

# Energy and Resources Group

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## Overview

The Energy and Resources Group (ERG) is an interdisciplinary academic unit of UC Berkeley, offering Minor, M.A., M.S., and Ph.D. degrees in Energy and Resources, and a Minor/Certificate in Sustainability. Established in 1973, ERG addresses issues of energy, climate change, resources, development, human and biological diversity, environmental justice, governance, and new approaches to economics, food, waste, and consumption.

The faculty of ERG consists of ten core professors of energy and resources, plus 200 affiliated faculty and researchers from across the Berkeley campus, Lawrence Berkeley National Laboratory, and elsewhere.

There are approximately 65 graduate students enrolled in ERG degree programs, about half doctoral students. The students come from a wide variety of backgrounds — engineering, natural sciences, social sciences, and humanities. The characteristics they have in common are an interest in interdisciplinary approaches to energy and resource issues and the intellectual credentials to succeed in a rigorous academic program. All receive training at ERG in the technological, environmental, economic, and sociopolitical dimensions of energy and resource issues while pursuing additional course work and individual research tailored to their interest and backgrounds.

ERG graduates are employed across the U.S. and around the world in universities, governmental and international agencies, legislative staff positions, national laboratories, public and private utilities, other energy and resource companies, consulting firms, and public-interest organizations.

## Undergraduate Program

Energy and Resources (<http://guide.berkeley.edu/archive/2022-23/undergraduate/degree-programs/energy-resources/>): Minor

Sustainability (<http://guide.berkeley.edu/archive/2022-23/undergraduate/degree-programs/energy-resources/#summerminorrequirementstext>): Summer Minor and Certificate

## Graduate Programs

Energy and Resources (<http://guide.berkeley.edu/archive/2022-23/graduate/degree-programs/energy-resources/>): MA, MS, PhD, Concurrent ERG/Public Policy MA and MS

## Energy and Resources

Expand all course descriptions [+] Collapse all course descriptions [-]

## ENE,RES 24 Freshman Seminar 1 Unit

Terms offered: Fall 2015, Spring 2012, Spring 2011

The Freshman Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Freshman Seminars are offered in all campus departments, and topics may vary from department to department and semester to semester.

Freshman Seminar: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit when topic changes.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** The grading option will be decided by the instructor when the class is offered. Final Exam To be decided by the instructor when the class is offered.

Freshman Seminar: Read Less [-]

## ENE,RES 39A Freshman and Sophomore Seminar: Complex Systems, Information Theory, and Big Data 2 Units

Terms offered: Fall 2016

Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester. Enrollment limits are set by the faculty, but the suggested limit is 25.

Freshman and Sophomore Seminar: Complex Systems, Information Theory, and Big Data: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final Exam To be decided by the instructor when the class is offered.

**Instructor:** John Harte

Freshman and Sophomore Seminar: Complex Systems, Information Theory, and Big Data: Read Less [-]

## ENE,RES 98 Directed Group Study for Lower Division Students 1 - 4 Units

Terms offered: Fall 2017, Fall 2016, Spring 2016

Lectures and small group discussions focusing on topics of interest that vary from semester to semester.

Directed Group Study for Lower Division Students: Read More [\[+\]](#)

### Rules & Requirements

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated for credit under special circumstances: Course may be repeated with consent of department.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Directed Group Study for Lower Division Students: Read Less [\[-\]](#)

## ENE,RES 99 Supervised Independent Studies for Freshmen and Sophomores 1 - 4 Units

Terms offered: Spring 2023, Spring 2022, Fall 2021

Supervised research on specific topics related to energy and resources. Supervised Independent Studies for Freshmen and Sophomores: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Consent of faculty adviser directing research; lower division standing (3.3 GPA or better)

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of independent study per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Supervised Independent Studies for Freshmen and Sophomores: Read Less [\[-\]](#)

## ENE,RES C100 Energy and Society 4 Units

Terms offered: Fall 2023, Fall 2022, Fall 2021

Energy sources, uses, and impacts: an introduction to the technology, politics, economics, and environmental effects of energy in contemporary society. Energy and well-being; energy in international perspective, origins, and character of energy crisis.

Energy and Society: Read More [\[+\]](#)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Summer:

8 weeks - 6 hours of lecture and 1.5 hours of discussion per week  
10 weeks - 6 hours of lecture and 1.5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Kammen

**Also listed as:** PUB POL C184

Energy and Society: Read Less [\[-\]](#)

## ENE,RES W100 Energy and Society 4 Units

Terms offered: Summer 2023 8 Week Session, Summer 2022 8 Week Session, Summer 2021 8 Week Session

Energy sources, uses, and impacts: an introduction to the technology, politics, economics, and environmental effects of energy in contemporary society. Energy and well-being; energy in international perspective, origins, and character of energy crisis.

Energy and Society: Read More [\[+\]](#)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of web-based lecture and 1 hour of web-based discussion per week

**Summer:** 8 weeks - 6 hours of web-based lecture and 1.5 hours of web-based discussion per week

**Online:** This is an online course.

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Kammen

**Also listed as:** PUB POL W184

Energy and Society: Read Less [\[-\]](#)

## ENE,RES 101 Ecology and Society 3 Units

Terms offered: Summer 2023 8 Week Session, Summer 2022 8 Week Session, Summer 2021 8 Week Session

This course introduces students to the many ways in which our lives are intertwined with the ecosystems around us. Topics will include ecological limits to growth, climate change and other threats to biodiversity, the value of ecosystem goods and services, the ecology of disease, ecotoxicology, the evolution of cooperation in ecosystems, industrial ecology, and the epistemology of ecology.

