Bulletin of
Duke University

Nicholas School of the Environment
2025-2026

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About the University Bulletins

The Office of the University Registrar is responsible for compiling, producing, and maintaining the bulletin for each school at Duke University. The content for the bulletins is established by the schools in conjunction with the Duke University Bulletins Policy.

The information in this bulletin applies to the academic year 2025-2026 and is accurate and current, to the greatest extent possible, as of August 2025. All bulletins are published online and serve as static documents for historical records of the university. The university reserves the right to change programs of study, academic requirements, teaching staff, the calendar, and other matters described herein without prior notice, in accordance with established procedures.

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Duke University's Mission & History

Mission Statement

Approved by the Duke University Board of Trustees October 1, 1994, and revised February 23, 2001, the Mission Statement for Duke University reads as follows:

"James B. Duke's founding Indenture of Duke University directed the members of the University to 'provide real leadership in the educational world' by choosing individuals of 'outstanding character, ability, and vision' to serve as its officers, trustees and faculty; by carefully selecting students of 'character, determination and application;' and by pursuing those areas of teaching and scholarship that would 'most help to develop our resources, increase our wisdom, and promote human happiness.'

"To these ends, the mission of Duke University is to provide a superior liberal education to undergraduate students, attending not only to their intellectual growth but also to their development as adults committed to high ethical standards and full participation as leaders in their communities; to prepare future members of the learned professions for lives of skilled and ethical service by providing excellent graduate and professional education; to advance the frontiers of knowledge and contribute boldly to the international community of scholarship; to promote an intellectual environment built on a commitment to free and open inquiry; to help those who suffer, cure disease, and promote health, through sophisticated medical research and thoughtful patient care; to provide wide-ranging educational opportunities, on and beyond our campuses, for traditional students, active professionals and life-long learners using the power of information technologies; and to promote a deep appreciation for the range of human difference and potential, a sense of the obligations and rewards of citizenship, and a commitment to learning, freedom and truth.

"By pursuing these objectives with vision and integrity, Duke University seeks to engage the mind, elevate the spirit, and stimulate the best effort of all who are associated with the University; to contribute in diverse ways to the local community, the state, the nation and the world; and to attain and maintain a place of real leadership in all that we do."

Duke University: A Brief Narrative History

Duke University traces its origins to a small school that opened in 1838 in Randolph County, North Carolina. Originally a preparatory school for young men called the Union Institute Academy, it was then chartered as a teaching college named Normal College by the state of North Carolina in 1851. The school underwent another transformation in 1859 when it turned to the Methodist Church for financial support. Reflecting the new partnership, the school's name changed to Trinity College.

From 1842 to 1882, Braxton Craven served as the principal and then president of the institution, overseeing its transition from a tiny schoolhouse to a full-fledged college. Shortly before his death, he helped to establish the Cherokee Industrial School at Trinity College, one of numerous schools established in the United States to "westernize" indigenous students, in this case boys and young men from the Eastern Band of the Cherokee. The School at Trinity lasted only a few years. It is worth noting that Craven enslaved several Black people prior to the Civil War, and that a number of other faculty and trustees were also enslavers.

John F. Crowell, Trinity College's president from 1887-1894, suggested that moving the college to an urban setting would attract more students, faculty, and financial support. With Crowell's encouragement, the trustees agreed to move the college, and after a spirited competition among regional cities, Trinity opened in Durham in 1892. Local tobacco magnates Washington Duke and Julian S. Carr assisted in providing land and money to Trinity. In 1897, at Washington Duke's request, the school began admitting women as regular students, making it an early co-educational institution. Carr's support for Trinity College was recognized with a building named in his honor in 1930. His name was removed in 2018 in light of his virulent white supremacist beliefs and actions.

Trinity prospered in its new location, and in 1924 the school was again transformed through philanthropy. Washington Duke's son James Buchanan Duke established the Duke Endowment, and the charitable foundation infused the college with funds. The trustees changed Trinity College's name to Duke University as a memorial to his father. The new funds supported the construction of a new campus, designed in a Gothic style by the Philadelphia architectural firm of Horace Trumbauer. The chief designer of West Campus, as well as the re-envisioned East Campus, was Julian Abele, a Black architect whose role in creating the architecture of Duke University was largely overlooked during his lifetime. In 2016, the main quad on West Campus was renamed Abele Quad in his honor.

President William P. Few (1910-1940) oversaw this metamorphosis of a small college into a complex university. In 1930, the Trinity College site (today's East Campus) became the Woman's College, while the West Campus served as the grounds for the all-male Trinity College. In 1972, Trinity College merged both colleges of men and women into what is now known as Trinity College of Arts and Sciences. Other schools include the School of Religion and Graduate School founded in 1926, the School of Medicine and hospital in 1930, and the School of Nursing in 1931. Originally established in 1904, the Law School reorganized in 1930. In 1938, what is today's Nicholas School of the Environment opened, and in 1939 the university formed what is now known as the Pratt School of Engineering. The last of James B. Duke's desires for the university was fulfilled when what is now the Fuqua School of Business, opened in 1969. The Sanford School of Public Policy became Duke's tenth school in 2005. The school was named for President Terry Sanford, formerly the governor of North Carolina, who supported a number of initiatives in the 1970s and 1980s to build Duke's reputation for excellence, growing the university's national and international profile.

Long a segregated institution, Duke first admitted Black graduate and professional students in 1961 and Black undergraduates in 1963. In 1968, a major student protest known as the Vigil demanded pay increases and better treatment of hourly workers, most of whom were Black. In 1969, Black students protested in what is now known as the Allen Building Takeover, demanding improved services and treatment for Black students. The protest resulted in the formation of what is now called the Department of African and African American Studies.

Faculty at Duke produce influential scholarship across a wide range of disciplines and professions. Two Duke faculty members have received the Nobel Prize in Chemistry: Professor Robert Lefkowitz in 2012 and Professor Paul Modrich in 2015. Duke researchers have mapped the human chromosome and led research into the treatment of HIV and AIDS. Duke faculty also research pressing social issues, producing high-impact scholarship on such topics as election districting and public health. Faculty authors have written books of award-winning nonfiction, fiction, and poetry, and have won awards ranging from the National Book Award to the Pulitzer Prize. Fifty Duke faculty are members of the American Academy of Arts and Sciences. Duke students have many opportunities to work with leading faculty in labs and on projects, ensuring hands-on experience during their course of study.

Duke has a number of notable athletic achievements. Best known is the men's basketball team, coached by Mike Krzyzewski from 1980 to 2022. The team has earned 5 national championships. The women's golf team holds the record at Duke for most national championships, at 7. Duke football has been played since the 1880s, when President Crowell coached the team himself. During the 1930s and 1940s, the football team competed in and won a number of bowl games, earning the nickname "Iron Dukes." The Rose Bowl game of 1942 was played in Durham due to wartime concerns on the West Coast and remains the only Rose Bowl played outside of Pasadena, California.

International programs have expanded over the last several decades, bringing international students to Duke in Durham and expanding international opportunities for Duke students. In 2005, Duke partnered with the National University of Singapore and opened the Duke-NUS Medical School. In 2014, graduate programs at Duke Kunshan University began, followed by undergraduate programs in 2018. DKU is a partnership between Duke and Wuhan University in Kunshan, China.

The university has changed in many ways since its founding, and like other historically white schools it continues to confront issues of racism, sexism, and other inclusion and equity challenges. Students of color and international students now represent more than 50% of the student body. Duke's hometown of Durham has also grown and changed, and Duke and Durham collaborate on topics ranging from community service to downtown development.

Ever evolving, Duke University strives to meet the stated aims of the university: “to foster a lively relationship between knowledge and faith; to advance learning in all lines of truth; to defend scholarship against all false notions and ideals; to develop a love of freedom and truth; to promote a respectful spirit of dialogue and understanding; to discourage all partisan and sectarian strife; and to further the advancement of knowledge in service to society.”

Updated September 21, 2020. Learn more from University Archives.

Duke University Leadership & Faculty

Full leadership profiles for those listed below are available at duke.edu/about/leadership.

Executive Leadership

Vincent E. Price, President
Craig Albanese, CEO, Duke University Health System
Daniel Ennis, Executive Vice President
Alec Gallimore, Provost
Mary E. Klotman, Executive Vice President for Health Affairs, Duke University

Academic Leadership

Deans of Schools and Colleges

Kerry Abrams, James B. Duke and Benjamin N. Duke Dean of the School of Law
Suzanne Barbour, Dean, Graduate School
Lori Bennear, Stanback Dean, Nicholas School of the Environment
Gary Bennett, Dean, Trinity College of Arts and Sciences
Edgardo Colón-Emeric, Dean, Divinity School
Mary E. Klotman, Dean, School of Medicine
Jerome P. Lynch, Dean, Pratt School of Engineering
Mary Frances Luce, Interim Dean, Fuqua School of Business
Manoj Mohanan, Interim Dean, Sanford School of Public Policy
Micheal Relf, Dean, School of Nursing

Vice Provosts

Lee Baker, Vice Provost for Undergraduate Education (effective October 1)
Edward Balleisen, Vice Provost for Interdisciplinary Studies
Abbas Benmamoun, Vice Provost for Faculty Advancement
David Bowersox, Vice Provost for Finance & Administration
Mary Pat McMahon, Vice Provost/Vice President of Student Affairs
Mohamed Noor, Executive Vice Provost
Noah Pickus, Associate Provost
Deborah F. Rutter, Vice Provost for the Arts
Joseph Salem, Rita DiGiallonardo Holloway University Librarian and Vice Provost for Library Affairs, & Interim Vice Provost for Learning Innovation & Lifetime Education and Digital Education
Toddi Steelman, Vice President and Vice Provost for Climate and SustainabilityUniversity Administration

Maggie Epps, Secretary to the Board of Trustees and Chief of Staff to the President
Tracy Futhey, Vice President for Information Technology and Chief Information Officer
Leigh P. Goller, Chief Audit, Risk and Compliance Officer
Kimberly Hewitt, Vice President for Institutional Equity and Chief Diversity Officer
David L. Kennedy, Vice President for Alumni Engagement and Development
Nina E. King, Vice President and Director of Athletics
Jennifer Lodge, Vice President for Research & Innovation
Antwan Lofton, Vice President of Human Resources & Chief Human Resources Officer
John J. Noonan, Vice President for Facilities
Rachel L. Satterfield, Vice President for Finance and Treasurer
Chris Simmons, Vice President for Government Relations
Kim Taylor, Vice President and General Counsel
Frank Tramble, Vice President for Communications, Marketing and Public Affairs
Neal Triplett, President, DUMAC
Stelfanie Williams, Vice President for Community Affairs

The Faculty

Duke faculty are chosen from among the most competitive selection processes in the country, having demonstrated excellence in their fields of research. Profiles of Duke's faculty members are available via Scholars@Duke.

Duke University Policies

Accreditation

Duke University is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) to award baccalaureate, masters, doctorate, and professional degrees. Contact SACSCOC at sacscoc.org or call (404) 679-4500 for questions about the accreditation of Duke University.

Clery Act

Information that the university is required to make available under the federal Clery Act is available by visiting the Records Division, Duke University Police Department, 502 Oregon Street, Durham, NC 27708, or by calling (919) 684-4602. See police.duke.edu/news-stats/clery for more details.

Duke's Commitment to Inclusive Excellence

Duke aspires to create a community built on collaboration, innovation, creativity, and belonging. Our collective success depends on the robust exchange of ideas—an exchange that is best when the rich diversity of our perspectives, backgrounds, and experiences flourishes. To achieve this exchange, it is essential that all members of the community feel secure and welcome, that the contributions of all individuals are respected, and that all voices are heard. All members of our community have a responsibility to uphold these values.

Find more details at provost.duke.edu/about.

Duke Community Standard

Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and nonacademic endeavors, and to protect and promote a culture of integrity.

To uphold the Duke Community Standard:

- I will not lie, cheat, or steal in my academic endeavors;
- I will conduct myself honorably in all my endeavors; and
- I will act if the Standard is compromised.

Students' Obligation to Act with Respect to the Duke Community Standard

The Duke Community Standard (DCS) stresses the commitment that students share with all members of the community to enhance the climate for honesty, fairness, respect, and accountability at Duke University. Students affirm their commitment to foster this climate by signing a pledge that includes taking constructive action if they witness or know about behavior they perceive to be inconsistent with the DCS, which may include violation of university policies. Although there are no disciplinary sanctions associated with the failure to act, students are nonetheless expected to take action to do something as a responsibility of membership in the Duke community.

The university recognizes that it is not always easy to act in these situations, but several alternatives are available to suit a student's level of comfort and confidence. These alternatives are not mutually exclusive.

- Speaking directly with the individual exhibiting the behavior, both to gain clarity about the situation and to inform the individual about the concern.
- Publicly calling attention to the behavior as it is occurring.
- For incidents involving social behaviors, alerting residence hall, Student Affairs, or other university staff. The information provided will give staff an opportunity to address the matter informally or through appropriate formal channels.
- For cases involving academic integrity, alerting the instructor that cheating may be occurring in the course. This alert can be in any form, including anonymous notification, and the reporting student will not be identified. The information provided will allow the faculty member to consider corrective measures, in consultation with the Office of Student Conduct and Community Standards, and to address the topic with the class or suspected student(s).
- Directly alerting staff in the Office of Student Conduct and Community Standards at (919) 684-6938 or conduct@duke.edu, who will confer with the faculty member involved, if an academic issue, or with the reporting student(s), strategizing next steps. Maintaining the confidentiality of the source is possible, but may limit the extent of action that can be taken.

For current regulations, refer to dukecommunitystandard.students.duke.edu.

Family Educational Rights & Privacy Act (FERPA)

The Family Educational Rights & Privacy Act (FERPA), 20 U.S.C § 1232g; 34 CFR Part 99, is a federal law that guides the release of students' education records, of which disciplinary records are a part.

Duke University adheres to a policy of compliance with the Family Educational Rights and Privacy Act. The policy (1) permits students to inspect their education records, (2) limits disclosure to others of personally identifiable information from education records without students' prior written consent, and (3) provides students the opportunity to seek correction of their education records where appropriate.

For additional information about FERPA, see studentprivacy.ed.gov/ferpa. For Duke's full FERPA policy, visit registrar.duke.edu/student-resources/family-educational-rights-and-privacy-act-ferpa.

Nondiscrimination Statement

Duke is committed to encouraging and sustaining a learning and work community that is free from prohibited discrimination and harassment. Duke does not discriminate on the basis of age, color, disability, ethnicity, gender, gender identity, gender expression, genetic information, national origin, race, religion, sex (including pregnancy and pregnancy-related conditions), sexual orientation, or military status, in the administration of its educational policies, admission policies, financial aid, employment, or any other institution program or activity.

Duke has designated the Vice President for Institutional Equity and Chief Diversity Officer as the individual responsible for the coordination and administration of its nondiscrimination and harassment policies.

Questions or comments about harassment or discrimination can be directed to one of the following administrators in the Office for Institutional Equity.

Discrimination in Duke's programs and activities:

Cynthia Clinton, AVP Harassment and Discrimination Prevention and Compliance
Title IX Coordinator
Office for Institutional Equity
114 S. Buchanan Blvd., Bay 8
Durham, NC 27708
(919) 684-8222

Sex discrimination in educational programs or activities:

Adrienne Allison, Deputy Title IX Coordinator for Students, Compliance Investigator
Office for Institutional Equity
114 S. Buchanan Blvd., Bay 8
Durham, NC 27708
(919) 684-8222

The complete text of Duke's Policy on Prohibited Discrimination, Harassment, and Related Misconduct and appropriate complaint procedures, may be found by visiting the Office for Institutional Equity's website. Additional information and resources are available through the U.S. Department of Education Office for Civil Rights, or call 1-800-421-3481.

Duke University Resources

Academic Resources

Duke University Libraries

The Duke University Libraries are the shared center of the university's intellectual life. The William R. Perkins Library, Bostock Library, and Rubenstein Rare Book & Manuscript Library comprise the main West Campus library complex, which is joined by Lilly and Music libraries on East Campus and the separately administered libraries serving the schools of Business, Divinity, Law, and Medicine. Together they form one of the nation's top ten private university library systems.

Institutes, Initiatives & Centers

The university institutes, initiatives and centers complement the widespread interdisciplinarity found in every school at Duke. They serve as crucial incubators of innovations in research, teaching and community engagement. Find a complete list of institutes, initiatives, and centers at interdisciplinary.duke.edu/university-institutes-initiatives-centers.

Interinstitutional Agreement with Neighboring Universities

Under a plan of cooperation—the interinstitutional agreement among Duke University and The University of North Carolina at Chapel Hill, North Carolina State University, North Carolina Central University, The University of North Carolina at Charlotte, and The University of North Carolina at Greensboro—a student regularly enrolled in Duke University as a degree-seeking student and paying full fees may enroll for one approved course each semester at one of the institutions in the cooperative program unless an equivalent course is offered at Duke in the same academic term. Credit so earned is not defined as transfer credit since grades in courses taken under the interinstitutional agreement are entered on the official record and used in determining the grade point average. Additional information is available at registrar.duke.edu/registration/interinstitutional-registration.

Technology Resources

- The Office of Information Technology (oit.duke.edu)
- Computing and Networking (wireless.duke.edu)

- Printing and Labs (oit.duke.edu/services-tools/printers-labs)
- Support and Training (oit.duke.edu/services-tools/support-training)

Continuing Studies Programs

Duke University offers a variety of pre- and post-college learning opportunities for learners across a wide variety of ages, backgrounds, and geographies. Overseen by Duke Learning Innovation & Lifetime Education (LILE), Duke's continuing students programs provide many opportunities for academic achievement, professional development and personal enrichment. Information about all programs listed below is available at learnmore.duke.edu.

For-Credit Academic Study

Admission to the Continuing Studies Program is discretionary. For consideration for admission, applicants to the Continuing Studies Program must meet at least one of the following two criteria:

- Earned a bachelor's degree from a college or university accredited by a national or regional accrediting body recognized by the Department of Education.
- Age 25 or older, and intend to initiate or complete academic study in a Duke University academic program.

Students are given academic counseling by LILE, and are subject to the regulations set forth for degree candidates, unless explicitly noted otherwise. A junior or senior who is currently enrolled at an external college or university who wishes to pursue an academic discipline unique to Duke University, may apply at learnmore.duke.edu/academics/undergraduate for admission as a nondegree, full-time visiting student for one or two semesters. Students with unique circumstances should contact LILE at learnmore@duke.edu.

Minimum GPA Requirement. Successful applicants are expected to have earned a minimum 3.0 GPA in their most recent program.

Applicants who fail to meet the minimum GPA requirement are subject to additional review and may be admitted on a provisional basis. As part of the additional review, the following will be taken under consideration:

- The applicant has not been enrolled as a full-time student in the last 4 years, and
- The applicant demonstrates the ability to successfully complete college level coursework by earning a passing grade (B or better) in a minimum of 4 courses during the last 2 years.

As part of a provisional admission, a student must earn a minimum 3.0 GPA in the semester immediately following the provisional admission.

Withdrawal. If a student enrolled in a Duke University program withdraws from the program, or is no longer in good academic standing, they must wait two academic terms before re-applying to any Duke program, including any continuing studies programs (see the Satisfactory Continuation Requirements outlined in the Bulletin of Undergraduate Instruction).

Semester Continuation Requirements. Semester continuation requires that you earn a passing grade (C-or better) in a minimum number of courses to remain in good standing. Students who receive at least one failing grade (D, D-, F) are subject to academic probation or academic dismissal.

Academic Probation	Earned D or D-in at least one course Earned F in one course, and C-or better in at least two courses
Academic Dismissal	Earned F in at least one course

Students placed on academic probation must acknowledge their probationary status in writing to the academic dean for Continuing Studies students, in order to continue into the next academic term. They are also expected to seek assistance from campus resources and have their course selection approved by their academic dean. In the probationary term they must earn grades of C or better in all courses to continue. Students who withdraw from all courses must wait two semesters to submit a request to return to study.

Program and application information is available at learnmore.duke.edu/academics/undergraduate. Application deadlines: August 1 for the fall semester, December 1 for the spring semester, April 15 for Term 1 of the summer session, and June 1 for Term 2 of the summer session.

Certificate Programs

Professional Certificates are designed with the needs of working adults in mind, with classes offered in the evening and on weekends. Current programs offered include business and finance, human resources, legal, management, Six Sigma, technology solutions , and more.

Nonprofit Management Program

Learners interested in the nonprofit sector or in community development are invited to explore the noncredit course offerings of this program. Taught by experts and practitioners, these short courses offer instruction concerning financial and resource management, management of personnel and volunteers, leadership development, fundraising, planning and evaluation, board development/governance, and media relations.

Osher Lifelong Learning Institute (OLLI) at Duke

OLLI at Duke began in 1977 as the Duke Institute for Learning in Retirement. Since 2004 the membership organization has been a member of the Osher Lifelong Learning Network, a group of more than 120 institutes across the country dedicated to meeting the needs of older learners and extending the demographic served by traditional universities. OLLI sponsors noncredit course offerings in the fall, winter, and spring as well as special interest groups and volunteer opportunities.

Pre-College

Duke Pre-College programs offer academic enrichment opportunities for academically-motivated middle and high school students in the summer. Current offerings include residential summer camps on Duke's campus and at the Duke Marine Lab, online courses, a coding camp, and community days for local students to experience learning at Duke.

Student Disability Access Office (SDAO)

The Student Disability Access Office (SDAO) is the office on campus that has been charged with and is committed to providing educational opportunities for students with disabilities in compliance with Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990 (ADA), and the ADA Amendments Act of 2008.

Core Functions of SDAO

- To establish services for equitable access on campus through partnership with students with disabilities.
- To manage, coordinate, implement and evaluate accommodation and service programs.
- To serve as a resource to students, faculty, and staff regarding access to academic and campus services
- To provide resource and referral information to the campus community at Duke and prospective students and their families.

SDAO works with each student individually to establish academic accommodations including adjustments, auxiliary aids and services for the purpose of mitigating barriers to students' access to campus facilities, programs, and activities.

For more information, visit access.duke.edu/students.

Duke University Campus Life, Activities & Support

Duke offers a wide variety of resources to help students connect and thrive beyond the classroom.

Dining, Housing & Transportation

- Duke Dining (students.duke.edu/living/dining)
- DukeCard (dukecard.duke.edu)
- Undergraduate Housing (studentaffairs.duke.edu/hdrl)
- Graduate and Professional Student Apartments (students.duke.edu/living/housing/graduate-professional-housing)
- Off-Campus Housing (students.duke.edu/living/housing/graduate-professional-housing/housing-in-durham)
- Parking & Transportation (parking.duke.edu)

Student Affairs & Organizations

- Career Center (careerhub.students.duke.edu)
- Division of Student Affairs (studentaffairs.duke.edu)
- Graduate and Professional Student Government (gpsg.duke.edu)
- Intercollegiate Athletics (goduke.com)
- Religious Life (chapel.duke.edu/religiouslife)

Student Health & Safety

- Campus Police (police.duke.edu)
- Counseling & Psychological Services (CAPS) (studentaffairs.duke.edu/caps)
- DukeReach (students.duke.edu/wellness/dukereach)
- DuWell (studentaffairs.duke.edu/duwell)
- Student Health (studentaffairs.duke.edu/studenthealth)

About

Headquartered in the heart of the Duke University campus, the Nicholas School of the Environment strives for a new paradigm, one that views and attempts to understand the earth and the environment—including humans—as an integrated whole. Addressing problems as well as identifying solutions, the Nicholas School's mission is to create knowledge and global leaders of consequence for a sustainable future.

To achieve this vision, the Nicholas School has assembled a unique and talented faculty of more than 150 world-class researchers and educators with expertise spanning forty-five core focal areas in the physical, life, and social sciences. Individually, Nicholas School faculty are leaders in their fields; collectively, they form a community of shared purpose and passion, each steeped and actively engaged in their respective disciplines but also committed to the multi- and interdisciplinary lines of inquiry and collaborations that are at the core of many environmental challenges.

We strive to fulfill our school's mission by:

- **Creating knowledge** through basic and applied multidisciplinary research designed to expand our understanding of the Earth and its environment;

- **Creating global leaders of consequence** through:
    - an undergraduate academic program designed to spread understanding of the Earth and the environmental ethic to a new cadre of Duke graduates, and prepare them for careers or advanced studies in many in-demand fields;
    - a professional master's program that combines the specificity of an MS and the practical nature of an MBA or MPP to train a diverse new breed of environmental professionals with in-demand skills needed to devise and implement effective environmental policies and practices in the private, public, and nonprofit sectors; and
    - a PhD program dedicated to adding to a new generation of world-class scientists, researchers, and educators in the environment;
- **Forging a sustainable future** by strategically focusing our intellectual resources and capital to address the most challenging environmental issues confronting society on three primary fronts:
    - climate and energy;
    - terrestrial and marine ecosystems; and,
    - human health and the environment.

In addition, the following three themes cut across all of the above: governance; economy and policy; data and technology; and our discovery mission in Earth and environmental applied and basic science.

Environmental issues affect us all. We all need to be part of the solution. At the Nicholas School, we believe lasting environmental change depends on embracing and encouraging the rich diversity of talent, perspectives, and experiences brought to our field by faculty, staff, students, and alumni from all backgrounds.

The Nicholas School values its strong partnership with Duke's Office of Institutional Equity and its support of the school's efforts to create a community that recognizes and values the contributions and concerns of all its members, regardless of their race, ethnicity, national origin, religion, sexual orientation, gender identification, physical capabilities, and other important characteristics of their identities. Through organizations such as DICE, BLS, Community, Culture and Belonging Council (CCB), oStem, and others, the Nicholas School strives to foster a truly inclusive community committed to the mission of the school.

The Nicholas School acknowledges the indigenous people on whose land the Duke community works, studies, and lives. What is now Durham was originally the territory of several Native nations, including Tutelo and Saponi–speaking peoples. Many of their communities were displaced or killed through war, disease, and colonial expansion. Today, the Triangle is surrounded by contemporary Native nations, the descendants of Tutelo, Saponi, and other Indigenous peoples who survived early colonization. These nations include the Haliwa-Saponi, Sappony, and Occanechi Band of Saponi. North Carolina's Research Triangle is also home to a thriving urban Native American community that represents Native nations from across the United States. Together, these Indigenous nations and communities contribute to North Carolina's ranking as the state with the largest Native American population east of Oklahoma.

Honor Code

The Nicholas School of the Environment advocates the highest standard of professional ethics and academic integrity. Students and faculty have developed an honor code for the school that is distributed to all students prior to matriculation and then discussed and signed during orientation. The Nicholas School uses the Community Standard as its basis.

About

History of the Nicholas School

The Nicholas School of the Environment at Duke University represents the joining of three programs whose histories are almost as old as the university itself: the School of Forestry and Environmental Studies and the Duke University Marine Laboratory, both formed in 1938, and the Department of Geology, founded in 1936.

In 1932, forestry instruction was first offered to undergraduate students, and in 1938 the School of Forestry was established as a graduate professional school under the direction of Dean Clarence F. Korstian. Dr. Korstian joined the faculty in 1931 as the first director of the Duke Forest. Brought to Durham by Dr. William P. Few, president of Duke at the time, Dr. Korstian set out to develop a demonstration and research forest that would serve as a model for owners of small tracts of timber in the South.

The master of forestry and doctor of forestry degrees were offered initially, and later the AM, MS, and PhD were offered through The Graduate School. The school's forestry program has been fully accredited by the Society of American Foresters since 1939.

Growing national concern with natural resources and environmental problems led to a new teaching and research emphasis in ecology in the 1970s. In 1974, the school's name was changed to the School of Forestry and Environmental Studies, and a new degree was added: the master of environmental management (MEM).

The Duke University Marine Laboratory also had its beginnings in the 1930s, when Dr. A.S. Pearse and colleagues from Duke were attracted to Pivers Island and its surrounding abundance of marine life for their summer field studies. The island afforded an excellent location in Beaufort, NC, for a field station. Through the subsequent efforts of Dr. Pearse and others, the land was acquired, and the first buildings of the Duke University Marine Laboratory were built in 1938. Originally, the Marine Lab served only as a summer training and research facility. Today, it operates year-round to provide training and research opportunities for undergraduate and graduate students, and visiting scholars.

In 1991, the School of Forestry and Environmental Studies was combined with the Duke University Marine Laboratory to form the School of the Environment. The new school represented an unprecedented university commitment to interdisciplinary education and research in environmental science, policy, and management. It was the only private graduate professional school of its type in the country. The school became the Nicholas School of the Environment in 1995 after a generous gift from Duke graduates Peter and Ginny Nicholas. In 1997, the Division of Earth and Ocean Sciences was created when the former Department of Geology, previously a part of Trinity College of Arts & Sciences, joined the school. This department also dates from the 1930s when Dr. Willard (Doc) Berry was hired as the first geologist at Duke University. By the 1960s, the Department of Geology had established itself as a center for the study of sedimentary geology. Today, the Division of Earth and Climate Sciences focuses on a number of areas at the intersection of earth and environmental sciences.

In the spring of 2014, the school celebrated the opening of Duke Environment Hall, a 70,000-square-foot facility designed to meet or exceed the criteria for LEED Green Building platinum certification, the highest level of sustainability. Environment Hall was renamed Grainger Hall in 2018 after a naming gift from the Grainger Family Descendants Fund.

