

# CLIMATE SCIENCE

Climate change is impacting global environmental and ecological systems, human health, water availability, agricultural systems and food security, human migrations, and economic systems. Future climate change is projected to further worsen food insecurity, water scarcity, human migrations, and global conflict.

This major is designed to give the students a solid foundation on how the climate system works and competency in areas of data analysis, planning and mitigation, and science communication. Students will take core courses in climate science and complementary areas, and select at least one focus area for additional specialization. Focus areas include: advanced climate science; data visualization; design and planning for sustainability; food, agriculture and biodiversity; policy and human behavior; and science communication.

## Student Learning Outcomes:

Graduates of the Climate Science degree will have the skills and knowledge to:

1. Understand scientific principles and their application to scientific inquiry and to societal concerns relating to climate science.
2. Demonstrate a broad understanding of the climate system, how it works on multiple timescales, and the utility of tools, such as models, and their strengths and limitations in the context of climate science.
3. Demonstrate a broad understanding of climate issues and policies.
4. Think critically about the range of climate information, data, and literature coming from a variety of sources and distil application-relevant knowledge.
5. Demonstrate proficiency in data analysis and problem-solving of relevant climate systems, issues, and challenges.
6. Understand societal concerns related to climate change to develop and/or promote practical and applied research within the climate change research community.
7. Work with diverse teams whose members have a range of professional and disciplinary skills relevant to climate issues.
8. Work to identify climate-related needs and develop strategies to address these needs.
9. Use systems thinking approaches to better understand/solve climate change issues.
10. Effectively communicate in oral, written, and visual formats.

## Climate Science Core Curriculum

C R P 293	Environmental Planning	3
or SOC 220	Globalization and Sustainability	
ECON 380	Energy, Environmental and Resource Economics	3
GEOL 100	How the Earth Works	3

or GEOL 101	Environmental Geology: Earth in Crisis	
GEOL 100L	How the Earth Works: Laboratory	1
GEOL 324	Energy and the Environment	3
GEOL 415	Paleoclimatology	3
JL MC 347	Science Communication	3
MTEOR 140	Climate and Society	3
MTEOR 206	Introduction to Weather and Climate	3
MTEOR 360X	Ocean-Atmosphere Interactions	3
MTEOR 404	Global Change	3
Capstone Choice		2
<b>Total Credits</b>		<b>33</b>

## Required Supporting Courses

CHEM 163	College Chemistry	5-6
& 163L	and Laboratory in College Chemistry *	
or CHEM 167	General Chemistry for Engineering Students	
& 167L	and Laboratory in General Chemistry for Engineering	
or CHEM 201	Advanced General Chemistry	
& 201L	and Laboratory in Advanced General Chemistry	
ECON 101	Principles of Microeconomics	3
MATH 160	Survey of Calculus (MATH 165 required for Advanced Climate Science Pathway)	4
or MATH 165	Calculus I	
PHYS 131	General Physics I	5
& 131L	and General Physics I Laboratory	
or PHYS 231	Introduction to Classical Physics I	
& 231L	and Introduction to Classical Physics I Laboratory	
STAT 305	Engineering Statistics	3
or STAT 101	Principles of Statistics	
or STAT 104	Introduction to Statistics	
<b>Total Credits</b>		<b>20-21</b>

\* Students with previously earned credit for CHEM 177 and CHEM 177L may use it to meet this requirement.

## Pathway Requirement

Students must complete one specialized pathway. All pathways require at least 15 credits; students choosing the Advanced Climate Science Pathway will complete 20 credits. All pathways require 9 credits at the 300-level or higher. Students are encouraged to carefully review course prerequisites when planning course selections in their chosen pathways.

- Advanced Climate Science
- Data Visualization
- Design and Planning for Sustainability
- Food, Agriculture and Biodiversity

- Policy and Human Behavior
- Science Communication

### ADVANCED CLIMATE SCIENCE

Advanced Climate Science requires MATH 166; PHYS 132 or PHYS 232; plus 12 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

MATH 166	Calculus II	4
PHYS 132	General Physics II	4
	or PHYS 232 Introduction to Classical Physics II	
12 credits from the following:		
AGRON 405	Environmental Biophysics	3
AGRON 406	World Climates	3
GEOL 402	Watershed Hydrology	3
GEOL 411	Hydrogeology	4
GEOL 452	GIS for Geoscientists (or other advanced GIS course such as GEOL 488)	3
GEOL 468	Applied Geostatistics for Geoscientists	3
GEOL 474	Glacial and Quaternary Geology	3
GEOL 479	Surficial Processes	3
GEOL 483	Environmental Biogeochemistry	3
GEOL 489	Survey of Remote Sensing Technologies	3
MTEOR 227	Computational Meteorology I (or other computer programming course such as GEOL 559)	3
MTEOR 301	General Meteorology	4
MTEOR 341	Atmospheric Physics I	3
MTEOR 408X	Numerical Weather and Climate Prediction	3
MTEOR 452	Climate Modeling	3

### DATA VISUALIZATION

Data Visualization requires 15 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

ARCH 439	Computational Design Theory	3
ARTIS 212	Studio Fundamentals: Digital Media	3
ARTIS 308	Computer Modeling, Rendering and Virtual Photography	3
ARTIS 408	Principles of 3D Animation	3
ARTIS 470X	Data, Code, and Form	3
ARTIS 473	Video Art	3
ARTIS 475	Interactive Art	3
C R P 251	Fundamentals of Geographic Information Systems	3
C R P 351	Intermediate Geographic Information Systems	3
C R P 449	Geodesign: Planning for Sustainable Futures	3
C R P 456	GIS Programming and Automation	3
GEOL 452	GIS for Geoscientists	3

