Climate and Sustainable Growth

Department Website: https://climate.uchicago.edu/chicago-curriculum-on-climate-and-sustainable-growth/

Program of Study

Climate change is one of the central challenges facing humanity. Increasing temperatures due to CO_2 emissions, by changing ecosystems, weather patterns, sea levels, among other harms, threatens humans and other living things. Meeting this challenge entails transforming the global energy system to eliminate carbon emissions from fossil fuels. At the same time, energy poverty is still common in many parts of the world. Allowing people in those parts of the world to flourish and develop, as is their right, requires increasing energy access while the energy system is transformed, creating a double challenge.

Energy system decarbonization may be complemented by carbon removal, solar geoengineering, and adaptation. Understanding these choices demands knowledge of the science of climate change, the economics and the history of energy systems, environmental management, and the social and political challenges of managing human societies within planetary constraints. Moreover, because carbon dioxide mixes in the atmosphere, climate change presents a global free-rider problem. Each nation benefits if others bear a greater share of the costs of emissions reductions. The free-rider problem is exacerbated by inequalities in past emissions and in current access to energy. Crafting solutions to this problem requires an understanding of politics, law, economics, and theories of justice.

The Climate and Sustainable Growth major offers a multidisciplinary approach to these problems. It covers the core physical and biological science aspects of the problem, as well as the social, economic, political, and humanistic perspectives needed to understand how climate change will affect people and other living things, and to understand and craft solutions. It offers a 360-degree view of the challenges of climate change and sustainable development.

The program of study consists of:

1. Eight foundational courses that introduce students to core aspects of the problem from a wide variety of perspectives.
2. Four courses within the student's choice of specialization. The specialization options are (i) Climate Science and Technology; (ii) Politics, Economics, and Society; and (iii) Finance.
3. The Capstone Seminar and Project (two courses).

Summary of Requirements for the BA in Climate and Sustainable Growth

General Education

Students must have a reasonable base of mathematics and science to complete the major or minor, and must take the following as part of their general education requirements:

Two quarters of calculus		200
MATH 13100-13200	Elementary Functions and Calculus I-II (or higher)	
Two quarters of chemistry		200
CHEM 10100 & CHEM 10200	Introductory General Chemistry I and Introductory General Chemistry II (or higher)	
Both of the following:		200
BIOS 13132	Ecology in the Anthropocene	
BIOS 20153	Fundamentals of Ecology and Evolutionary Biology	
Total Units		600

Major Courses

The total number of courses is 14, made up as follows:

Foundational Courses (8) [#]		800
CCSG 19000	The Climate and Growth Challenge	
CCSG 20100	The Science of Climate Change	
CCSG 20300	The Economics of Climate Change and Energy	
CCSG 20500	Energy: Science, Technology, and Human Usage	
CCSG 20700	Climate Change Justice: The Ethical and Moral Dimensions of Climate Change	
CCSG 20900	The Politics and Law of Climate Change and Energy	
CCSG 21100	Climate Change: Impacts and Adaptation	
CCSG 25000	Climate Change and Energy in Other Countries: September Travel Abroad [*]	
Four Courses in One Specialization (see below)		400

The Capstone Seminar and Project		200
CCSG 29001	Capstone Seminar	
CCSG 29002	Capstone Project	
Total Units		1400

[#]**Note:** Students who have taken a similar course in another department to one of the foundational courses will count that course toward the CCSG major and **may not** take the foundational course. For example, a student who has taken GEOS 13300 The Atmosphere satisfies the requirement for CCSG 20100 The Science of Climate Change). Please consult with the Director of Undergraduate Studies for relevant substitutions.

*__Note on the September Travel Abroad course (__CCSG 25000__):__ students majoring in Climate and Sustainable Growth may only take the September Travel Abroad course during their fourth year at the College and only after they have completed at least five of the foundational courses.

The Specializations

Students must declare one of the following specializations by the beginning of their fourth year.