Ecology and Society: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** One college level course, or high school Advanced Placement, in either physics or biology; introductory calculus

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Summer:

6 weeks - 7.5 hours of lecture per week

8 weeks - 6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** TBA

Ecology and Society: [Read Less](#) [-]

## ENE,RES 102 Quantitative Aspects of Global Environmental Problems 4 Units

Terms offered: Spring 2023, Spring 2022, Spring 2021

Human disruption of biogeochemical and hydrological cycles; causes and consequences of climate change and acid deposition; transport and health impacts of pollutants; loss of species; radioactivity in the environment; and quantitative models to understand these environmental problems.

Quantitative Aspects of Global Environmental Problems: [Read More](#) [+]

### Objectives & Outcomes

**Course Objectives:** Application of basic principles of natural science to the analysis of human influence on environmental conditions and processes at continental to global scale. Topics covered include dimensions of the physical world and of human modifications of it; techniques of estimation and back of the envelope calculation; box models of environmental stocks and flows: equilibrium and feedback; chemical equilibria in the environment; nutrient cycles and their disruptions; acid deposition and its consequences; climate change and its consequences; stratospheric ozone depletion; sources, fate and effects of toxic substances in the global environment; radioactivity and radiation; macroecology; carrying capacity and human population growth; biodiversity and its diminution; epidemics.

**Student Learning Outcomes:** Students will also have gained insight into the multi-disciplinary nature of environmental science, having used physical, chemical, and biological principles to create and solve analytical models.

Students will be familiar with and able to apply a diverse set of quantitative tools for understanding and analyzing environmental problems.

### Rules & Requirements

**Prerequisites:** Upper division standing; calculus (Mathematics 1A-1B or 16A-16B); Physics (7A-7B or 8A-8B), Chemistry (1A or 4A), Biology (1B), or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

**Summer:** 8 weeks - 6 hours of lecture and 4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Kueppers

Quantitative Aspects of Global Environmental Problems: [Read Less](#) [-]

## ENE,RES C124 Gender and Environment 4 Units

Terms offered: Fall 2023, Spring 2023, Fall 2022

This course examines the centrality of gender and intersectionality in understanding nature-society relations across time and space. During the first half of the semester, students will become familiar with key feminist theoretical approaches to studying environmental problems, including ecofeminism, feminist environmentalism, feminist critiques of science, feminist political ecology, and queer and more-than-human ecologies. In the remainder of the semester, students will apply the theories learned to explore contemporary feminist environmental movements and analyze key topics, such as resource politics, pollution and toxins, environmental and reproductive justice, climate change, and the ethics of care.

Gender and Environment: Read More [\[+\]](#)

### Objectives & Outcomes

**Student Learning Outcomes:** Upon taking this course, students will be able to: 1) explain different approaches to theorizing the gender-environment nexus; and 2) apply theoretical and conceptual tools to engage with, reflect on, and critique contemporary local and global environmental issues from an intersectional feminist perspective.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

**Instructor:** Chung

**Also listed as:** ESPM C124

Gender and Environment: Read Less [\[-\]](#)

## ENE,RES 131 Data, Environment and Society 4 Units

Terms offered: Fall 2023, Fall 2022, Fall 2021

This course will teach students to build, estimate and interpret models that describe phenomena in the broad area of energy and environmental decision-making. Students leave the course as both critical consumers and responsible producers of data-driven analysis. The effort will be divided between (i) learning a suite of data-driven modeling and prediction tools (including linear model selection methods, classification and regression trees and support vector machines) (ii) building programming and computing expertise and (iii) developing capacity to formulate and answer resource allocation questions within energy and environment contexts.

Data, Environment and Society: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Required: Foundations of Data Science (Computer Science C8/Information Systems C8/ Statistics C8) and high school or college calculus Recommended: An introductory computer programming course (Computer Science 61A or Computer Science 88) and Linear Algebra (Mathematics 54, Electrical Engineering and Computer Science 16A, or Statistics 89A)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Callaway

Data, Environment and Society: Read Less [\[-\]](#)

## ENE,RES C160 CLIMATE JUSTICE 4 Units

Terms offered: Fall 2023, Fall 2022

Climate change is transforming our world in ways we are only beginning to understand, and in many ways we cannot yet imagine. The emerging theoretical and practical lenses of social and environmental justice (EJ) provide tools with which to examine and understand this new world. Using literature, media, and engaged field experiences, this course brings together the scholarship, scientific and engineering innovation, policy, literature and media, and activism around the interacting themes of climate change and social justice. CLIMATE JUSTICE: Read More [+]

### Rules & Requirements

**Credit Restrictions:** Students will receive no credit for ENE,RES C160 after completing ENE,RES 160, or ARCH 153. A deficient grade in ENE,RES C160 may be removed by taking ENE,RES 160, or ARCH 153.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Mills-Novoa

**Also listed as:** ESPM C176

CLIMATE JUSTICE: Read Less [-]

## ENE,RES 170 Environmental Classics 3 Units

Terms offered: Summer 2023 8 Week Session, Summer 2022 8 Week Session, Summer 2021 8 Week Session

What is the history and evolution of environmental thinking and writing in the USA? How have certain 'environmental classics' shaped the way in which we think about nature, society and progress? Why did these become 'classics' and why/how did they influence environmental thought and policy? What is their relevance today? This course includes substantial reading assignments.

