NREP provides engineers, social and physical scientists, and others with the skills needed to respond to domestic and global challenges related to natural resources and energy issues in the 21st century. The program trains students in quantitative and qualitative research and critical thinking skills. Students engage in research, and gain experience working with industry, government, and non-governmental organizations.

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community development, social responsibility, and similar positions in energy, environment, and mining companies; local, state, and federal government positions related to energy and resources; and non-profit organizations (advocacy, trade associations, etc.) working on energy and natural resources issues.

NREP is a professional degree that requires 30 credit hours: 18 in the core and 12 in electives. Students are encouraged to pursue internships which may count toward elective credits. Transfer students may apply up to 6 credit hours for courses that meet our requirements.

**Required Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HASS593</td>
<td>Natural Resources &amp; Energy Policy: Theories and Practice</td>
<td>3.0</td>
</tr>
<tr>
<td>PEGN530</td>
<td>Environmental Law and Sustainability</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS550</td>
<td>Political Risk Assessment</td>
<td>3.0</td>
</tr>
<tr>
<td>MNGN571</td>
<td>Energy, Natural Resources, and Society</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**ELECT**

**QUANTITATIVE METHODS ELECTIVE**

Total Semester Hrs 15.0

Approved Quantitative Methods course list:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBGN500</td>
<td>ECONOMETRICS I</td>
<td>3.0</td>
</tr>
<tr>
<td>MATH530</td>
<td>INTRODUCTION TO STATISTICAL METHODS</td>
<td>3.0</td>
</tr>
<tr>
<td>MNGN585</td>
<td>MINE RISK MANAGEMENT</td>
<td>3.0</td>
</tr>
<tr>
<td>GEGN532</td>
<td>GEOLOGICAL DATA ANALYSIS</td>
<td>3.0</td>
</tr>
<tr>
<td>GEGN575</td>
<td>APPLICATIONS OF GEOGRAPHIC INFORMATION SYSTEMS</td>
<td>3.0</td>
</tr>
</tbody>
</table>

With the NREP Graduate Director’s approval, students may also take an online graduate-level course.

**Mines' Combined Undergraduate / Graduate Degree Program**

Students enrolled in Mines' combined undergraduate/graduate program (meaning uninterrupted registration from the time the student earns a Mines undergraduate degree to the time the student begins a Mines graduate degree) may double count up to six hours of credits which were used in fulfilling the requirements of their undergraduate degree at Mines, towards their graduate program. Any courses that count towards the graduate degree requirements as either "Required Coursework" or "Elective Coursework" may be used for the purposes of double counting at the discretion of the advisor (MS Non-Thesis) or thesis committee (MS Thesis or Ph.D.). These courses must have been passed with a “B-” or better and meet all other University, Department, Division, and Program requirements for graduate credit.

**Approved Electives by Areas of Interest**

4 courses (12 credit hours); at least 6 credit hours in HASS. Students may apply up to two 400-level courses (6 credit hours) in areas consistent with the degree and with the Graduate Director’s approval. Other electives may be approved on a case-by-case basis.

Students are encouraged to focus on one of the following areas of interest and/or to get a Minor in a related discipline, such as Environmental Engineering or Mining. Some courses have prerequisites or are primarily for engineers in those fields; students should check with the professor before taking the course.

### International Development and Global Issues

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HASS535</td>
<td>INTERNATIONAL DEVELOPMENT</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS591</td>
<td>ENERGY POLITICS</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS592</td>
<td>ENERGY AND SECURITY POLICY</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS560</td>
<td>GEOPOLITICS OF NATURAL RESOURCES</td>
<td>3.0</td>
</tr>
</tbody>
</table>

### Energy and Environmental Studies

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HASS521</td>
<td>ENVIRONMENTAL PHILOSOPHY</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS525</td>
<td>ENVIRONMENTAL COMMUNICATION</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS568</td>
<td>ENVIRONMENTAL JUSTICE</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS587</td>
<td>ENVIRONMENTAL POLITICS AND POLICY</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS588</td>
<td>GLOBAL WATER POLITICS AND POLICY</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS591</td>
<td>ENERGY POLITICS</td>
<td>3.0</td>
</tr>
<tr>
<td>HASS592</td>
<td>ENERGY AND SECURITY POLICY</td>
<td>3.0</td>
</tr>
<tr>
<td>CEEEN573</td>
<td>RECLAMATION OF DISTURBED LANDS</td>
<td>3.0</td>
</tr>
<tr>
<td>CEEEN574</td>
<td>SOLID WASTE MINIMIZATION AND RECYCLING</td>
<td>3.0</td>
</tr>
<tr>
<td>CEEEN575</td>
<td>HAZARDOUS WASTE SITE REMEDIATION</td>
<td>3.0</td>
</tr>
<tr>
<td>CEEEN576</td>
<td>POLLUTION PREVENTION: FUNDAMENTALS AND PRACTICE</td>
<td>3.0</td>
</tr>
<tr>
<td>CEEEN595</td>
<td>ANALYSIS OF ENVIRONMENTAL IMPACT</td>
<td>3.0</td>
</tr>
<tr>
<td>EBGN570</td>
<td>ENVIRONMENTAL ECONOMICS</td>
<td>3.0</td>
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</tbody>
</table>