Academic Calendar

Summer 2025

- February 17 (M) Registration begins for all summer sessions
- May 14 (W) Summer Term 1 classes begin
- May 16 (F) Drop/Add for Term 1 ends (11:59 PM)
- May 26 (M) Memorial Day holiday. No classes are held
- June 19 (Th) Juneteenth holiday. No classes are held
- June 23 (M) Term 1 classes end
- June 24 (T) Reading period (until 7:00 PM); Term 1 final examinations begin (7:00 PM)
- June 26 (Th) Term 1 final examinations end
- June 30 (M) Summer Term 2 classes begin
- July 2 (W) Drop/Add for Term 2 ends (11:59 PM)
- July 4 (F) Independence Day holiday. No classes are held
- August 8 (F) Term 2 classes end
- August 9 (Sa) Reading period (until 7:00 PM); Term 2 final examinations begin (7:00 PM)
- August 11 (M) Term 2 final examinations end (10:00 PM)

Fall 2025

- August 18 (M) Orientation for MEM, MF and DEL-MEM begins
- August 19 (T) New graduate student orientation begins
- August 24 (Su) First-Year Convocation
- August 25 (M) Fall semester classes begin (8:30 AM); Drop/Add continues
- September 1 (M) Labor Day. No classes are held
- September 5 (F) Drop/Add ends (11:59 PM)
- September 25-28 (Th-Su) Founders' Weekend. Classes are held Thursday and Friday
- October 10 (F) Fall break begins (7:00 PM)
- October 15 (W) Classes resume (8:30 AM)
- October 20 (M) Shopping carts open for Spring 2026
- October 29 (W) Registration begins for Spring 2026
- November 25 (T) Thanksgiving recess begins (10:30 PM); Graduate classes end
- November 26-December 9 (W-T) Graduate reading period
- December 10 (W) Final examinations begin (9:00 AM)
- December 15 (M) Final examinations end (10:00 PM)

Spring 2026

- January 7 (W) Spring semester begins (8:30 AM). A Monday class schedule is followed. Drop/Add continues
- January 19 (M) Martin Luther King Jr. Day holiday. No classes are held
- January 21 (W) Drop/Add ends (11:59 PM)
- February 9 (M) Shopping Carts open for Summer 2026
- February 16 (M) Registration begins for Summer 2026
- March 6 (F) Spring recess begins (7:00 PM)
- March 16 (M) Classes resume (8:30 AM)
- March 23 (M) Shopping Carts open for Fall 2026
- April 1 (W) Registration begins for Fall 2026; Summer registration continues
- April 15 (W) Graduate classes end

- April 16-26 (Th-Su) Graduate reading period
- April 27 (M) Final examinations begin
- May 2 (Sa) Final examinations end (10:00 PM)
- May 8 (F) Commencement begins
- May 10 (Su) Graduation exercises; Conferring of degrees

Summer 2026

- May 13 (W) Summer Term 1 classes begin
- May 15 (F) Drop/Add for Term 1 ends (11:59 PM)
- May 25 (M) Memorial Day holiday. No classes are held
- June 19 (F) Juneteenth holiday. No classes are held
- June 22 (M) Term 1 classes end
- June 23 (T) Reading period (until 7:00 PM); Term 1 final examinations begin (7:00 PM)
- June 25 (Th) Term 1 final examinations end
- June 29 (M) Summer Term 2 classes begin
- July 1 (W) Drop/Add for Term 2 ends (11:59 PM)
- July 3 (F) Independence Day holiday. No classes are held
- August 7 (F) Term 2 classes end
- August 8 (Sa) Reading period (until 7:00 PM); Term 2 final examinations begin (7:00 PM)
- August 10 (M) Term 2 final examinations end (10:00 PM)

Degrees & Divisions

Degree Offerings

Graduate Professional Degrees

Most students entering the Nicholas School seek graduate professional degrees, preparing for careers as expert environmental problem-solvers after two years of study. The Master of Environmental Management (MEM) degree trains students to understand the scientific basis of environmental problems, as well as the social, political, and economic factors that determine effective policy options for their solution with an eye toward forging a sustainable future. Mid-career environmental professionals can also earn the MEM degree through the Duke Environmental Leadership (DEL) Program (through a combination of traditional and distance-learning formats, students focus on environmental management and leadership development). The Master of Forestry (MF) degree develops experts in sustainable management of forested ecosystems. The Sanford School of Public Policy and the Nicholas School offer an International Master of Environmental Policy (iMEP) degree through a program based at the Duke Kunshan University campus in Kunshan, China.

Students enrolling at the Nicholas School also have the opportunity to seek concurrent degrees with the Fuqua School of Business (MBA), Duke Law School (JD), the Sanford School of Public Policy (MPP), the Pratt School of Engineering (MEMP), the Duke Divinity School (MTS and MDiv), and the master of arts in teaching (MAT) through The Graduate School. Additionally, the Nicholas School has concurrent degree agreements with UNC Law School, Kenan-Flagler School of Business at UNC, and the Master of City and Regional Planning at UNC.

Doctoral Degrees

The traditional PhD, which is offered to Nicholas School students through The Graduate School, provides the opportunity for students to pursue in-depth interest in a more narrowly focused field in preparation for a career in teaching and/or research or in application-oriented settings. Doctoral students work with faculty in each of the Nicholas School's four divisions: environmental natural sciences, environmental social systems, earth and climate sciences, and marine science and conservation.

Undergraduate Degrees

The Nicholas School cooperates with the Trinity College of Arts & Sciences in awarding six undergraduate degrees: the AB in environmental sciences and policy, the BS in environmental sciences, the AB and BS in earth and climate sciences, and the AB and BS in marine science and conservation. In addition, minors are offered in environmental sciences and policy, earth and climate sciences, and marine science and conservation. A certificate in energy and the environment is offered. Courses for the majors are taught by more than sixty Duke professors in twenty cooperating departments and schools. The Department of Biology offers a BS with a concentration in marine biology that is fulfilled by a semester in residence at the Duke University Marine Laboratory—a major facility of the Nicholas School.

Divisions

The school is composed of four divisions, which serve graduate professional, doctoral, and undergraduate students:

Earth and Climate Sciences

With focal areas in climate change, energy, solid earth processes, and surficial processes, the Division of Earth and Climate Sciences (ECS) is headquartered in the Levine Science Research Center on Duke's West Campus. ECS faculty conduct research all over the world, from the 3,200-meter-deep Hess Deep trench in the Pacific Ocean to the 4,000-meter altitudes of the South American Altiplano.

Environmental Natural Sciences

The Environmental Natural Sciences (ENS) division includes faculty that are engaged in natural science research; i.e., those who often support "wet-lab" based experimental and field research on the impact of human activities on ecology and health related topics. This includes faculty that conduct research on ecology, hydrology, toxicology, chemistry and epidemiology. The ENS division is headquartered in Grainger Hall on Duke's West Campus in Durham.

Environmental Social Systems

The Environmental Social Systems division (ESS) includes faculty that typically engage in research on humans, social elements and processes that bidirectionally interact with each other and nature and includes faculty in the following areas (although not exclusively): environmental economics, policy, resource management, decision making, community engaged research, finance, corporate sustainability, and equity/justice. The ESS division is headquartered in Grainger Hall on Duke's West Campus in Durham.

Marine Science and Conservation

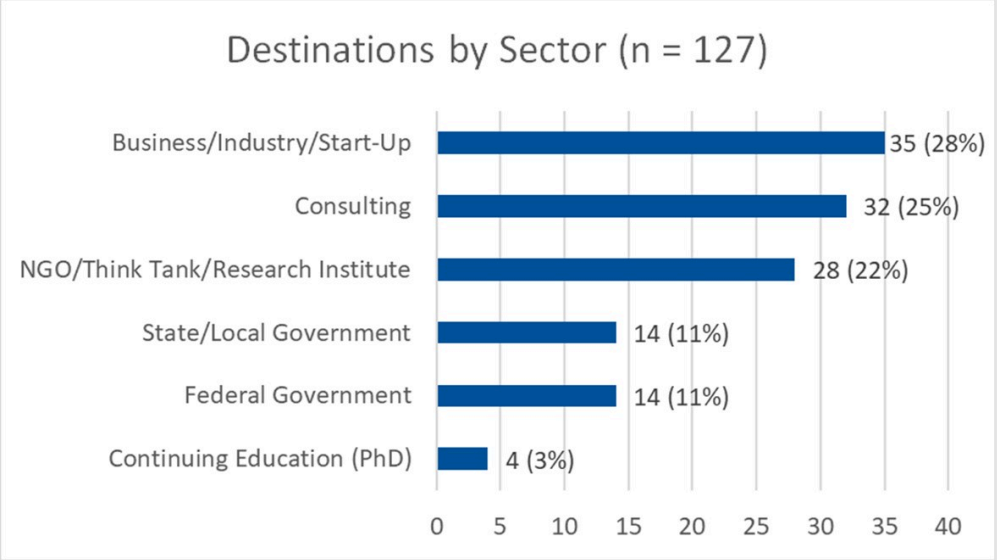
The Division of Marine Science and Conservation (MSC) strives to be at the forefront of understanding marine environmental systems, their conservation, and their governance through leadership in research, training, and communication. The MSC division is headquartered at the Duke University Marine Laboratory in Beaufort, North Carolina. Faculty research interests include biological and physical oceanography, marine biology and conservation, marine environmental health, marine biotechnology, and marine policy and management.

Employment Trends & Statistics

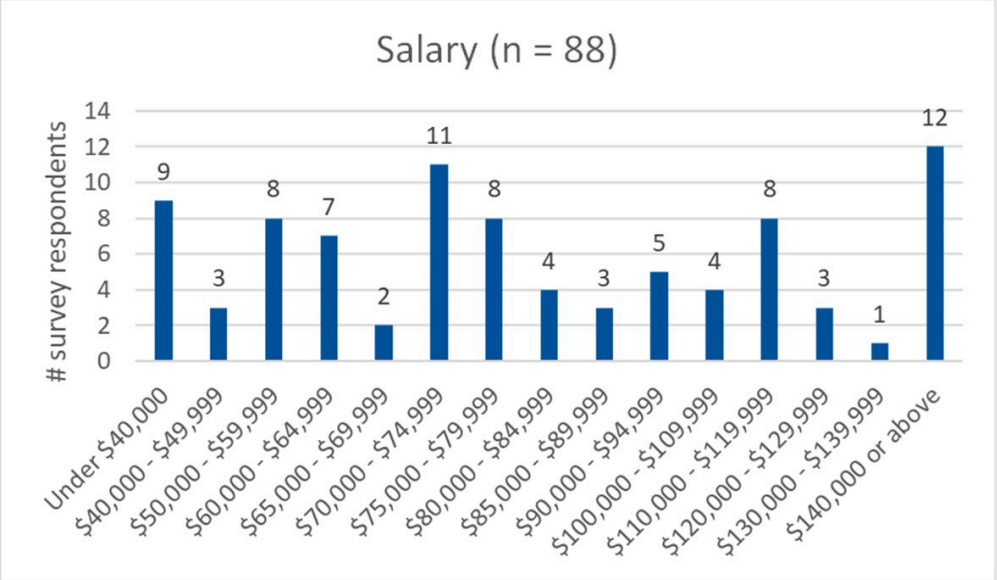
The variety and geographic distribution of organizations that employ Nicholas School graduates demonstrate the value and relevance of the Master of Environmental Management and the Master of Forestry programs. Graduates' career success confirms the marketability of a professional/graduate degree from Duke.

The following employment statistics are based on data collected for the Nicholas School class of 2024 six months following graduation.

2024 Distribution of Employment by Sector



2024 Salary Ranges



Salary

The average reported salary was $85,300 for this population. Reported salaries vary widely depending on the type of employer, employment sector, individual qualifications, previous experience(s), and employment location.

Sample First Destination Employers by Sector (Class of 2024)

CORPORATE/CONSULTING

- Arborview Capital
- Aurora Sustainable Lands
- Boston Consulting Group
- Belvedere Property Management LLC
- Converge Strategies
- Deloitte
- EDF Renewables ICF Consulting
- Marathon Capital
- McKinsey and Co.
- Meta
- National Grid
- NextEra
- Royal Caribbean Group
- ScotiaBank
- Weyerhaeuser
- WSP

PUBLIC/GOVERNMENT

- City of Durham (NC)
- Colorado State University, Public Lands Policy Group
- Hawaii Green Infrastructure Authority
- John A. Knauss Marine Policy Fellowship
- Mid-Atlantic Fishery Management Council
- National Oceanic and Atmospheric Administration (NOAA)
- National Renewable Energy Laboratory
- New York City Department of Environmental Quality
- North Carolina Office of Recovery and Resiliency
- Pacific Fishery Management Council
- US Environmental Protection Agency (EPA)
- US Department of Energy

NGO/THINK TANK

- ACR at Winrock International
- Duke University
- EnFocus, Inc.
- Environmental Defense Fund (EDF)
- NC League of Conservation Voters
- Oceana
- Rachel Carson Council
- RMI
- The Nature Conservancy
- World Bank

Career and Professional Development

The Nicholas School of the Environment operates its Career and Professional Development Center (CPDC) for MEM, MF, iMEP, and DEL-MEM students and alumni, including those students enrolled in concurrent degree programs.

The professional staff in CPDC are leading career experts in the fields of energy, environment, and sustainability. To help students maximize their career readiness, the center's professional staff pledges to:

- Assist in developing a student's career strategy;
- Help students refine and communicate career skills they possess and acquire new ones for career success;
- Assist in making connections with professionals and alumni in a student's chosen field; and
- Provide a variety of career experiences, tools, and resources.

For more information, visit nicholas.duke.edu/careers.

The Nicholas School recommends three main career networking platforms—a Nicholas School Job Share Facebook group managed by alumni, the Duke Alumni Engagement and Development Office's Alumni database, and the NSOE LinkedIn group. The LinkedIn group is managed by CPDC, and members are vetted to ensure they are a member of the Nicholas community (prospective/student, alumni, faculty, or staff) before being admitted to the group.

The CPDC schedules career exploration opportunities, employer information sessions, site visits, and on-campus recruiting events throughout the academic year to allow students to meet employers and broaden their knowledge of the environmental profession.

The Duke Career Center (DCC) provides career services to Trinity College undergraduates and doctoral students in The Graduate School. For more information, visit students.duke.edu/belonging/career-center.

Summer Enrichment Opportunities

Practical experience is integral to the Nicholas School's educational process and even more important to employers seeking qualified candidates. Some type of summer enrichment experience is recommended, but not required, between academic years of study. The CPDC staff can assist students in identifying experiences that meet professional development goals or research interests. Internships, fellowships, or research experiences are opportunities for students to explore or enhance career experiences, learn or apply new skills, establish networks of practicing professionals, and gain perspective on environmental issues in various regions or countries. Typically more than 90 percent of all Nicholas School students report completing summer enrichment experiences during their MEM or MF program.

Each year Nicholas School students participate in summer experiences throughout the United States and around the world. Students work with consulting firms, businesses, industry, nonprofit organizations, government agencies, and international organizations to supplement career preparation or research interests. Enrichment experiences may be secured at other times throughout the school year.

Summer Enrichment Funding Opportunities

The CPDC staff may also assist students in identifying paid opportunities or securing financial support for underfunded summer projects. The Nicholas School provides additional financial support that MEM, MF, and DEL-MEM students utilize to partially support both US-based and international opportunities. Students typically apply for summer enrichment funding in the spring term of years in which they are not graduating.

Made possible by the generous support of Fred and Alice Stanback, the Nicholas School partners with targeted conservation organizations to administer the Duke University Stanback Fellowship Program. Its purpose is to provide all Duke students with the opportunity to apply for a significant paid summer learning experience in environmental policy, research, applied resource management, and/or stakeholder engagement. In 2025, approximately 89 internship projects with 27 non-governmental conservation organizations were secured exclusively by Nicholas School and Duke University students. Incoming MEM and MF students may become eligible to apply once Student Services confirms receipt of the tuition deposit.

Facilities

The Nicholas School of the Environment is located in Grainger Hall at 9 Circuit Drive on Duke University's West Campus, and linked by a walkway to additional space in the A wing of the Levine Science Research Center (LSRC), home of many of the Nicholas School's research labs as well as Student Services.

A 70,000-square-foot, five-story glass-and-concrete platinum LEED-certified building, Grainger Hall incorporates state-of-the-art green features and technologies inside and out. The hall houses classrooms, an auditorium, private offices, open office space, computer labs, an outdoor courtyard, and an environmental art gallery, as well as conference rooms, shared workrooms, and common areas. Green features include solar panels, innovative climate control and water systems, a rooftop event space, and garden, windows that moderate light and heat, an organic orchard, and sustainably designed landscaping.

The divisions of Earth and Climate Sciences (ECS), Environmental Natural Sciences (ENS) and Environmental Social Systems (ESS) are housed across Grainger Hall and the LSRC. ECS maintains state-of-the-art facilities for geochemical analysis and climate modeling studies. ENS hosts extensive research facilities focusing on environmental health.

Duke University Marine Laboratory is home to the fourth division of the Nicholas School, the Marine Science and Conservation division. Situated on Pivers Island, off the coast of Beaufort, North Carolina, the Marine Lab is Duke's coastal campus.

Location

Duke University is situated in Durham, a city of more than 291,000 inhabitants in the central Piedmont region of North Carolina. The Appalachian escarpment lies approximately one hundred miles to the west of Durham, and the coastal plain is but a short distance to the east. The Duke University Marine Laboratory is located 180 miles to the southeast of Durham, on Pivers Island, adjacent to the historic town of Beaufort, North Carolina. The Nicholas School is thus ideally situated near areas of ecological and topographic diversity that offer many opportunities for study as well as recreation.

Piedmont North Carolina is characterized by a rolling, forested topography interspersed with small farms and rural communities in addition to the state's largest cities. The climax forests of the Piedmont are hardwoods; however, human disturbance has resulted in the establishment of many forests of native southern pines. To the west, the Appalachian Mountains contain magnificent hardwood forests, giving way to spruce-fir forests at higher elevations. The region hosts a large percentage of the rich biodiversity of the southeastern United States.

The coastal plain of North Carolina, well known for its agricultural production, is used extensively by many of the nation's forest industries for plantations of native pines. Coastal wetlands and estuaries, now recognized as one of the nurseries of world fisheries, offer abundant and valuable natural resources. The barrier islands of North Carolina's Outer Banks serve to protect these coastal waters. The rapidly increasing population and development in this region make proper management of its natural resources particularly important to the nation.

Because of the school's central location near these regions of vital ecological importance and rapid human population growth, students are afforded the opportunity to study many current environmental problems in the field. Both the opportunity and the challenge exist to analyze these pressing problems and to develop sound approaches to their management.

Facilities, Locations & Resources

Duke Forest

Duke Forest comprises more than 7,000 acres of land in Alamance, Durham, and Orange counties and has been managed for teaching and research purposes since the early 1930s. A variety of ecosystems, forest cover types, plant species, soils, topography, and past land use conditions are represented within its boundaries. In terms of size, diversity, accessibility, and accumulated long-term data, Duke Forest is a resource for studies related to forest ecosystems and the environment that is unmatched by any other university.

Academic use of the Duke Forest ranges from class instruction to long-term research projects and includes studies on vegetation composition, landscape ecology, remote sensing, invertebrate zoology, atmospheric science, and global climate change. A large volume of information is available to support teaching and research efforts including data on soils, topography, and forest inventory, as well as historic and current management records.

In addition to leading educational tours and field laboratory exercises, Duke Forest Staff are available to assist faculty, students, teachers, and researchers in project development—from site selection and logistics to utility hook-ups and stand management. To initiate or lead academic activities in Duke Forest, please contact the Office of Duke Forest at dukeforest@duke.edu. More information can also be found online at dukeforest.duke.edu.

Facilities, Locations & Resources

Duke University Marine Laboratory

General Information

The Duke University Marine Laboratory is a campus of Duke University and a unit within the Nicholas School of the Environment. The Division of Marine Science and Conservation (MSC) strives to be at the forefront of understanding marine environmental systems, their conservation, and their governance through leadership in research, training, communication and application..

The Marine Laboratory campus serves year-round resident Duke faculty in the Division of Marine Science and Conservation who, together with research and administrative staff, provide training, educational, and research opportunities. Duke academic programs served by the Marine Laboratory campus include undergraduate students, graduate professional degree students, and doctoral students. Students and post-graduates from other colleges may enroll for one or more semesters or summer sessions. Visiting student groups use the Laboratory's dormitory and laboratory facilities and scientists come from North America and across the globe to conduct research on the campus. A weekly seminar/lecture series features distinguished scientific speakers from across the nation and abroad.

Location and Natural Environment

The Marine Lab is situated on Pivers Island, near the historic town of Beaufort. Beaufort is the third-oldest town in North Carolina and is surrounded by fishing, agricultural, and leisure-tourism communities. The area is well known for its historic and scenic attractions as well as being a seaside recreation destination. Cape Lookout National Seashore and the Rachel Carson Estuarine Research Reserve are within easy boating distance.

The laboratory is within range of both temperate and tropical species of marine biota. The edge of the Gulf Stream oscillates between thirty and forty miles offshore, with reefs on the wide continental shelf and habitat for marine vertebrates. The coastal region of North Carolina is a system of barrier islands, sounds, and estuaries rich in flora and fauna, and other diverse habitats, including rivers, creeks, mud flats, sand beaches, dunes, marshes, peat bogs, cypress swamps, bird islands, and coastal forests. It is a haven for both nature lovers and those interested in the pursuit of marine science.

Two other university laboratories, federal and state laboratories, plus a museum, and an aquarium in the Beaufort-Morehead City area collectively house one of the highest concentrations of marine scientists in the nation. These are the University of North Carolina's Institute of Marine Sciences (IMS), North Carolina State University's Center for Marine Science and Technology (CMAST), the North Carolina State University Seafood Laboratory, the National Oceanic and Atmospheric Administration's (NOAA) Beaufort Laboratory, the North Carolina Divisions of Marine Fisheries and Coastal Management, the North Carolina Maritime Museum, and the North Carolina Aquarium at Pine Knoll Shores. This concentration of marine scientists provides a critical mass for the pursuit of science, conservation, and education.

Teaching and Research Facilities

The Marine Lab campus features dormitories, a dining hall, a student center, classrooms, laboratories, and research buildings. The Repass Ocean Conservation Center, the Marine Lab's first LEED-certified building, and Duke University's second building to receive a rating of LEED Platinum. The Orrin Pilkey Research Laboratory was dedicated in 2014 and provides the Marine Lab with a state-of-the-art space for studying molecular biology, genomics, marine microbes, and community ecology. The Pilkey Laboratory includes a conference room and a teaching lab where faculty and students can apply advanced genetic tools and techniques toward understanding marine systems and marine ecosystems. The Pilkey Laboratory was designed with sensitivity to the changing coastal environment-including site design utilizing prevailing winds and sunlight, geothermal heating and cooling systems, and recycled and regional materials-and is LEED Gold certified.

In addition to modern analytical facilities, the Marine Lab operates a variety of seawater systems and tanks for experimental work. The Marine Lab maintains modern computer facilities and IT services, including state-of-the-art video conferencing facilities. Computer and library facilities are described in further detail in the sections highlighting the Computer and Library Resources of the Nicholas School and Duke University. The Marine Lab features a fully equipped, and state-of-the-art shared-use Marine Conservation Molecular Facility in the Bookhout Research Laboratory. This laboratory enables a range of genetic studies from genomics to population genetics and forensics. The Marine Robotics and Remote Sensing Lab is led by faculty member Dave Johnston. The new facility has enabled the Marine Lab to conduct cutting edge research around the globe, partner with other research facilities, and engage local school groups. The Marine Lab's newest vessel, the R/V Shearwater arrived in early 2020. The vessel allows researchers and other institutions to conduct research along the Atlantic seaboard in a wide range of vital fields, including marine ecology and conservation, biological oceanography, and renewable ocean energy development. The mission of the vessel is research, education, and outreach. The lab also operates the R/V Richard T. Barber, a 30-foot aluminum vessel used mostly for nearshore and offshore faculty and student research; the R/V Kirby-Smith, a 28-foot Carolina Skiff with a capacity of eighteen passengers used mostly for student research and teaching; and a fleet of kayaks and canoes for research and teaching.

Undergraduate Study at the Duke University Marine Laboratory

All undergraduate students at Duke, no matter what their major, have the opportunity to study at the Duke University Marine Laboratory in Beaufort, North Carolina. Academic programs include a fall semester, a spring semester, and two five-week summer terms. The fall and spring semesters include Beaufort Signature Travel Courses with extended field trips to a variety of domestic and international locations, which vary from year to year but may include Australia, Belize, Canada, Puerto Rico/ St. Croix, or Singapore. The academic programs integrate classroom lectures and laboratories with direct field and shipboard experiences. For more information, visit the Duke Marine Lab website at nicholas.duke.edu/marinelab.

Undergraduate courses at the Marine Lab fulfill major requirements for several undergraduate majors including but not limited to the majors in marine science and conservation, environmental sciences, earth and climate sciences, and majors in the Pratt School of Engineering. A semester or summer term of coursework at the Marine Lab is a core requirement of the BS major in biology with a concentration in marine biology. For more information see biology.duke.edu/undergraduate/major/concentrations/marine-biology.

Regional Resources

Research Triangle Park

Numerous industrial and governmental organizations have established research facilities in the Research Triangle Park, ten miles from the Duke campus. US government facilities include a major research laboratory of the Environmental Protection Agency, the Forestry Sciences Laboratory of the United States Forest Service, and the National Institute of Environmental Health Sciences (NIEHS). These laboratories provide opportunities for student research and internships in some of the nation's most advanced research facilities.

Forest History Society

Founded in 1946, the Forest History Society is a nonprofit, nonadvocacy organization committed to balanced and objective investigations of human interaction with the forest environment. In 1984, it became affiliated with Duke University and moved its headquarters to Durham. The Forest History Society co-publishes the quarterly journal *Environmental History* and maintains a large collection of archival materials, including records from the American Forestry Association, American Forest Institute, National Forest Products Association, and the Society of American Foresters. These valuable resources and the services of the society's reference staff are available to Nicholas School students. The society also provides the F. K. Weyerhaeuser Fellowship for a graduate student studying forest conservation history (see Financial Aid sections in chapters for professional degree and doctoral students in this bulletin) and cosponsors the Lynn W. Day Distinguished Lectureship in Forest & Conservation History with the Nicholas School and the Department of History. For more information, visit foresthistory.org or call (919) 682-9319.

Carolina Population Center

The Carolina Population Center is a community of outstanding scholars who promote population research and education at The University of North Carolina at Chapel Hill. The CPC offers classes and seminars and supports its own library as well as an online catalog of resources. For more information, visit cpc.unc.edu.

Ackerman Center for Excellence in Sustainability

Based at the Kenan-Flagler School of Business at The University of North Carolina at Chapel Hill, the Ackerman Center for Excellence in Sustainability provides education, research, outreach, and best practices to accelerate progress in social and environmental sustainability using profitable business solutions. The ACES world class curriculum, real-world applications, and relevant research help students and companies succeed with sustainable strategies. Nicholas School students with interests in business and the environment, industrial ecology, and sustainable business practices frequently enroll in courses offered by this center. For more information, visit cse.unc.edu.

Organization for Tropical Studies at Duke

The Organization for Tropical Studies (OTS) is a nonprofit consortium that has grown to include fifty universities and research institutions from the United States, Latin America, and Australia. In the early 1960s, scientists from US universities forged working relationships with colleagues at the Universidad de Costa Rica in the interest of strengthening education and research in tropical biology. Intense interest both in the United States and Costa Rica led to the founding of OTS in 1963. OTS was founded to provide leadership in education, research, and the responsible use of natural resources in the tropics. To address this mission, OTS conducts graduate and undergraduate study abroad programs; facilitates scientific research; participates in tropical forest conservation; and maintains four biological stations in Costa Rica, and another in Kruger National Park, South Africa. For more information, visit tropicalstudies.org.

Nicholas Institute for Energy, Environment & Sustainability

The Nicholas Institute for Energy, Environment & Sustainability (nicholasinstitute.duke.edu) accelerates solutions to critical energy and environmental challenges, advancing a more just, resilient, and sustainable world . The Nicholas Institute combines the deep knowledge and expertise found at a top-tier research university with the action orientation demonstrated by the most effective public and private sector organizations.

Institute experts conduct and curate actionable research and analysis to inform decision-making, and also engage directly with policymakers, businesses, and communities in sustained ways. This includes purveying timely, relevant, and practical counsel; convening stakeholders to develop pragmatic, evidence-based solutions; and developing partnerships that bridge sectors, communities, and governmental bodies to strengthen solutions' impact and durability.

The Nicholas Institute leverages this external work to deliver transformative educational experiences that equip Duke University students to champion environmental progress as they lead lives and careers of influence. The Nicholas Institute's educational programs serve students across Duke's top-ranking undergraduate and graduate degree programs (including the Nicholas School's)---preparing future leaders in a wide range of sectors.

The scientists, engineers, economists, lawyers, and policy experts at the Nicholas Institute work on a diverse range of topics, including energy and climate finance and policy, climate risk, ecosystem services, energy access, energy data analytics, extreme heat, nature-based solutions, oceans and marine systems, plastics policy, sustainable infrastructure, transportation, water resources, and more.

The Nicholas Institute is one of Duke's signature interdisciplinary institutes, initiatives, and centers—engaging with and connecting students, faculty, staff, and alumni across all Duke schools (including the Nicholas School) in addition to external partners and stakeholders. In 2023, the Nicholas Institute became part of Duke's new Office of Climate and Sustainability, which is charged with oversight of the Duke Climate Commitment (climate.duke.edu).

The Nicholas Institute is located in Suite 101 of Gross Hall for Interdisciplinary Innovation at 140 Science Drive.

To get updates on Nicholas Institute opportunities, sign up for the email list at nicholasinstitute.duke.edu/newsletter.

Opportunities for Students

The Nicholas Institute is committed to delivering high-impact educational opportunities for undergraduate and graduate students across Duke, including those pursuing degrees at the Nicholas School. Nicholas Institute experts—many of whom have faculty appointments at Duke schools—teach a range of courses across campus and regularly advise capstone opportunities such as master's projects.

The Nicholas Institute also delivers a robust slate of experiences and offering outside the classroom:

- Opportunities to get involved with research and decision-maker engagement: The Nicholas Institute serves as the administrative home of Bass Connections in Energy & Environment (interdisciplinary student-faculty research teams focused on real-world challenges, typically during the school year) and Climate+ (interdisciplinary summer research teams at the intersection of climate and data science). In addition to taking part in these teams (which often include Nicholas Institute experts), students from across the university can partner with Nicholas Institute staff on research as student assistants. Graduate students (including doctoral and professional students) at the Nicholas School can engage with the Nicholas Institute's efforts via the Nicholas School's assistantship program. The Nicholas Institute also hosts the UN Climate Change Negotiations Practicum, a hands-on course that explores international climate change negotiations and climate policy under the United Nations Framework Convention on Climate Change (UNFCCC) and that typically culminates in attending the annual UNFCCC Conference of the Parties (COP).
- Events featuring diverse experts and professionals: Each year, the Nicholas Institute hosts numerous educational events on energy and environmental topics. Many events feature opportunities to glean insights from and interact with professionals who are working in the energy and environment space or who are making relevant decisions in government, business, and civil society. Some events include networking components that bring together students, faculty, and staff as well as Duke alumni, local professionals, and students, faculty, and staff from other universities. Other events include significant experiential components—like the Nicholas Institute's Power Trips, which facilitate site visits to energy companies and facilities.
- Support for student-led activities: The Nicholas Institute helps network the leaders of undergraduate and graduate student organizations across campus that focus on energy and environmental issues. The Nicholas Institute offers a limited amount of funding for student-led activities open to students from diverse degree programs. Nicholas Institute staff also provide advising and financial support for Energy Week at Duke, an annual student-led event series.
- Career advising and internship support: The Nicholas Institute supports the University Career Center, and the Nicholas School Career & Professional Development Center in the advising of students interested in energy and sustainability careers. The Institute's Energy Internship Program supports students exploring careers across the energy sector.