GEOL 488	GIS for Geoscientists II	3
L A 211	Digital Design Methods for Landscape Architecture	3
L A 454	Fundamentals of Remote Sensing and Spatial Analysis	3
L A 459	Digital Design Methods for Landscape Architecture	3
STAT 332	Visual Communication of Quantitative Information	3

### DESIGN AND PLANNING FOR SUSTAINABILITY

Design and Planning for Sustainability requires 15 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

ARCH 451X	Whole Building Energy Performance Modeling	3
ARCH 558	Sustainability and Green Architecture	3
C R P 251	Fundamentals of Geographic Information Systems	3
C R P 291	World Cities and Globalization	3
C R P 293	Environmental Planning	3
C R P 301	Urban Analytical Methods	4
C R P 351	Intermediate Geographic Information Systems	3
C R P 383	Theory of the Planning Process	3
C R P 445	Transportation Policy and Planning	3
C R P 449	Geodesign: Planning for Sustainable Futures	3
C R P 455	Smart and Sustainable Cities	3
C R P 457	Geogames for Civic Engagement	3
C R P 460	Social Justice and Planning	3
C R P 484	Sustainable Communities	3
C R P 492	Planning Law, Administration and Implementation	3
GEOL 452	GIS for Geoscientists	3
GEOL 488	GIS for Geoscientists II	3
L A 270	Foundations in Natural Resource Policy and History	3

### FOOD, AGRICULTURE AND BIODIVERSITY

Food, Agriculture and Biodiversity requires 15 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

A ECL 231	Principles of Wildlife & Fisheries Conservation	3
A ECL 471	Introductory Conservation Biology	3
AGRON 180	Global Agriculture in a Changing World	3
AGRON 181	Introduction to Crop Science	3
AGRON 182	Introduction to Soil Science	3
AGRON 316	Crop Structure-Function Relationships	3
AGRON 317	Principles of Weed Science	3
AGRON 334	Forage Crop Management	3
AGRON 342	World Food Issues: Past and Present	3
AGRON 405	Environmental Biophysics	3

AGRON 406	World Climates	3
BIOL 204	Biodiversity	2
BIOL 211	Principles of Biology I	3
BIOL 312	Ecology	4
BIOL 355	Plants and People	3
BIOL 366	Plant Systematics	4
BIOL 370	GIS for Ecology and Environmental Science	3
or NREM 446	Integrating GPS and GIS for Natural Resource Management	
ENT 370	Insect Biology	3
or A ECL 366	Natural History of Iowa Vertebrates	
or BIOL 354	Animal Behavior	
ENT 374	Insects and Our Health	3
ENT 471	Insect Ecology	3
GLOBE 304	Socio-Economic Global Resource Systems	3
GLOBE 360	Global Health	3
HORT 342	Landscape Plant Installation, Establishment, and Management	3
HORT 475	Urban Forestry	3
NREM 301	Natural Resource Ecology and Soils	4
NREM 311	Field Ecology in Montana	4
NREM 390	Fire Ecology and Management	3
NREM 452	Ecosystem Management	3

## POLICY AND HUMAN BEHAVIOR

Policy and Human Behavior requires POL S 383 plus 12 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

POL S 383	Environmental Politics and Policies	3
12 credits from the following:		
HIST 362	Global Environmental History	3
HIST 363	U. S. Environmental History	3
PHIL 230	Moral Theory and Practice	3
PHIL 330	Ethical Theory	3
PHIL 334	Environmental Ethics	3
POL S 335	Science, Technology, and Public Policy	3
POL S 344	Public Policy	3
POL S 443	Energy Policy	3
POL S 480	Ethics and Public Policy	3
PSYCH 318	Judgment and Decision Making	3
SOC 220	Globalization and Sustainability	3
SOC 382	Environmental Sociology	3
SOC 331	Social Class and Inequality	3

SOC 348	Global Poverty, Resources and Sustainable Development	3
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## SCIENCE COMMUNICATION

Science Communication requires 15 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

BPM I 323	Scientific Illustration Principles and Techniques	3
BPM I 326	Illustration and Illustration Software	3
BPM I 327	Illustration as Communication	3
ENGL 332	Visual Communication of Quantitative Information	3
ENGL 355	Literature and the Environment	3
ENGL 477	Seminar in Technical Communication	3
JL MC 260X	Media Controversies in Science and Technology	
JL MC 401	Mass Communication Theory	3
JL MC 474	Communication Technology and Social Change	3
JL MC 476	World Communication Systems	3
PHIL 206	Introduction to Logic and Scientific Reasoning	3
P R 220	Principles of Public Relations	3
P R 305	Publicity Methods	3
P R 323X	Strategic Communication in Agriculture and the Environment	3
SP CM 322	Argumentation, Debate, and Critical Thinking	3
SP CM 327	Persuasion and Social Influence	3

As majors in the College of Liberal Arts and Sciences, Climate Science students must meet College of Liberal Arts and Sciences (<http://catalog.iastate.edu/collegeofliberalartsandsciences/#iascollegerequirementstext>) and University-wide requirements (<http://catalog.iastate.edu/collegescurricula/>) for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement.

Communication Proficiency requirement: According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.