers' availability, and to respect any changes that would affect student safety. Students will be notified if this occurs.

Module 1: Ecosystem Impacts in Terrestrial Systems
This module introduces students to the terrestrial landscape and recent issues related to changing climate. Topics span the range of individual physiological constraints to biome shifts. Different levels of organization are explored across different scales to give a general understanding of major processes at work in terrestrial systems. Major Arctic feedback loops, especially those related to carbon loss from permafrost thaw, will be examined as well.

Required Reading:

Suggested Reading:

Module 2: Ecosystem Impacts in Freshwater Systems
This module addresses consequences of climate variability in fresh waters. Topics will include things such as groundwater recharge rates and resource management, nutrient release and eutrophication in northern systems, and impacts from changes in precipitation and snowpack.

Required Reading:

Suggested Readings:


**Module 3: Ecosystem Impacts in Marine Systems**

The most visible and informative indicator of climate change in the Arctic is the change in sea ice cover. Arctic sea ice extent has declined over the past decades with far-reaching consequences for ecosystems and humans. In addition to sea ice thickness and extent, there have been rapid changes to salinity, temperature, and pH in several areas and the oceans worldwide. We will look at observed and projected changes to marine ecosystems from myriad perspectives related to global change.

*Required Reading:*


*Suggested Readings:*


**Module 4: Arctic Resilience and Adaptation**

This module broadly examines Arctic biological and physical systems, as well as observed changes and how they will affect those living in the Arctic. This section of the course content is an interdisciplinary mix of topics designed to introduce students to the Arctic. This module is delivered primarily in Greenland. The Arctic has always undergone
change, and indigenous peoples in the Arctic have depended on and adapted to their environment. Their knowledge of their surroundings is a vital resource for their well-being. Adaptation to climate change is a key challenge for Arctic peoples and the world. The module is also based on knowledge and information derived from field visits and interaction with local communities in Greenland.

**Evaluation and Grading Criteria**

Papers will be graded on style and structure, depth of analysis, and synthesis of secondary and primary sources.

**Description of Assignments:**

**Oral Quiz (10%)**

Students are given an oral quiz to determine whether they can identify and competently explain climate drivers, main feedback loops, and large-scale ecosystem impacts of climate change.

**Oral Presentation (20%)**

Each student will give an oral presentation on a paper of his/her choosing that looks at ecosystem impacts of climate change. The paper must describe the climate scenarios applied to the study system. Students must have a thorough enough understanding of the impacts and scenarios to answer audience questions. All papers are approved by the Academic Director in advance.

**Three Paper Analyses (60%)**

Each student will analyze three peer-reviewed papers. The papers are assigned, and they cover the topics of climate change impacts in terrestrial, freshwater, and marine ecosystems. The analyses are one page, and they consist of four roughly equal sections: summary of the study and findings, broader significance of the paper, strengths, and weaknesses. A discussion of the paper will take place when these ecosystems are covered in class.

**Participation (10%)**

Participation will be graded by timely arrival, active involvement in class discussions, and culturally appropriate behavior on excursions.

**Assessment:**

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<th>Assignment</th>
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<tbody>
<tr>
<td>Oral Quiz</td>
<td>10%</td>
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<tr>
<td>Oral Presentation</td>
<td>20%</td>
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<tr>
<td>Paper Analyses (3)</td>
<td>60%</td>
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<tr>
<td>Participation</td>
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Instructions and rubrics will be provided for all assignments.

**Grading Scale:**

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<thead>
<tr>
<th>Grade</th>
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<tbody>
<tr>
<td>94-100%</td>
<td>A</td>
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<tr>
<td>90-93%</td>
<td>A-</td>
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<tr>
<td>87-89%</td>
<td>B+</td>
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<td>84-86%</td>
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<tr>
<td>80-83%</td>
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Expectations and Policies

- **Show up prepared to discuss.** Be on time, have your readings completed and points in mind for discussion or clarification. Complying with these elements raises the level of class engagement for everyone.
- **Have assignments completed on schedule and done according to the specified requirements.** This will help ensure that your assignments are returned in a timely manner.
- **Ask questions in class. Engage the lecturer.** These are often very busy professionals who are doing us an honor by coming to speak.
- **Comply with academic integrity policies.** There is no tolerance for plagiarism or cheating.
- **Respect differences of opinion (classmates, lecturers, local constituents we engage with on site visits).** You are not expected to agree with everything you hear, but you are expected to listen across difference and consider other perspectives with respect.

**Academic Policies:** SIT prides itself on providing students with an experientially based program; we hold ourselves, and our students, to the highest of academic standards. Students are asked to refer to the **SIT Study Abroad Handbook** for policies on academic integrity, ethics, academic warning and probation, diversity and disability, sexual harassment and the academic appeals process.

**Disability Services:** Students with disabilities are encouraged to contact Disability Services at disabilityservices@sit.edu for information and support in facilitating an accessible educational experience. Additional information regarding SIT Disability Services, including a link to the online request form, can be found on the Disability Services website at http://studyabroad.sit.edu/disabilityservices.