Students interested in engaging with the Nicholas Institute are encouraged to sign up for the email list at nicholasinstitute.duke.edu/newsletter.

Research Centers

Research centers in the Nicholas School of the Environment are by design and intent flexible, multidisciplinary units. A major aim is to bring together specialized groups of scholars and professionals from many disciplines to focus their attention on current natural resources and environmental problems. The centers are headed by a director and staffed by an interdisciplinary faculty from Duke, neighboring universities, and a variety of public and private research organizations. Depending on the level of funding, the centers may also employ research assistants and other support staff. The centers do not offer courses or degrees; rather, they offer students, scientists, and other professionals an opportunity to participate in research through collaboration with affiliated faculty.

Juli Plant Grainger Center for River Science

Co-Directors: Martin Doyle, Professor of River Science and Policy, Division of Environmental Sciences and Policy, Nicholas School of the Environment; James Heffernan, Associate Professor of Ecosystem Ecology and Ecohydrology Division of Environmental Sciences and Policy, Nicholas School of the Environment and Director of Graduate Studies, Ecology PhD program (UPE); Emily Bernhardt, James B. Duke Distinguished Professor, Division of Environmental Sciences and Policy, Nicholas School of the Environment; and Ryan Emanuel, Associate Professor, Division of Environmental Sciences and Policy and co-chair, Community Engagement and Environmental Justice.

The River Center was formed in 2011 as an intellectual community of faculty, postdocs, students, and technical staff who share a common passion for the study of rivers and their watersheds. The current group consists of four Duke research labs (Doyle, Heffernan, Emanuel, and Bernhardt) that have an interest in advancing river science. Current research in the multidisciplinary labs spans water and its relationships to ecosystems and people. Research interests are wide-ranging and include ecohydrological processes that affect terrestrial water balances; the movement of elements, chemicals and nanoparticles within and between forests, floodplains, wetlands and streams; understanding the context for river science in society, water policy, river management and water governance; the structure and function of streams, wetlands, and other ecosystems shaped by the flow of water.

Researchers in these labs also seek to inject the best possible science into ongoing discussions about stewardship of river ecosystems and their watersheds through policy and management. Research in the River Center includes both close collaborations among the core River Center labs and work with other faculty in the Nicholas School, in other departments at Duke, and with collaborators around the nation and the world.

The physical home of the River Center is located in the Duke Water Science Laboratory and Research Center, a state-of-the-art facility containing shared lab space and a shared analytical facility. Find more information at dukerivercenter.org.

Duke University Wetland and Coasts Center

Director: Brian R. Silliman, Rachel Carson Distinguished Professor of Marine Conservation Biology, Division of Marine Science & Conservation, Nicholas School of the Environment. Curtis J. Richardson, Research Professor of Resource Ecology, Division of Environmental Sciences and Policy, Nicholas School of the Environment.

The Duke University Wetland and Coasts Center advances science that supports the sustainable function of wetlands and the ecosystem services they provide—locally, nationally, and globally. The center pursues this mission through research, education, and partnerships that tackle pressing issues such as wetland restoration and rewilding, climate change impacts on nutrient cycling and carbon sequestration, invasive species management, and the role of wetlands in improving water quality and enhancing landscape water retention.

Few environmental topics have sparked as much public debate as wetland protection. As ecosystems situated between land and water, wetlands feature dynamic water levels and low oxygen conditions, supporting unique communities of plants and animals. These systems include bogs, cypress swamps, fens, prairie potholes, peatlands, oyster reefs, salt marshes, mangroves, and seagrass meadows. Wetlands filter pollutants, mitigate floods, reduce coastal erosion, build land, support fisheries, and connect surface and groundwater systems. Critically, they store more than 30% of the world's soil carbon. Despite their value, many people still underestimate wetlands, viewing them as wastelands to be drained or developed—a misconception that has contributed to the loss of over half of the wetlands in the United States.

The Duke University Wetland and Coasts Center brings together scientists, educators, and professionals to address wetland challenges at every scale. Core participants include the center director, affiliated faculty, visiting scholars, postdoctoral researchers, and graduate and undergraduate students. Housed within a professional school at a private university, the center operates independently and is well-positioned to provide objective, science-based leadership on wetland issues, free from the political constraints often faced by public institutions. Find more information at wetland.nicholas.duke.edu.

Superfund Research Center

Director: Heather Stapleton, Ronie-Richele Garcia-Johnson Distinguished Professor, Division of Environmental Sciences and Policy, Nicholas School of the Environment

It is increasingly recognized that early life stages of humans and other organisms are particularly sensitive to exposure to environmental stressors and pollutants. The Duke University Superfund Research Center (DUSRC) unites researchers from the Nicholas School of the Environment, the Pratt School of Engineering, and the Duke University Medical Center in examining the effects of selected contaminants that are widespread in the environment, including Superfund sites. Of particular concern are effects on both wildlife and communities that inhabit or are located in close proximity to Superfund sites. The theme of the DUSRC specifically focuses on later life consequences of early life exposures, and new strategies for remediating heavily polluted areas such as Superfund sites. The center is supported by the National Institute of Environmental Health Sciences (NIEHS).

The goal of the center is to elucidate mechanisms of toxicity, and health consequences in both humans and ecosystems, resulting from exposure to mixtures of chemicals that are considered neurodevelopmental toxicants. Of particular interest are selected pesticides, metals, polycyclic aromatic hydrocarbons, and flame retardants that affect development of the nervous system, cardiovascular system, and endocrine systems. In addition to conducting basic research in these areas, the center's key activities include undergraduate, graduate, and post-doctoral training in the environmental health sciences and engineering, the translation of basic research findings into useful information for health professionals, government agencies, and the public, and active engagement with communities concerned with exposures to hazardous chemicals. Find more information at sites.nicholas.duke.edu/superfund.

Student Organizations

Nicholas School Chartered Groups

Nicholas School Student Council (NSSC) of the Nicholas School of the Environment is an advocate on behalf of professional students, representing the interests and concerns of these students to the Duke University and Nicholas School community. The NSSC is a group of elected and volunteer-appointed Masters of Environmental Management (MEM) and Masters of Forestry (MF) students that serves as an advisory body to the faculty and administration and provides a conduit between the student body, faculty, and administration. NSSC also coordinates the annual Earth Day and Field Day activities.

Nicholas PhD Advocacy Council (NPAC) is a group composed of peer-elected students from the Nicholas School-affiliated PhD programs (ENV, UPE, UPEP, MSC, TOX, ECS) which aims to represent and support the academic and professional interests of all Nicholas School-affiliated PhD students, while fostering a sense of community within the Nicholas School. NPAC aims to:

1. Strengthen professional and social relationships among students in Nicholas School-affiliated PhD programs (e.g., through professional development activities such as the Graduate Afternoon Seminar).
2. Advocate for the academic and professional interests of Nicholas School-affiliated PhD students.
3. Provide support to program administrators for PhD student needs (e.g., Nicholas School PhD student orientation).

4. Provide representation for Nicholas School-affiliated PhD students to other administrative and advocacy groups (e.g., Nicholas School faculty meetings, Duke Graduate and Professional Student Council).

Professional Groups

Duke Conservation Society (DCS) focuses on contemporary conservation issues and solutions covering a variety of fields and exploring multiple forms of conservation including wildlife, land trusts, market-based, community-based, and policy-based among others. The society's vision is to provide a resource for students and future conservationists in finding solutions to the natural world's most pressing problems.

Duke Water Network (DWN) is a student organization dedicated to connecting Duke students interested in water with each other, community members, and professionals in the fields of water management, science, policy, and business. DWN may organize employer and alumni networking events, trips to explore innovative water management approaches, talks and panels, and other events that fulfill its mission.

Duke Sustainability Board is housed in the Nicholas School of the Environment, promotes awareness of sustainability initiatives and complex environmental issues. We are an organization uniquely positioned to facilitate communication among all clubs in the Nicholas School, because we can connect students from various disciplines through a common appreciation of sustainable development. We seek to provide opportunities for graduate students to learn about environmental trends and how they can reduce their personal impacts. Our mission is to increase knowledge of sustainability efforts, support collaboration between student clubs, and connect students to professionals working across diverse fields.

Eno Literary Magazine (Eno) has a mission to encourage, promote, and publish artistic forms of expression that inspire a deeper understanding and appreciation for the environment. The magazine aims to inspire artists to create work celebrating nature and to encourage consumers to reflect and act in service of the environment.

Nicholas School Energy Club (NSEC) has a mission to educate Nicholas School students and the broader Duke community about energy issues and provide professional development opportunities in energy through networking events, field trips, socials, and conferences. NSEC coordinates activities with the Duke University Energy Initiative and partner energy clubs at the Fuqua School of Business and the Sanford School of Public Policy.

Ocean Policy Working Group (OPWG) focuses on the political, economic, and cultural dimensions of human interactions with the ocean. The group brings together graduate and professional students from a variety of disciplinary backgrounds to consider how their areas of study influence perceptions of the ocean. In addition, the group's biannual publication, *Upwelling,* is a great way for members, faculty, and alumni to showcase their policy work with the greater Duke community.

Student Association for Geospatial Analysis (SAGA) is a graduate student organization for students interested in developing and sharing skills related to geospatial analysis. The mission of SAGA is to provide the graduate students of Duke University with a resource to expand, explore, and build professional skills in the field of Geospatial Analysis. SAGA serves as an organization to inform students about emerging trends and techniques, as well as to develop skills not taught through Nicholas School curriculum.

Social Groups

Diverse & Inclusive Community for the Environment (DICE) fosters a welcoming community within the Nicholas School so that members of disenfranchised groups/communities will feel that they belong in the community. This means bridging gaps between peoples of various identities by both acknowledging their differences and also learning to recognize shared interests and experiences. DICE seeks to empower members of disenfranchised groups/communities to join the Nicholas School community.

Nicholas School Golf Club provides an inclusive community building environment for members of the Nicholas School to meet up and enjoy golf-related activities together. It facilitates across concentration/degree friendships. It is open to people of all skill levels and allows people to freely learn a game that is a lifelong skill and highly useful in the business world. Many people across the Nicholas School cite the Golf Club as being one of their favorite social groups to participate in and a meaningful component of the School's culture.

Nicholas School's Black & Latinx Club (BLC) is a student group providing a space to celebrate and educate the Nicholas School community on Black and Latino culture. It serves the needs of not only Black and Latino students but also any student, faculty, or staff member who wishes to engage in meaningful activities that build cultural, academic, and environmental awareness.

Nic Queer Network (NQN) represents the needs and concerns of students, staff, faculty, and other Nicholas School community members who identify as LGBTQIA+ or allies.

Nicholas School Naturalists provides the graduate students of Duke University with a resource and opportunity to explore the mountain trails, lakes and rivers, and coastline of North Carolina and adjacent states. Facilitated by students for students, we lead guided excursions including day hikes, camping and backpacking trips, and water recreation. NicNats aims to connect students in the Nicholas School and beyond from a variety of academic concentrations through outdoor recreation and excursions.

Nicholas School Partners and Spouses intends to make students and their partners feel welcome at the Nicholas School and the Duke community, and soften the transition process to Durham through social networking.

Duke Affiliates—Societies, Chapters, Clubs, and Initiatives

Duke Chapter of American Fisheries Society (DukeFish) is the graduate student chapter of the American Fisheries Society (AFS) at Duke University. AFS is an international organization whose mission is to promote and improve the conservation and sustainability of fishery resources and aquatic ecosystems. It is the oldest and largest fisheries professional society, established in 1870. The group promotes sustainable fisheries and consumer practices by reaching out to our peers, community members, and local industries through education, outreach, and community participation.

Duke Environmental Law and Policy Forum (DELPF) began in 1991 as an interdisciplinary magazine published annually. Since then, the Forum has grown into a traditional environmental law journal. DELPF has retained its interdisciplinary roots and presents scholarship that examines environmental issues by drawing on legal, scientific, economic, and public policy resources. DELPF's affiliations with the Nicholas School for the Environment, the Sanford School of Public Policy, and the Law School render it uniquely positioned to adapt to the increasingly interdisciplinary nature of environmental law. DELPF is a student-run publication, with staff members from the Law School, the Nicholas School for the Environment, and the Sanford School of Public Policy. New journal members, both JD and non-JD, are selected based on their writing skills, research ability, and interest in both DELPF and environmental policy.

Society of American Foresters (SAF), Duke Chapter, is the national scientific and educational organization representing the forestry profession. The Duke University Student SAF Chapter is a professional organization that facilitates student involvement in forestry at the local, regional, and national levels by promoting the forestry program at the Nicholas School, sustaining Duke's relationship with other forestry schools, organizing both educational and community service events, and facilitating student attendance at SAF national conferences and meetings.

Duke Student Association of Wetland Scientists (SAWS) is a student-run organization dedicated to wetland ecology, restoration, and conservation at Duke University. The goal is to provide a meeting ground for graduate and non-graduate students interested in all aspects of wetlands. Activities include field trips, seminars, and volunteer events. The club works in coordination with the Duke University Wetlands Center.

Duke RESTORE is a Duke University student organization, based in the Nicholas School of the Environment, focused on advancing the field of ecosystem restoration to enhance resilience of natural and human systems. Our vision for Duke RESTORE is to give students hands on experiences in restoration in North Carolina through our six teams: Seagrass, Living Shorelines, Coral, Eco-Cultural, Forest, and Re-Wilding, with the Forest and Re-Wilding teams being founded in the Fall of 2023.

MEM/MBA Club is the home for concurrent MEM/MBA students and provides the key link between the Nicholas School and Fuqua School of Business. The club's mission is to support students' academic transition between two graduate programs, facilitate social cohesion, and encourage professional development through Duke's unique hybrid education. The MEM/MBA program—both within Duke and externally through increased visibility and outreach to the Nicholas School of the Environment, The Fuqua School of Business, and the UNC Kenan-Flagler Business School—actively works with school administrations to streamline MEM/MBA academics and administrative processes.

Nicholas School Net Impact is the Nicholas School chapter of the national Net Impact organization. It is a networking and professional development club that connects Nicholas School students with environmental professionals in the private sector and provides access to resources for further business related education.

Working Group on the Environment in Latin America (WGELA) is a collaborative effort between Duke University, the University of North Carolina, and North Carolina State University undergraduate and graduate students to promote a rich comprehension of environmental issues in Latin America through interdisciplinary collaboration. WGELA aims to foster a dialogue concerning critical environmental issues affecting Latin America. The group also seeks to improve the understanding of the social, historical, political, and cultural contexts in which these environmental issues are embedded, and build capacity among an interdisciplinary and cross-institutional group of individuals to address and conduct research on Latin American issues.

Duke Society for Ecological Restoration (DESR) is a student group with a mission to foster inclusive and productive conversation about restoration as a solution to many of our environmental issues, and plan activities that help students gain restoration skills and experience. We work to provide field-based experiences for Nicholas School students (and those within the broader Duke community) who might not have as many opportunities to get outside of the classroom. We plan two larger field-based experiences each year, and in between those trips, we aim to have frequent social and educational get-togethers for students to discuss a wide variety of restoration issues and connect and network with like-minded people.

Duke Environmental Justice Network (DEJN) seeks to connect graduate and professional students committed to understanding and addressing environmental injustices. Our mission is to represent a diverse range of expertise and backgrounds to form a cross-cutting network to bridge the gaps between different schools and disciplines around how environmental justice is discussed and incorporated across big Duke. DEJN has had working groups focused on outreach to local groups, engaging with NSOE leadership, and education and events. This year we hosted local community members and EJ scholars as speakers in events at the intersections of EJ and water, energy, international climate justice, and waste, respectively. We want to continue to focus on topics and areas where EJ can be expanded upon with more context and nuance than is sometimes represented in our courses. Additionally, we aim to send students to the North Carolina Environmental Justice Network Summit during years it is hosted as well as other EJ-focused conferences in order to provide an opportunity for engagement with EJ leaders across North Carolina and the United States.

Oceans@Duke is an interdisciplinary community of undergraduate and professional students at Duke University working at the intersections of science, engineering, and business to promote sustainable ocean solutions. We aim to connect students with professionals that can support ocean related careers, build a cross school community focused on ocean sustainability, and elevate Duke University as a knowledge leader within this space.

Technology at the Nicholas School

Nicholas School IT maintains computer labs and shared printers, and provides audio-visual and technology support to students, faculty, and staff in all divisions and across both campuses. Software available in Nicholas School IT computer labs includes ArcGIS, ENVI, Adobe Creative Cloud, Stata, and R, among other applications used in classes at the Nicholas School.

Nicholas School conference rooms are configured with equipment for seamless video conferencing with the Marine Lab campus in Beaufort, NC, and elsewhere. Specialized Zoom classrooms are utilized for remote and hybrid instruction.

Students can purchase computers and accessories from the Duke Technology Center located on the lower level of the Bryan Center, and have those machines serviced at Duke Computer Repair located on Hillsborough Road, just a short distance from campus.

Links to technology product and support information available on campus is accessible on the Nicholas School Intranet with NetID credentials at sites.nicholas.duke.edu/intranet/nicholas-it/quick-reference-links.

Admissions

Requirements and Prerequisites

The Nicholas School of the Environment welcomes applications from domestic and international students of all backgrounds who seek an intellectually challenging education designed to prepare them for leadership in a wide variety of natural resource and environmental careers. Admission to the Master of Environmental Management (MEM) and the Master of Forestry (MF) is open to students who hold a four-year equivalent bachelor's degree from an accredited college or university. Admission as a nondegree student may also be granted under appropriate circumstances.

Students enrolled in the Duke Environmental Leadership Master of Environmental Management (DEL-MEM) Program are subject to the same requirements, responsibilities, and policies as set forth for on-campus MEM students, except where specifically differentiated (i.e., admissions requirements, credit requirements, program format, and curriculum requirements). Admission to the DEL-MEM is open to students who hold a four-year equivalent bachelor's degree from an accredited college or university and have a minimum of five years of post-degree environmentally-related experience (professional or a significant commitment to personal/volunteer work in related fields). The DEL-MEM Program is a two-year, four-semester Master of Environmental Management degree-granting program utilizing distance-learning technologies.

For information about the International Master of Environmental Policy (iMEP), see here.

Prerequisites

All students admitted to the Nicholas School are expected to have had the following (except the DEL-MEM program, see below):

- some previous training in the natural sciences or the social sciences related to their area of interest in natural resources and environment;
- at least one college semester of calculus; and
- at least one college semester of statistics that includes descriptive statistics, probability distributions, hypothesis testing, confidence intervals, correlation, and simple linear regression.

Additional courses may be required or recommended as follows:

- **Master of Environmental Management**
  - **Ecotoxicology and Environmental Health.** One semester of college chemistry is required; principles of ecology and organic chemistry are recommended
  - **Environmental Economics and Policy.** One semester of microeconomics required—either a full semester microeconomics course or an introductory course that is more than half microeconomics rather than macroeconomics.
  - **Terrestrial and Freshwater Environments.** It is strongly recommended that students pursuing the Terrestrial and Freshwater Environments concentration have a solid foundation in environmental science prior to enrolling. Depending on student interests and goals, such preparation might include coursework in ecology, environmental engineering, or geosciences. It is strongly recommended that students have one semester of Principles of Ecology or similar (200- or 300-level) course in environmental science and one advanced undergraduate course in ecology, earth systems science or related environmental science.
- **Master of Forestry.** One semester of principles of ecology and one semester of microeconomics (either a full semester microeconomics course or an introductory course that is more than half microeconomics rather than macroeconomics) are required.
- **Duke Environmental Leadership.** Minimum of five years of post-degree environmentally-related experience (professional or a significant commitment to personal/volunteer work in related fields)

Any course submitted in fulfillment of a prerequisite should be taken for graded credit, a final grade of at least a B- must be earned and the course must be submitted on an official transcript from the accredited institution where the course was taken. Although not recommended, courses taken on the pass/fail grading basis, advanced placement credit and non-graded courses may be used to fulfill prerequisites.

Although students lacking the level of preparation described above may be admitted, deficiencies should be made up prior to enrollment in the Nicholas School. It is especially important for concurrent degree , Master of Forestry, and students planning to study at the Duke University Marine Laboratory in their second year to complete all prerequisites prior to enrollment. Students lacking prerequisites may be unable to complete the recommended sequence of

courses and may find it difficult to graduate on time. For this reason, we strongly urge students to complete all required prerequisites successfully prior to matriculating. Courses taken after matriculation to satisfy prerequisites do not count toward the credits required for the degree. Students who fail to meet the required prerequisites by the end of the first year of study may be dismissed from the program

Recruitment, Campus Visitation, and Interviews

Each year, representatives of the Nicholas School recruit prospective students through a range of in-person and virtual opportunities, including but not limited to virtual admissions information sessions, graduate school fairs, career fairs, and professional conferences.

Prospective students may view upcoming recruitment events, request further information about the DEL-MEM, MEM, and MF programs, and sign up for application process updates from the Nicholas School of the Environment by visiting nicholas.duke.edu/admissions/connect-with-us.

While campus visits are neither required nor considered as a factor for admission to the Nicholas School, prospective students who are able to travel to Durham may find them helpful and informative. Campus visits occur during the academic year when classes are in session (i.e. during the fall and spring semesters), and visitors select from pre-scheduled weekdays. Visit registration includes the option to customize the visit day from a list of pre-scheduled activities, such as touring NSOE facilities, meeting with NSOE staff, and a class visit (subject to staff and faculty availability). Virtual tours of the Durham campus and the Duke University Marine Lab are also available. Interested students may learn more about virtual and in-person campus tours by visiting nicholas.duke.edu/admissions/visit-or-virtual-tour.

An interview with a member of the admissions committee is not required for admission to the on-campus MEM or MF programs. Applicants to the DEL-MEM program are required to participate in an interview, if requested by the admissions committee.

Admissions Criteria

Admissions criteria for the on-campus Master of Environmental Management and Master of Forestry are designed to ensure that admitted students will perform well while they are at Duke and after they graduate. The Admissions and Awards Committee evaluates each candidate holistically for their academic potential, professional promise, and ability to benefit from and contribute to the goals of the school. Academic performance as an undergraduate and work experience are key factors considered in the application review process alongside letters of recommendation, the applicant's personal statement, résumé, and other information required on the application. Individuals with prior relevant work experience are especially encouraged to apply.

The admissions criteria for the DEL-MEM Program include a minimum of five years of post-degree environmentally-related experience (professional or a significant commitment to personal/volunteer work in related fields). Academic performance as an undergraduate, professional environmental work experience, leadership experience and/or potential, letters of recommendation, applicant essays, and an applicant interview are the primary factors considered in the application review process for the DEL-MEM. Extracurricular activities and other information requested on the application also provide a basis for selection.

Application Procedures

Application for admission to the on-campus Master of Environmental Management and the Master of Forestry degrees and the DEL-MEM is made through the Office of Student Services of the Nicholas School of the Environment by submitting an electronic application and electronic upload of supporting documents (see details below).

For the on-campus MEM, MF, and DEL-MEM, the application deadline is December 15 preceding the fall in which admission is desired. Admission is offered for the fall term only. Applications received after the December 15 deadline may be considered on a space-available basis after all on-time applications have been considered. All applications for admission are also considered for a limited number of merit-based financial awards; merit-based financial assistance is not guaranteed. Need-based grants from the school require a separate application process which should be completed by early February, even if a final admissions decision has not yet been conveyed.

Application instructions and the link to the online application are available by visiting nicholas.duke.edu/admissions/how-apply. No applicant will be considered until the completed application form and all required documents described below are received and processed by the Office of Student Services.

1. **Application Form.** The electronic application may be accessed through the Nicholas School website, nicholas.duke.edu/admissions. Both on-campus MEM and MF as well as DEL-MEM applicants should use the above link. Applications to the PhD program are available through The Graduate School website.
2. **Official Transcripts.** One copy of the transcript from each undergraduate and graduate school attended should be uploaded electronically as part of the electronic application. Unofficial transcripts are acceptable for the application review process. Official transcripts showing awarding of the degree must be submitted by every matriculating student prior to enrolling. If the original transcript is not in English, the applicant must also provide a certified English translation. If not included on the transcript, students must provide proof of the degree prior to enrollment. If the institution uses SCRIP-SAFE International (or similar agent) for the delivery of official transcripts, the applicant may request that their registrar forward an official transcript to nicholas-admissions@duke.edu. If electronically delivered transcripts are not available, the applicant may request that paper transcripts be sent to the Office of Student Services, Nicholas School of the Environment, Duke University, Box 90328, Durham, NC 27708-0328 in sealed envelopes that have been signed across the flap by the registrar of the institution attended.
3. **Application Essay(s).** Applicants are required to submit one or more application essays as outlined in the application instructions on the NSOE website. The Admissions and Awards Committee attaches considerable weight to the statement of purpose submitted by the applicant. This statement should reflect well-defined motivation to pursue graduate study.

4. **Letters of Recommendation.** Each applicant is required to request three letters of recommendation to be submitted electronically on their behalf from persons who know their educational and/or professional achievements.
5. **Application Fee.** Please refer to the admissions webpage for up-to-date information regarding any application fee associated with the application.

Additional Procedures for International Students

Each year the Nicholas School of the Environment welcomes international students among its professional degree candidates, including the Duke Environmental Leadership program. International 3-year degree programs require a degree equivalency evaluation by a NACES approved agency. (naces.org/members) Applicants are responsible for any related fees. International transcripts not converted on a 4.0 GPA scale require a course-by-course foreign credential evaluation completed by a NACES approved agency. When ordering your foreign credential evaluation, please be sure that your GPA is calculated on a 4.0 scale and included in your agency evaluation. Applicants are responsible for any related fees. All transcripts must be in English. Transcripts not issued in English should be uploaded along with an English translation; the required course-by-course foreign credential evaluation can also be used as the English translation.

English Language Proficiency

Applicants whose first language is not English must submit an official score on the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS) exam, or the Duolingo English Test. This requirement is waived if the applicant earned their undergraduate degree in the United States, earned an undergraduate or master's degree from an English-only speaking institution, or has been working in the United States for two years or more. The Nicholas School does not set minimum required scores; if an applicant's score is low, they may be accepted on the provision that they complete an intensive English language program in the United States prior to the start of the program.

- **Test of English as a Foreign Language (TOEFL),** ets.org/toefl. Official TOEFL scores should be reported to Duke University's institution code 5156; there is no department code. Applicants will be prompted to enter unofficial, self-reported exam scores on the application form.
- **International English Language Testing System (IELTS),** ielts.org
    - Applicants will be prompted to upload a pdf of IELTS score reports with their application materials. Scores will be considered unofficial until NSOE staff manually verifies your scores through the testing service as part of the application review.
- **Duolingo,** englishtest.duolingo.com
    - Applicants will select "Duke University Graduate Programs: Graduate School; Divinity; Engineering; Environment; Public Policy; Duke Kunshan" at the "Graduate" program type level as the institution to send scores to.
    - Make sure to include subscores when you select your institution. Score reports without subscores will not be accepted. If you are not sure how to include subscores in your score report, please contact Duolingo English Test support on the Duolingo English Test website.

Proof of Funding

The visa-granting authority in the student's country of origin, ordinarily the United States Embassy, requires proof that sufficient funds are available to the student to cover the expenses of study before a visa can be granted. International students are not eligible for federal and state loans, although they may qualify for certain educational loans through private United States agencies. Labor and visa policies might limit the eligibility for non-US citizens to pursue summer employment and permanent employment in the United States after graduation. School-based financial assistance, if it is offered, is not sufficient to cover all costs associated with studying at the Nicholas School. International students should expect to demonstrate other significant sources of support to meet regulatory requirements and obtain a visa.

DEL-MEM Visa Requirements for Non-US Citizens

If admitted, the DEL-MEM program requires students to participate in five (5) place-based sessions. Four of these sessions take place at Duke University in Durham, NC, and one place-based session is held in Washington, DC. Duke University and the US Department of Homeland Security require non-US citizens entering the United States to participate in the DEL-MEM program place-based sessions to enter the United States on an F-1 student visa for each place-based session. A business or tourist visa is not sufficient.

Admission with Nondegree Status

Persons wishing to enter the Nicholas School of the Environment as nondegree students must submit a special application form requesting nondegree status along with an application fee of $25. The applicant must have completed a bachelor's degree from an accredited college or university and must submit an official transcript of all previous coursework. The student must have one letter of recommendation; this letter should indicate why the applicant should be allowed to undertake nondegree study at Duke. The application itself requires a brief statement of purpose in which the applicant should state their reasons for such study at Duke.

Admission as a nondegree student does not guarantee future admission to the MEM or MF degree. Nondegree students who complete an application for the professional degree and are offered admission may be able to count a limited number of appropriate credits from their nondegree status at Duke toward the MEM or MF degree. The student's program chair will determine which if any credits may be counted toward the degree. Applying credits taken as a nondegree student does not reduce the number of semesters required for the degree or the tuition required. Neither the on-campus nor the DEL-MEM programs accept transfer credits from other institutions.

Notification of Admission Decisions

After the Admissions and Awards Committee has completed a review of all applicants for the upcoming fall semester, applicants will be notified via email that their decision is available to view by logging into their applicant portal. Hard copy letters are not sent; students may save a PDF of their decision letter from within their applicant portal for their records. Admission decisions for all applicants will be released by mid-March.

Students who are offered admission and who intend to enroll must formally accept the offer of admission via an electronic admissions reply form and submit a nonrefundable enrollment deposit by the posted enrollment deposit deadline. Instructions for doing so and the deadline are included in the applicant's decision letter. Students who are offered admission but do not intend to enroll are encouraged to complete the electronic admissions reply form to decline their offer of admission. Failure to respond by the stated deadline may result in withdrawal of the application.

Notification of any school-based financial awards and Financial Aid Notices (FAN) will be sent to admitted students within a few weeks of admission; FANs include federal loans for which the student may be eligible.

Students may be offered a place on a waiting list and must accept or decline via an electronic reply form by the deadline noted in their decision letter. Should space be available after the initial enrollment deposit deadline for admitted students, students who accept a place on the waiting list will be considered for admission. All students who accept a place on the waiting list receive a final decision by the end of June.