### Mining

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEEEN556</td>
<td>MINING AND THE ENVIRONMENT</td>
<td>3.0</td>
</tr>
<tr>
<td>CEEEN573</td>
<td>RECLAMATION OF DISTURBED LANDS</td>
<td>3.0</td>
</tr>
<tr>
<td>MNGN501</td>
<td>REGULATORY MINING LAWS AND CONTRACTS</td>
<td>3.0</td>
</tr>
<tr>
<td>MNGN503</td>
<td>MINING TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT</td>
<td>3.0</td>
</tr>
<tr>
<td>MNGN510</td>
<td>FUNDAMENTALS OF MINING AND MINERAL RESOURCE DEVELOPMENT</td>
<td>3.0</td>
</tr>
<tr>
<td>MNGN540</td>
<td>CLEAN COAL TECHNOLOGY</td>
<td>3.0</td>
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### Business, Economics, and Energy Analytics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBGN509</td>
<td>MATHEMATICAL ECONOMICS</td>
<td>3.0</td>
</tr>
<tr>
<td>EBGN510</td>
<td>NATURAL RESOURCE ECONOMICS</td>
<td>3.0</td>
</tr>
<tr>
<td>EBGN530</td>
<td>ECONOMICS OF INTERNATIONAL ENERGY MARKETS</td>
<td>3.0</td>
</tr>
<tr>
<td>EBGN594</td>
<td>TIME-SERIES ECONOMETRICS</td>
<td>3.0</td>
</tr>
<tr>
<td>EBGN632</td>
<td>PRIMARY FUELS</td>
<td>3.0</td>
</tr>
<tr>
<td>GEOL514</td>
<td>BUSINESS OF ECONOMIC GEOLOGY</td>
<td>3.0</td>
</tr>
<tr>
<td>MATH530</td>
<td>INTRODUCTION TO STATISTICAL METHODS</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Courses approved for Quantitative Methods may also be taken as electives.

### Program Requirements

**Graduate Certificate in Natural Resources and Energy Policy**

Designed to be completed in a single semester, or over two semesters for part-time students, the Certificate in Natural Resources & Energy Policy (NREP) is a 9 credit-hour program affiliated with the MS in NREP.
To earn the certificate, students must take two of the five required courses for the Master's program plus an elective to be approved by the NREP Director:

HASS593  NATURAL RESOURCES & ENERGY POLICY: 3.0 THEORIES AND PRACTICE
PEGN530  ENVIRONMENTAL LAW AND SUSTAINABILITY 3.0
MNGN571  ENERGY, NATURAL RESOURCES, AND SOCIETY 3.0
HASS550  POLITICAL RISK ASSESSMENT 3.0
QUANT  QUANTITATIVE METHODS ELECTIVE

Approved Quantitative Methods list:

EBGN590  ECONOMETRICS I 3.0
MATH530  INTRODUCTION TO STATISTICAL METHODS 3.0
MNGN565  MINE RISK MANAGEMENT 3.0
GEGN532  GEOLOGICAL DATA ANALYSIS 3.0
GEGN575  APPLICATIONS OF GEOGRAPHIC INFORMATION SYSTEMS 3.0

Courses

HASS521. ENVIRONMENTAL PHILOSOPHY. 3.0 Semester Hrs.
Equivalent with LAI5521,
Analyzes environmental ethics and philosophy including the relation of philosophical perspectives to policy decision making. Critically examines often unstated ethical and/or philosophical assumptions about the environment and how these may complicate and occasionally undermine productive policies. Policies that may be considered include environmental protection, economic development, and energy production and use. 3 hours seminar; 3 semester hours.