Environmental Classics: Read More [+]

### Objectives & Outcomes

**Course Objectives:** This course will use a selection of books and papers from the last 6 decades that have had a profound impact on academic and wider public thinking -- primarily in the USA -- about the environment and society to probe these issues. In class, we will situate the key reading in its historical context and discuss its contributions, critiques and consequences. Through these classics the class will explore: the evolution of environmental thought; the connections between environment, perception and policy; and the links between scientific thought and public perception.

### Hours & Format

**Summer:** 8 weeks - 4 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Environmental Classics: Read Less [-]

## ENE,RES 171 California Water 3 Units

Terms offered: Summer 2023 First 6 Week Session, Summer 2022 First 6 Week Session, Summer 2021 8 Week Session

The story of water development in California provides compelling examples of water politics, the social and environmental consequences of redistributing water, and the relationships between water uses, energy, and climate. This course provides the historical, scientific, legal, institutional, and economic background needed to understand the social and ecological challenges of providing water for California's growing population, agricultural economy, and other uses - all of which are made more complex by climate change.

California Water: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Students will grasp the historical, scientific, legal, institutional, and economic background needed to understand the social and ecological challenges of providing water for California's growing population, agricultural economy, and other uses - all of which are made more complex by climate change.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Summer:

6 weeks - 6 hours of lecture per week

8 weeks - 4 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

California Water: Read Less [-]

## ENE,RES W174 Water and Sanitation Justice 3 Units

Terms offered: Summer 2023 8 Week Session, Summer 2022 8 Week Session, Summer 2021 8 Week Session

This course will explore the many manifestations of water and sanitation justice and injustice on interlocking scales (i.e. local, national, transnational) while illustrating analytical ideas connecting to a range of social processes including claims for human rights, deprivation and exclusion, urbanization and infrastructure development, and privatization of land and water. We will look at various case studies in high-income and low-income countries and use key technical and social concepts to examine rights, equity, and justice with respect to water and sanitation. This course partially satisfies requirements for the ERG Summer Minor/Certificate in Sustainability.

Water and Sanitation Justice: Read More [+]

### Objectives & Outcomes

**Course Objectives:** This course will acquaint you with theoretical and practical knowledge about water and sanitation justice.

**Student Learning Outcomes:** Analyze water and sanitation through a variety of disciplinary perspectives: Arts, Engineering, Humanities, and in the social sciences of Sociology, Geography, Environmental Studies, Politics, Economics, Anthropology

Compare issues at local to global scales

Explain key issues of water and sanitation justice

Explain water and sanitation policy and governance historical examples, locally and globally

Identify factors influencing water and sanitation justice and injustice

Seriously consider strategies for addressing water and sanitation injustice

Understand impacts of water and sanitation injustice on quality of life

### Hours & Format

**Summer:** 8 weeks - 6 hours of web-based lecture and 2.5 hours of web-based discussion per week

**Online:** This is an online course.

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Ray

Water and Sanitation Justice: Read Less [-]



## ENE,RES 175 Water and Development 4 Units

Terms offered: Spring 2016, Spring 2014, Spring 2013

This course introduces students to water policy in developing countries. It is a course motivated by the fact that over one billion people in developing countries have no access to safe drinking water, three billion do not have sanitation facilities, and many millions of small farmers do not have reliable water supplies to ensure a healthy crop. Readings and discussions will cover: the problems of water access and use in developing countries; the potential for technological, social, and economic solutions to these problems; the role of institutions in access to water and sanitation; and the pitfalls of the assumptions behind some of today's popular "solutions."

Water and Development: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Upper division standing or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** ERG Faculty

Water and Development: [Read Less](#) [-]

## ENE,RES C176 Climate Change Economics 4 Units

Terms offered: Fall 2023, Summer 2023 8 Week Session, Fall 2022

This course is a self-contained introduction to the economics of climate change. Climate change is caused by a large variety of economic activities, and many of its impacts will have economic consequences. Economists have studied climate change for more than two decades, and economic arguments are often powerful in policy decisions. The course will familiarize students with these arguments and equip them with the tools to participate in discussions of climate change policy through an economic lens.

Climate Change Economics: [Read More](#) [+]

### Objectives & Outcomes

**Course Objectives:** The course will start with a brief review of the science of climate change, discuss scenarios of economic growth and the greenhouse gas emissions caused by economic activities and investigate various emission reduction opportunities and their economic costs. A significant amount of time will be spent on studying the impacts of climate change, their economic evaluation and how adaptation can lower the costs of climate damages.

We will then study various theoretical frameworks economists have developed that answer the question how estimates about the costs and benefits of climate policy can be combined to find "good" climate policies. We then study three more specialized topics that turn out to be of great importance when analyzing climate change policy: first, how do we compare costs and benefits of generations that live many centuries apart? Second, how do we design climate policy when our projections of both the costs and the benefits of climate policy are highly uncertain? And third, how can equity considerations be accounted for in an economic assessment of climate change policy? The course will close with a look at international cooperation on climate policy and why it has been so difficult to agree on effective treaties that implement climate change policy.

**Student Learning Outcomes:** Students will also have gained insight into the practical aspects of modeling the economics of climate change by building a simple integrated assessment model in Excel. They will be able to use that model to do simple analysis of climate change policy themselves.