Deferred Admission

Applicants are admitted only to the class for which they have applied and should not apply until they are prepared to undertake professional studies. Deferrals will be granted for Teach for America, Peace Corps, AmeriCorps, City Year, and military service. Deferrals for other reasons may be granted on a case-by-case basis. Deferrals are not granted for financial reasons. Deferrals are granted for one year (next fall admission cycle). Students interested in requesting a deferral should contact the Office of Student Services via email as soon as possible after receiving their admissions decision at nicholas-admissions@duke.edu. Approved deferral requests require receipt of a tuition deposit; should the student choose not to matriculate, they will forfeit their deposit and be required to reapply for future admission consideration. Any financial aid awards will be canceled and re-evaluated alongside the next admitted student class, and a new application for need-based financial aid will be required.

Academic Regulations

Course Planning

It may be possible to change coursework advisors, with the approval of both the current and prospective advisors, and it is common to have as a master's project advisor someone other than the coursework advisor. It also may be possible to change concentrations through the end of the second semester (out of four required semesters of enrollment), provided that the student has met the prerequisites for the new concentration and provided that it is still possible for the student to meet all requirements of the new program before graduation. A student changing concentrations will usually be assigned a new coursework advisor. The student is responsible for ensuring that all degree requirements have been met. Faculty coursework advisors and staff in Student Services are available to advise and assist students but the final responsibility rests with the student. Concentration changes, after the second semester, may also be considered if the student meets all requirements of the new program before graduation.

Students in the DEL-MEM Program have the majority of their required coursework planned for them. Students work directly with the faculty program director, the staff program coordinator, and/or the Nicholas School registrar to ensure they are meeting these requirements before graduation; however, the responsibility rests with the students to successfully manage their coursework. DEL-MEM students will be assigned a master's project advisor during their second semester.

Language Requirements

Non-native English speakers applying to the MEM, MF, and DEL-MEM should consult with that program for specific requirements beyond the TOEFL, nicholas.duke.edu/admissions/how-apply.

Accommodations

Students desiring accommodations to support their studies should contact the Student Disability Access Office (access.duke.edu; email sdao@duke.edu). Students must provide appropriate documentation and discuss their needs with the professionals in that office. Duke University makes its own decisions regarding accommodations; just because a student received accommodations previously does not guarantee accommodations at Duke. If SDAO determines that accommodations are warranted, the office will communicate those accommodations to the ADA liaison in the Nicholas School, who will in turn communicate those accommodations to the student's instructors. Students are responsible for providing course enrollment details to the ADA liaison in advance of each semester. Students may not request individual accommodation of instructors and instructors should direct students to SDAO or the ADA liaison for the school. The ADA liaison will work with the student and the instructors to ensure compliance.

More information about the SDAO is available in the Duke University Bulletin at registrar.bulletins.duke.edu/resources/sdao.

Registration

Entering students who enroll in the Master of Environmental Management, Master of Forestry, or DEL-MEM degree programs will receive instructions from the Nicholas School registrar about registering for courses. Registration for new students typically takes place over the summer or during orientation week. Students register for succeeding semesters at times scheduled in the university calendar.

Registration is approved by the advisor and completed by the student using an online registration system. Registration is required to take courses for credit or audit. A student must be registered to establish eligibility for university and other loans, the student health service, and study and laboratory space. All tuition and fee payments and any indebtedness must be settled before registration can be completed.

Course Credits

Candidates for the professional degrees are considered fully registered when they enroll full-time for the number of semesters required in their individual degree programs (for example, four semesters for the MEM or MF degree). Students normally register for 12 graduate credits per semester, although a variation from 9 to 16 graduate credits is common. Students must have the permission of their advisor to register for more than 16.5 graduate credits in a semester, and all students who wish to enroll for fewer than 9 graduate credits must make a formal request to the education committee to study part-time.

Courses below the 500 level may not be applied toward the required credits needed for a master's/graduate degree, except for courses taught at Duke Law School. With the approval of their program, graduate students may enroll in lower-level courses as a course overload, but these courses will not count toward any graduation requirement (including electives) and will not count toward the credits required to demonstrate full-time enrollment status. Graduate/professional students interested in enrolling in courses below the 500 level must complete the appropriate registration form and submit it to the Office of Student Services.

The DEL-MEM Program is a minimum thirty-course credit degree program. To complete the DEL-MEM Program within four consecutive semesters, students typically take between 6 and 9 graduate credits per semester. Permission is required to register for fewer than 6 graduate credits or more than 12 graduate credits in a semester. Students must be enrolled with at least 6 graduate credits to be considered a full-time student and to receive federal financial aid, if eligible. Students registering for fewer than 6 graduate credits per semester are not eligible to receive federal financial aid.

Transfer Credits

The Nicholas School does not accept transfer credits; courses taken through the Interinstitutional Agreement (see below) are not considered transfer credits.

Late Registration

All students should register at the times specified by the university.

Drop/Add

The period for dropping and adding courses ends on the tenth calendar day of the fall and spring semesters. During the summer, dropping or adding courses is limited to the first three days of the term. Students are advised to make all class changes on the first day of class if possible.

Reciprocal Agreements with Neighboring Universities

Students enrolled full-time in the Nicholas School during the regular academic year may enroll for up to 6 course credits (two course maximum) per semester at The University of North Carolina at Chapel Hill, North Carolina State University, North Carolina Central University, or any other university participating in the Interinstitutional Agreement if they are also registered for at least 6 course credits at Duke during the same semester. Similarly, graduate students at these universities may take up to 6 course credits per semester at Duke. In the summer, students may take courses interinstitutionally if they are enrolled at Duke for at least the same number of hours they wish to take at the other school(s); graduate students are limited to two summer courses at other institutions. This agreement does not apply to contract programs such as the American Dance Festival. The student must pay any special fees required of students at the host institution and provide their own transportation. A transportation service sponsored by the Robertson Scholars Program travels between Duke and Chapel Hill on a regular schedule during the academic year. The reciprocal agreements with neighboring universities do not apply to distance-learning programs. In general, online or distance-learning courses are not part of the interinstitutional agreement. If a student identifies a course at one of the participating institutions that is offered only in an online format, the student may petition the central registrar's office for permission to take the course through the Interinstitutional Agreement. Decisions will be on a case-by-case basis with no expectation of setting a precedent.

Immunization Requirement

North Carolina law requires students entering a college or university in the state to be immunized against measles, rubella, tetanus, pertussis, diphtheria, and in some cases, polio. Each entering student is required to present proof of these immunizations in accordance with the instructions contained in the Student Health Services form provided with the student's matriculation material. This form should be completed and returned to Student Health Services prior to the student's first day of classes. Duke University cannot permit a student to attend classes unless the required immunizations have been obtained. Students who fail to meet the immunization requirements will be withdrawn from the university. DEL-MEM students are exempt from this requirement unless the student chooses to take courses on campus. If that happens, then a Certificate of Immunization or record of immunization must be presented on or before the date the person first registers for a semester.

Courses

Course Descriptions

Courses offered by the school are described in this bulletin. However, courses are subject to change. Prior to registration for a given term, the Office of Student Services prepares a list of courses to be offered.

Independent Study

All professional degree students have the opportunity to pursue independent study with individual faculty members. After discussing the potential for an independent study with a faculty member, students register to take independent study credit under ENVIRON 593, ENVIRON 791, ECS 791 or ENVIRON 997 for DEL-MEM students.

Field Trips, Field Work, and Travel Courses

The MEM and MF degrees are applied and experiential in nature. Field trips and travel courses enhance that experiential learning and add significant value to the learning experience. Course Field Trips are defined as experiential learning trips or field work taking place outside the normal assigned classroom and are considered a required or recommended (but optional) element of a course.

Planning for Travel Courses

Faculty should determine whether experiential learning opportunities are required or optional for a course offering. Consideration should be given to whether there are reasonable alternatives aligned with course objectives for required experiential learning activities. Students who do not participate in optional experiential learning activities should not be negatively impacted through the grading process or otherwise.

Faculty are responsible for planning and working with the Nicholas School administrative staff on the logistics of field trips, including transportation, meals, communications, and safety protocols.

In all cases where a field trip or field work necessitates a student leaving campus, the following policies and procedures must be observed:

- The instructor must include all details regarding any field or travel for the course in the course syllabus.
- The instructor must discuss the field trip with the students enrolled in the course on the first day of class.
- Required field trips may not be scheduled to conflict with other courses.
- Students must have the opportunity to consider the requirements of the course and make an enrollment decision prior to the conclusion of drop/add.
- If required, the student must sign a participation agreement provided by the instructor and submit the signed agreement to Experiential Learning prior to departure. Students who do not sign the agreement may not participate in the field experience.
- The instructor must file an Emergency Response Plan with Experiential Learning in advance of departure.
- Transportation must be provided; students may not use personal vehicles for travel related to field trips. Drivers must be instructors or teaching assistants and they must have completed the required training.
- Some courses will require course fees to offset the cost of travel. Those course fees will be listed in DukeHub and assessed to the student's bursar account. Should the student need additional financial aid to cover the additional travel cost, the student should consult their financial aid counselor.

Master's Project—MEM Students

All MEM students must complete a master's project in which knowledge, skills, and tools acquired during the two years of study are applied to address environmental problems. Students will receive 4 to 6 course credits for the master's project; some exceptions apply to dual degree (e.g., MBA, MPP, and MCRP) students. These students must submit a project proposal that has been approved by the MP advisor according to published deadlines. During the final two terms, major emphasis should be placed on the project.

Most students in the MEM program complete collaborative, or group, master's projects. In group master's projects, teams of three to five students take on a real-world challenge facing a client. Students work directly with the client, under the supervision of an assigned faculty advisor, to address the challenge. These projects begin in the fall semester of the students' second year and are completed in the following spring semester. Fewer numbers of students complete individual and/or more research-based master's projects. Students in this group should identify their project during the second term of study, work on it during the summer between academic years and complete it during the third and fourth terms.

Students may use summer internships as the basis for master's projects and may consult closely with a supervisor outside the school to complete the work, though their faculty supervisor is the final reviewer and grader of the project. In most cases, students reach out to faculty members whom they would like to have serve as the advisor on their project, taking into account subject matter, experience, and interest. Concentration Program Chairs may guide students on which faculty would be well suited to advise their projects.

Students should maintain close contact with their advisors throughout their work on the master's project. Advisors review and approve the project in mid-March for public presentation in early April. All students are required to make a public presentation of their project at a Symposium in April or December that is open to the public.

All completed master's projects are required to be uploaded to Duke Library's DukeSpace website and are searchable across the Internet. If the master's project contains sensitive information (e.g., from the client's point of view, in terms of future publication elsewhere, or sensitivity for commercial ventures) students may create a redacted version of the written master's project or request an embargo of up to two years.

Master's Project—MF Students

The Master of Forestry degree, which is accredited by the Society of American Forester (SAF), requires students to complete a 4-credit capstone course. Students would have the option to conduct a 3-semester master's project in addition to the capstone, but they are not required to do so. Client-based, 2-semester, group master's projects are not available to Master of Forestry students.

Master's Project—DEL-MEM Students

All DEL-MEM students must complete a master's project of 4-6 course credits. The project should be identified during the second term of study, initiated during the summer between academic years, and completed during the third and fourth terms. During the final two terms, major emphasis should be placed on the project. In completing the project, the student applies theoretical and analytical training acquired during the two years of study to actual natural resource or environmental problems. DEL-MEM students are encouraged to use current professional career interests and projects as the basis for their master's project and may consult closely with a supervisor outside the school, as well as with their faculty master's project advisor, to complete their work. Students should maintain close contact with their advisors during the development and writing of the master's project. Projects should reach the final stages of completion by midterm of the final semester. The advisor is responsible for critical assessment and grading. All students are required to make a public presentation of their project at a Symposium in April or December that is open to the public.

Auditing

Students registered for a full course load may audit courses free of charge. Otherwise, the audit fee is $736 per course credit. In classes in which enrollment is limited, students enrolled for credit will receive priority. Audited courses are recorded with a grade of AD for satisfactory completion or WA for unsatisfactory completion on the student's permanent record. Regular attendance is expected. Changes from audit to credit are not permitted after the Drop/Add period. Audited courses may not be used to fulfill either concentration or graduation requirements. Audited courses may not be counted toward the number of credits required for graduation. Students must obtain written permission from the instructor to audit a course.

Retaking Courses

Courses required as a part of the concentration elected by the student or required by the advisor must be retaken if failed. Courses prerequisite to more advanced courses the student wishes to take must be retaken if failed. Elective courses may be retaken if the student wishes to do so. See the section on grades below for additional information.

Class Attendance

It is expected that students attend class every time the course meets. It is understood that on occasion the student may need to miss class due to illness. Whenever possible, as a courtesy to the instructor, the student should be in communication with the instructor in advance of the absence. If the absence is unexpected due to illness, the student should alert the instructor as soon as possible. If a medical condition or extended illness causes the student to miss more than one class meeting, a doctor's note should be provided to Student Services. If a medical condition or extended illness causes absence from a test, mid-term, or exam, the instructor may arrange an alternate test date, at the instructor's discretion. If such is the case the student must provide a doctor's excuse to Student Services.

Grades

Grading System

The grading system used in the Nicholas School and The Graduate School is as follows: A (exceptional); B (good); C (satisfactory); F (failing); I (incomplete); Z (continuing). Plus (+) and minus (-) notations are permitted. Course instructors are unable to change grades once final grades have been submitted unless there has been an error in calculation or transcription.

The grades of P (pass) and F (fail) are used in the Nicholas School for seminars, master's projects, concentration seminars, and modular courses. At the instructor's option, the grades of P or F or regular letter grades are used for intensive courses and independent projects. If a student wishes to take a regularly letter-graded course on a Pass/Fail basis, permission for the Pass/Fail option must be obtained in writing from the instructor prior to registration for the course. Regularly graded courses taken on a Pass/Fail basis may not count toward graduation or fulfill programmatic requirements.

The grade of Z is assigned for an independent project or a master's project that extends over a period of more than one semester; a final grade is given upon completion of the project.

Incomplete Grades

A grade of I indicates that some portion of the student's work is lacking, for an acceptable reason, at the time grades are reported. Students unable to complete course requirements by the deadline must have communicated with the instructor well in advance of the conclusion of the course so that the instructor may determine if an Incomplete is appropriate and necessary. Students who fail to communicate with the instructor and who fail to complete the course requirements will be assigned a failing grade (F). Requirements of all courses in which an instructor assigns a grade of Incomplete must be fulfilled within one calendar year following the date of the assignment of the incomplete grade.

In exceptional circumstances, upon recommendation of the professor who assigned the grade of Incomplete, the dean of the Nicholas School may extend the time for completion of the course requirements. If, in the judgment of the professor and the student's advisor, completion of the requirements is not a reasonable alternative for the student, the student may petition the Education Committee to allow the grade of I to stand permanently on their record. No student will be allowed to graduate with an Incomplete unless permission has been granted for it to stand permanently on the record.

Failure

Failing a course may leave a student short of credits for graduation or lacking concentration curriculum requirements. If the failed course is not necessary to complete program curriculum requirements, the student may substitute another course to make up the lost credit, with the advisor's approval. If the failed course is necessary to complete concentration curriculum requirements, the student must retake either that course or an acceptable substitute, with the advisor's approval. An Independent Study is not an acceptable substitute for a failed course. Both the original failing grade and the grade received for the retaken or substitute course will appear on the student's transcript.

Failure of a course also subjects the student to dismissal.

Probation and Dismissal

Any of the following situations will result in probationary status for the following semester:

- Failing one or more courses
- Two or more C (C-, C, C+) grades in a semester
- Failing to maintain a cumulative average of at least B-

A student on probation must meet jointly with their advisor and one additional regular-rank faculty member selected by the student and their advisor before the end of Drop/Add (preferably before the beginning of the semester) to discuss what is going wrong and how to remedy it. These faculty committees or the Education Committee have the discretion to suggest that a student take a leave of absence for a semester if they judge that to be the best way for the student to improve academic performance. A student on probation must meet again with the advisor and second faculty member a month after the first meeting to review academic progress.

Any student who does not meet academic standards at the end of the probationary semester will be subject to dismissal from the Nicholas School. The Education Committee will make decisions on dismissal.

In addition, students must have at least 48 graduate credits (30 graduate credits within the DEL-MEM Program) with a grade point average of B- (2.7) or better to graduate. Students who fail to meet that standard during their final semester must take additional Duke course credits to meet the standard before they can graduate. Any exceptions are at the discretion of the Education Committee.

1. For students placed on probation, the Nicholas School's policy regarding awards from the school (e.g., merit-based financial aid, need-based grants, fellowships, scholarships, recognition awards with no monetary component) is as follows: Students not in good standing (with regard to academics or honor code) are not eligible for any new awards from the Nicholas School (e.g., scholarships, fellowships, school-supported internships, and recognitions without monetary component) whether academic performance is a criterion or not.
2. Students holding scholarships or other awards when they are put on probation may be allowed to keep them for one semester if the student's petition to do so is approved by the senior associate dean for academics and the assistant dean for student services. Any student not released from probation after one semester will not be eligible to retain the scholarship/fellowship.

Students who are dismissed for honor code or other serious violations must relinquish any awards.

Satisfactory Academic Progress

Federal regulations require that, in order to be eligible for assistance from any Federal Title IV student aid program, including but not limited to the Federal Direct Unsubsidized Loan and the GradPLUS loan, a student must be making satisfactory academic progress.

For the purpose of Title IV financial aid eligibility only, a student enrolled in the Master of Environmental Management and/ or Master of Forestry degree in the Nicholas School of the Environment as a full-time degree-seeking student must meet the following standards of satisfactory academic progress:

1. The student must have a cumulative grade point average of at least a B- (2.7) or higher after completing their first semester and at the end of each subsequent semester (fall and spring semesters; does not include summer terms one and two).
2. A student in either the MEM or the MF must earn their degree before earning 72 course credits (150% of the standard minimum 48 credits). A student in the dual MEM/MF must earn at least 72 course credits to graduate and successfully complete the degree requirements before earning 108 course credits. A student in a dual degree program must complete successfully at least 36 course credits and earn their degree before earning 54 course credits on their Nicholas School transcript. Students must successfully complete all of their degree requirements before obtaining 150% of the credits needed to graduate from each program as outlined.
3. The student must earn satisfactory grades in at least 67% of their cumulative credits. Satisfactory grades in the Nicholas School are A, B, C (including + and -), CR, and P.

Any student who fails to meet satisfactory academic progress will be placed on Title IV warning for one semester. During that semester, the student will continue to be eligible for Title IV aid. At the end of a term during which a student is on Title IV warning, if the student still fails to meet any of the requirements, the student will become ineligible for Title IV assistance.

Academic Irregularities

All cases falling outside the stated policies and procedures of the school are referred to the Education Committee for decision. The committee reviews and makes decisions regarding course requirements for graduation, student probation, and dismissal, student petitions for waivers of degree requirements, and all actions that deviate from established academic regulations. Any waiver requests to reduce credits, course requirements, minimum semesters of tuition, or semester enrollment requirements must be made before half of the total credits are completed for the student's degree program.

A student who desires to petition the committee should do so by writing to its chair. A precise statement of the reason for the request is required. The student will be notified in writing of the decision of the committee by the chair.

Transcripts of Credit

A student who is registered for a course and who successfully completes the requirements as prescribed by the instructor receives credit on university records. A transcript fee, charged to all students during their first semester of enrollment, covers all future transcript requests. Only the Office of the University Registrar issues transcripts of credit. Currently enrolled students may request transcripts through DukeHub. Alumni wishing to request transcripts should go to registrar.duke.edu/student-resources/transcripts and follow the instructions for requesting an official transcript. Diplomas are withheld for students who fail to clear all financial obligations to the university upon graduation.

Length of Study

For full-time on-campus students and DEL-MEM students, the typical time for completing a professional master's degree is four semesters, not including summer. All degree requirements for the MEM, MF, and DEL-MEM must be completed within five years of the first term of admission. Any term/s during which the student is not enrolled for any number of credits still counts and is included in the five-year window for completion.

For a typical dual degree student, the normal time for completing both professional degrees is five to eight semesters depending on the other concurrent degree being pursued. The time to degree completion remains five years from the first term of admission. Any term/s during which the student is not enrolled for any number of credits still counts and are included in the five-year window for completion.

Leave of Absence or Withdrawal

Occasionally, special circumstances require a student to leave the university for one or two semesters at a time. If the reason for the departure is considered an emergency, the student may request a leave of absence for a period not to exceed one year. If the reason is to study elsewhere in a combined degree program, a leave will be granted for the length of study. If the student plans to do field studies or an internship, they must maintain university enrollment by paying a registration fee each semester of the academic year until full-time study is resumed.

Under all circumstances, the student must request the leave for a specific length of time prior to departure from the university. Extensions must be requested if they are required for a maximum of two semesters, except as indicated above. Failure to request a leave or an extension of leave may result in a penalty charge and/or dismissal from the university. A student is eligible to request a leave of absence only after having completed at least one semester of study.

A student who wishes to withdraw from the university must make a written request to do so. For refunds upon withdrawal, see the section on financial information on the page Tuition Policies.

Graduation

Even if degree plans are tentative, a candidate for a degree must apply for graduation at the designated time for each semester. The application is valid only for the semester for which it is filed. If the student does not receive the degree as expected, they must apply again at a later time.

All candidates are encouraged to attend the commencement exercises at which their degrees are to be awarded. A student who is unable to attend must notify the Nicholas School registrar no later than four weeks prior to commencement to receive the degree in absentia.

Concurrent Degrees

The most current information on all concurrent degree programs can be found at nicholas.duke.edu/academics/masters-programs/concurrent-degree-programs. In general, the Nicholas School works with the partner school to coordinate enrollments between the two schools. Students must apply to and be admitted by each school, and each school makes its own admission decisions. Typically, each school agrees to reduce by one semester the number of credits a student must earn, and the student agrees to tie the two degrees together so that the student may not earn one degree without the other.

Financial aid for concurrent degree students will be adjusted to take into account the reduction in required semesters of enrollment and credits needed. Students pursuing or interested in pursuing a concurrent degree should consult with the financial aid counselor for the Nicholas School for details particular to their specific concurrent degree program. Students in the Duke Environmental Leadership (DEL) MEM Program are not eligible to pursue a dual/concurrent degree.

Master of Environmental Management and Master of Forestry

With careful planning of their curriculum, students can earn both the MEM and the MF degrees concurrently. The requirements for earning both degrees are as follows:

- The student must qualify for either the MEM or MF degree by earning 48 graduate credits under the requirements outlined in the previous section.

- For the second degree, the student must complete an additional 24 graduate credits of study that, in combination with courses taken for the first degree, meet the substance of the requirements for the second degree. Two additional semesters in residence are normally required, although, with careful planning, the student may complete both professional degrees in a total of five semesters.
- The Master of Forestry degree requires students to complete a 4- credit capstone course. Students would have the option to conduct a 3-semester master's project in addition to the capstone, but they are not required to do so.

Determination of eligibility for the degrees will be made on an individual basis and will consider the educational background and objectives of the student.

Master of Business Administration

Students interested in a professional degree in environment and business at Duke have two options: 1) the Master of Environmental Management (MEM) degree in the Business and the Environment Concentration of the Nicholas School or 2) concurrent Master of Environmental Management or Master of Forestry/Master of Business Administration degrees (MEM or MF + MBA) from the Nicholas School of the Environment and the Fuqua School of Business. At least three years of study are required to earn the combined degrees of Master of Environmental Management/Master of Business Administration or Master of Forestry/Master of Business Administration. At least 36 graduate credits within the Nicholas School, recorded on the Nicholas School transcript, are required to receive the MEM or MF degree. Students are also required to fulfill the MEM master's project requirement by either reporting on an applied project or expanding on a project that they have already completed during their MBA degree. A typical program sequence would involve spending the first year in the Nicholas School followed by a year in the Fuqua School of Business and concluding with the final year of combined work in both schools.

These concurrent degrees stress analytical reasoning and management science, while providing the student with knowledge of current problems in the natural resources, energy systems, and sustainable business practices. The study of managerial, resource, and energy economics, organization theory and management, strategy and natural resource management, the legal environment, and the public policy aspects of resource industries form a substantial component of each degree.

Because of the academic demands of these degrees, those entering without the necessary analytical skills or life science background may be required to take additional work beyond that specified.

Students who wish to undertake both the Master of Environmental Management or Master of Forestry and Master of Business Administration degrees must apply and be admitted by both the Nicholas School and the Fuqua School of Business. Students electing to pursue the MEM or MF concurrently with the MBA must complete the requirements for both degrees before either degree will be awarded. For information on the Master of Business Administration degree, the prospective student should visit fuqua.duke.edu.

The concurrent MEM/MBA or MF/MBA is also an option at the Nicholas School and the Kenan-Flagler School of Business at the University of North Carolina-Chapel Hill. The application and admissions processes are completely separate; applicants must meet Nicholas School requirements as well as requirements stated by Kenan-Flagler. The sequence of enrollment between the two schools differs slightly as well. Students considering pursuing the concurrent MEM/MBA or MF/MBA at UNC should consult with a member of the Student Services team for additional details.

Detailed information on the MEM or MF + MBA Program and requirements can be found at nicholas.duke.edu/academics/masters-programs/concurrent-degree-programs.

Master of Public Policy

Students interested in a professional degree in environmental policy at Duke have three options: 1) the Master of Environmental Management (MEM) degree in the Environmental Economics and Policy Concentration of the Nicholas School; 2) a Master of Public Policy (MPP) degree from the Sanford School of Public Policy; or 3) concurrent MEM/MPP (or MF/MPP) degrees from the Nicholas School and the Sanford School.

The concurrent MEM (or MF)/MPP degree provides training in the politics and economics of resource and environmental policymaking. Emphasis is placed on understanding the social and political forces involved, developing facilities with quantitative and logical methods of forecasting, and evaluating policy consequences. Knowledge of the uses and limitations of policy analysis and an awareness of the ethical dimensions of policy choice are also stressed.

The concurrent degree takes three years to complete. Typically, the first year is devoted to study in the Sanford School of Public Policy, the second year is spent in the Nicholas School of the Environment and the third year combines work in both the Nicholas School and the Sanford School. At least 36 graduate credits within the Nicholas School, as recorded on the Nicholas School transcript, are required to earn the MEM or MF degree. A summer internship with a resource or environmental agency, or with a related legislative, judicial, or interest group, is required for the policy degree. Students in this concurrent degree program have the option of doing two separate master's projects (MP), or one combined MP. Concurrent degree students working in a group MP in the Nicholas School must choose the two-MP option. Students who choose to complete two separate MPs may enroll in up to 6 MP credits (ENVIRON 899) at the Nicholas School, and 6 credits at Sanford (PUBPOL 807 and PUBPOL 808). Students who choose to complete one combined MP may enroll for 3 credits in PUBPOL 807 in the fall, and 3 credits in ENVIRON 899 in the spring of their third year.

Students must apply to and be accepted by both the Nicholas School of the Environment and the Sanford School of Public Policy. For detailed information on the public policy degree, visit the Sanford School of Public Policy website at sanford.duke.edu.

Juris Doctor in Environmental Law

Environmental and natural resource issues increasingly require legal and regulatory knowledge for resolution. There is a growing demand for resource managers and scientists who have legal credentials; similarly, attorneys are facing more situations in which knowledge of natural resources and the environmental sciences is critical to the resolution of disputes. To satisfy these demands, the Nicholas School of the Environment and the Duke University School of Law have developed a cooperative arrangement to allow the pursuit of concurrent Master of Environmental Management (or Master of Forestry) and Juris Doctor degrees.

For students in the concurrent MEM (or MF)/JD Program, the Nicholas School requires 36 graduate credits, including a master's project. The School of Law requires 84 graduate credits in law, 12 graduate credits of which may be satisfied through courses taken in the Nicholas School.

Typically, a student will complete the first year of study at the Duke Law School and the second in the Nicholas School. During the third and fourth years, the student will take a combination of courses in both schools. Students electing to pursue the MEM concurrently with the JD must complete requirements for both degrees before either degree will be awarded.

MEM/JD candidates must apply to and be accepted by both the Nicholas School of the Environment and the Duke Law School. For information on the law degree, prospective students should visit Duke University School of Law, website for more information, law.duke.edu.

Detailed information on the MEM or MF+ JD Program and requirements can be found at nicholas.duke.edu/academics/masters-programs/concurrent-degree-programs.

Master of Arts in Teaching

Over the past several decades, international concern for protecting ecosystems has led to an increased need to educate citizens on the challenges facing the environment. Numerous education programs are now aimed at K-12 students as well as the general population. Environmental education is of increasing importance to those who prepare to teach, particularly in the sciences. Duke's concurrent degree program between the Nicholas School of the Environment and The Graduate School allows students to meet this challenge by earning a Master of Environmental Management (MEM) and a Master of Arts in Teaching (MAT) degree.

In this concurrent degree program, to earn the MEM degree students must complete 36.0 course credits in the Nicholas School, including a master's project. For the MAT degree, students will complete 30.0 course credits, including a full-year teaching internship and all requirements for the North Carolina teaching licensure in comprehensive science at the high school level. Competencies required by the state will be met through undergraduate courses taken prior to admission to Duke, science courses taken as part of the MAT, or courses taken as part of the MEM.

Students will normally enroll in the MAT Program during the summer and then complete an academic year of student teaching and MAT coursework prior to enrolling in the MEM Program for three semesters. Students electing to pursue the MEM concurrently with the MAT must complete requirements for both degrees before either degree will be awarded.

Students must apply to and be accepted by both the Nicholas School of the Environment and The Graduate School of Duke University, citing the Master of Arts in Teaching Program. Students admitted to the MAT Program in comprehensive science must hold an undergraduate degree in one of the natural sciences with significant undergraduate preparation in biology and chemistry. Organic chemistry is required.

Questions concerning the MAT degree should be addressed to the Director of the Master of Arts in Teaching Program, (919) 684-4353, educationprogram.duke.edu/MAT.

Detailed information on the MEM + MAT Program and requirements can be found at nicholas.duke.edu/academics/masters-programs/concurrent-degree-programs.

Master of Engineering Management

Duke's concurrent degree program between the Nicholas School of the Environment and the Pratt School of Engineering provides a broad perspective to blend the Master of Engineering Management (MEMP) students' engineering backgrounds and the Master of Environmental Management (or Master of Forestry) students' training in natural and social environmental sciences, resulting in graduates with a strong mix of technical and contextual knowledge and tools well suited to careers in several environmental sectors, particularly energy and environment, environmental health, and water resources. Students wishing to pursue the MEM in a concurrent arrangement with the MEMP should plan on two to three years of study.

Students must complete 36 graduate credits in the Nicholas School, including a master's project. An additional 24 graduate credits must be taken in the Pratt School of Engineering, including a required summer internship.