HASS523. ADVANCED SCIENCE COMMUNICATION. 3.0 Semester Hrs.
Equivalent with LAI5523,
This course will examine historical and contemporary case studies in which science communication (or miscommunication) played key roles in shaping policy outcomes and/or public perceptions. Examples of cases might include the recent controversies over hacked climate science emails, nuclear power plant siting controversies, or discussions of ethics in classic environmental cases, such as the Dioxin pollution case. Students will study, analyze, and write about science communication and policy theories related to scientific uncertainty; the role of the scientist as communicator; and media ethics. Students will also be exposed to a number of strategies for managing their encounters with the media, as well as tools for assessing their communication responsibilities and capacities. 3 hours seminar; 3 semester hours.

HASS525. ENVIRONMENTAL COMMUNICATION. 3.0 Semester Hrs.
Equivalent with LAI5525,
This course explores the ways that messages about the environment and environmentalism are communicated in the mass media, fine arts, and popular culture. The course will introduce students to key readings in environmental communication, media studies, and cultural studies in order to understand the many ways in which the images, messages, and politics of environmentalism and the natural world are constructed and contested by diverse audiences. Students will critically analyze their roles as science and/or technology communicators in the context of environmental issues, and will apply their skills to creating communications projects for diverse audiences. 3 lecture hours, 3 semester hours.

HASS535. INTERNATIONAL DEVELOPMENT. 3.0 Semester Hrs.
Equivalent with LAI535,
(i, ii, S) Explores the political economy of current and recent-historical development strategies, models, efforts, and issues in various world regions. The class will focus on Africa, Asia, Eurasia, Latin America, or the Middle East, depending on the semester. Development is understood to be a nonlinear, complex set of processes involving political, economic, social, cultural, and environmental factors whose ultimate goal is to improve the quality of life for individuals. Students will explore the roles of governments, companies, organizations, and individuals. Exact topics to be covered will vary with current events and the specific region; topics might include income inequality, the role of national and private energy companies, the impact of globalization, the role of development aid, and concepts of good governance. Students may take the course up to three times, covering different regions. 3 hours lecture; 3 semester hours.

HASS541. AFRICAN DEVELOPMENT. 3.0 Semester Hrs.
Equivalent with LAI541,
Provides a broad overview of the political economy of Africa. Its goal is to give students an understanding of the possibilities of African development and the impediments that currently block its economic growth. Despite substantial natural resources, mineral reserves, and human capital, most African countries remain mired in poverty. The struggles that have arisen on the continent have fostered thinking about the curse of natural resources where countries with oil or diamonds are beset with political instability and warfare. Readings give first an introduction to the continent followed by a focus on the specific issues that confront African development today. 3 hours lecture and discussion; 3 semester hours.

HASS550. POLITICAL RISK ASSESSMENT. 3.0 Semester Hrs.
Equivalent with LAI550,
Uses social science analytical tools and readings as well as indices prepared by organizations, such as the World Bank and the International Monetary Fund, to create assessments of the political, social, economic, environmental and security risks that multinational corporations may face as they expand operations around the world. Students will develop detailed political risk reports for specific countries that teams collectively select. Prerequisite: HASS 545 and IPE Minor. 3 hours seminar; 3 semester hours.

HASS560. GEOPOLITICS OF NATURAL RESOURCES. 3.0 Semester Hrs.
Equivalent with LAI560,
This seminar examines geopolitical competition between great and aspiring powers for influence, control over land and natural resources, critical geo-strategic trade routes, or even infrastructure. Using empirical evidence from case studies, students develop a deeper understanding of the interconnections between the political, economic, social, cultural and geographic dimensions of foreign policies, as well as issues of war and peace.

HASS565. SCIENCE, TECHNOLOGY, AND SOCIETY. 3.0 Semester Hrs.
Equivalent with LAI565,
Provides an introduction to foundational concepts, themes, and questions developed within the interdisciplinary field of science and technology studies (STS). Readings address anthropological understandings of laboratory practice, sociological perspectives on the settling of techno-scientific controversies, historical insights on the development of scientific institutions, philosophical stances on the interactions between technology and humans, and relationships between science and democracy. Students complete several writing assignments, present material from readings and research, and help to facilitate discussion. 3 hours lecture and discussion; 3 semester hours.
HASS568. ENVIRONMENTAL JUSTICE. 3.0 Semester Hrs.
This course explores the history of the environmental justice movement, current and emerging environmental justice issues, and the application of environmental justice concepts and theories to environmental decision-making. Course content and activities are designed to enrich student understanding of how environmental injustice is produced (locally, regionally, and globally), how environmental justice issues are measured and analyzed, and how environmentally just outcomes can be achieved.