Students will be familiar with the tools economists use to analyze climate change policy. They will have studied empirical estimates of the costs and benefits of climate policy and have an understanding of the analytical issues that drive research on the economics of climate change.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

**Summer:** 8 weeks - 6 hours of lecture and 4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Anthoff

**Also listed as:** ENVECON C176/IAS C176

Climate Change Economics: [Read Less](#) [-]

## ENE,RES 180 Ecological Economics in Historical Context 3 Units

Terms offered: Fall 2016

Economists through history have explored economic and environmental interactions, physical limits to growth, what constitutes the good life, and how economic justice can be assured. Yet economists continue to use measures and models that simplify these issues and promote bad outcomes. Ecological economics responds to this tension between the desire for simplicity and the multiple perspectives needed to understand complexity in order to move toward sustainable, fulfilling, and just economies.

Ecological Economics in Historical Context: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Summer:

6 weeks - 7.5 hours of lecture per week

8 weeks - 6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Ecological Economics in Historical Context: Read Less [-]

## ENE,RES 190 Seminar in Energy and Resources Issues 3 Units

Terms offered: Summer 2020 8 Week Session, Spring 2019, Summer 2018 Second 6 Week Session

Critical, cross disciplinary analysis of specific issues or general problems of how people interact with environmental and resource systems. More than one section may be given each semester on different topics depending on faculty and student interest.

Seminar in Energy and Resources Issues: Read More [+]

### Rules & Requirements

**Prerequisites:** Upper division standing and consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of lecture per week

### Summer:

6 weeks - 7.5 hours of lecture per week

8 weeks - 2-6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Seminar in Energy and Resources Issues: Read Less [-]

## ENE,RES 190B Energy and Environmental Issues 4 Units

Terms offered: Spring 2022, Spring 2021

Critical, data-driven analysis of specific issues or general problems of how people interact with environmental and resource systems. This course will teach students to build, estimate and interpret models that describe phenomena in the broad area of energy and environmental decision-making. More than one section may be given each semester on different topics depending on faculty and student interest.

Energy and Environmental Issues: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit when topic changes. Students may enroll in multiple sections of this course within the same semester.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Energy and Environmental Issues: Read Less [-]

## ENE,RES 190C Energy and Environmental Issues 4 Units

Terms offered: Fall 2020, Fall 2018

Critical, data-driven analysis of specific issues or general problems of how people interact with environmental and resource systems. This course will teach students to build, estimate and interpret models that describe phenomena in the broad area of energy and environmental decision-making. More than one section may be given each semester on different topics depending on faculty and student interest.

Energy and Environmental Issues: Read More [+]

### Rules & Requirements

**Prerequisites:** 1. Foundations of Comp Sci: COMPSCI C8 or STAT C8 or INFO C8: Foundations of Data Science 2. Computing: COMPSCI 61A: The Structure and Interpretation of Computer Programs or COMPSCI 88: Computational Structures in Data Science 3. Math: MATH 54: Linear Algebra and Differential Equations or ELENG 16A: Designing Information Devices and Systems I or STAT 89A: Linear Algebra for Data Science

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Energy and Environmental Issues: Read Less [-]



## ENE,RES C192 Business, Sustainability, and Society 3 Units

Terms offered: Summer 2022 8 Week Session, Summer 2021 8 Week Session

As corporations have grown in influence, concerns over their impact on people and the planet have also grown, pushing sustainability, corporate social responsibility, and the wider impact of business into the spotlight. This course focuses on business ethics, supply chains, resource constraints, labor issues, innovation, and environmental externalities, as well as the internal challenges, competitive pressures, external stakeholders, and other issues that businesses must consider while trying to act responsibly.

Business, Sustainability, and Society: Read More [\[+\]](#)

### Hours & Format

**Summer:** 8 weeks - 6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required, with common exam group.

**Instructor:** Rochlin

**Also listed as:** UGBA C192R

Business, Sustainability, and Society: Read Less [\[-\]](#)

## ENE,RES 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units

Terms offered: Fall 2020, Fall 2019, Spring 2016

Group studies of selected topics.

Directed Group Studies for Advanced Undergraduates: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Upper division standing, plus particular courses to be specified by instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Directed Group Studies for Advanced Undergraduates: Read Less [\[-\]](#)

## ENE,RES 199 Supervised Independent Study and Research 1 - 4 Units

Terms offered: Spring 2023, Summer 2022 8 Week Session, Spring 2022 Individual conferences.

Supervised Independent Study and Research: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Enrollment restricted by regulations in General Catalog

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of independent study per week

**Summer:** 8 weeks - 1.5-15 hours of independent study per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Supervised Independent Study and Research: Read Less [\[-\]](#)

## ENE,RES C200 Energy and Society 4 Units

Terms offered: Fall 2023, Fall 2022, Fall 2021

Energy sources, uses, and impacts; an introduction to the technology, politics, economics, and environmental effects of energy in contemporary society. Energy and well-being; energy international perspective, origins, and character of energy crisis.

Energy and Society: Read More [\[+\]](#)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Summer:

8 weeks - 6 hours of lecture and 1.5 hours of discussion per week

10 weeks - 6 hours of lecture and 1.5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Kammen

**Also listed as:** PUB POL C284

Energy and Society: Read Less [\[-\]](#)

## ENE,RES W200 Energy and Society 4 Units

Terms offered: Summer 2023 8 Week Session, Summer 2022 8 Week Session, Summer 2021 8 Week Session, Fall 2020

Energy sources, uses, and impacts: an introduction to the technology, politics, economics, and environmental effects of energy in contemporary society. Energy and well-being; energy in international perspective, origins, and character of energy crisis.