Prior to enrolling in the fall, students fulfill their required engineering internship in the summer preceding the fall term. During the first year, courses are split evenly between engineering and environment with an emphasis on core engineering courses. The second year includes elective credits in the Pratt School of Engineering and key core courses in the Nicholas School. During the third year, students will complete their master's projects for the Nicholas School; they may be able to finish in one additional semester or may require the full year to complete the remaining credits and the master's project.

Students must apply to and be accepted by both the Nicholas School of the Environment and the Pratt School of Engineering. Students electing to pursue the MEM or MF concurrently with the MEMP must complete requirements for both degrees before either degree will be awarded. Questions concerning the MEMP should be addressed to the Master of Engineering Management Program, Phone: (919) 660-5455; pratt.duke.edu/grad/masters.

Detailed information on the MEM or MF + MEMP Program and requirements can be found at nicholas.duke.edu/academics/masters-programs/concurrent-degree-programs.

Master of City and Regional Planning

The Master of Environmental Management (or Master of Forestry) and Master of City and Regional Planning (MEM/MCRP or MF/MCRP) dual degree program between the Nicholas School of the Environment at Duke and the Department of City and Regional Planning at the University of North Carolina at Chapel Hill provides this knowledge, along with the technical and analytical skills needed to become a leader in urban sustainability, resilience, and environmental stewardship. Individuals with expertise in environmental policy and finance, renewable energy, environmental health, or urban ecology, as well as urban planning and design, will be especially competitive in the emerging job market. MEM/MCRP graduates will find employment in the public and private sectors and nongovernmental organizations, and the dual degree will open employment options at the local (municipal) and regional levels.

MEM (or MF)/MCRP students must fulfill the core course requirements for each program and will earn separate degrees. The MEM (or MF) requires at least 36 graduate credits, while the MCRP requires at least 36 graduate credits, allowing MEM (or MF)/MCRP students to complete both degrees in three years (six full-time semesters). The UNC Graduate School will transfer up to 15 Duke credits to the student's UNC transcript upon completing the MCRP program.

The MEM (or MF) and MCRP programs each require a capstone Master's Project (MP)

- Students may fulfill their Nicholas School MP requirement by (1) completing a separate individual or group MP, or (2) reporting out and expanding on an applied project such as an independent study or a class project that they may have already completed as part of their MCRP studies by diving deeper into a related environmental component.
- Students fulfill their MCRP MP requirement by completing a final project of professional quality on a topic in their area of specialization. This is an independent project and students must complete it in their last semester in the program. Students may expand on work they have already completed as part of their MEM requirements by carving out an independent portion if the MEM project was a group project and by diving deeper into the Urban Planning component of the project.

Prospective MEM (or MF)/MCRP students apply separately to each institution, with admission to one program not guaranteeing acceptance into the other. The MEM (or MF)/MCRP program requires three continuous years of full-time study and leads to a Master of Environmental Management (or Master of Forestry) degree conferred by Duke, and a Master of City and Regional Planning degree conferred by UNC Chapel Hill. Students must complete requirements for both degrees before either degree will be awarded.

Students may begin at either Duke or UNC Chapel Hill and spend a full year as well as one semester of their third and final year in each program.

Detailed information on the MEM + MCRP Program and requirements can be found at nicholas.duke.edu/academics/masters-programs/concurrent-degree-programs.

Master of Theological Studies/Master of Divinity

Duke Divinity School's mission is to engage in spiritually disciplined and academically rigorous education in service and witness to the Triune God amid the church, the academy, and the world. We strive to cultivate a vibrant community through theological education on Scripture, engagement with the living Christian tradition, and attention to and reflection on contemporary contexts to form leaders for faithful Christian ministries. The curriculum for the Master of Divinity and Master of Theological Studies is designed to give students a solid foundation for wherever their calling takes them—be that ordination, lay ministry, nonprofit work, or a career in teaching. Classes cover Biblical studies, church history, Christian theology, World Christianity, ministry, worship, preaching, Biblical languages, the Black Church, and a variety of electives.

Duke's Master of Environmental Management (MEM) prepares graduates with deep subject matter expertise in an environmental topical area and combines that knowledge with a toolkit of cutting- edge, essential skills that can be immediately applied in a wide array of rapidly evolving environmental careers. Duke's Master of Forestry (MF) program seeks to instill in students a foundation of sound, structured theory coupled with practical forest management skills, to enable its graduates to think critically, act purposefully and make forest management decisions for the broadest benefit of current and future generations. The educational program leading to the Master of Forestry degree is accredited by the Society of American Foresters (SAF) eforester.org/, the largest professional forestry organization in the United States. Nicholas School students have the option to spend up to two semesters at the Duke Marine Lab, regardless of their concentration. Students in the Duke Environmental Leadership (DEL) MEM Program are not eligible to pursue this dual degree.

- *MTS + MEM/MF:* The program is completed in three continuous years of full-time study and leads to a Master of Theological Studies and Master of Environmental Management (or Master of Forestry) degrees. The MTS + MEM/MF program will be a 6-semester program requiring students to complete a minimum of 12 courses (48 credit hours) registered through the Divinity School for the MTS and 36 credits for the MEM and 39 credits for the MF registered through the Nicholas School.
- *MDVR + MEM/MF:* The program is completed in four continuous years of full-time study and leads to a Master of Divinity (residential) and Master of Environmental Management (or Master of Forestry) degrees. The MDVR + MEM/MF program will be an 8-semester program requiring students to complete a minimum of 20 courses (80 credit hours) registered through the Divinity School for the MDVR and 36 credits for MEM and 39 credits for the MF registered through the Nicholas School.

Questions concerning the dual/concurrent degree requirements and degree sequencing should be addressed to the NSOE registrar at nsoe-registrar@duke.edu. Detailed information on this program can be found at nicholas.duke.edu/academics/masters-programs/concurrent-degree-programs.

Concurrent Degrees with Other Universities

With the special permission of the education committee and the dean of the Nicholas School of the Environment, students are permitted, on an individual basis, to establish concurrent degree programs with certified graduate degree programs either within or outside of Duke University. In the past, students have designed such programs with law schools, business schools, and graduate engineering programs. As with the other concurrent degrees, the student must be enrolled in the Master of Environmental Management or Master of Forestry degree program for at least 36 graduate credits and be in residence for three semesters.

To receive permission to pursue a specially designed concurrent degree, the student must show an official acceptance from another certified graduate degree program. For additional information concerning special concurrent degrees, applicants should consult the Nicholas School Office of Student Services.

Tuition & Fees

Estimated Expenses for the 2025-2026 Academic Year

The following approximate costs are indicative of costs that can be expected by MEM and MF candidates; PhD students should consult the bulletin of The Graduate School for similar data. Students should expect that tuition and fees will increase annually; the amounts are determined by the school and the university and reviewed and approved by the Board of Trustees.

	ON-CAMPUS	DEL-MEM
Tuition	$48,088	$48,088
Student health fee	$1,006	-
Graduate student activity fee	$38	-
Recreation fee	$389	-
Graduate student services fee	$25	-
Transcript fee (first semester only)	$120	$120
Housing	$13,822	-
Food	$4,320	$4,320
Books and supplies	$660	$660
Transportation	$2,088	$1,962
Motor vehicle registration and parking	$273-$1,500	-
DEL-MEM Place-based Sessions Associated Costs (food, lodging, transportation)	-	$2,775

In addition to these fixed expenses, the student may incur other expenses, which will depend to a large extent upon individual tastes and habits. All on-campus students are required to carry major health insurance either through Duke's comprehensive medical insurance plan or by providing proof that other health insurance provides comparable coverage. International students are required to purchase Duke's student medical insurance plan. The average Duke Nicholas School student can plan on a budget in the range of $78,665 to $79,875 for the academic year. Students with spouses and children should expect to have higher expenses.

Specific tuition information for the Duke Environmental Leadership program can be found at nicholas.duke.edu/admissions/tuition-fees.

Flat-Rate Tuition

Professional degree students in the Nicholas School pay a flat rate of tuition per semester (excluding the summer session) (see Flat-Rate Tuition—Duke Environmental Leadership Program below for the DEL-MEM Program). Students enrolled in the regular two-year MEM or MF degree program are required to pay the flat rate tuition for a minimum of four semesters. Students in concurrent degree programs at Duke pay a flat rate to the university throughout their concurrent degree program that is split proportionately between the two programs regardless of where the student is taking courses in a particular semester; the tuition rate for the Nicholas School is equivalent to three semesters. Students in the concurrent MEM/MF program must enroll full-time for at least five semesters and pay the flat-rate tuition for a minimum of five semesters.

The flat-rate tuition allows Master of Environmental Management and Master of Forestry degree candidates to register for 9 or more credits for a fixed tuition payment per semester. The normal full-time enrollment is expected to be 12 graduate credits per semester, although credits may vary from 9 to 16.5 depending upon the student's academic and assistantship requirements. Permission is required to register for fewer than 9 or more than 16.5 credits in a semester.

If the student is permitted to be enrolled part-time (fewer than 9 course credits), they will be charged per course credit ($2,184 per unit for the 2025-2026 academic year). Students who are approved for part-time enrollment status are not eligible for school financial aid. Students must be enrolled in 6 credits to be eligible for federal loans. The per credit rate is available to professional degree students only after the minimum number of semesters of tuition have been paid (three, four, or five semesters depending on the degree program/s).

Students who wish to earn additional credits during the summer will be charged at the summer rate per course credit. Payment for summer session courses is in addition to the required four semesters at the flat tuition rate. Students who have completed the required semesters in residence and all course requirements except the master's project will be charged a minimum registration fee ($400 for 2025-2026) each semester until the degree is completed. Students being paid for a summer internship may not receive academic credit in addition to the salary.

All students are expected to be registered in residence, to be approved for a leave of absence, or to pay a minimum registration fee for each semester until their degree is completed.

Flat-Rate Tuition—Duke Environmental Leadership Program

Professional degree students in the Nicholas School DEL-MEM Program pay a flat rate of tuition per semester (excluding the summer session) for four semesters.

The DEL-MEM Program is a minimum thirty-course-credit program that must be completed in four semesters over two years. The flat-rate tuition allows Master of Environmental Management degree candidates to register for courses for a fixed tuition payment per semester. To complete the DEL-MEM Program within the required amount of time, students typically take between 6 and 9 credits per semester. Permission is required to register for fewer than 6 credits or more than 12 credits in a semester. Students must be enrolled with at least 6 credits to be considered a full-time student and to receive federal financial aid, if eligible. Students registering for fewer than 6 course credits per semester are not eligible to receive federal financial aid.

Students who have completed the required four semesters and all course requirements, except the master's project, will be charged a minimum registration fee ($400 for 2025-2026) each semester until the degree is completed.

All students are expected to be registered, to be approved for a leave of absence, or to pay a minimum registration fee for each semester until their degree is completed.

Tuition & Fees

Tuition Policies

Payment of Accounts

Invoices for tuition, fees, and other charges are sent electronically by the Office of the Bursar and are payable by the invoice due date. As a part of the agreement of admission to Duke University, a student is required to pay all invoices as presented, unless other arrangements are made in advance. Students interested in arranging a payment plan should review the information at the Bursar's website at finance.duke.edu/bursar/Payments/#Bursarmonthlypaymentplan.

Late Payment Charge

If the total amount due on the student invoice is not received by the invoice due date, a penalty charge will be accrued from the billing date and applied to the past due balance. The past due balance is defined as the previous balance less any payments and credits received during the current month. Student loan payments already accepted and in process in the system will not cause a late payment charge.

Restrictions

If the total amount due on the student invoice is not received by the due date, the student will be considered in default and will not be allowed to register for classes, receive a copy of the academic transcript, have academic credits certified, be granted a leave of absence or receive a diploma at graduation. In addition, an individual in default may be subject to dismissal from the university.

Tuition Refund Policy

In case of withdrawal from the university, Title IV federal financial aid received by students enrolled for the first time at Duke will be refunded on a pro rata basis. The pro rata formula is calculated by multiplying the total school charges by the remaining fraction of the enrollment period for which the student has been charged, rounded downward to the nearest 10 percent, less any unpaid charges owed by the student. The pro rata refund policy does not apply to any student whose withdrawal occurs after the 60 percent point in the period of enrollment. Sample refund calculations are available from the Student Services office.

If the student receives federal financial aid but is not attending the university for the first time or if the student does not receive federal financial aid, tuition will be refunded or carried forward as a credit for later study according to the following schedule:

WITHDRAWAL	REFUND
Before classes begin	full amount
During first or second week	80%
During third, fourth or fifth week	60%
During sixth week	20%
After sixth week	none

School-based financial aid will be canceled if a student withdraws from the university. Doing so could leave an outstanding balance on the student's account that would need to be paid by the student. Should the student reapply for admission at a later time school-based aid is not guaranteed. Students will be considered in the pool with other students admitted for that term.

Audit Fee

Students registered for a full course load may audit courses without charge. Otherwise, audit fees are $736 per credit.

Transcripts

Official transcripts are available upon request from the Duke University Office of the University Registrar. During their first semester in residence, students are charged a fee that covers all future requests for official transcripts. The Nicholas School of the Environment cannot issue official transcripts. Current students may order transcripts through DukeHub. For more information, visit registrar.duke.edu/student-records-resources/transcripts-and-verifications.

Student Health Fee

All students are assessed a fee for the Student Health Service. This fee is distinct from health insurance and does not provide major medical coverage.

Medical Insurance

All on-campus students are billed for major medical/health insurance in the fall semester unless proof of other insurance is provided. Family plans are available through the university's insurance vendor for an additional fee. All international students will be registered automatically for the Duke Student Medical Insurance policy. International students are required to carry health insurance for a spouse or children living in Durham.

Students enrolled in the DEL-MEM Program are exempt from the health insurance fee. However, DEL-MEM students opting to enroll in the Duke Student Medical Insurance plan can do so by contacting the university's insurance vendor.

Tuition and Fees for the Summer

MEM and MF students who wish to take additional credits during the summer should expect to do so through other departments in the university or at the Duke University Marine Laboratory in Beaufort. Students should consult with their advisors to make sure the courses are appropriate for their program of study. Tuition and fees for summer study depend on the department. Students choosing to study at the Marine Lab during the summer are still required to pay four full semesters of tuition and be in residence for at least three semesters in the pursuit of their degree. Information on fees, housing, policies, and procedures related to the Duke University summer session is available at summersession.duke.edu.

Summer session coursework cannot be considered a substitute for the required semesters in residence during the academic year, nor does it reduce the flat rate tuition for the academic year. DEL-MEM students wishing to study during the summer at the Marine Lab may submit a request to the DEL faculty program director for permission. DEL-MEM students who are permitted to take summer courses at the Marine Lab are still obligated to be enrolled full-time for four semesters and pay four semesters of full-time tuition in addition to any tuition and fees required at the Marine Lab.

Students wishing to take courses at other institutions through the Interinstitutional Agreement must be enrolled in the same number or more credits at Duke during the same summer term.

Recreation Fee

A mandatory fee will be charged to all registered students for usage of campus recreational facilities. Students' spouses or domestic partners are eligible to use the facilities for an additional fee. Students enrolled in the DEL-MEM Program are not assessed this fee. Local DEL-MEM students wishing to use campus recreational facilities may do so for a fee.

Debts

Students are expected to meet all financial obligations to the university prior to completion of the degree. Failure to pay all university charges by the due dates specified by the university will bar the student from registration, class attendance, receipt of diplomas, certification of credits, leave of absence, or graduation until the account is settled in full. Further, an individual in default may be subject to dismissal from the university.

Financial Assistance

Financial assistance in the form of merit-based scholarships, fellowships, or assistantships as well as limited need-based grants, is available for qualified students. Funds to support these awards are limited. As a result, all students must have other financial resources available to support their studies. For many students, the federal loan programs provide a large portion of the funds necessary to cover the cost of attendance. Students in the DEL-MEM Program may also be eligible for limited financial support from the school.

All professional degree students who are US citizens or permanent residents must file the Free Application for Federal Student Aid (FAFSA) to be considered for student loans and work-study. A separate application must be filed for each academic year. Applicants may obtain a FAFSA online at studentaid.gov. The report should be sent to Duke University code 002920. Professional degree applicants must also complete the financial aid section of the Application for Admission.

Scholarships and assistantships are awarded based on a combination of demonstrated outstanding academic ability, perspectives, and experiences, and demonstrated professional promise as seen on the application for admission. Scholarships are obtained from foundation grants, private industry, individual donors and school funds, all of which are in limited supply. Consequently, only highly qualified students can expect to receive awards.

Duke Aid (Non-Nicholas School). Students receiving scholarships from other Duke sources that cover their full-tuition, such as the University Scholars Program, will have their Nicholas School merit-based aid replaced by the other scholarship, if applicable. During the second year enrolled at the Nicholas School, if the other scholarship is not awarded for a second year, the student will receive the original Nicholas School merit scholarship that was awarded at the time of admission, if applicable. If a student has received a need-based grant as part of their Nicholas School financial aid, they will retain that grant during the year their tuition is being covered by the non-NSOE scholarship. In no case can the total amount of aid (merit, need or loans) exceed the overall Cost of Attendance (COA). Aid will be reduced to equal the COA.

Concurrent Degree Students. Students who pursue a concurrent degree will have their financial aid adjusted and should communicate with the financial aid counselor to understand the adjustments. Additional information on the NSOE website, nicholas.duke.edu/about/policies/tuition-and-financial-aid-policy-concurrent-degree-students.

Research assistantships are obtained primarily from grant and contract funds awarded to various faculty in the school. University-funded assistantships may be available for students who have sufficient experience to contribute to one or more ongoing research or academic programs. Research assistantships awarded at the university level are extremely limited, typically awarded only to doctoral students and therefore, should not be relied upon by MEM and MF students as a source of financial support. Assistantships awarded by the Nicholas School are merit-based and pay a salary. They do not carry any sort of tuition waiver or stipend.

Pursuant to the Tax Reform Act of 1986, students performing any services (whether degree-related or not) required by their scholarship, fellowship, or assistantship must have income taxes withheld. However, if the student anticipates no tax liability at the end of the calendar year, they can note “exempt” on the state and federal withholding forms and no taxes will be withheld. Income tax information is reported to the student by the university in January.

In all instances, admission to the Nicholas School is a prerequisite for the award of assistance in any form. If offered financial assistance, professional degree students typically receive the award for two years of study; it is expected that they will complete their degree within this period. The school has the right to examine the progress of each student to determine eligibility for continuation of awards beyond the first year. Students not in good standing (with regard to academics or honor code) are not eligible for any new awards from the Nicholas School (e.g., scholarships, fellowships, recognitions without monetary component) whether academic performance is an eligibility criterion or not.

No student will receive financial aid while on probation unless an appeal is approved by the associate dean for academics and the assistant dean for student services.

In no case may the amount of financial aid awarded to a student from all sources in a given year exceed the estimated annual costs of attending the Nicholas School as determined by the school.

Financial Aid for Concurrent Degree Students

NSOE students in a concurrent degree program with another Duke program will have an adjustment made to their NSOE tuition charge to a new blended tuition rate, as well as an adjustment in their NSOE financial aid award. Students in a concurrent degree program will be charged the equivalent of three semesters of tuition; similarly, concurrent degree students who have been offered school-based aid will receive the equivalent of three semesters of aid.

Students pursuing a concurrent degree with a non-Duke program are obligated to three semesters of enrollment and payment of three semesters of tuition and fees. School-based aid offered at the time of admission will be awarded for three semesters to coincide with the three semesters in which the student is enrolled at Duke.

In all cases, students pursuing or considering pursuing a concurrent degree must complete the survey found at the Nicholas School website, nicholas.duke.edu/about/policies/tuition-and-financial-aid-policy-concurrent-degree-students, and meet with the school’s financial aid counselor before October 15 of their first year at Duke, regardless of where they begin their concurrent degree program.

Eligibility for Financial Assistance

A significant portion of the financial assistance for students in the Nicholas School of the Environment is provided by federal, Title IV funds. To qualify for such funding, usually in the form of loans, students must meet federal eligibility requirements including the maintenance of satisfactory academic progress (see Satisfactory Academic Progress section in Academic Regulations). Professional degree students must meet satisfactory academic progress standards to maintain eligibility for Title IV funds.

Although professional degree students, including DEL-MEM students, have five years from the first date of matriculation in the school to complete their degree requirements, they are eligible for school-based aid for the equivalent of four full-time semesters only (three semesters of they are a concurrent degree student). Federal financial assistance (loans) requires that the student be enrolled at least half-time during the semester to be eligible for federal loans.

Assistantships

Merit-based assistantships may be awarded to a select number of professional degree on-campus MEM and MF students during their first year of study to assist faculty and staff with teaching, research, professional, and other projects. It is expected that students will work for eight hours a week on their assigned project. Assistantships require a regular work schedule to be arranged between the student and the faculty or staff member to whom they are assigned. Students receiving an assistantship will be informed of the positions available, application, interview, and assignment process just prior to the start of the fall term

Students who receive assistantships are paid by the Nicholas School on the monthly payroll, and taxes may be taken out. For the 2025-2026 academic year, the award for eight hours per week of assistance is $4,000 gross. Normally, assistantships are available only for the academic year and require full-time enrollment in the school. If a student completes the assistantship in full, is in good academic standing, and returns to full-time enrollment in the Nicholas School for their second year in 2026-2027, the student will receive the assistantship funds as scholarship applied directly to their bursar account toward their tuition for the second year with no work requirement

Need-Based Grants

The Nicholas School reserves a limited amount of financial aid for students with significant financial needs. Both domestic and international students in the on-campus MEM, MF, and DEL-MEM degrees may apply for need-based aid. There is a separate required application process for a student to be considered for a need-based grant. The Nicholas School uses College Board (CSS Profile and IDOC) services for students to submit their applications. For students entering in the fall, the deadline for completing an application for need-based aid is early February preceding the Fall enrollment term. Note that the application for need-based aid is due before the student is notified of admission status. Students should not wait for an admission decision to apply for a need-based grant.

Parental asset and income information are required as part of the application for a need-based grant. Additional details regarding the application process may be found at the Nicholas School website, nicholas.duke.edu/admissions/financial-support-aid. To receive the same need-based grant in their second year, students must be enrolled full-time in the Nicholas School in good standing, affirm that their financial situation has not improved by the end of their first year and they must be returning to full-time enrollment in the Nicholas School for their second year in the next academic year.

Work-Study

Work-study funds for professional degree students are administered through the Office of Student Services. At the beginning of the academic year, students are made aware of work-study opportunities and informed of the application procedures. Interested students must file the Free Application for Federal Student Aid (FAFSA) to determine eligibility. Because the FAFSA is available only to US citizens and permanent residents, work/study funds are not available for students enrolling in the program on the F-1 or J-1 visa. Some on-campus jobs may not require work/study funding but many will require it. Currently, students enrolled in the DEL-MEM Program are not eligible for work-study funds.

Application for Awards for the Entering Student

Students wishing to be considered for merit-based scholarships must submit a complete application no later than December 15 preceding the fall for which admission is desired. Applications received after December 15 will be considered for merit-based assistance only if funds remain after considering all on-time applications. Applicants should initiate the necessary action early to ensure that the required documents are filed with the school's Office of Student Services on or before December 15 to be assured of equal consideration for financial aid. Completed applications received after the December 15 deadline will be considered if vacancies occur at a later date.

Notification and Acceptance of Awards

Applicants who submit completed applications by December 15 and are subsequently offered admission will be notified soon after admission regarding merit-based and/or need-based aid. Once offered by the university or the school, funds are committed to one student and are therefore unavailable to others. As a consequence, it is the policy of the Nicholas School that all awards offered may be declined prior to May 1 without prejudice. However, offers accepted and left in effect after May 1 are binding for both the student and the school.

Loans

Federally insured student loans are often necessary and useful in helping a student afford the graduate program of their choice. Students considering federal loans should consider the nature of the loan and the positive and negative aspects of future loan payments and should also investigate all other forms of financial assistance.

Federal law requires all students to have completed a Free Application for Federal Student Aid (FAFSA) to determine financial need. The FAFSA form may be obtained online at studentaid.gov or by contacting a college or university financial aid office or the Office of Student Services. No loan application will be processed without the FAFSA form having been submitted to the central processor. In addition, in some cases, federal law requires verification of income and other information.

Federal Direct Unsubsidized Loans

Federal Direct Unsubsidized loans of up to $20,500 are available for eligible graduate/professional students. For loans made to new borrowers, interest is calculated at a fixed annual rate of 7.94 percent for the 2025-2026 academic year. Interest on unsubsidized loans must be paid by the student during enrollment or capitalized to the principal at the borrower's request. A loan origination fee of approximately 1.057 percent will be charged and will be deducted before the loan disburses, valid through September 30, 2025.

Students who borrow through the federal direct unsubsidized program will be given entrance and exit counseling concerning the projected and actual costs of their loans. They will also be provided with information on loan consolidation should this repayment option be desired or needed. Borrowers must sign the Master Promissory Note for each loan.

Graduate Plus Loan Information

The Deficit Reduction Act of 2005 allows graduate and professional students to borrow under the Federal PLUS loan program. Students must be graduate/professional students enrolled at least half-time in a matriculated program; they must complete a current FAFSA; they must first apply for the maximum loan eligibility in Federal Unsubsidized loan before the PLUS can be awarded; parents of graduate students will not be eligible to borrow the loan.

PLUS Loan borrowers are required to pass a basic credit check. The borrower may borrow the difference between the total cost of the student's education (including books, fees, and personal expenses) minus any financial aid the student will receive. The interest rate on the PLUS loan is 8.94 percent for the 2025--2026 academic year. A loan fee of approximately 4.228 percent (valid through September 30, 2025) will be charged and will be deducted proportionately prior to each loan disbursement.

Repayment begins within sixty days after the final disbursement of each loan. The maximum repayment period is ten years, and the minimum monthly payment is $50. Students may be eligible to defer payments as long as they maintain at least half-time enrollment. In addition, some loan guarantee agencies charge a 1 percent guarantee fee, which will also be deducted from disbursements.

Fellowships for MEM/MF Students

The Nicholas School is fortunate to have alumni, members of the Board of Visitors and friends of the school who have endowed funds to support financial aid for MEM and MF degree students. Funds are allocated based on the requirements of the endowment agreements. After admissions decisions have been made and conveyed to the student, the application for admission is used to determine merit-based scholarships. Students wishing to be considered for need-based grants must submit a separate application (see above, Need Based Grants).

All Programs

Doctoral Programs

The Nicholas School cooperates with The Graduate School in awarding six PhDs in the following fields: Earth and Climate Sciences, Ecology, Environment, Environmental Policy, Integrated Toxicology & Environmental Health, and Marine Science and Conservation. Click here to learn more about these doctoral programs.

Master's Programs

International Master of Environmental Policy (Duke Kunshan University)
Master of Environmental Management
Master of Environmental Management in Environmental Leadership
Master of Forestry in Forest Resource Management

Certificates for Master's Students

Climate Science and Applications Certificate
Geospatial Analysis Certificate

Undergraduate Programs

The Nicholas School cooperates with the Trinity College of Arts & Sciences in awarding six undergraduate degrees, three minors, and two certificates. Click here to learn more about these undergraduate programs.

Doctoral Programs

The PhD prepares students most commonly for careers in academia. In more recent years, students earning their doctorate from the environmental programs at Duke have gone on to have satisfying careers in consulting, business, government, and other arenas that allow them to apply their knowledge. Doctoral students emphasize scholarly research as a major part of their degree programs though a growing number of students focus their research on those areas with direct practical applications. An active research program is a vital component of the Nicholas School of the Environment, and most of the research projects in the school utilize PhD candidates as research assistants. The Nicholas School does not normally consider applications for the MS, although some students may be awarded an MS as part of a doctoral program.

A majority of faculty in the Nicholas School are members of the faculty of The Graduate School and are actively involved in the training of doctoral (PhD) students in the fields of earth and ocean sciences, marine science and conservation, environmental, and toxicological sciences. Prospective students should contact individual faculty mentors prior to applying to the doctoral program to ensure mutual interests in research topics. Policies and procedures for admission and registration, academic regulations, and requirements for the PhD are given in detail in the bulletin of The Graduate School and not repeated in detail here.

Doctoral students are admitted to work with Nicholas School faculty by application handled entirely by Duke Graduate School through one of the six PhD programs:

- Environment (ENV)
- Earth and Climate Sciences (ECS)
- Marine Science and Conservation (MSC)
- Integrated Toxicology & Environmental Health Program (ITEHP)
- University Program in Ecology (UPE), with an advisor chosen from within the Nicholas School faculty
- University Program in Environmental Policy (UPEP), with an advisor chosen from within the Nicholas School faculty

Environment (ENV)

The **Environment (ENV) PhD Program** offers students opportunities to work with faculty who specialize in an array of disciplines within the physical, chemical, biological, and social sciences, as well as integration among them. Because of the intensive research nature of this degree, coursework is tailored to the particular needs of the research topic agreed upon by the student, the faculty mentor, and the committees involved. The ENV program is organized around four research themes:

- **Ecosystem Science**, which emphasizes conservation ecology, landscape ecology, wetland ecology, forest ecology, soils, biogeochemistry, and hydrology of watersheds
- **Environmental Chemistry and Toxicology**, which emphasizes the fate and effects of natural and anthropogenic stressors, particularly chemicals, in the environment
- **Aquatic and Atmospheric Sciences**, which concentrate on problems spanning natural divisions of the biosphere- soil, plants, lakes, watersheds, and the atmosphere
- **Environmental Social Sciences**, which emphasize the management of natural resources and the environment by individuals and societies.

Applicants are strongly encouraged to contact the individual faculty member under whose supervision they are interested in pursuing graduate study. Information about each faculty member's area of research interest can be found in the Nicholas School of the Environment bulletin and on the school's website at nicholas.duke.edu. While the program does not admit students for an MS degree, this degree may be awarded as part of a PhD program. The AM degree is available only for students who wish to participate in the joint JD program between the Nicholas School and the School of Law. Direct inquiries to dgsa@nicholas.duke.edu. Information about the program and the faculty can be found at nicholas.duke.edu/academics/doctoral-programs/environment-env.

Earth and Climate Sciences (ECS)

The **Earth and Climate Sciences (ECS) PhD Program** offers research opportunities in three broad areas of geoscience: earth-surface processes, oceans and climate, and earth resources. Earth-surface processes in ECS focus on the interactions between life, water, and landscapes including coastal ecomorphodynamics and remote sensing, watershed ecohydrology, and landscape evolution including that of coupled human-landscape systems. Oceans and climate research in ECS include ocean circulation, atmospheric dynamics, paleoclimatic/paleoenvironment reconstruction, marine biogeochemistry, and ocean/atmosphere interactions, particularly as they relate to global climate change. In addition, research in earth resources addresses the geologic formation and human use of mineral, energy, water, and land resources, including mineral formation, life-cycle analysis, energy consumption/emissions, water quality as it relates to human health, and the role of technology in the Anthropocene.