HASS584. US WATER POLITICS AND POLICY. 3.0 Semester Hrs.
(I) The story of water in the American West is one of engineering and applied science inextricably intertwined with a "Gordian knot" of law and policy, changing social and cultural values, and increasingly unpredictable hydrology. This course will familiarize students with the complexities of contemporary water governance, using the Colorado River system as its central case study. The Colorado River makes for an excellent point of departure because it is one of the most dammed, diverted, legislated, litigated, and loved rivers in the world and because we literally use it up; the river has seldom reached the sea since the 1960s. Indeed, the challenges that face the Colorado River's 40 million stakeholders today have less to do with applying law and engineering to developing water resources, and much more to do with figuring out how to share an over-appropriated resource while mitigating the social and ecological consequences of past choices. Our primary goal in the course will be to learn concepts of adaptive governance that provide a constructive and framework for analyzing and addressing such challenges. 3 hours lecture; 3 semester hours.

HASS586. SCIENCE AND TECHNOLOGY POLICY. 3.0 Semester Hrs.
Equivalent with LAIS586.
Examines current issues relating to science and technology policy in the United States and, as appropriate, in other countries. 3 hours lecture and discussion; 3 semester hours.

HASS587. ENVIRONMENTAL POLITICS AND POLICY. 3.0 Semester Hrs.
Equivalent with LAIS587.
Explores environmental policies and the political and governmental processes that produce them. Group discussion and independent research on specific environmental issues. Primary but not exclusive focus on the U.S. 3 hours lecture and discussion; 3 semester hours.

HASS588. GLOBAL WATER POLITICS AND POLICY. 3.0 Semester Hrs.
Equivalent with LAIS588.
(II) This interdisciplinary seminar course analyzes how droughts, floods, water management, global trading system, and climate change affect the hydrological and food systems that are critically important for economic prosperity and political stability. It addresses water policy at scales that range from community level to global governance regimes. It uses relevant analytical perspectives of, for example, psychology, political economy, development studies, and institutional approaches in economic geography to help students understand how certain transboundary water conflicts have emerged, their national and regional implications, and policies and institutions that can be used to resolve them. 3 hours lecture; 3 semester hours.

HASS590. ENERGY AND SOCIETY. 3.0 Semester Hrs.
Equivalent with LAIS590.
(II) The course begins with a brief introduction to global energy production and conservation, focusing on particular case studies that highlight the relationship among energy, society, and community in different contexts. The course examines energy successes and failures wherein communities, governments, and/or energy companies come together to promote socially just and economically viable forms of energy production/conservation. The course also explores conflicts driven by energy development. These case studies are supplemented by the expertise of guest speakers from industry, government, NGOs, and elsewhere. Areas of focus include questioning the forward momentum of energy production, its social and environmental impact, including how it distributes power, resources and risks across different social groups and communities. 3 hours seminar; 3 semester hours.

HASS591. ENERGY POLITICS. 3.0 Semester Hrs.
(I) We will use political science approaches, theories, and methods to investigate the global, regional, state, and local politics of renewable and non-renewable energy, spanning all uses: transportation, heating and cooling, and electricity. We will look at the politics behind energy in a subset of countries to be chosen by the class, such as China, Brazil, India, Austria, Spain, Venezuela, and Germany. We will then focus on energy in Colorado (and possibly a few other US states), conducting primary research on the stakeholders and the relevant political outcomes for non-renewables and renewables, making comparisons between the two groups. We will work with energy companies, non-governmental organizations, university and research entities, government representatives, and local activists. 3 lecture hours, 3 semester hours.

HASS592. ENERGY AND SECURITY POLICY. 3.0 Semester Hrs.
(II) Energy and Security Policy is a graduate course that applies a social science lens to understanding the intersections between national and international security concerns and energy. In this course, we will examine these intersections through a case study approach that includes directed readings, such as books and peer-reviewed journal articles, that incorporate student-led discussions and research projects. By exploring various energy security scenarios, such as restricted access to oil and gas, graduate students will gain a comprehensive understanding of the energy-security nexus and the role governments and policies play in enhancing or limiting security. 3 hours lecture, 3 semester hours.