Energy and Society: Read More [\[+\]](#)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of web-based lecture and 1 hour of web-based discussion per week

**Summer:** 8 weeks - 6 hours of web-based lecture and 1.5 hours of web-based discussion per week

**Online:** This is an online course.

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Kammen

**Also listed as:** PUB POL W284

Energy and Society: Read Less [\[-\]](#)

## ENE,RES C202 Modeling Ecological and Meteorological Phenomena 3 Units

Terms offered: Fall 2015, Fall 2014, Fall 2013

Modeling methods in ecology and meteorology; stability analysis; effects of anthropogenic stress on natural systems. Offered alternate years.

Modeling Ecological and Meteorological Phenomena: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Integrative Biology 102 or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Harte

**Also listed as:** ESPM C211

Modeling Ecological and Meteorological Phenomena: Read Less [\[-\]](#)

## ENE,RES C205 Quantitative Methods for Ecological and Environmental Modeling 3 Units

Terms offered: Fall 2015, Fall 2013, Fall 2012, Fall 2011, Fall 2009

This course will review the background mathematical and statistical tools necessary for students interested in pursuing ecological and environmental modeling. Topics include linear algebra; difference equation, ordinary differential equation, and partial differential equation models; stochastic processes; parameter estimation; and a number of statistical techniques. This course will be recommended as a prerequisite for advanced modeling courses in Integrative Biology, Energy and Resources Group, and Environmental Science, Policy, and Management. Quantitative Methods for Ecological and Environmental Modeling: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Also listed as:** ESPM C205/INTEGBI C205

Quantitative Methods for Ecological and Environmental Modeling: Read Less [\[-\]](#)

## ENE,RES C221 Climate, Energy and Development 3 Units

Terms offered: Fall 2019, Fall 2018, Fall 2017

Graduate seminar examining the role of energy science, technology, and policy in

international development. The course will look at how changes in the theory and practice

of energy systems and of international development have co-evolved over the past half-

century, and what opportunities exist going forward.

A focus will be on rural and decentralized energy use, and the issues of technology, culture,

and politics that are raised by both current trajectories, and potential alternative energy

choices. We will explore the frequently divergent ideas about energy and development that

have emerged from civil society, academia, multinational development agencies, and the

private and industrial sector.

Climate, Energy and Development: Read More [ + ]

### Rules & Requirements

**Prerequisites:** Graduate student standing or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Kammen

**Also listed as:** DEVP C221/PUB POL C221

Climate, Energy and Development: Read Less [ - ]

## ENE,RES C223 Agrarian Questions 4 Units

Terms offered: Not yet offered

The seminar offers an introduction to the interdisciplinary field of critical

agrarian and food studies, which brings together Marxian agrarian

political economy, historical and political sociology, postcolonial and

subaltern studies, post structural feminist theory, critical development

studies, and political ecology. Students should come out of this class with

a genealogical understanding of key debates and emergent issues in the

field. Our goal is to think theoretically and empirically about the social

relations of land, labor, and livelihoods and how these relations articulate

with broader political economic processes.

Agrarian Questions: Read More [ + ]

### Rules & Requirements

**Credit Restrictions:** Students will receive no credit for ENE,RES C223

after completing ESPM 223. A deficient grade in ENE,RES C223 may be

removed by taking ESPM 223.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Chung

**Also listed as:** ESPM C223

Agrarian Questions: Read Less [ - ]

## ENE,RES C226 Photovoltaic Materials; Modern Technologies in the Context of a Growing Renewable Energy Market 3 Units

Terms offered: Fall 2015, Spring 2013, Spring 2011

This technical course focuses on the fundamentals of photovoltaic energy conversion with respect to the physical principals of operation and design of efficient semiconductor solar cell devices. This course aims to equip students with the concepts and analytical skills necessary to assess the utility and viability of various modern photovoltaic technologies in the context of a growing global renewable energy market.

Photovoltaic Materials; Modern Technologies in the Context of a Growing Renewable Energy Market: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Material Science and Mineral Engineering 111 or 123 or equivalent. Should have a firm foundation in electronic and optical props of semiconductors and basic semiconductor device physics

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Also listed as:** MAT SCI C226

Photovoltaic Materials; Modern Technologies in the Context of a Growing Renewable Energy Market: Read Less [\[-\]](#)

## ENE,RES 254 Electric Power Systems 4 Units

Terms offered: Spring 2023, Spring 2020, Spring 2019

Provides an understanding of concepts in the design and operation of electric power systems, including generation, transmission, and consumption. Covers basic electromechanical physics, reactive power, circuit and load analysis, reliability, planning, dispatch, organizational design, regulations, environment, end-use efficiency, and new technologies.

Electric Power Systems: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Physics 7B or 8B or equivalent

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Callaway

Electric Power Systems: Read Less [\[-\]](#)

## ENE,RES C266 Political Ecologies of Climate Change Adaptation 3 Units

Terms offered: Fall 2023

As the climate crisis escalates and mitigation efforts stagnate, adaptation has come to the forefront of public debates and funding priorities. This course will explore the varied political ecologies of climate change adaptation. By drawing on political ecology, this course will include both foundational and emerging scholarship that explores how climate change adaptation is shaping and being shaped by the material impacts of climate change, the political economy of climate governance and finance, and the agency of experts, funders, promoters, and the individuals and collectives adapting to climate change. We will examine the history of climate change adaptation concepts and governance while also exploring emerging frontiers in the field.