Climate Science and Technology

Students in the Climate Science and Technology specialization must choose four courses from the following:

GEOS 22060	What Makes a Planet Habitable?
GEOS 23205	The Cryosphere: Glaciers and Ice Sheets
GEOS 23600	Chemical Oceanography
GEOS 23900	Environmental Chemistry
GEOS 24300	Paleoclimatology
GEOS 24800	Climate Systems Engineering
GEOS 29002	Field Course in Modern and Ancient Environments
MENG 21100	Principles of Engineering Analysis I [#]
MENG 25310	Energy Storage and Conversion Devices [#]
MENG 25320	Electrochemical Principles and Methods [#]

Students should be aware that MENG courses have substantial prerequisites. If you are counting on taking those courses to complete the major, make sure you check that you have taken the appropriate prerequisites.

Politics, Economics, and Society

The specialization is divided into three clusters, (i) economics, (ii) politics and law; and (iii) social impacts. Students are free to mix courses among the clusters. If a student is double-majoring, they may wish to take all of their specialization courses from entirely one cluster, such as economics, if that is their other major.

Students must take four courses from the list below.

ECONOMICS CLUSTER	
BUSN 20800	Big Data
PBPL 26930	Environmental Economics: Theory and Applications
PBPL 28633	How Do We Evaluate Policies?: An Empirical Approach
PPHA 36925	Utilities and Electricity Markets: Regulation in the United States
PPHA 39925	Energy Policy and Human Behavior
POLITICS & LAW CLUSTER	
CEGU 23100	Environmental Law
CEGU 24102	Environmental Politics
CEGU 24701	U.S. Environmental Policy
CEGU 24776	International Environmental Policy
PLSC 23501	International Political Economy
PLSC 24203	International Environmental Politics
SOCIAL IMPACTS CLUSTER	
CEGU 26260	Environmental Justice in Principle and Practice I
CEGU 26261	Environmental Justice in Principle and Practice II
HIST 22707	The Industrial Revolution

PBPL 28728	Climate Change and Society: Human Impacts, Adaptation, and Policy Solutions
PBPL 27818	Philosophical Foundations of Public Policy
PBPL 25704	Environmental Justice in Chicago
PLSC 22202	Philosophies of Environmentalism and Sustainability
RETH 30702	Introduction to Environmental Ethics
SSAD 29400	Climate Change and Human Mobility

Finance

Students must take a total of four courses as outlined below.

One of:		100
BUSN 20100	Financial Accounting	
or BUSN 30000	Financial Accounting	
BUSN 20140	Accounting and Financial Analysis	
or BUSN 30116	Accounting and Financial Analysis	
One of:		100
BUSN 20400	Investments	
or BUSN 35000	Investments	
BUSN 20410	Corporation Finance	
or BUSN 35200	Corporation Finance	
BUSN 35001	Introductory Finance	
Two of:		200
BUSN 20330	Building the New Venture	
BUSN 20800	Big Data	
or BUSN 41201	Big Data	
BUSN 30133	Navigating the ESG Landscape: Sustainability Information and Analysis	
BUSN 34113	Impact Investing	
BUSN 35120	Portfolio Management	
BUSN 41000	Business Statistics	
BUSN 42129	The Political Economy of Climate Change	
Total Units		400

Capstone

Students must complete a capstone requirement, which they will typically take in their senior year. The capstone requirement consists of the Capstone Seminar and a capstone project. The Capstone Seminar guides students engaged in research design, data collection and analysis, and thesis writing and will be offered in the Autumn Quarter. To create cross-fertilization of ideas, as well as student community, the seminar will include students from all the specializations. The project continues through the Spring Quarter.

Grading

Students who are majoring in Climate and Sustainable Growth must receive quality grades in courses taken to meet the requirements of the program.

Honors

Eligibility for honors requires a GPA of 3.5 or higher overall and in each of the courses taken to meet the requirements of the program, and a BA Thesis or Practice Capstone Project that is judged to merit honors.

Advising

Majors should plan their course of studies in consultation with the Coordinator of Undergraduate Studies.