HASS593. NATURAL RESOURCES & ENERGY POLICY: THEORIES AND PRACTICE. 3.0 Semester Hrs.
(I) This course introduces students to the policy-making process, drawing on a variety of theoretical approaches, geographic locations (within the US and in other countries), and resources and energy issues. Coordinated by the NREP Graduate Director, speakers will be from HASS, Economics and Business, Petroleum Engineering, Mining, and other departments with policy expertise, as well as from others who influence and create public and private policy. In the second half of the course, students will conduct original research projects that focus on natural resources and energy, applying theoretical frameworks they have learned from the speakers. 3 lecture hours, 3 semester hours.

HASS598. SPECIAL TOPICS. 6.0 Semester Hrs.
(I, II, S) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once, but no more than twice for the same course content. Prerequisite: none. Variable credit: 0 to 6 credit hours. Repeatable for credit under different titles.
HASS599. INDEPENDENT STUDY. 0.5-6 Semester Hr.
(I, II, S) Individual research or special problem projects supervised by a faculty member, also, when a student and instructor agree on a subject matter, content, and credit hours. Prerequisite: Independent Study form must be completed and submitted to the Registrar. Variable credit: 0.5 to 6 credit hours. Repeatable for credit under different topics/experience and maximums vary by department. Contact the Department for credit limits toward the degree.

HASS601. ACADEMIC PUBLISHING. 2-3 Semester Hr.
Equivalent with LAIS601.
Students will finish this course with increased knowledge of general and discipline-specific writing conversations as well as the ability to use that knowledge in publishing portions of theses or dissertations. Beyond the research article, students will also have the opportunity to learn more about genres such as conference abstracts, conference presentations, literature reviews, and research funding proposals. Prerequisite: Must have completed one full year (or equivalent) of graduate school course work. Variable credit: 2 or 3 semester hours.

HASS698. SPECIAL TOPICS. 6.0 Semester Hrs.
(I, II, S) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once, but no more than twice for the same course content. Prerequisite: none. Variable credit: 0 to 6 credit hours. Repeatable for credit under different titles.

HASS699. INDEPENDENT STUDY. 0.5-6 Semester Hr.
(I, II, S) Individual research or special problem projects supervised by a faculty member, also, when a student and instructor agree on a subject matter, content, and credit hours. Prerequisite: Independent Study form must be completed and submitted to the Registrar. Variable credit: 0.5 to 6 credit hours. Repeatable for credit under different topics/experience and maximums vary by department. Contact the Department for credit limits toward the degree.

HASS707. GRADUATE THESIS / DISSERTATION RESEARCH CREDIT. 1-15 Semester Hr.
Equivalent with LAIS707.
(I, II, S) GRADUATE THESIS/DISSERTATION RESEARCH CREDIT
Research credit hours required for completion of a Masters-level thesis or Doctoral dissertation. Research must be carried out under the direct supervision of the student's faculty advisor. Variable class and semester hours. Repeatable for credit.

LICM501. PROFESSIONAL ORAL COMMUNICATION. 1.0 Semester Hr.
A five-week course which teaches the fundamentals of effectively preparing and presenting messages. "Hands-on" course emphasizing short (5- and 10-minute) weekly presentations made in small groups to simulate professional and corporate communications. Students are encouraged to make formal presentations which relate to their academic or professional fields. Extensive instruction in the use of visuals. Presentations are rehearsed in class two days prior to the formal presentations, all of which are video-taped and carefully evaluated. 1 hour lecture/lab; 1 semester hour.

Professors
Hussein A. Amery, Department Head
Elizabeth Van Wie Davis
Jon A. Leydens

Kenneth Osgood,

Associate Professors
Tina L. Gianquitto
Kathleen J. Hancock, NREP Graduate Program Director
James D. Straker

Assistant Professors
Adrienne Kroepsch
Qin Zhu

Teaching Professors
Jonathan Cullison
Melanie Brandt, McBride Director
Paula A. Farca
Cortney Holles
Robert Klimek
Toni Lefton, Director, University Honors and Scholars Programs
Sandy Woodson, Undergraduate Advisor

Teaching Associate Professors
Maggie Greenwood
Seth Tucker, Director of Hennenbach
Eliza Buhrer
Joseph Horan, Assistant Department Head
Derrick Hudson
Shannon Davies Mancus

Teaching Assistant Professor
Rachel Osgood

Professors Emeriti
W. John Cieslewicz
T. Graham Hereford
Barbara M. Olds
Eul-Soo Pang
Anton G. Pegis
Thomas Philiope, University Emeritus Professor
Arthur B. Sacks

Associate Professors Emeriti
Betty J. Cannon
Kathleen H. Ochs
Laura J. Pang
Karen B. Wiley

Teaching Professor Emeriti
James Jesudason