A student in the ECS PhD program may elect to get an MS degree while working toward the PhD. If this option is elected, the requirements are the same as for the MS program in terms of coursework, time limits, and thesis requirements. Direct inquiries to dgsa@nicholas.duke.edu. More information about the program and the faculty can be found at nicholas.duke.edu/academics/doctoral-programs/earth-climate-sciences-ecs.

Marine Science and Conservation (MSC) Doctoral Study at the Duke University Marine Laboratory

Duke Marine Laboratory (DUML) campus is located in the coastal town of Beaufort, NC, situated 180 miles from the main Durham campus. DUML is home to the Marine Science and Conservation (MSC) PhD Program established in 2008 with an interdisciplinary, research-focused, five-year program with an emphasis on both natural and social sciences. Faculty research in the MSC Division is focused on oceanography, marine biology, marine biomedicine, marine biotechnology, and coastal and marine policy and management. Faculty and students study the biology of marine species, address global-scale marine issues, and use advanced technologies, analysis, and modeling that allow science and policy to be evaluated across space, time, and disciplines.

MSC doctoral students typically spend the first two semesters taking graduate classes on the Durham campus before moving to Beaufort to complete their research; however, residence in Durham is not a requirement. Although the residency of the advisor is not necessary to study at the Marine Lab, some sources of funding are contingent upon having an advisor from the Marine Lab's resident faculty. Students receive up to five years of full support, including stipend, tuition, and fees, if they maintain satisfactory progress toward their degree. Students seeking admission to the MSC program are encouraged to contact faculty of interest directly prior to submitting their application to The Graduate School.

For information on the MSC PhD, visit nicholas.duke.edu/academics/doctoral-programs/marine-science-conservation-msc or contact Rachel Lo Piccolo, Program Coordinator of Graduate Studies, at rachel.lopiccolo@duke.edu or (252) 504-7585. Additional DUML information can be found at nicholas.duke.edu/marinelab.

Cooperative University Programs

Integrated Toxicology & Environmental Health Program (ITEHP)

The **Integrated Toxicology & Environmental Health Program (ITEHP)** prepares students from a variety of backgrounds and educational disciplines for participation as rigorously trained research scientists active in environmental health careers. The field of environmental health is inherently interdisciplinary in nature, and participation in the ITEHP develops holistic thinking skills in trainees to better enable them to perform cutting edge research and to solve real-life problems in this field. The ITEHP includes the participation of faculty members from the departments of biochemistry, cell biology, chemistry, engineering, neurobiology, pathology, pharmacology, and cancer biology, and the Nicholas School of the Environment, including the Duke University Marine Laboratory. Among the principal areas of concentration in the program are neurotoxicology and neurological disease, epigenetics, genetic toxicology, cancer, developmental toxicology, children's health, environmental exposure and toxicology, and pulmonary toxicology and disease. Duke faculty members have a variety of collaborative research efforts and, in some cases, student rotations are available with scientists at the nearby laboratories of the National Institute of Environmental Health Sciences (NIEHS), and the Environmental Protection Agency (EPA).

Application to the program can be made in one of two ways:

1. **Direct Admission:** Students may apply for admission directly through the ITEHP. Applicants should indicate their Intended Degree on their Graduate School application as "PhD. (Biomedical Sciences Programs – School of Medicine)" and their Department/Degree as "Integrated Toxicology and Environmental Health –Ph.D." Students admitted directly into the program affiliate with a degree-granting department (including various PhD programs in the Nicholas School of the Environment, Pratt School of Engineering, or School of Medicine) depending upon their choice of a research mentor, typically at the end of their first year. Students directly admitted to ITEHP are awarded a full fellowship (tuition, fees, and stipend), and these training grant fellowships are restricted to US Citizens or Permanent Residents only. Non-US Citizens who are interested in ITEHP must apply via Option #2 below through a participating department and pursue the ITEHP certificate.
2. **Certificate Option:** Students who do not meet direct-admission requirements or those with a primary interest in a departmentally-based field may also apply to the ITEHP by selecting their primary program of interest (e.g. "Environment – Ph.D.") on their graduate school application, then entering "ITEHP Certificate" in the "Area(s) of Interest" field on the graduate school application. In addition, these students must send an email to ITEHP@duke.edu to indicate interest in the ITEHP certificate. (It is also possible for PhD students to add the ITEHP certificate option after they matriculate. Contact the program for more details.)

There is no difference in the eventual degree granted through either mechanism; both routes result in a PhD granted by a specific department, with certification from ITEHP.

Complete program details and contact information can be found at nicholas.duke.edu/academics/doctoral-programs/university-program-integrated-toxicology-and-environmental-health-itehp. Further information may be obtained from the ITEHP Program at ITEHP@duke.edu.

University Program in Ecology (UPE)

The University Program in Ecology (UPE), formed in 2000, is an interdepartmental PhD program comprising faculty from the Nicholas School of the Environment, Arts, and Sciences (biology and evolutionary anthropology departments), The Pratt School of Engineering (department of civil and environmental engineering), and the Medical School (department of molecular genetics and microbiology). The UPE Program offers training toward a PhD in ecology.

The UPE provides interdisciplinary training in all aspects of ecology, including physiological and behavioral ecology; population and evolutionary ecology; community and landscape ecology; biogeochemistry; and ecosystem and global-change ecology. The program serves to integrate an exceptionally broad and diverse collection of faculty expertise found in various departments and schools at Duke. The UPE is a rigorous, research-oriented graduate program with an excellent record of scholarly publications by the program's students. All students participate in a two-semester, graduate-level core course that focuses on both historical and contemporary foundations of ecology (theory, principles, and research); any additional coursework is tailored to each student's specific interests and needs. Students organize and run a weekly seminar series and participate in reading groups, symposia, and other activities run by the program.

Special facilities for study and research include the Marine Lab (nicholas.duke.edu/marinelab), Duke Forest (dukeforest.duke.edu), Duke Wetlands Center (nicholas.duke.edu/wetland), the Organization for Tropical Studies, plus an extraordinary array of major analytical equipment and additional resources (nicholas.duke.edu/marinelab/about/facilities, biology.duke.edu/research-areas).

Students seeking admission to the University Program in Ecology should file an application with The Graduate School, specifying consideration by the UPE and one of the participating departments. Direct inquiries to dgsa@nicholas.duke.edu. Find more information at nicholas.duke.edu/academics/doctoral-programs/university-program-ecology-upe.

University Program in Environmental Policy (UPEP)

The University Program in Environmental Policy was established in 2010 and is jointly administered by the Nicholas School and the Sanford School of Public Policy. It is the first and only PhD program in the United States jointly administered by a school of the environment and a school of public policy. It is a multidisciplinary, research-focused five-year doctoral degree, intended to prepare candidates for positions in applied academic departments and professional schools (e.g., environment and natural resources, public policy, public administration, international affairs), domestic and international public agencies, and environmental organizations, research institutes, and policy-consulting firms. Although the program is multidisciplinary, it is designed to ensure that students have strength in a particular social science discipline. Students designate their concentration when applying and currently may select either environmental economics or environmental politics.

UPEP students work closely with PhD students in other disciplines, within each School as well as across Duke. We have close affiliations with Duke's Nicholas Institute for Energy, Environmental, & Sustainability and the Duke Global Health Institute.

Applicants from varied academic, cultural, socioeconomic, and professional backgrounds are welcome. Approximately 3-5 students are projected to enter the program each fall, for a total of 20-25 students enrolled at any given time. Direct inquiries to dgsa@nicholas.duke.edu. Further information on the University Program in Environmental Policy can be found at nicholas.duke.edu/academics/doctoral-programs/university-program-environmental-policy-upep.

Graduate School Registration

Students in PhD programs initiate course registration through the directors of graduate studies of the Nicholas School (in Earth and Climate Sciences, Environment, University Program in Ecology, University Program in Environmental Policy, and University Program in Integrated Toxicology and Environmental Health) and/or their faculty advisor/s. Registration for courses is completed through the student online registration system (DukeHub). Registration requirements and procedures are described in the bulletin of The Graduate School, the department/program websites, and in consultation with faculty advisor(s).

Doctoral Programs

Doctoral Admissions

Applicants for the PhD must use The Graduate School's electronic application, available at gradschool.duke.edu/admissions. An individual faculty member in the Nicholas School (or other schools at Duke University, in the case of the University Programs) must accept responsibility to advise an applicant before admission can be offered (this is not necessarily the case for ITEHP though students should contact faculty ahead of time); thus, students applying to the doctoral programs are strongly encouraged to correspond with prospective faculty advisors and visit the campus. Brief summaries of individual faculty research interests are given with the faculty listing in this bulletin.

Qualification of Students

Students seeking admission to The Graduate School must have earned an AB or BS degree (or the equivalent in the case of foreign students) from an accredited institution. Usually, the student should have majored in the area of intended graduate study or one closely related to it. Because research is such an integral part of doctoral education in the Nicholas School, the student's undergraduate record must evidence the capability, motivation, and commitment to conduct independent study and research at an advanced level.

Special Admissions Information for Cooperative University Programs

Integrated Toxicology & Environmental Health Program (ITEHP)

ITEHP is an admitting program and a certificate program. Applications to the program can be made in two ways. There is no difference in the eventual degree granted through either mechanism; both routes result in a PhD granted by a specific department, with certification in toxicology.

1. Direct Admit: Students may apply for admission directly through the ITEHP. Students admitted directly into the program affiliate with a department depending on their choice of research mentor, typically at the end of their first year. The direct-admit option is funded by an NIEHS Training Grant and is thus only available to US citizens or legal permanent residents; applicants who do not meet this requirement can apply through the certificate option below.
2. Certificate Option: Students who do not meet direct-admit requirements or those with a primary interest in a departmentally- based field may also apply to the ITEHP by selecting their primary admitting unit as the specific graduate department (e.g. School of the Environment, Engineering, Medicine), and entering "ITEHP Certificate" in the "Area of Interest" field on the graduate school application. In addition, these students must send an email to ITEHP@duke.edu to indicate interest in the ITEHP certificate. (NOTE: It is also possible for students to add the ITEHP certificate option after they matriculate. Contact the program for more details).

Interested prospective students will find complete program details and contact information at nicholas.duke.edu/academics/doctoral-programs/university-program-integrated-toxicology-and-environmental-health-itehp. Further information may be obtained from the ITEHP Program, 919-613-8078; ITEHP@duke.edu.

University Program in Ecology (UPE)

Students are admitted for doctoral work in the University Program in Ecology through The Graduate School. Departments participating in the ecology program guarantee that any student admitted is automatically admitted for PhD study in the home department of the student's major professor.

The University Program in Ecology admits students with the promise of two years of financial support from the program, followed by support from the department of the student's selected major advisor. Students are supported for up to five years of doctoral study if they maintain satisfactory progress toward their degree.

Students seeking admission to the University Program in Ecology should file an application with The Graduate School, specifying consideration by the UPE or one of the participating departments. Direct inquiries to dgsa@nicholas.duke.edu. Find more information at nicholas.duke.edu/academics/doctoral-programs/university-program-ecology-upe.

University Program in Environmental Policy (UPEP)

Students seeking admission to the University Program in Environmental Policy should file an application with The Graduate School, specifying consideration by the UPEP. Direct inquiries to dgsa@nicholas.duke.edu. Further information on the University Program in Environmental Policy can be found at nicholas.duke.edu/academics/doctoral-programs/university-program-environmental-policy-upep.

Applicants are encouraged to contact faculty members with related interests to learn more about their current research projects and interest in accepting new doctoral students.

Doctoral Programs

Doctoral Financial Assistance

Generally speaking, Duke Graduate School guarantees PhD students five years of stipend, tuition, and fee support, plus six years of full coverage for health and dental insurance premiums. Students in all of the doctoral programs are supported if they maintain satisfactory progress toward their degree. Some students receive fellowships to support their studies, while others are supported as teaching assistants, receiving a stipend and fellowship that cover tuition and fees. Other students are supported as research assistants, with funding derived from research grants managed by their major professors. In recent years, a significant number of doctoral students have also been successful in national competitions for graduate fellowships from the National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), National Institutes of Health (NIH), and other agencies.

All Duke PhD students will receive a 12-month stipend during their first five years of study. During the academic year (fall and spring semesters), students are funded on fellowships, teaching assistants, or research assistants (as stated above). Summer funding will come from a variety of sources, such as external funding, advisors' funding sources, the Duke Graduate School, the Provost's Office, individual departments, the schools that house PhD programs, and other areas of campus. We expect you, as a member of the Duke graduate community, to make a good-faith effort to apply for all possible institutional and external fellowships that may be available to students in your field. Such opportunities not only offer funding but also strengthen students' CVs and provide valuable experience and training.

Fellowships Offered through the Nicholas School

Rachel Carson Fellowship. Established by William C. Powell, Thomas E. Powell Jr., and friends, the Carson Fund provides fellowships to PhD candidates who use the Rachel Carson Sanctuary site in Beaufort, North Carolina, as a major component of their research. First consideration will be given to PhD students in residence at the Duke University Marine Laboratory.

Robert W. Safrit Jr. Fellowship. Established by Robert W. Safrit, this fellowship is for students at the Duke University Marine Laboratory.

Harvey W. Smith Graduate Fellowship. Established by Evelyn Chadwick Smith, the Harvey W. Smith Graduate Fellowship Endowment provides fellowships to doctoral candidates in marine science.

Dr. Larry Widell Memorial Fellowship. Established by Christopher M. Widell, this endowment provides fellowships to Nicholas School students, with preference given to doctoral candidates.

Fellowships Offered through The Graduate School

The Graduate School offers a number of campus-wide competitive fellowships and scholarships. The James B. Duke Fellowships and University Scholars Program are available to incoming doctoral students in all departments. Advanced students may apply for the Katherine Stern Fellowship, which provides dissertation-year support. Students are also eligible for conference travel awards and for a variety of other special internships or fellowships. The Graduate School also provides a number of awards for domestic and international research travel for doctoral students.

Doctoral students may receive support from the Dean's Graduate Award Fellowships and Presidential Fellowships or through the National GEM Consortium.

The Frederick K. Weyerhaeuser Forest History Fellowship is given annually by the Forest History Society to a Duke University graduate student who wishes to study broadly in the area of forest and conservation history.

The W. D. Billings Fellowship is given to doctoral students who plan to specialize in some area of plant ecology. The fellowship was established by Shirley M. Billings in honor of her husband, the late W. Dwight Billings, a physiological plant ecologist at Duke for more than thirty years who was renowned for his work in arctic and alpine environments.

For detailed information about campus-wide financial aid opportunities for doctoral students, including application procedures, please consult the bulletin of The Graduate School.

National, Regional, and Foundation Awards

In addition to those awards available through the Nicholas School or the university, students are urged to compete for national and foundation awards for graduate study. Of particular interest to doctoral students in the Nicholas School are National Science Foundation Graduate Fellowships and NASA Doctoral Fellowships. The websites of these agencies offer details on applying for these fellowships.

Teaching Assistantships

Each year a selected number of PhD candidates may be offered a financial aid package consisting of full tuition plus a monthly stipend. The monthly stipend requires up to 19.9 hours of work per week during the nine-month academic year. Students receiving these stipends are assigned by the director of graduate studies to serve as teaching assistants for various faculty or courses during the fall and spring semesters.

Research Assistantships

Funded from grant and contract research under the direction of various members of the faculty, research assistantships provide support during the course of study of the PhD candidate. Typically, the research assistant completes one or more phases of a research project under the direction of the principal investigator, or a member of the faculty. Normally, the research completed forms a substantial component of the requirements of the PhD dissertation. However, in some instances, students may pursue research in an area of study unrelated to the student's dissertation.

International Master of Environmental Policy (Duke Kunshan University)

Program Code: K-MEP-MEP
Degree Designation: Master of Environmental Policy
Department: Nicholas School of the Environment, School of Public Policy
Website: nicholas.duke.edu/academics/masters-programs/international-master-environmental-policy & sanford.duke.edu/academics/masters-programs/international-master-environmental-policy

Program Summary

The Sanford School of Public Policy and the Nicholas School of the Environment (NSOE) offer a two-year International Master of Environmental Policy (iMEP) program based at the Duke Kunshan University campus in Kunshan, China. The iMEP Program offers a highly analytical and multidisciplinary master's degree based on the Duke Master of Public Policy (MPP) and Master of Environmental Management (MEM) programs. With an emphasis on both international and Chinese experience and contexts, the iMEP combines a world-class faculty, a cutting-edge research center, an innovative curriculum, and unparalleled career opportunities.

Duke Kunshan University's iMEP Program prepares its graduates to meet the pressing environmental and economic challenges facing the international community through effective policy solutions by drawing from an array of disciplines. The core curriculum combines economics, science, law and governance, policy, and program evaluation. The program is four semesters and includes sixteen courses for a total of 48.0 graduate course credits. The program allows Duke Kunshan University students to spend the spring semester of their second year at Duke. In their second year, iMEP students complete a client-based or quantitative research master's project in partnership with an academic advisor.

The iMEP Program simultaneously creates a one-semester study away opportunity for Sanford MPP/MIDP and NSOE MEM/MF students, who may travel to Duke Kunshan University in their third semester. Duke and Duke Kunshan faculty may participate in a similar exchange.

iMEP Academic Policies

Credit Hour Requirements

iMEP students are required to enroll each fall and spring term from matriculation until graduation as full-time students for a period of four semesters. During each of these four semesters, students must maintain a course load of at least 12 credits, for a total of 48 credits. Taking more than 12 credits per semester is considered a credit overload, and requires the approval of the iMEP Director of Graduate Studies (DGS). Students who have overloaded on credits during one semester may receive approval from the DGS to underload on credits during a subsequent semester. In making such a determination, the DGS will take into consideration a student's overall performance in the program, GPA, and course workload. Under normal conditions (e.g., those in which a student has not previously overloaded on course credits), students are strictly prohibited from underloading course credits, except under extenuating circumstances and only with the express approval of the DGS. Violation of this prohibition may result in the student being placed on academic probation.

Course Withdrawal

If a course must be dropped after the official Drop/Add period ends for a given semester, the student must formally withdraw from the course by contacting the iMEP DGS and the DKU Registrar's Office (dku-registrar@dukekunshan.edu.cn) All withdrawals will be noted on the student's record with a grade of W (withdrew from a course). Coursework discontinued without the DGS's permission will result in a grade of F

Study Away Semester at Duke

iMEP students will have the option to study away at Duke the spring semester of their second year. While at Duke the students will enroll in the first semester of their MP course and three electives chosen from the Sanford School of Public Policy or the Nicholas School of the Environment. Students are limited to only three elective courses unless they receive approval from the director of the program. Students will register for courses at Duke during the graduate student registration window during the preceding fall semester. iMEP students may also register for courses outside of the Sanford and Nicholas schools by following the same registration policies laid out by the MPP Program. iMEP students will receive registration service and support through the iMEP Program coordinator at Duke.

Grades

Grades in the iMEP Program are as follows: A, B, C, F, I, X, Z, and W.

- **I (incomplete)** indicates that some portion of the student's work is lacking, for an acceptable reason, such as illness, emergency, or circumstance outside a student's reasonable control, at the time the grades are reported. The student may request in writing to the instructor for assignment of an Incomplete (I) for the course. The student and instructor should coordinate a timeline for submission of the missing work to resolve an incomplete (I), no later than the last class day of the tenth week of the subsequent regular semester except when an earlier deadline has been established by the instructor. If the student does not satisfy the requirements within the agreed-upon timeline, the incomplete (I) will convert to an F and be reported to the Office of the Registrar. Once recorded, a notation of the I will become part of the student's permanent academic record.
- **The grade of X** indicates that a student has missed the final examination for a course and must make it up by the end of the fifth week of the following semester to receive a grade for the course.
- **The grade of Z** indicates satisfactory progress at the end of the first semester of a two-semester course. For graduate students enrolled in the summer session, a temporary I for a course may be assigned after the student has submitted a written request. If the request is approved by the instructor of the course, then the student must satisfactorily complete the work prior to the last day of classes of the subsequent summer term.
- **A grade of W** indicates that the student officially withdrew from the course.
- **A grade of F** in a core course normally occasions withdrawal from a degree program not later than the end of the ensuing semester or term; a grade of F in any other course occasions at least academic probation.
- **A grade of C** or lower in a core course may result in the student being required to retake the course in a subsequent academic term. The DGS will review the student's overall academic performance and progress toward meeting iMEP degree requirements and will confer with the course instructor to determine whether such a retake is warranted.
- To be certified as making satisfactory progress toward the degree, graduate students must maintain at least a 3.0 (B) cumulative grade point average. Students falling below this average jeopardize not only their financial support, but their continuation in the program.

Academic Standing

To remain in good academic standing, and to graduate from the iMEP Program, students must maintain at least a 3.0 (B) cumulative grade point average. Students must also demonstrate satisfactory progress in research and related activities beyond coursework. Students falling below the 3.0 average jeopardize their financial support and are subject to dismissal. A failure to maintain good academic standing, for whatever reason, will result in the student being placed on probation for one semester. If the student has not regained good academic standing by the end of that semester, the student may be dismissed from the program without receiving a degree. During the probationary period, students are strictly prohibited from underloading course credits or withdrawing from a course prior to the end of the semester. Doing so without the expressed approval of the DGS will be considered a violation of the terms of the academic probation and may result in the student being dismissed from the university without receiving a degree..

iMEP Academic Requirements

The curriculum for the iMEP degree consists of sixteen courses (48.0 course credits) spread out over two years. Students will be required to take seven core courses (21.0 course credits) to ensure quality and consistency in the degree. They will also be required to enroll in a full year of the master's project class (MP, 6.0 course credits). Unlike the traditional MA programs in China, the iMEP Program does not offer a thesis option but a capstone project. There will be flexibility with the seven elective courses (21.0 course credits) to allow students to pursue particular environmental policy and resource issues as well as enhance their methodological skills. Finally, students will have the opportunity to complete a summer internship, ideally connected to their MP. The curriculum includes

- Two-week Boot Camp the summer prior to first semester
- Seven core courses (21.0 course credits)
- Seven elective courses (21.0 course credits)

- Two MP capstone courses (6.0 course credits)
- Summer Internship

This program also administers an English reading and writing examination prior to enrollment. Because iMEP is an English-only program, students will need to be screened for language before they can enroll. For students that need additional support in writing, they will be required to enroll in one of the English-language courses offered through the writing program at Duke Kunshan University (in addition to their 48.0 credits). For students whose native language is not Chinese, the Language and Culture Center at Duke Kunshan University provides different levels of Chinese courses. Chinese coursework is entirely optional, does not confer credit, and must be taken in addition to the required coursework. In addition to a weekly introductory course for graduate students, independent language study with a support coach is available for students with some previous Chinese experience.

Courses numbered below the 500-level may not be applied toward the required credits needed for the iMEP graduate degree. With the approval of the program's DGS, graduate students may enroll in undergraduate courses, but these courses will not count toward any graduation requirements and will not be included in the student's GPA calculation. Graduate students must be classified as full-time students based on their graduate-level course enrollment as a prerequisite for enrolling in courses numbered below 500.

Core Courses

- ENVIRON 805K. Environmental Economics (Year 1 Fall)
- PUBPOL 870K. Statistics and Program Evaluation (Year 1 Fall)
- PUBPOL 871K. Environmental Policy Analysis (Year 1 Fall)
- ENVIRON 718K. Environmental Sciences (Year 1 Spring)
- PUBPOL 872K. Environmental Economics Policy Practicum (Year 1 Spring)
- ENVIRON 803K. Environmental Policy Process (Year 1 Spring)
- ENVIRON 835K. Environmental Law (Year 2 Fall)

Electives

Below are electives that have been taught by iMEP faculty, adjuncts, or visiting Duke faculty. Not all electives will be offered each year. These are just samples of the classes that could be offered. The program may interest Duke faculty outside of the Nicholas School of the Environment and Sanford, including those who teach history, engineering, law, and sociology, for example. As the program develops, it will continue to provide additional course offerings.

- Building an NGO Toolkit
- Climate Change Economics and Policy
- Key Areas in International
- Environmental Policy
- Independent Study
- Natural Resources and Protected
- Area Management
- Research Methods I
- Research Methods II
- Environmental GIS
- Environmental Economics II
- Global Environmental Health Challenges
- ESG Fundamentals
- Business Strategy and the Environment
- Key Areas in International Environmental Policy
- Independent Study
- Natural Resources and Protected Area Management Environmental
- Science Research Methods
- Economics and Policy (Crosslisted in Global Environmental Health)

Master's Project Capstone

MP Capstone Class (Year 2 Fall and Spring) – The master's project (MP) is an 8,500-11,500-word, single-spaced paper, policy memo, or journal article required of all master's students in the iMEP Program. Two types of projects are possible: a project for an actual client that involves a variety of methodological approaches (Client-based), or a project based on quantitative methods that may or may not have an actual client (research-based). Hybrids of these projects are also possible. Students are encouraged to build their projects from their summer internships where possible and to deepen their policy-area expertise by taking appropriate elective courses.

Research-Based Projects

This type of MP more closely resembles a Master's thesis. Students may propose an original research idea to a faculty member or apply to a faculty-generated research project. Research-based projects should also be undertaken as a group project, unless the Advisor agrees to supervise an individual project. Research MPs follow the standard format for scientific research or policy analysis to introduce a new idea and problem-solving approaches and may involve original field data collection. Students interested in a doctoral degree or employment in research roles may benefit from this type of MP. Working with the MP advisor, the student needs to follow scientific or analytical methods in their topic area. The research topic must be relevant to environmental policy, and involve rigorous quantitative and/or qualitative methodology. Research MPs should strive for publishable quality, although external publication is not required. If the project involves working with human subjects, then students may need to apply to the Duke Kunshan University Institutional Review Board (IRB) to review and approve their protocol. If the project involves handling animal subjects, students may need the Duke Kunshan University Institutional Animal Care and Use Committee (IACUC) to review and approve their protocol.

Client-Based Projects

For this type of MP students will work with a client to recommend a specific course of action to solve an environmental policy problem. As principle, Client-based projects should be undertaken as a group project, unless the Advisor agrees to supervise an individual project. Students may develop their own project or apply to work on “Faculty-client generated projects”. Projects ideally (but not necessarily) combine with summer internships or target an organization that the student(s) would like to work with in the future. To be approved as a MP topic, the client must have a significant policy problem posed in the form of “What should the client do?”. The research topic must also be relevant to environmental policy. This project outcome must meet the MP criteria and measure up to standards of good analysis, including a clear definition of the problem and careful evaluation of the relevant evidence, identification of important trade-offs and potential indirect consequences, and the presenting of specific conclusions and recommendations. A client project involving policy analysis or recommendations, program evaluation, or quality improvement studies that is not going to be published is not designed to contribute to a field of knowledge and does not need Institutional Review Board (IRB) review. However, if the research 1) is with human subjects and 2) will be made public in any way, then IRB is required. If the research involves handling animal subjects, students may need the Duke Kunshan University Institutional Animal Care and Use Committee (IACUC) to review and approve their protocol.

Process for Completing the Project

In the spring semester of their first year, iMEP students should start the process of identifying a client, and a policy problem to address. By April 1, students must submit an MP Advisor Application form to the iMEP Program director. The MP advisor must be iMEP faculty with a primary appointment at Duke Kunshan University, or from Duke University with a secondary appointment at Duke Kunshan University. By April 31, students should have met with their MP advisor and must sign an MP agreement containing the title and a succinct presentation of the MP project, which will be submitted to the iMEP Program coordinator at Duke Kunshan. If the MP is a client-based project, an acceptance letter or email from the client should be provided with the MP agreement. If the project involves human subjects, then the student should begin the IRB process as soon as possible. Students should check with their employer whether there is a confidentiality clause and if data from the internship can be stored in the public domain.

In their second year, all iMEP students enroll in the required fall and spring MP courses. The course syllabus will provide a deadline in early September for a statement of intent and a deadline for changing the MP advisor. The fall term course is designed to help each student conceptualize their project, to provide guidelines related to applied research (IRB procedures and study design), and to complete a prospectus that will be due to the MP I instructor by late November and the MP advisor by the end of the semester.

For most students, the spring semester of their second year will take place at Duke University in Durham, where the iMEP faculty lead Jackson Ewing will teach the MP II course. It is recommended that the student complete all data collection before the beginning of their last semester. Students will maintain long-distance communication with their advisor if they are based at Duke Kunshan University. The first draft is due to their MP advisor in late March of the final semester. The final copy is due in April of the final semester. The final copy must be submitted in electronic (PDF) format to Sihui Zhou at sihui.zhou@dukekunshan.edu.cn. The student must also get an electronic Master’s Project Submission form signed by their MP advisor by the date specified on their Master’s Project II syllabus. A final master’s defense involving a presentation and Q&A with all students and MP advisors present will be scheduled after the final copy due date and before graduation.

Grading of the MP

The MP advisor reviews the final MP and attributes one of the following grades: credit or no credit. If a student disagrees with the decision of the advisor, they can make a reasoned appeal of this decision to the director of graduate studies. In this case, an appeal committee consisting of the MP advisor and an ad hoc group of faculty members selected by the director of graduate studies makes a final decision on the MP grade.

iMEP Admissions

Eligibility

iMEP seeks applications from a variety of academic, professional, ethnic, and cultural backgrounds. The iMEP Program is an international program seeking applicants from across the globe. The selection committee considers the applicant’s academic performance as an undergraduate, range of courses taken, Graduate Record Examination (GRE) scores, TOEFL and IELTS scores, English and writing skills, personal statement, relevant work experience, and faculty and employer evaluations.

As prerequisites, applicants must hold the equivalent of a US bachelor's degree from an accredited institution. Also, iMEP recommends students complete both basic statistics and microeconomics courses prior to enrollment.

Application

Applications are submitted online through the iMEP admissions website**.** The early bird deadlines are August 31 and October 31. The application priority deadline for the iMEP Program is January 15. After the priority deadline, applications for the iMEP will continue to be accepted and considered on a space available basis until May 31. The iMEP Program waives the application fee. The online application page is available at env.dukekunshan.edu.cn/admissions/how-to-apply.