Political Ecologies of Climate Change Adaptation: Read More [\[+\]](#)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Mills-Novoa

**Also listed as:** ESPM C266

Political Ecologies of Climate Change Adaptation: Read Less [\[-\]](#)

## ENE,RES 270 Environmental Classics 3 Units

Terms offered: Fall 2013, Fall 2011, Fall 2009

Motivation: What is the history and evolution of environmental thinking and writing? How have certain "environmental classics" shaped the way in which we think about nature, society, and development? This course will use a selection of 20th-century books and papers that have had a major impact on academic and wider public thinking about the environment and development to probe these issues. The selection includes works and commentaries related to these works that have influenced environmental politics and policy in the U.S. as well as in the developing world. Through the classics and their critiques, reviews, and commentaries, the class will explore the evolution of thought on these transforming ideas.

Environmental Classics: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructors:** Kammen, Ray

Environmental Classics: Read Less [\[-\]](#)

## ENE,RES C271 Energy and Development 3 Units

Terms offered: Spring 2016

This advanced graduate seminar will examine the theoretical frames and models used to examine the linkages between energy and development, and the impacts of one on the other.

Energy and Development: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Energy and Resources ENE,RES C100 or C200 or Public Policy PUB POL C184 or C284 Energy and Resources ENE,RES 102 Environmental Economics and Policy ENVECON C151 or ECON C171 or equivalent Economics course

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Kammen

**Also listed as:** PUB POL C271

Energy and Development: Read Less [\[-\]](#)

## ENE,RES 273 Research Methods in Social Sciences 3 Units

Terms offered: Fall 2021, Fall 2019, Fall 2017

This course aims to introduce graduate students to the rich diversity of research methods that social scientists have developed for the empirical aspects of their work. Its primary goal is to encourage critical thinking about the research process: how we "know," how we match research methods to research questions, how we design and conduct our information/data collection, what we assume explicitly and implicitly, and the ethical dilemmas raised by fieldwork-oriented studies.

Research Methods in Social Sciences: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Ray

Research Methods in Social Sciences: Read Less [\[-\]](#)

## ENE,RES 275 Water and Development 4 Units

Terms offered: Spring 2023, Spring 2022, Spring 2020

This class is an interdisciplinary graduate seminar for students of water policy in developing countries. It is not a seminar on theories and practices of development through the "lens" of water. Rather, it is a seminar motivated by the fact that over 1 billion people in developing countries have no access to safe drinking water, 3 billion don't have sanitation facilities and many millions of small farmers do not have reliable water supplies to ensure a healthy crop. Readings and discussions will cover: the problems of water access and use in developing countries; the potential for technological, social, and economic solutions to these problems; the role of institutions in access to water and sanitation; and the pitfalls of and assumptions behind some of today's popular "solutions."

Water and Development: Read More [\[+\]](#)

### Hours & Format

**Fall and/or spring:** 15 weeks - 4 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Ray

Water and Development: Read Less [\[-\]](#)

## ENE,RES 276 Climate Change Economics 4 Units

Terms offered: Fall 2023, Fall 2022, Fall 2021

This course is a self-contained introduction to the economics of climate change. Climate change is caused by a large variety of economic activities, and many of its impacts will have economic consequences. Economists have studied climate change for more than two decades, and economic arguments are often powerful in policy decisions. The course will familiarize students with these arguments and equip them with the tools to participate in discussions of climate change policy through an economic lens.

Climate Change Economics: Read More [+]

### Objectives & Outcomes

**Course Objectives:** The course will start with a brief review of the science of climate change, discuss scenarios of economic growth and the greenhouse gas emissions caused by economic activities and investigate various emission reduction opportunities and their economic costs. A significant amount of time will be spent on studying the impacts of climate change, their economic evaluation and how adaptation can lower the costs of climate damages.

We will then study various theoretical frameworks economists have developed that answer the question how estimates about the costs and benefits of climate policy can be combined to find “good” climate policies. We then study three more specialized topics that turn out to be of great importance when analyzing climate change policy: first, how do we compare costs and benefits of generations that live many centuries apart? Second, how do we design climate policy when our projections of both the costs and the benefits of climate policy are highly uncertain? And third, how can equity considerations be accounted for in an economic assessment of climate change policy? The course will close with a look at international cooperation on climate policy and why it has been so difficult to agree on effective treaties that implement climate change policy.

**Student Learning Outcomes:** Students will also have gained insight into the practical aspects of modeling the economics of climate change by building a simple integrated assessment model in a scientific programming language of their choice. They will be able to use that model to do simple analysis of climate change policy themselves. Students will be familiar with the tools economists use to analyze climate change policy. They will have studied empirical estimates of the costs and benefits of climate policy and have an understanding of the analytical issues that drive research on the economics of climate change.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

**Summer:** 8 weeks - 6 hours of lecture and 4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** David Anthoff

Climate Change Economics: Read Less [-]

## ENE,RES 280 Energy Economics 3 Units

Terms offered: Fall 2016, Fall 2015, Spring 2015

Input-output and cost benefit analysis applied to energy; exhaustion theory and economics of energy supply; patterns of energy use; trade-offs in energy conservation; the effect of energy policy on supply and demand; projecting future energy and resource supply and use.