Double Majoring

Majoring in Climate and Sustainable Growth and another major is permitted. Students in a given major may be required to substitute courses from that major for the foundational courses in CCSG (e.g., geophysical sciences majors who have taken either GEOS 13300 The Atmosphere or GEOS 24220 Climate Foundations will count that course toward the CCSG major instead of CCSG 20100 The Science of Climate Change). Please consult the Coordinator of Undergraduate Studies for the necessary substitutions. Furthermore, students may petition to substitute the BA Thesis Workshop of their other major for the Climate and Sustainable Growth Capstone sequence, provided their thesis involves climate change and energy.

Summary of of Requirements for the Minor

The minor in Climate and Sustainable Growth consists of six courses: two mandatory courses and a choice of four other courses drawn from the foundational courses from the major. The two mandatory courses are (i) CCSG 19000 The Climate and Growth Challenge and (ii) CCSG 20500 Energy: Science, Technology, and Human Usage. Students are strongly encouraged to take CCSG 20100 The Science of Climate Change and CCSG 20300 The Economics of Climate Change and Energy as supporting courses but need not if they have covered equivalent content in their major.

Note that all general education prerequisites from the major will apply as prerequisites for the minor.

Because courses for the minor may overlap with courses a student is taking for their major, they must have approval from the Director of Undergraduate Studies for the set of courses used for the minor. Students may not take courses for the minor that are in the same area of study as their major (e.g., they may not take CCSG 20300 The Economics of Climate Change and Energy if they are an economics major). In addition, students in the minor may not take CCSG 25000 Climate Change and Energy in Other Countries: September Travel Abroad unless they are in their fourth year at the College and have taken at least four of the required courses for their minor.

Courses in the minor must be taken for quality grades and may not be double-counted with the student's major(s), other minors, or general education requirements.

Students who wish to declare a minor in Climate and Sustainable Growth must reach out to the program contact listed below to indicate their intention to complete the minor and have their Consent to Complete a Minor Program (https://college.uchicago.edu/sites/default/files/documents/College%20Dean%20of%20Students/Minor%20Consent%20Form.pdf) form signed. Students will need to submit the signed form to their College adviser before the end of the Spring Quarter of their third year.

Email List

The Climate and Sustainable Growth major is supported by the Institute on Climate and Sustainable Growth (https://climate.uchicago.edu/). The Institute offers internships, fellowships, and lectures and speaker series related to the problems of climate change, energy, and sustainable growth. Students majoring in Climate and Sustainable Growth or who are interested in the major should subscribe to our email list to get information about these activities. You can subscribe automatically here (https://share.hsforms.com/1EsXeMoMJTyeEaYl8p9E2vwrg3jk/).

Climate and Sustainable Growth Courses

CCSG 19000. The Climate and Growth Challenge. 100 Units.
The global energy and climate challenge is perhaps the most important problem society faces. It requires identifying approaches to ensure people have access to the inexpensive and reliable energy critical for human development, without causing disruptive climate change or unduly compromising health and the environment. The course pairs technical and economic analysis to develop an understanding of policy challenges in this area. Lecture topics will include the past, present, and future of energy supply and demand, global climate change, air pollution and its health consequences, selected energy technologies such as solar photovoltaics, nuclear power, unconventional oil and gas, and an analysis of theoretical and practical policy solutions in developed and emerging economies.
Terms Offered: Autumn
Note(s): This course sets out the basic parameters of the problem and gives students an understanding of how the other required courses of the major fit together. All newly declared climate and energy majors must take this class together.

CCSG 20100. The Science of Climate Change. 100 Units.
This is a foundational climate science course intended for the students taking the nonscience specialization within the Climate and Sustainable Development major. Topics covered includes methods of climate science, Earth's energy balance and greenhouse effects, natural and anthropogenic perturbation to climate, extreme weather and climate change, role of oceans and carbon cycles, and geoengineering.
Terms Offered: Winter
Note(s): Students taking the science specialization within this major will have to take either GEOS 13300 The Atmosphere or GEOS 24220 Climate Foundations, and GEOS 23800/ENSC 23800 Global Biogeochemical Cycles. Students in other specializations can also substitute these courses for the new climate foundations course. If students take this course, they cannot take Global Warming for their general education requirement.