In addition to the prerequisite bachelor's degree, the following are required:

- Complete the online application form
- Résumé/ CV
- Statement of Purpose (500–1,000 words): As part of the online application, the applicant must upload a Statement of Purpose. The statement should be one to two pages and single-spaced. It should briefly discuss:
    - Purposes and objectives in pursuing graduate study;
    - Special interests and plans;
    - Strengths and weaknesses in the applicant's chosen field;
    - Any research projects or any independent research in which the applicant has actively participated and how they have influenced their career choice and desire to pursue graduate studies; and
    - Any particular reasons the applicant may have for applying to Duke Kunshan University (e.g., the applicant would like to work with a specific faculty member).
- Transcript(s): Transcript from each post-secondary institution attended is required (an uploaded unofficial transcript with the degree posted and other transcripts for all colleges and universities attended).
- Test Scores:
    - Graduate Record Examination (GRE). Ask Educational Testing Service to send an official copy of the scores to Duke Kunshan University, using institution code 7552. No department code is needed. If ETS requires a department code, select any one of the department codes listed. Regardless of the department code entered, the scores will come to Duke Kunshan University as long as applicants use institution code 7552. Be sure to alert the iMEP Program if the name on an application is different from the name on an applicant's score report.
    - GRE Equivalent: Applicants may apply for a GRE score waiver by meeting any of the following requirements:
        - High GPA and appropriate coursework at an elite university. The applicants from DKU and "Project 985 Universities" in China with 3.5+ GPA or top 20% ranking in the major class can request to waive the GRE. Applicants without an undergraduate degree from an English-language university must have 105+ TOEFL (or 7.5+ IELTS). The applicants from outside China must provide evidence to justify their course work and university status.
        - Specific alternative tests. GMAT, LSAT, and TEM-8 scores can be used in lieu of the GRE.
        - Years and quality of experience for mid-career professionals. The work experience must be sufficient to demonstrate writing, quantitative and analytic skills.
        - Advanced terminal degrees such as PhD, MD, JD, and EdD.
    - Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS). The program's language of instruction is English, and written and spoken English proficiency is required. Students who are not native English speakers must provide language evaluation test scores with their application materials.
        - TOEFL: The minimum score for the TOEFL Internet-based Test (TOEFL iBT) is 90. Ask Educational Testing Service to send an official copy of the scores to Duke Kunshan University, using institution code B624. Applicants do not need a department code. If ETS requires a department code, select any one of the department codes listed. Regardless of the department code entered, the scores will come to Duke Kunshan University as long as applicants use institution code B624.
        - IELTS: The minimum score for IELTS is 7.0. Please email iMEP@dukekunshan.edu.cn for mailing address. The IELTS is administered by Cambridge ESOL, British Council, and IDP: IELTS Australia. See ielts.org for more information.
        - Duolingo English Test: There is no institutional code for Duolingo, but applicants will need to select Duke University Graduate Programs: Graduate School; Divinity; Engineering; Environment; Public Policy; Duke Kunshan as the institution to send scores to. Make sure to include subscores. Score reports without subscores will not be accepted.
        - TOEFL/IELTS/Duolingo Waiver Policy: If the applicant's native language is any language other than English, they must submit an official score report from the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), or the Duolingo exam. This requirement may be waived if the applicant earned an undergraduate degree in the United States, earned an undergraduate or master's degree from an English-only speaking institution outside of the United States, or has been working in the United States for two years or more. If you believe you qualify for a TOEFL/IELTS/Duolingo waiver based on the above criteria, indicate your eligibility in the Additional Academic

Information section of the application under the Test Score Instructions for the TOEFL/IELTS exam. Due to the volume of applications we receive, we will not examine, confirm the status of, or grant any waiver requests prior to extending an offer of admission.

- Letters of Recommendation: At least two letters of recommendation (two academic references and one professional preferred).

Visiting Duke Kunshan and the iMEP Program

Professors, scholars, and prospective students are welcome to visit iMEP at Duke Kunshan University. During the visit, they can learn detailed information about academic programs, research projects, administrative methods, and cooperation opportunities. To schedule a meeting with the iMEP Program, email iMEP@dukekunshan.edu.cn.

iMEP Financial Aid

Merit-Based Scholarship

Duke Kunshan University is committed to enrolling a highly talented, diverse, and international student body. All students are automatically considered for merit scholarships based on their Graduate School application. No additional application is required to be considered for these awards.

Need-Based Financial Aid

Citizens of People's Republic of China are eligible to apply for need-based financial aid if their family financial situation meets the criteria set by Duke Kunshan University. US citizens may apply for need-based financial aid through Duke University by completing the FAFSA. Loan funds are provided through the Federal Direct Unsubsidized and Graduate PLUS programs.

Work-Study Opportunity at Duke Kunshan

Resident Assistant

Resident Assistants (RAs) and Graduate Resident Fellows (GRFs) are student leaders who live on the residence hall floor and serve as a primary resource for students, providing peer help on academic, social, and personal issues; ensuring the health and safety of residents, and building a positive community within the residence hall. The RA position is for one semester, while the GRF position is for one academic year. RAs and GRFs receive training on topics of student development theories, roommate conflict resolution, preventive mental health, programming, assessment, community building, leadership, and teamwork. Currently, all RAs and GRFs receive single-room housing remuneration for their work. For more information on applying, visit dukekunshan.edu.cn/en/student-life/residence-life#leadership-opportunities. Questions about RA should be addressed to residencelife@dukekunshan.edu.cn.

Student Workers

Students enrolled in a Duke Kunshan degree program can work on campus on a variety of activities, from research assistantship to administrative operations. The maximum working hours of the student workers is 40 hours/month. The payment varies depending on the grades of students and type of work. International students may get positions as student workers.

iMEP Tuition & Fees

Duke Kunshan University offers a world-class education for highly qualified students from all backgrounds. The cost of attending Duke Kunshan reflects the university's commitment to providing an outstanding educational experience and is comparable to that of other leading private universities.

Duke Kunshan is committed to enrolling a highly talented, diverse, and international student body. Scholarship support is available to support these goals. All applicants will automatically be considered for available scholarships, up to and including full scholarships.

Special financial aid will be offered to all Chinese students from mainland China, Hong Kong, Macau, and Taiwan to lower the tuition standard to RMB 180,000 per year. Additional scholarships of varying amounts will be available based on academic achievement and family financial circumstances. Admitted students will be given an opportunity to submit supplemental financial information.

Tuition and Fees for the 2025-2026 Academic Year

Cost of Attendance for International Students (non-Chinese citizens)				
	FIRST-YEAR STUDENT		SECOND-YEAR STUDENT	
	Fall 2025 (Kunshan)	**Spring 2026 (Kunshan)**	**Fall 2025 (Kunshan)**	**Spring 2026 (Duke)**
Tuition	$24,044	$24,044	$24,044	$24,044
Health Insurance	$1,408	-	$587	$1,428
Student Fees	-	-	-	$850
• Health Fee	-	-	-	$503
• Transcript Fee	-	-	-	$120
• Activity Fee	-	-	-	$19
• Graduate Student Service Fee	-	-	-	$13
• Recreation Fee	-	-	-	$195
Total Tuition and Fees	**$25,452**	**$24,044**	**$24,631**	**$26,322**
Books & Supplies	**$100**	**$100**	**$100**	**$330**
Housing	$1,695	$1,695	$1,695	$7,510
Food	$1,483	$1,483	$1,483	$2,350
Domestic/International Travel	$3,000	-	$3,000	-
Local Transportation	-	-	-	$1,130
Miscellaneous/Personal Expenses	$847	$847	$847	$2,370
Total Living Expenses	**$7,025**	**$4,025**	**$7,025**	**$13,360**
Total Cost of Attendance	**$32,577**	**$28,169**	**$31,756**	**$40,012**

Cost of Attendance for Domestic Students (Chinese Citizens)

Figures are in RMB.

	FIRST-YEAR STUDENT		SECOND-YEAR STUDENT	
	Fall 2025 (Kunshan)	**Spring 2026 (Kunshan)**	**Fall 2025 (Kunshan)**	**Spring 2026 (Duke)**
Tuition	¥210,000	¥210,000	¥210,000	¥210,000
Health Insurance	¥,800	-	¥,800	¥10,110
Student Fees	-	-	-	¥6,108
• Health Fee	-	-	-	¥3,623
• Transcript Fee	-	-	-	¥850
• Activity Fee	-	-	-	¥136
• Graduate Student Service Fee	-	-	-	¥94
• Recreation Fee	-	-	-	¥1,405
Total Tuition and Fees	**¥210,800**	**¥210,000**	**¥210,000**	**¥232,326**
Books & Supplies	**¥708**	**¥708**	**¥708**	**¥2,377**
Housing	¥12,000	¥12,000	¥12,000	¥53,171
Food	¥10,500	¥10,500	¥10,500	¥16,638
Domestic/International Travel	¥1,500	¥1,500	¥1,500	¥21,240
Local Transportation	-	-		¥8,000
Miscellaneous/Personal Expenses	¥6,000	¥6,000	¥6,000	¥16,780
Total Living Expenses	**¥30,708**	**¥30,000**	**¥30,000**	**¥118,206**
Total Cost of Attendance	**¥241,508**	**¥240,708**	**¥241,508**	**¥350,532**

All figures are estimates only.

Cost of Attendance (COA) Notes

- All fees and rates provided at this time are estimates.
- All tuition will be invoiced by and paid to Duke Kunshan University. Other fees and charges will be invoiced and paid in either China or the United States.
- Duke Kunshan student residence and dining facilities are closed during the winter break between the fall and spring semesters and for seven days during the Chinese New Year Holiday. Students should arrange accommodation during the campus closing periods. The costs are not included in the above estimated costs of attendance. Students need to pay the costs on their own.
- International travel includes an estimate of the cost of one round-trip flight to the United States for Chinese students or from an international destination to Shanghai for international students, typical visa costs, and, for non-Chinese students, additional health check and registration costs associated with establishing legal residence in China. Students wishing to return to their home countries during breaks in their study before the end of the year should budget additional funds for these trips. For detailed insurance information, visit dukekunshan.edu.cn/clinic/health-insurance.
- US based and international students from outside the United States (i.e., India, Africa, Hong Kong, Macau, Taiwan) who do not apply through Duke's GEO (Study Abroad) application system are required to enroll in the Global Health Insurance Plan.
- Insurance plan year is August 1-July 31; insurance will be charged at the actual approved rate regardless of prior estimates. International students are required to purchase and enroll in the Health Insurance Plan (including SOS) from the university. For detailed information about insurance, visit dukekunshan.edu.cn/clinic/health-insurance.
- All students must pay a refundable Campus Deposit of RMB 2,000/USD $300. The deposit would be used to pay for the costs of replacement of lost DKU cards; repairs of residence damages; excessive cleaning; refrigerator rental; library overdue, damaged, or lost books; replacement processing fees; and other similar losses and damages caused to university properties.

Master of Environmental Management

Degree Designation: Master of Environmental Management
Department: Nicholas School of the Environment
Website: nicholas.duke.edu/academics/masters-programs/master-environmental-management

Program Summary

Duke's Master of Environmental Management (MEM) prepares graduates with deep subject matter expertise in an environmental topical area, and combines that knowledge with a toolkit of cutting-edge, essential skills that can be immediately applied in a wide array of rapidly-evolving environmental careers.

The structure of our curriculum allows you to customize your education to what is important to you by selecting two concentrations—one that will give you depth of knowledge in a topical area (Environment Concentration), and a second that will provide the skills needed to put this knowledge into practice (Management Concentration). You will select one of each from the following lists.

Environment Concentrations

- **Coastal and Marine Systems (CaMS)**: Gain a deep understanding of the complex interactions between people and oceans, examining coastal processes and environments, while learning to assess and manage how human activities affect—and are affected by—these vital ecosystems.
- **Ecotoxicology and Environmental Health (EEH)**: Understand how pollutants affect the health of people and ecosystems by assessing the fate, effects, and risks of pollutants using a multidisciplinary approach that incorporates toxicology, environmental chemistry, risk assessment, and ecology.
- **Energy and Environment (EE)**: Train to become an expert problem solver with the interdisciplinary skills and knowledge needed to lead the transition to a more sustainable energy future.
- **Terrestrial and Freshwater Environments (TFE)**: Gain a foundational and practical understanding of processes that shape terrestrial and freshwater environments, and the couplings between these ecosystems.

Management Concentrations

- **Business and Environment (BE)**: Equip yourself to help organizations implement environmentally sustainable business practices, honing your skills and knowledge through practical applications, client-based consulting projects, and interactions with industry leaders.
- **Community Engagement and Environmental Justice (CEEJ)**: Explore the structural, institutional, and historical basis of inequity and injustice, the role of power in their perpetuation, and the theory and methods for empowering communities to enact their vision for their environment in ways that are economically viable, socially just, and sustainable.
- **Environmental Analytics and Modeling (EAM)**: Train to make decisions and communicate with data through coursework and applied projects providing exposure to real-world problem solving from data acquisition through processing, analysis, and presentation using cutting-edge tools and analytical techniques.
- **Environmental Economics and Policy (EEP)**: Learn to inform effective solutions for today's national and international environmental problems by analyzing how households, businesses, governments, and other stakeholders react to existing and proposed environmental and resource policies.

Master of Environmental Management (MEM)

MEM Academic Requirements

Specific to Your Path

The Master of Environmental Management curriculum allows students to select two concentrations—one environment concentration and one management concentration. Students will take four courses, or 12 credits, in each of their two selected concentrations.

- Environment Concentration Courses: 12 credits (4 courses) in the chosen concentration
- Management Concentration Courses: 12 credits (4 courses) in the chosen concentration
- Free Electives: 17-19 credits (5-6 courses)

All MEM Students

- Master's Project (MP): 4-6 credits
- Seminar: 1 credit awarded at the end of 4 semesters

TOTAL: Minimum 48 credits required

Dual-Degree Students pursuing the MEM in conjunction with another professional degree at Duke or one of our partner schools, consult the concurrent degree requirements on the Nicholas School's site for additional information.

Master of Environmental Management (MEM)

MEM Environment Concentrations

Your Environment Concentration is designed to provide depth of knowledge in a primary topical area. You will choose one Environment Concentration and will take four courses in this area.

The list below is intended to provide examples of courses offered in the past to support each area of knowledge and skill building.

Detailed information about each concentration is available at nicholas.duke.edu/academics/masters-programs/master-environmental-management/mem-degree-curriculum.

Coastal and Marine Systems (CaMS)

Students are required to take one fundamental coastal and marine natural science, and one fundamental coastal and marine social science course. Students are also required to take two selected concentration electives, one from a list of natural science courses and one from a list of social science and policy courses. The remainder of the concentration courses can be customized by the student and their advisor to support their professional development goals. Most CaMS students will spend their second year at the Duke University Marine Laboratory, located in Beaufort, NC. Courses with the A suffix are generally taught at the Marine Lab.

1. ENVIRON 707 Coastal and Marine Ecosystems (3 credits)
2. ENVIRON 786/A Marine Policy (3 credits)
3. Coastal and Marine Systems concentration natural science elective. Examples include but are not limited to:
    - ENVIRON 719/A Aquaculture and the Environment (3 credits)
    - ENVIRON 773A Marine Ecology (4 credits)
    - ENVIRON 776A Marine Mammals (3 credits)
4. Coastal and Marine Systems concentration social science and policy elective. Examples include but are not limited to:
    - ENVIRON 502 Climate Change and the Law (2 credits)
    - ENVIRON 506 Environmental Justice: Theory and Practice for Environmental Scientists and Policy Professionals (3 credits)
    - ENVIRON 528SA Community-Based Marine Conservation (3 credits)
    - ENVIRON 533A Marine Fisheries Policy (3 credits)
    - ENVIRON 775 Ocean and Coastal Law and Policy (3 credits)
    - ENVIRON 860SA Political Ecology (3 credits)

Ecotoxicology and Environmental Health (EEH)

Students must choose between two EEH Concentration Tracks: Traditional or Research.

EEH Traditional Track Course Requirements – 4 courses

1. ENVIRON 537 Environmental Health (spring)
2. ENVIRON 539 Human Health & Ecological Risk Assessment (spring)
3. ENVIRON 560 Environmental Health Pollutant Chemistry and Toxicology (spring)
4. Choose one additional course from the list below:
    - ECS 525: Ocean and Freshwater Pollution (fall)
    - ENVIRON 538: Global Environmental Health: Economics and Policy (ad hoc)
    - ENVIRON 605: Air Quality Management (fall)
    - ENVIRON 610: Ecotoxicology (ad hoc)

EEH Research Concentration Track Course Requirements* – 6 courses

1. ENVIRON 501 Environmental Toxicology (fall)
2. ENVIRON 537 Environmental Health and Epidemiology (spring)
3. ENVIRON 539 Human Health & Ecological Risk Assessment (spring)
4. ENVIRON 540 Chemical Fate of Organic Compounds (fall) **OR** ENVIRON 542L Environmental Aquatic Chemistry (fall)
5. Students in the Research Track must choose two additional courses (see list below) in one of the following areas of specialization: Toxicology, Chemistry, and Epidemiology & Environmental Health (6 credits minimum). Not all classes are offered on a regular basis. See course schedule for current course offerings.
    - **Toxicology Specialization** – Recommended courses include graduate level toxicology, physiology, biochemistry, and molecular biology field. Suggested additional courses are listed below; other alternative courses may be substituted with approval by the EEH Chair.
        - ENVIRON 516 Global Change: Molecules to Organisms (3 credits)
        - ENVIRON 610 Ecotoxicology (3 credits)
        - ENVIRON 819 Mechanisms in Environmental Toxicology (3 credits)
        - PHARM 533 Essentials of Pharmacology and Toxicology (3 credits)
        - TOXC 707 Advanced Toxicology at UNC-Chapel Hill (3 credits)
    - **Chemistry Specialization** – ENVIRON 540 and ENVIRON 542L are required courses for students specializing in environmental chemistry, plus at least one course from the list below. Suggested additional courses are listed below; other alternative courses may be substituted with approval by the EEH Chair.
        - ENVIRON 667 Chemical Transformation of Environmental Contaminants (3 credits)
        - ENVIRON 790 Environmental Cheminformatics (3 credits)
        - ECS 571 Isotopes in Earth and Environmental Sciences (3 credits)

        - CEE 666 Aquatic Geochemistry (3 credits)
    - **Epidemiology & Environmental Health Specialization** – Two additional courses (not including the core environmental health classes) in a graduate level field are required. Suggested additional classes are listed below. Other classes not listed here may be substituted with approval by the EEH Chair.
        - ENVIRON 538 Global Environmental Health: Economics and Policy (3 credits)
        - ENVIRON 605 Air Quality Management (3 credits)
        - GLHLTH 705 Biostatistics and Epidemiology I (4 credits)
        - GLHLTH 707 Biostatistics and Epidemiology II (4 credits)

*NOTE: It is highly recommended that all students take ENVIRON 710 (Applied Statistical Modeling for Environmental Management). Students may also register for up to 8-10 MP credits to support a more research-intensive Master's Project.

Energy and Environment (EE)

1. ENVIRON 520 Resource and Environmental Economics I (1.5 credits, fall year two) and ENVIRON 635 Energy Economics and Policy (1.5 credits, fall year two)
2. ENVIRON 631 Energy Technology and its Impact on the Environment (3 credits, spring year one)
3. ENVIRON 711 Energy and Environment (3 credits, fall year one)
4. ENVIRON 716L Modeling for Energy Systems (3 credits, fall year one)

Terrestrial and Freshwater Environments (TFE)

1. Choose 2 foundational natural science courses from the following:
    - The Climate System (ECS 511), Climate and Society (ECS 550), Spatial Ecology (ENVIRON 567), Hydrology in Environmental Management (ENVIRON 732), Watershed Hydrology (ENVIRON 734), Forest Ecosystems (ENVIRON 503), Tropical Ecology (ENVIRON 517), Freshwater Ecosystems (ENVIRON 744), Biogeochemistry (ENVIRON 564), Soil Resources (ENVIRON 721), Urban Ecology (ENVIRON 646)
2. Choose one specializing natural science course in your topical area:
    - Water Quality Health (ECS 524), Environmental Toxicology (ENVIRON 501), Ocean and Freshwater Pollution (ECS 525), Functional Ecology of Plants (ENVIRON 505), Conserving the Variety of Life (ENVIRON 703), others as appropriate and approved by advisor
3. Choose one social science course relevant to your focal area:
    - Environmental Law (ENVIRON 835), Environmental Politics (ENVIRON 577), Water Resources Law (LAW 320, 2 credits), Resource and Environmental Economics I & II (ENVIRON 520, 521, 1.5 credits each) or Resources and Environmental Economics I & Economics of Forest Resources (ENVIRON 520, 680, 1.5 credits each), Land Use Principles (ENVIRON 550)

Master of Environmental Management (MEM)

MEM Management Concentrations

Your Management Concentration enables you to develop essential skillsets related to professional practice in the area you selected as your Environment Concentration. You will choose one Management Concentration and will take four courses in this area.

The list below is intended to provide examples of courses offered in the past to support each area of knowledge and skill building.

Detailed information about each concentration is available at nicholas.duke.edu/academics/masters-programs/master-environmental-management/mem-degree-curriculum.

Business and Environment (BE)

1. ENVIRON 782 Marketing for Environmental Professionals (3 credits, spring)
2. ENVIRON 796 Financial Foundations for Environ Managers (3 credits, fall)
3. ENVIRON 811 Business and Environment (3 credits, fall first year)
4. ENVIRON 831 Business Strategy for Sustainability (3 credits, spring)

Community Engagement and Environmental Justice (CEEJ)

1. ENVIRON 755 Community Engagement in the Environmental Field (typically taught in the fall semester; gateway course for CEEJ concentration)
2. Environmental Justice Course (complete at least one)
    - ENVIRON 506 Environmental Justice: Theory and Practice for Environmental Scientists and Policy Professionals (typically taught in fall)
    - ENVIRON 790 Environmental Justice (typically taught in fall)
    - ENVIRON 860SA Political Ecology (typically taught in spring at the Duke University Marine Lab)

3. Practicum Course (complete at least one)
    - ENVIRON 528SA Community-Based Marine Conservation in the Gulf of California (typically taught in spring at the Duke University Marine Lab)
    - ENVIRON 795 Practicum in Community Engagement in the Environmental Field: (typically taught in spring; prerequisite course: ENVIRON 755 (fall)).
    - ENVIRON 869 Environmental Law and Policy Clinic (typically taught fall and spring)
4. Concentration Elective (if students have not already completed 12 credits of coursework from the list above, they may select one of the following courses to meet concentration requirements)
    - ENVIRON 556 Environmental Conflict Resolution
    - ENVIRON 557 Social Science Surveys for Environmental Management
    - ENVIRON 590 Evaluating Environmental Programs
    - ENVIRON 590 Indigenous Land and Water
    - ENVIRON 590S Narrating Nature Documentary and Environmental Studies
    - ENVIRON 632 Environmental Education and Interpretation
    - ENVIRON 658/A Applied Qualitative Research Methods
    - ENVIRON 705A Social Impact Analysis
    - ENVIRON 754A Research Design for Environmental Social Sciences
    - ENVIRON 790 Urban Forestry Greenspace Management
    - ENVIRON 820S Conservation Ethics
    - ENVIRON 887/A Theory and Methods for Policy Analysis of the Commons

Environmental Analytics and Modeling (EAM)

1. ENVIRON 559 Fundamentals of Geospatial Analysis (4 credits, fall/spring)
2. ENVIRON 710 Applied Statistical Modeling for Environmental Management (3 credits, spring year one)
3. ENVIRON 872L-1 Environmental Data Exploration (3 credits, fall)
4. EAM Core Electives (choose two)
    - ECS 568S Integrated Assessment Modeling-Examining Strategies for Meeting Energy and Environmental Goals
    - ENVIRON 559 Fundamentals of Geographic Information Systems and Geospatial Analysis
    - ENVIRON 623 Ecological Diversity and Climate Change
    - ENVIRON 658 Qualitative Methods
    - ENVIRON 658A Qualitative Methods
    - ENVIRON 665 Bayesian Inference for Environmental Models
    - ENVIRON 716L Modeling for Energy Systems
    - ENVIRON 717 Markets for Electric Power
    - ENVIRON 761 Geospatial Analysis for Land and Water Management
    - ENVIRON 797 Time Series Analysis for Energy and Environment Applications
    - ENVIRON 832 Environmental Decision Analysis
    - ENVIRON 850 Did The Policy Work? Quantitative Causal Inference In Environmental Policy
    - ENVIRON 859 Geospatial Data Analytics
    - ENVIRON 859A Geospatial Data Analytics
    - ENVIRON 876A Data and Time Series Analysis in Marine Sciences

Environmental Economics and Policy (EEP)

1. ENVIRON 520 Resource and Environmental Economics I (1.5 credits, fall) and 521 Resource and Environmental Economics II (1.5 credits, fall)
    - Students may substitute ENVIRON 635 Energy Economics and Policy or ENVIRON 680 Economics of Forest Resources for ENVIRON 521
2. ENVIRON 577 Environmental Politics (3 credits, spring)
    - Students may substitute ENVIRON 705A Social Impact Analysis, ENVIRON 860S/A Political Ecology, or ENVIRON 877A Theory and Methods for Policy Analysis of the Commons for ENVIRON 577
3. ENVIRON 710 Applied Statistical Modeling for Environmental Management (3 credits, fall)
4. ENVIRON 835 Environmental Law (3 credits, spring)

Master of Environmental Management in Environmental Leadership

Program Code: N-DEL-MEM
Degree Designation: Master of Environmental Management
Department: Nicholas School of the Environment
Website: nicholas.duke.edu/academics/masters-programs/duke-environmental-leadership-master-environmental-management

Program Summary

The Duke Environmental Leadership Master of Environmental Management (DEL-MEM) focuses on leadership and is designed for mid-career professionals. The DEL-MEM Program's hybrid (online and place-based) format makes it feasible for professionals to pursue the degree while working full-time.

The DEL-MEM is a two-year, four-semester, thirty-course-credit program designed for mid-career professionals with a minimum of five years of professional experience in an environmental field. The DEL-MEM focuses on interdisciplinary and global themes, strategic approaches to environmental management, communication, and effective leadership. The DEL-MEM degree is offered primarily via distance-learning technologies and is complemented with five short place-based sessions.

For more information about the DEL-MEM Program, contact nicholas-admissions@duke.edu or (919) 613-8070 or visit nicholas.duke.edu/academics/masters-programs/duke-environmental-leadership-master-environmental-management.

Academic Requirements

This is a two-year, four-semester, 30-credit degree.

Core Courses & Seminars – 17 credits

The following courses are required for all DEL-MEM students:

- ENVIRON 961: Ecosystem Science and Management
- ENVIRON 962: Economics of Environmental Management
- ENVIRON 963: Strategy and Implementation for Environmental Leaders
- ENVIRON 964: Environmental Law and Policy
- ENVIRON 966: Professional Writing Course
- ENVIRON 995: Leadership Seminar (includes five place-based sessions)

Focused Courses / Electives – Minimum 7 credits

Students can choose from a wide variety of electives*, including:

- Business Strategy for Environmental Sustainability
- The Science of Climate Change
- Community-Based Environmental Management (with a field component in Mexico)
- Restoration Ecology: Principles & Practice (optional field trip to Kaua'i)
- Sustainable Development (optional field trip to Colombia)
- GIS
- Sustainable Cities
- Corporate Sustainability and Carbon Accounting
- Energy Law

*Offerings of elective courses are specifically cultivated by the DEL-MEM Faculty Director and may vary from year to year.

Master's Project – 6 credits

ENVIRON 899: Master's Project. See Master's Projects on the Nicholas School's website for more information.

Master of Forestry

Program Code: N-FRM-MF
Degree Designation: Master of Forestry
Department: Nicholas School of the Environment
Website: nicholas.duke.edu/academics/masters-programs/master-forestry

Program Summary

The Master of Forestry degree integrates forest ecology and management within an educational program that emphasizes related environmental fields. The program builds knowledge in basic forest ecology and ecological management of forests for a variety of uses, including nontraditional forest products and conservation. This distinctive approach is brought about by coordinating a core set of forestry courses in sampling, measurement, dendrology, silviculture, and ecology—combined with electives in resource-oriented courses (such as soils, hydrology, air quality, water quality, biological conservation, and physiology); statistical analysis and modeling; and resource economics and policy. The Duke Forest serves as an outdoor laboratory in many of these courses.

The focus of the Master of Forestry is problem solving in complex ecological and management systems. Within the program, students may acquire skills that qualify them for positions in industry, conservation organizations, government agencies, nonprofit organizations, and other groups involved with the use and conservation of forests. The MF Program is accredited by the Society of American Foresters, which is recognized by the Council on Higher Education

Accreditation as the specialized accrediting body for forestry educational programs in the United States. Students can develop additional credentials for employment by concurrently completing the MF degree and a master of environmental management degree in the Nicholas School of the Environment or other concurrent degree programs (i.e., business, law, or public policy) at Duke, as described in the section that follows.

Prerequisites: statistics, calculus, principles of ecology, and microeconomics (or general economics that focuses on microeconomics rather than macroeconomics) required.

For more detailed information about this program, including specific prerequisites and degree requirements, see nicholas.duke.edu/academics/masters-programs/master-forestry.

Academic Requirements

The MF curriculum includes coursework toward four core competencies: forest ecology and biology; measurement of forest resources; silviculture and management of forest resources; and forest resources policy, economics, and administration. Within these categories, students customize their course selections to emphasize particular resources (e.g., forest carbon, forest hydrology, biodiversity conservation) or analytic approaches (e.g., geospatial analysis, finance, environmental justice).

Course credits are distributed among core competency areas specified by SAF, in addition to Nicholas School-wide requirements, quantitative analysis, and electives.