Energy Economics: Read More [+]

### Rules & Requirements

**Prerequisites:** Economics 100A or equivalent; basic calculus or linear algebra

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 6 weeks - 7.5 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

Energy Economics: Read Less [-]

## ENE,RES 290 Seminar in Energy and Resources 1 - 4 Units

Terms offered: Fall 2023, Spring 2023, Fall 2022

Graduate student presentations and faculty-student discussions of advanced topics in energy and resources. Specific topics vary according to faculty and student interest.

Seminar in Energy and Resources: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2-3 hours of seminar and 0-1 hours of discussion per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

Seminar in Energy and Resources: Read Less [-]



## ENE,RES 290A Seminar in Energy and Resources 3 Units

Terms offered: Fall 2021, Spring 2021, Fall 2020

Graduate student presentations and faculty-student discussions of advanced topics in energy and resources. Specific topics vary according to faculty and student interest.

Seminar in Energy and Resources: Read More [\[+\]](#)

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of seminar per week

**Summer:** 8 weeks - 6 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

Seminar in Energy and Resources: Read Less [\[-\]](#)

## ENE,RES 291 Special Topics in Energy and Resources 1 - 3 Units

Terms offered: Fall 2016, Spring 2012, Spring 2011

Study and critical analysis of advanced topics in energy and resources using interdisciplinary approaches. Specific topics vary according to faculty and student interest.

Special Topics in Energy and Resources: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing or consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

Special Topics in Energy and Resources: Read Less [\[-\]](#)

## ENE,RES 292A Tools of the Trade 2 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

Quantitative methods for energy and resource analysis. Topics include linear algebra, differential equations, statistical methods, chemical equilibrium theory, and thermodynamics.

Tools of the Trade: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Offered for satisfactory/unsatisfactory grade only.

Tools of the Trade: Read Less [\[-\]](#)

## ENE,RES 293A Master's Seminar I: Interdisciplinary Analysis and the Environment 3 Units

Terms offered: Fall 2023, Fall 2022, Fall 2021

ENERES 293A is the first of 4 required seminars of the ERG Masters' sequence. It provides an intellectual and practical orientation to the Energy and Resources Group and to what makes us "ERG". It's at once an understanding interdisciplinary approaches class and a cohort-building class. ERG is a community of scholars and researchers who are actively engaged in academic research, policy design, and engagement with civil society. ENERES 293A provides a space in which interdisciplinary approaches to domains, methods / tools and worldviews are explored, individually and collaboratively, for the fields that comprise energy and resources research.

Master's Seminar I: Interdisciplinary Analysis and the Environment: Read More [+]

### Objectives & Outcomes

#### Course Objectives: 1.

Develop a cohort among incoming students and connect with the larger ERG community.

2.

Explore the foundations of the environmental field by reading seminal papers and books in the space.

3.

Introduce interdisciplinary thinking and problem-solving frameworks through a unifying topic throughout the semester.

### Rules & Requirements

**Prerequisites:** Open to ERG graduate students only

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** Ray

**Formerly known as:** Energy and Resources Group 201

Master's Seminar I: Interdisciplinary Analysis and the Environment: Read Less [-]

## ENE,RES 293B Master's Seminar II: Methods for Interdisciplinary Analysis 3 Units

Terms offered: Spring 2023, Spring 2022

This is the second semester of the ENERES 293 sequence for all ERG Master's Degree students. The primary purpose of the sequence is to support students in the process of doing independent interdisciplinary research. ENERES 293B is designed to help students learn to identify and develop tractable and impactful interdisciplinary research projects. Master's Seminar II: Methods for Interdisciplinary Analysis: Read More [+]

### Objectives & Outcomes

#### Course Objectives: 1.

Discuss career paths and research with experts in students' area(s) of interest – some of whom are eligible to be a reader of the students' capstone Master's Project.

2.

Develop and refine an individual development plan.

3.

Read and discuss several frameworks for the process of doing interdisciplinary research, and interpret existing research in the context of those frameworks.

4.

Complete group activities to identify and argue for research in a new area.

5.

Encourage students to think carefully about their mentoring needs and how they will fulfill those needs.

6.

Develop a refined research question for the ERG capstone Master's Project, as well as a supporting annotated bibliography, a list of anticipated methods and data to be used, and a plan for obtaining them.

### Rules & Requirements

**Prerequisites:** Energy and Resources ENERES 293A

**Credit Restrictions:** Students will receive no credit for ENE,RES 293B after completing ENE,RES 292B. A deficient grade in ENE,RES 293B may be removed by taking ENE,RES 292B, or ENE,RES 292B.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructors:** ERG Faculty, Callaway

**Formerly known as:** Energy and Resources Group 292B

Master's Seminar II: Methods for Interdisciplinary Analysis: Read Less [-]

## ENE,RES 293C Master's Seminar III - Master's Project Development for Interdisciplinary Analysis, Part 1 3 Units

Terms offered: Fall 2023, Fall 2022, Fall 2021

This is the third semester of the ERG master's seminar series. This semester shifts from a focus on intellectual exploration to the design and execution of the master's project. While some students may have already started their projects through summer research and/or fieldwork experiences, others may be starting fresh. This semester is designed to meet students wherever they are in the process of developing their research. It will also focus on building communication/translation skills and continuing the professional development work started in ENERES 293B.