CCSG 20300. The Economics of Climate Change and Energy. 100 Units.
This course covers relevant portions of introductory microeconomics and economic issues associated with climate change and energy using the problems of climate change and energy to illustrate basic economic concepts. It also introduces students to tools for mitigating emissions, such as taxes, subsidies, regulation, and quantity controls. As with the climate science course, this course requirement could be satisfied with one or more advanced economics courses.
Terms Offered: TBD

CCSG 20500. Energy: Science, Technology, and Human Usage. 100 Units.
The use of fossil fuel energy is central to modern economies and is also the central cause of climate change. Stopping climate change requires replacing the fossil fuel system with cleaner sources of energy. At the same time, many people in developing countries need new sources of energy to achieve the living standards of developed countries. This dual problem-replacing existing fossil fuel systems while simultaneously expanding access to energy-is the key reason climate change is such a hard problem. This course helps students understand this problem, focusing on energy conversion technologies, such as fossils, wind, solar, nuclear, and hydro, and on energy systems, such as transmission, storage, and energy markets. This course may also cover carbon dioxide removal technologies.
Terms Offered: Spring

CCSG 20700. Climate Change Justice: The Ethical and Moral Dimensions of Climate Change. 100 Units.
Climate change raises central issues of justice and morality. Some countries or places have emitted far more carbon dioxide than other countries or places. The most vulnerable places are often poor and have had relatively low emissions. In addition, because carbon dioxide stays in the atmosphere for centuries, decisions today affect people who will be alive in the distant future. This course will address issues of justice and climate change, exploring what obligations of people living in one country or time have to people living in other countries or times. We will ask what the resolution of those issues means for policies to address climate change. Students should be prepared to take all sides of these issues, including positions that they are deeply uncomfortable with.
Terms Offered: TBD

CCSG 20900. The Politics and Law of Climate Change and Energy. 100 Units.
Solving the problem of climate change requires that greenhouse gas emissions be eliminated everywhere-a highly complex challenge. As a result, climate negotiations have been ongoing for more than 30 years, but they have had only limited success. This course addresses theoretical and empirical studies of agreements among nation states on environmental issues and domestic politics (within nation states) of environmental regulation-in other words, the political engineering of effective climate agreements. This course could include a legal component.
Terms Offered: Spring

CCSG 21100. Climate Change: Impacts and Adaptation. 100 Units.
Climate change would not be an important issue but for the impacts. Impacts are not only purely physical or biological, such as changes in weather patterns or sea level rise, but also depend on adaptation. For example, people will adjust their farming practices in response to changes in the climate, partially alleviating the impact. This course would study the impacts of climate change and possible adaptations people will make. The course will be designed around the use and presentation of data on impacts, focusing on the data produced by IPCC Working Group II.
Terms Offered: TBD

CCSG 25000. Climate Change and Energy in Other Countries: September Travel Abroad. 100 Units.
Climate change is a global problem that will affect people around the world. In addition, many people in developing countries lack access to reliable sources of energy. To understand the problem of climate change, students need to be exposed to how people outside the United States are experiencing the problem.
Terms Offered: Summer. September term study abroad
Note(s): This course will use the short September term to allow students to travel outside of the United States, such as to existing UChicago centers in Paris or Delhi, or possibly to other areas.

CCSG 29001. Capstone Seminar. 100 Units.
The Climate and Sustainable Growth Major requires completion of a Capstone Seminar and Capstone Project, to be taken consecutively in the fourth year.
Terms Offered: Autumn

CCSG 29002. Capstone Project. 100 Units.
The Climate and Sustainable Growth Major requires completion of a Capstone Seminar and Capstone Project, to be taken consecutively in the fourth year.
Terms Offered: Spring Winter