Master's Seminar III - Master's Project Development for Interdisciplinary Analysis, Part 1: [Read More](#) [+]

### Objectives & Outcomes

#### Course Objectives: 1.

Develop verbal and written communication skills and techniques

- a. Project pitches
- b. Peer presentations
- c. Individual presentations
- d. Optional presentation to lab group
- e. Writing workshop
- f. Written outline of Master's project

#### 2.

Network with people in and outside of the ERG community

- a. Determine the appropriate scope and focus for a Master's project
- b. Begin to plan for a career beyond the Master's degree

#### 3.

Develop project management and leadership skills

- a. Practice managing and executing a research plan
- b. Lead discussions on individual research
- c. Provide constructive feedback on peers' research
- d. Ask for specific types of guidance and mentorship from advisors and readers

#### 4.

Define the scope of a Master's project that can answer an interdisciplinary question

- a. Identify a gap in existing literature and/or a field of research
- b. Develop a question that is actionable under the timeline of the master's project
- c. Bound the project with a defined literature search and analysis

#### 5.

Complete the initial steps of the Master's project

- a. Read past Master's projects and identify how to design a research thesis/

## ENE,RES 293D Master's Seminar IV: Master's Project Development for Interdisciplinary Analysis Part II 3 Units

Terms offered: Spring 2023, Spring 2022

Required of, and open only to, fourth-semester Energy and Resources Master's Degree students. Topics include structuring and writing a research paper, crafting and delivering a clear, engaging presentation on the Master's project, supporting classmates with these goals, and professional development. In addition to whole-class sessions, students will work in small groups throughout the semester and conduct individual professional way-finding exercises. Students will apply the interdisciplinary approaches and perspectives learned in the core curriculum and previous courses in this series.

Master's Seminar IV: Master's Project Development for Interdisciplinary Analysis Part II: [Read More](#) [+]

### Objectives & Outcomes

#### Course Objectives: Complete and file the masters project paper.

Develop and deliver a clear and engaging presentation on their master's project.

Prepare for post-graduation activities.

### Rules & Requirements

**Prerequisites:** Energy and Resources ENERES 293A, ENERES 293B, ENERES 293C

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

**Instructor:** ERG Faculty

**Formerly known as:** Energy and Resources Group 292D

Master's Seminar IV: Master's Project Development for Interdisciplinary Analysis Part II: [Read Less](#) [-]

## ENE,RES 295 Special Topics in Energy and Resources 1 Unit

Terms offered: Fall 2023, Spring 2023, Fall 2022

Presentations of research in energy issues by faculty, students, and visiting lecturers. Master's degree students required to enroll for two semesters.

Special Topics in Energy and Resources: Read More [\[+\]](#)

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1.5 hours of colloquium per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Offered for satisfactory/unsatisfactory grade only.

Special Topics in Energy and Resources: Read Less [\[-\]](#)

## ENE,RES 296 Doctoral Seminar 2 Units

Terms offered: Fall 2023, Spring 2023, Fall 2022

Lectures, reports, and discussions on current research in energy and resources. Particular emphasis on topics of research interest for current Ph.D. students in the Energy and Resources Group.

Doctoral Seminar: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of independent study per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Offered for satisfactory/unsatisfactory grade only.

**Formerly known as:** 298

Doctoral Seminar: Read Less [\[-\]](#)

## ENE,RES 298 Doctoral Seminar 2 Units

Terms offered: Fall 2023, Spring 2023, Fall 2022

Lectures, reports, and discussions on current research in energy and resources. Sections are operated independently and under direction of different staff.

Doctoral Seminar: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 0 hours of independent study per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Offered for satisfactory/unsatisfactory grade only.

Doctoral Seminar: Read Less [\[-\]](#)

## ENE,RES 298N Directed Group Study 1 - 3 Units

Terms offered: Fall 2016, Spring 2016, Fall 2015

Informal group studies of special problems in energy and resources.

Directed Group Study: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing and consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Offered for satisfactory/unsatisfactory grade only.

Directed Group Study: Read Less [\[-\]](#)

## **ENE,RES 299 Individual Research in Energy and Resources 1 - 12 Units**

Terms offered: Fall 2023, Summer 2023 10 Week Session, Spring 2023

Investigation of problems in energy and resources from an interdisciplinary perspective.

Individual Research in Energy and Resources: Read More [\[+\]](#)

### **Rules & Requirements**

**Prerequisites:** Graduate standing

**Repeat rules:** Course may be repeated for credit without restriction.

### **Hours & Format**

**Fall and/or spring:** 15 weeks - 1-12 hours of independent study per week

### **Additional Details**

**Subject/Course Level:** Energy and Resources Group/Graduate

**Grading:** Letter grade.

Individual Research in Energy and Resources: Read Less [\[-\]](#)

## **ENE,RES 301 Graduate Student Instructor Practicum 3 Units**

Terms offered: Spring 2013, Fall 2012, Spring 2012

Course credit for experience gained in academic teaching through employment as a graduate student instructor.

Graduate Student Instructor Practicum: Read More [\[+\]](#)

### **Rules & Requirements**

**Prerequisites:** Appointment as a graduate student instructor in the Group and permission of the graduate advisor

**Repeat rules:** Course may be repeated for credit without restriction.

### **Hours & Format**

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### **Additional Details**

**Subject/Course Level:** Energy and Resources Group/Professional course for teachers or prospective teachers

**Grading:** Offered for satisfactory/unsatisfactory grade only.

Graduate Student Instructor Practicum: Read Less [\[-\]](#)