Specific to MF Students

- **Competency Areas.** Competency areas include forest ecology and biology; measurement of forest resources; silviculture and management of forest resources; and forest resources policy, economics, and administration. Courses taken to fulfill requirements other than those suggested here need advisor approval. (F) and (S) courses are usually offered in fall and spring semesters, respectively.
    - Forest Ecology & Biology: 6 credits
        - ENVIRON 503 Forest Ecosystems, 3 credits (S)
        - One course from the options below:
            - ENVIRON 505 Functional Ecology of Plants, 3 credits (F)
            - ENVIRON 567 Spatial Ecology, 3 credits (F)
            - ENVIRON 721 Soil Resources, 3 credits (F)
            - ENVIRON 732 Hydrology in Environmental Management, 3 credits (F)
            - ENVIRON 734 Watershed Hydrology, 3 credits (F)
    - Measurement of Forest Resources: 6 credits
        - ENVIRON 701 Forest Measurements, 3 credits (F)
        - ENVIRON 731 Dendrology, 3 credits (F)
    - Silviculture & Management of Forest Resources: 11 credits
        - ENVIRON 705L Silviculture, 4 credits (S)
        - ENVIRON 763 Forest Management Traveling Seminar, 1.5 credits (rotating topics; may be taken up to three times for credit). Either of two NCSU courses, FOR 514 or FOR 522, can replace ENVIRON 763.
        - ENVIRON 806 Duke Forest Practicum, 2 credits (S)
        - ENVIRON 889L Forestry Capstone, 4 credits (F)
    - Forest Resources Policy, Economics & Administration: 7.5 credits
        - ENVIRON 520 Resource and Environmental Economics I, 1.5 credits (F)
        - ENVIRON 680 Economics of Forest Resources, 1.5 credits (F). NCSU's course FOR 519 can replace ENVIRON 520 & 680.
        - ENVIRON 727 Forests in the Public Interest, 1.5 credits (F) (may be taken up to 2 times for credit)
        - One course from the options below:
            - ENVIRON 550 Land Use Principles and Policies, 3 credits
            - ENVIRON 577 Environmental Politics, 3 credits
            - ENVIRON 835 Environmental Law, 3 credits
    - Quantitative Analysis: 6 credits
        - ENVIRON 710 Applied Statistical Modeling Environmental Management, 3 credits (S)
        - One course from the options below, 3 credits:
            - ENVIRON 558L Satellite Remote Sensing for Environmental Analysis
            - ENVIRON 559 Fundamentals of Geospatial Analysis
            - ENVIRON 724 Landscape Analysis and Management
            - ENVIRON 761 Geospatial Analysis for Conservation & Management
            - ENVIRON 796 Financial Foundations for Environmental Managers
            - ENVIRON 832 Environmental Decision Analysis
            - ENVIRON 859/A Geospatial Data Analytics

One methods-oriented quantitative course is required. One or more courses focusing on Geographic Information System/Geospatial Analysis are highly recommended to satisfy the Quantitative Analysis requirement or as Specializing Electives (next section). Quantitative courses are also taught by the Duke Department of Statistical Science, Fuqua School of Business, Sanford School of Public Policy, and Departments of Biology, Economics, Political Science, Sociology, and Evolutionary Anthropology. In addition, various departments at NCSU and UNC offer graduate-level quantitative coursework that can be used to meet this requirement.

- **Specializing Electives**: 7-9 credits
- **Trips and Additional Experiences**
- MF Capstone Course: MF students must complete the MF Capstone Course (4 credits), which is included in the Silviculture & Management of Forest Resources competency area. They may propose a Master's Project as an optional, additional program activity.

All MF and MEM Students

- Master's Project (MP): 4-6 credits
- Seminar: 1 credit awarded at the end of 4 semesters

TOTAL: Minimum 48 credits required

When taken on its own, the MF program requires a total of at least 48 credits and four semesters of enrollment. A student pursuing the MF concurrently with the MEM will need at least five semesters of enrollment to earn the minimum of 72 credit hours and fulfill degree requirements. If the joint degrees do not substantially overlap in coursework, six semesters might be needed to complete both degrees. Consult the concurrent degree requirements for additional information.

Climate Science and Applications Certificate

Program Code: N-CCS-C
Degree Designation: Certificate
Department: Nicholas School of the Environment
Website: nicholas.duke.edu/academics/certificate-programs/climate-change-science-and-applications

Program Summary

The Nicholas School's Climate Change Science and Applications (CCSA) certificate program is open to all Master of Environmental Management (MEM) and Master of Forestry (MF) students. To earn the certificate, students must complete 12 credit hours of required coursework in physical or natural science, social science, and integrated assessment modeling, as well as a climate-related elective specific to their individual concentration area. They also must demonstrate mastery of skills learned through these courses by applying them in their Master's project or another equally substantive faculty-supervised capstone research project.

Students who wish to pursue this certificate program should add the program through their Stellic account.

Academic Requirements

The courses are in three required categories, and in some categories various courses can be used to meet the requirements. Lists of recommended courses in each category are available at nicholas.duke.edu/academics/certificate-programs/climate-change-science-and-applications.

- Natural/Physical Science: 1 course
- Social Science: 1 course
- Modeling: 1 course
- Elective: 1 course

Geospatial Analysis Certificate

Program Code: N-GIS-C
Degree Designation: Certificate
Department: Nicholas School of the Environment
Website: nicholas.duke.edu/academics/certificate-programs/geospatial-analysis-certificate-program

Program Summary

Geospatial analyses are a rapidly growing approach to problem solving across a wide array of environmental and earth science disciplines. The Nicholas School's Geospatial Analysis Program develops and maintains:

- Undergraduate and graduate (professional MEM & PhD) geospatial technologies curricula
- Research support for geospatial technologies and analysis
- Professional non-degree, distance learning instruction & certificate programs
- The institutional geospatial technology liaison between the Nicholas School and University

The certificate is open only to degree-seeking students in the Master of Environmental Management and Master of Forestry programs. Students who wish to pursue this certificate program should submit the Intent to Pursue a Certificate form to the NSOE registrar.

Academic Requirements

The curriculum is intended to augment the educational tracks of a wide number of students from across the Nicholas School. The Geospatial Certificate requires 4 courses from the geospatial curriculum. Information about the courses eligible to fulfill the certificate requirements is available at nicholas.duke.edu/academics/certificate-programs/geospatial-analysis-certificate-program.

- Fundamentals: 1 course
- Geospatial Electives: 3 courses

Undergraduate Programs

The Nicholas School cooperates with the Trinity College of Arts & Sciences in awarding six undergraduate degrees, three minors, and one certificate. Courses for the majors are taught by more than sixty Duke professors in twenty cooperating departments and schools. The Department of Biology offers a BS with a concentration in marine biology that is fulfilled by a semester in residence at the Duke University Marine Laboratory—a major facility of the Nicholas School.

Courses for the majors and minors are taught by Nicholas School faculty and professors in cooperating departments and schools within Duke University. Information about these majors and minors is available through the undergraduate office in A101 LSRC (undergradadmin@nicholas.duke.edu) or through the program website at nicholas.duke.edu/academics/undergraduate-programs.

All undergraduate students follow the policies outlined in the Duke University Undergraduate Bulletin.

Majors and Minors

- Earth and Climate Sciences (AB)
- Earth and Climate Sciences (BS)
- Earth and Climate Sciences Minor
- Environmental Sciences (BS)
- Environmental Sciences and Policy (AB)
- Environmental Sciences and Policy Minor
- Marine Science and Conservation (AB)
- Marine Science and Conservation (BS)
- Marine Science and Conservation Minor

Undergraduate Certificate

- Energy and the Environment

Academic Recognition

The Sara LaBoskey Award is given annually by the Nicholas School to a graduating senior in environmental science/policy in recognition of personal integrity and academic excellence. The award was established by Vicki and Peter LaBoskey in memory of their daughter, Sara LaBoskey.

The Thomas V. Laska Memorial Award is given annually by the Division of Earth and Climate Sciences of the Nicholas School to a graduating senior in recognition of outstanding achievement and promise for future success in earth and ocean sciences. The award was established by Andrew J. and Vera Laska in memory of their son, Thomas Vaclav Laska.

The Rachel Carson Scholars Program provides Duke University undergraduate students with direct research experience in marine science and conservation. Named in honor of Rachel Carson—a marine biologist, author, and conservationist whose work advanced the global environmental movement—scholars acquire the necessary skills to be the next generation of marine conservation leaders. Scholars engage in faculty-mentored, independent research for at least one semester at the Duke University Marine Laboratory.

The Scholars in Marine Medicine Program is an interdisciplinary undergraduate research experience for Duke University undergraduates who have an interest in the intersection of oceans and human health. Research opportunities span environmental toxicology, biotechnology, and marine pharmacology, with faculty mentorship across both the Duke University Marine Laboratory and the Duke School of Medicine. All scholars are encouraged to spend at least one semester and/or summer term at the Duke University Marine Laboratory.

The Repass-Rodgers Scholars Program provides Duke University undergraduate students with direct research experience in marine conservation technology. Through faculty-mentored research, scholars will acquire the necessary skills to become the next generation of leaders at the nexus of marine science and ocean engineering and will develop innovative solutions to address environmental challenges. All scholars are encouraged to spend at least one semester and/or summer term at the Duke Marine Laboratory.

The Climate Scholars Program aligns with Duke's Climate Commitment, a university-wide initiative to advance climate solutions. In this program, Duke University undergraduate students focus on diverse perspectives of the climate crisis and carry out faculty-mentored research on climate solutions, impacts, and policy across disciplines. Scholars are required to take two courses in the Earth and Climate Science (ECS) Division, followed by faculty-mentored research.

Financial Assistance

The Duke Undergraduate Financial Aid Office handles all financial aid matters, and the Bulletin of Undergraduate Instruction includes information about scholarships available to Duke undergraduates as well as loans and tuition payment plans.

Summer Tuition Scholarships. Duke Marine Lab Summer Tuition Scholarships are available to all students enrolled in marine science summer courses. A student may receive only one summer tuition scholarship per summer. The precondition for review of a scholarship application is admission to a specific summer course. Admission to courses does not automatically imply award of a scholarship; separate reviews are conducted. Please contact the Duke Marine Lab Enrollment Office at ml_enrollment@nicholas.duke.edu to apply for a summer tuition scholarship. Applicants are required to submit a brief statement of purpose, i.e., the reason for taking the particular course and demonstrate a need for the scholarship. The deadline is April 2025. Details are available online at nicholas.duke.edu/marinelab/academics/undergraduate/scholarships-financial-aid.

The Stanback Fellowship Program. The Nicholas School offers paid summer learning experiences to any currently enrolled Duke undergraduate student through the Duke University Stanback Fellowship Program. Made possible by the support of Fred and Alice Stanback, the program provides students with significant work experience in grassroots conservation, advocacy, applied resource management, or environmental policy. More information is available at nicholas.duke.edu/careers/students/stanback-fellowship-program.

All Courses

ECS701S - Research Orientation Seminar

Course Description

Introduction to resources, skills, and practices for conducting research in earth and ocean sciences, with emphasis on written and oral communication. Required of all entering graduate students in Earth and Climate Sciences. Consent of director of graduate studies required.

Grading Basis

Graded

Course Typically Offered

Fall Only

Units

Min Units:

3

Max Units:

3

ECS704LA - Biological Oceanography

Course Description

Patterns of abundance, diversity and activity of organisms in major ocean ecosystems. Identifies major physical, chemical and ecological processes that affect these patterns, and analyzes the impact of biology on ecosystems. Uses 'flipped' classroom emphasizing hands-on data collection and quantitative analyses, field trips aboard DUML research vessels, and participatory activities to demonstrate core concepts in biological oceanography. Taught in Beaufort at Duke Marine Lab. Spring enrollment requires travel. Graduate section includes experimental design component and research paper on final project.

Grading Basis

Graded

Course Typically Offered

Fall and/or Spring

Units

Min Units:

4

Max Units:

4

Crosslisted Courses

BIOLOGY704LA BIOLOGICAL OCEANOGRAPHY, ENVIRON704LA BIOLOGICAL OCEANOGRAPHY

ECS715 - Introduction to Coastal Environmental Change Processes

Course Description

Nearshore physical processes responsible for the evolution of beaches and barrier islands. Various problems and possible solutions arising from human development of retreating shorelines. Involves a field trip and research paper.

Grading Basis

Graded

Course Typically Offered

Occasionally

Units

Min Units:
3

Max Units:
3

ECS716A - Beach and Island Geological Processes

Course Description
Field seminar on the evolution of beaches and barrier islands with emphasis on the interactions between nearshore processes and human development. Prerequisite: Earth and Climate Sciences 315/515 or consent of instructor. Also taught as Earth and Climate Sciences 316A.

Grading Basis
Credit / No Credit

Course Typically Offered
Spring Only

Units

Min Units:
2

Max Units:
2

ECS722 - Hydrologic and Environmental Data Analysis

Course Description
Course will focus on acquisition of skills necessary to extract information from observations of hydrological and environmental processes, connect the extracted information with the physical processes generating the data, and estimate physical quantities at ungauged location/times. Emphasis on process understanding via data analysis techniques. Applications used as a way to understand the general concepts, with examples drawn from water science. Prerequisites: Basic computer skills, Algebra, Calculus are required. Experience with computational software (e.g. Matlab or R) is helpful but not required.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON722 HYDROLOGIC DATA ANALYSIS, CEE761 HYDROLOGIC DATA ANALYSIS

ECS723D - Hydrology

Course Description
An introduction to hydrology by examining how rainfall and snowmelt become streamflow, evapotranspiration, and groundwater with emphasis on hydrological processes inside watersheds. Topic areas include: hydrologic cycle and water balances, evapotranspiration and snow energy balances, vadose zone hydrology, hydrogeology, hyporheic zones, riparian zones, streamflow generation mechanisms, biogeochemical budgets, and field measurement techniques. Linkages between physical hydrology and broader ecological and environmental sciences will be highlighted. Includes local field trips.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

ECS785DS - Analyzing Current Contributions in Earth, Atmospheric and Climate Sciences

Course Description
Analyzing and discussing journal articles about a range of timely topics across the Earth and climate sciences. Each paper is associated with the research to be presented by the upcoming speaker in the Earth and Climate Sciences (ECS) seminar series. Faculty and senior graduate students rotate to provide background lectures needed to understand the paper/seminar, which will expose students to basic concepts from the wide range of research sub-fields represented within the Earth and Climate Sciences program. Meets twice per week, with one class meeting devoted to each ECS seminar (approximately every second week). Consent of director of graduate studies required.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall and/or Spring

Units

Min Units:
2

Max Units:
2

ECS785S - Analyzing Current Contributions in Earth, Atmospheric and Climate Sciences

Course Description
Analyzing and discussing journal articles about a range of timely topics across the Earth and climate sciences. Each paper is associated with the research to be presented by the upcoming speaker in the Earth and Climate Sciences (ECS) seminar series. Faculty and senior graduate students rotate to provide background lectures needed to understand the paper/seminar, which will expose students to basic concepts from the wide range of research sub-fields represented within the Earth and Climate Sciences program. Meets twice per week, with one class meeting devoted to each ECS seminar (approximately every second week). Consent of director of graduate studies required.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall and/or Spring

Units

Min Units:
2

Max Units:
2

ECS790 - Special Topics in Earth and Climate Sciences

Course Description
Content to be determined each semester.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
3

ECS790S - Advanced Topics in Geology

Course Description
Topics, instructors, and credits to be arranged each semester.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
3

ECS791 - Independent Study

Course Description
Consent of instructor required.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
1

Max Units:
3

ECS792S - Microgrid Seminar

Course Description
This seminar will focus on designing and costing microgrids. Microgrids range from building to campus to community power systems that are connected to the conventional electric grid but can be islanded off from it, to systems that power remote facilities beyond and thus totally disconnected from the grid. Designing a microgrid entails more than simply hooking up distributed generation technologies to one or more loads. It also involves understanding existing regulations and the circumstances under which they can be connected, resolving ownership, etc. This seminar will explore how to analyze both load data and data on local renewable energy resource potential. Prerequisite: Environment 631, 711, and 716L.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1.5

Max Units:
1.5

ECS818 - Snow, Glaciers, and Climate Change

Course Description
As the climate warms, rapid and dramatic changes are occurring to the cryosphere - melting glaciers and ice sheets, disappearing sea ice, thawing permafrost, and shrinking winter snowpacks. We will study these processes, their relationship with the earth and climate system, & how they are responding to climate change. Discuss the ways humans interact with the cryosphere, including the impact of climate change on communities and geo-engineering for mitigating cryospheric change. Grad students will lead weekly discussions & complete a more rigorous final project involving analysis of cryospheric data. This is a graduate level version of an undergraduate introductory course. Open to grads only.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ECS851L - Geospatial Data Science

Course Description
Learn about the foundations of modern geospatial data science - how to analyze vector, raster, and network data in Python & train a basic machine learning model to make predictions. Assignments will be based on real data with analytical methods addressing contemporary environ challenges in the US. Learn about aspects of data science including data acquisition, scalability, & visualization and general principles in project mgmt. Undergrads will conduct a research project. Grad students will complete a final project - including a short research paper. Recommended: some experience with programming and GIS. This is a graduate level version of an undergraduate intro course. Open to grads only.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENERGY520 - Resource & Environmental Economics I

Course Description
Part 1 of a survey course in environmental and natural resource economics. Part 1 focuses on basic theory and methods of economic analysis of environmental problems including benefit-cost analysis, non-market valuation, and instrument choice. Open only to graduate students. Recommended prerequisite: Introductory course in microeconomics and one semester of calculus.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ECON530 RESOURCE & ENVIRON ECON I, ENVIRON520 RESOURCE & ENVIRON ECON I, PUBPOL576 RESOURCE & ENVIRON ECON I

General Education Curriculum Codes
SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENERGY520D - Resource & Environmental Economics I

Course Description
Part 1 of a survey course in environmental and natural resource economics. Part 1 focuses on basic theory and methods of economic analysis of environmental problems including benefit-cost analysis, non-market valuation, and instrument choice. Prerequisite: Introductory course in microeconomics and one semester of calculus. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ENVIRON520D RESOURCE & ENVIRON ECON I, ECON530D RESOURCE & ENVIRON ECON I, PUBPOL575D RESOURCE & ENVIRON ECON I

General Education Curriculum Codes
SS - (SS) Social Sciences

ENERGY524 - Water Quality Health

Course Description
Explore basic concepts of water quality and human health with focus on the global water cycle, global water demand and availability, chemical properties of water, contaminants in water, health implications, and environmental isotope hydrology. Highlights relationships between human activities, water scarcity, water quality degradation, and ecological and health consequences. Addresses some policy implications related to conflicts over water resources and impact of energy production on water resources. Prerequisites: prior knowledge of introductory calculus and chemistry or consent of instructor.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON524 WATER QUALITY HEALTH, GLHLTH534 WATER QUALITY HEALTH, ECS524 WATER QUALITY HEALTH

ENERGY572S - Impact Evaluation: Energy and Development

Course Description
Universal energy access is often viewed as a catalyst for economic growth and development, yet the existing evidence on the effects of energy access are mixed. Understanding causal effects of these efforts is important given the alternative development initiatives that could be supported with funding from various sources (e.g., government, NGO, and development banks). This course will provide students with an understanding of (1) the status of empirical economic evidence on the energy and development relationship, and (2) the importance of causal evidence to estimate the impacts of energy interventions and policies in developing countries. This course aims to provide the skills necessary to both evaluate the merits of existing studies as well as propose future impact evaluations.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL572S IMPACT EVAL ENERGY AND DEV

General Education Curriculum Codes
R - (R) Research, SS - (SS) Social Sciences

ENERGY578 - Environment, Social, Governance (ESG) Investing

Course Description
This course addresses the challenges and opportunities in implementing an ESG investment strategy. Begins with a review of the history and definitions of ESG investing and highlights how financial institutions are increasingly building ESG products and practices. The course will emphasize applications in energy, environment, climate change, and social equity, and will include many guest speakers who are experts in the field. Students will enhance their understanding of impact investing, renewable energy, climate tech, corporate sustainability, venture capital, private equity, asset management, and equities research. Recommended prereqs: Econ 205, Econ 372, Environ 796, Energy 620, or instructor consent.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECON578 ESG INVESTING

ENERGY578K - Environment, Social, Governance (ESG) Investing

Course Description
This course addresses the challenges and opportunities in implementing an ESG investment strategy. Begins with a review of the history and definitions of ESG investing and highlights how financial institutions are increasingly building ESG products and practices. The course will emphasize applications in energy, environment, climate change, and social equity, and will include many guest speakers who are experts in the field. Students will enhance their understanding of impact investing, renewable energy, climate tech, corporate sustainability, venture capital, private equity, asset management, and equities research. Taught at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

ENERGY579 - Climate Tech Startups and Investors

Course Description
This course provides an overview of business development in the rapidly growing climate tech sector. Through 'in the trenches' input from guest speakers (founders and investors across the U.S.) and assignments, students will learn about the climate tech landscape and become more fluent with certain business skills and tools, such as (1) market sizing, (2) investor databases, (3) competitor analysis, (4) productivity techniques, and (5) term sheets.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
I&E579 CLIM TECH STARTUPS & INVESTORS

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, SS - (SS) Social Sciences

ENERGY588 - A Practical Introduction to Solar Energy Project Development in The U.S.

Course Description
This course offers a practical exploration of the major aspects of renewable project development for students interested in pursuing a career in renewable energy. We will examine the major stakeholders and activities involved in siting, developing, permitting, engineering, financing and constructing a renewable power facility. Students will be introduced to tools commonly used in the industry, and hear directly from industry experts. Recommended prerequisite: ENVIRON 231 or ENVIRON 711.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON588 INTRO TO SOLAR PROJECT DEV

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, SB - (SB) Social & Behavioral Analysis: A&S Curriculum

ENERGY590 - Special Topics in Energy

Course Description
Content to be determined each semester. May be repeated.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

ENERGY590S - Advanced Topics in Energy

Course Description
Selected topics vary by semester.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

ENERGY620 - Energy Finance

Course Description
Exploration of energy financing and investment decisions as they relate to energy companies and energy-related projects. Key topics include discount rates, discounted cash flows, valuation approaches, option pricing, real options, energy derivatives, project finance, energy specific taxation, and risk management. Prerequisites: College-level calculus, Introductory Micro/Macroeconomics (Economics 101 Economic Principles or equivalent), and either Economics 572, Environment 796, or Engineering Management 530.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENERGY630 - Transportation and Energy

Course Description
Examination of transportation-related energy use and its impact on the environment. Learn how technology, infrastructure, and policy, as well as personal and cultural preferences, interact to meet demands for personal mobility and freight movement. Cutting across these themes will be consideration of strategies to reduce transportation energy use and its environmental impacts, with an introduction to information resources and tools for evaluating both. Provides opportunities to hone problem solving and analytical skills, and challenges students to think critically and creatively about the trade-offs among complex transportation options.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON630 TRANSPORTATION AND ENERGY

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (SS) Social Sciences

ENERGY630D - Transportation and Energy

Course Description
Examination of transportation-related energy use and its impact on the environment. Learn how technology, infrastructure, and policy, as well as personal and cultural preferences, interact to meet demands for personal mobility and freight movement. Cutting across these themes will be consideration of strategies to reduce transportation energy use and its environmental impacts, with an introduction to information resources and tools for evaluating both. Provides opportunities to hone problem solving and analytical skills, and challenges students to think critically and creatively about the trade-offs among complex transportation options.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON630D TRANSPORTATION AND ENERGY

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (SS) Social Sciences

ENERGY631 - Energy Technology and Impact on the Environment

Course Description
Efficiencies and environmental impacts of both new and established energy sources and conversion methods. Consideration of alternative energy technologies, including electricity generation by fossil fuels, nuclear, solar, wind and water; space heating and cooling by traditional methods and by solar; and transportation energy in automobiles, mass transit and freight. Environmental consequences of energy choices on local, national and global scales, including toxic emissions, greenhouse gases and resource depletion. Prerequisite: Environment 231 or Environment 711. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON631 ENERGY TECHNOL ENVIRON IMPACTS

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NS - (NS) Natural Sciences

ENERGY631D - Energy Technology and Impact on the Environment

Course Description
Efficiencies and environmental impacts of both new and established energy sources and conversion methods. Consideration of alternative energy technologies, including electricity generation by fossil fuels, nuclear, solar, wind and water; space heating and cooling by traditional methods and by solar; and transportation energy in automobiles, mass transit and freight. Environmental consequences of energy choices on local, national and global scales, including toxic emissions, greenhouse gases and resource depletion. Prerequisite: Environment 231 or Environment 711. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON631D ENERGY TECHNOL ENVIRON IMPACTS

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (NS) Natural Sciences

ENERGY635 - Energy Economics and Policy

Course Description
Economics of markets and policies for various energy supply sources, energy demand and efficiency, their interactions with each other, and with the economy and environment. Will explore rationales for why markets for energy and related technologies have been subject to extensive government intervention. Course will analyze effects of policy responses, including energy price regulation, the interface of energy, environmental, and technology policy, and policy motivated by energy security concerns. Prerequisite: Introductory Microeconomics (Economics 101 or equivalent) and college calculus.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ENVIRON635 ENERGY ECONOMICS AND POLICY

General Education Curriculum Codes
SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENERGY635D - Energy Economics and Policy

Course Description
Economics of markets and policies for various energy supply sources, energy demand and efficiency, their interactions with each other, and with the economy and environment. Will explore rationales for why markets for energy and related technologies have been subject to extensive government intervention. Course will analyze effects of policy responses, including energy price regulation, the interface of energy, environmental, and technology policy, and policy motivated by energy security concerns. Prerequisite: Introductory Microeconomics (Economics 101 or equivalent) and college calculus.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ENVIRON635D ENERGY ECONOMICS AND POLICY

General Education Curriculum Codes
(SS) Social Sciences

ENERGY638 - Environmental Life Cycle Analysis & Decision

Course Description
Provides theoretical foundations of environmental life cycle assessment tools and methods used for products and global supply chains. Introduces various life cycle inventory and life cycle assessment tools used by the community of scientists and industry. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON638 ENVIRONMENTAL LCA

General Education Curriculum Codes
R - (R) Research, STS - (STS) Science, Technology, and Society, NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENERGY711 - Energy and Environment

Course Description

Overview of the challenges confronting humanity as a consequence of our reliance on energy. Challenges include dwindling supplies, rising demand and environmental degradation. Realistic responses require an understanding of the complexity of the energy system, including energy resources, uses, and impacts, in the context of social, political and economic imperatives. Lectures will be augmented by presentations from guest speakers from industry, government and non-profit organizations.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

Crosslisted Courses

ENVIRON711 ENERGY & ENVIRONMENT

ENERGY713A - Clean Energy Field Trip

Course Description

Field study of the clean energy industry around the San Francisco Bay area, California, with first-hand perspective from renewable energy experts. Includes a field trip with a required fee for the trip.

Grading Basis

Graded

Units

Min Units:

1

Max Units:

1

Crosslisted Courses

ENVIRON713A CLEAN ENERGY

ENERGY716L - Modeling for Energy Systems

Course Description

Introduction to computer programming and operations research in energy systems analysis with emphasis on formulation of optimization problems and simulation models. Applications and case studies dealing with energy systems problems, their externalities, and government policies that affect them. Data analysis, spreadsheet modeling, VBA programming in Excel; linear programming (lp), post-optimality and sensitivity analysis, multi-period lp, stochastic lp, network models for minimum path, maximum flow and optimal planning problems; probabilistic analysis Monte Carlo simulation, including generation of independent and correlated random variables, and goodness of fit tests.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

Crosslisted Courses

ENVIRON716L MODELING FOR ENERGY SYSTEMS

ENERGY727 - Energy Law

Course Description

The course will examine the legal framework governing energy production and consumption in the United States, and policy approaches for balancing energy needs with other societal goals.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENERGY790 - Special Topics in Energy

Course Description
Topics vary by semester.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
1

Max Units:
3

ENERGY790K - Special Topics in Energy

Course Description
Topics vary by semester. Offered at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
1

Max Units:
3

ENERGY795 - Connections in Energy: Interdisciplinary Team Projects

Course Description
Teams of undergraduate and graduate students work with faculty supervisors to identify, refine, explore and develop solutions to pressing energy issues. Teams may also include postdoctoral fellows, visiting energy fellows, and other experts from business, government, and the non-profit sector. A team's work may run in parallel with or contribute to an on-going research project. Teams will participate in seminars, lectures, field work and other learning experiences relevant to the project. Requires substantive paper or product containing significant analysis and interpretation. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENERGY795A - Connections in Energy: Interdisciplinary Team Projects

Course Description
Teams of undergraduate and graduate students work with faculty supervisors to identify, refine, explore and develop solutions to pressing energy issues. Teams may also include postdoctoral fellows, visiting energy fellows, and other experts from business, government, and the non-profit sector. A team's work may run in parallel with or contribute to an on-going research project. Teams will participate in seminars, lectures, field work and other learning experiences relevant to the project. Requires substantive paper or product containing significant analysis and interpretation. Instructor consent required. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENERGY795T - Bass Connections Energy & Environment Research Team

Course Description
Tutorial course for Bass Connections yearlong project team. Topics vary depending on semester and section. Teams of undergraduate and graduate students work with faculty to address critical energy and environmental challenges. Teams may also include postdoctoral fellows and experts from business, government, and the nonprofit sector. A team's work may run in parallel with or contribute to an ongoing research project. Teams will participate in seminars, data collection and analysis, lab work, field work, and other learning experiences relevant to the project. Requires final paper or product containing significant analysis and interpretation. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENERGY795TA - Bass Connections Energy & Environment Research Team

Course Description
Bass Connections Year-long Project Team. Topics vary depending on semester and section. Teams of undergraduate and graduate students work with faculty to address critical energy and environmental challenges. Teams may also include postdoctoral fellows and experts from business, government and the non-profit sector. A team's work may run in parallel with or contribute to an on-going research project. Teams will participate in seminars, data collection and analysis, lab work, field work and other learning experiences relevant to the project. Requires final paper or product containing significant analysis and interpretation. Instructor consent required. Taught in Beaufort.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENERGY796 - Connections in Energy: Interdisciplinary Team Projects

Course Description
Teams of undergraduate and graduate students work with faculty supervisors to identify, refine, explore and develop solutions to pressing energy issues. Teams may also include postdoctoral fellows, visiting energy fellows, and other experts from business, government, and the non-profit sector. A team's work may run in parallel with or contribute to an on-going research project. Teams will participate in seminars, lectures, field work and other learning experiences relevant to the project. Requires substantive paper or product containing significant analysis and interpretation. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENERGY796A - Connections in Energy: Interdisciplinary Team Projects

Course Description
Teams of undergraduate and graduate students work with faculty supervisors to identify, refine, explore and develop solutions to pressing energy issues. Teams may also include postdoctoral fellows, visiting energy fellows, and other experts from business, government, and the non-profit sector. A team's work may run in parallel with or contribute to an on-going research project. Teams will participate in seminars, lectures, field work and other learning experiences relevant to the project. Requires substantive paper or product containing significant analysis and interpretation. Instructor consent required. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

ENERGY796T - Bass Connections Energy & Environment Research Team

Course Description
Tutorial course for Bass Connections yearlong project team. Topics vary depending on semester and section. Teams of undergraduate and graduate students work with faculty to address critical energy and environmental challenges. Teams may also include postdoctoral fellows and experts from business, government, and the nonprofit sector. A team's work may run in parallel with or contribute to an ongoing research project. Teams will participate in seminars, data collection and analysis, lab work, field work, and other learning experiences relevant to the project. Requires final paper or product containing significant analysis and interpretation. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENERGY796TA - Bass Connections Energy & Environment Research Team

Course Description
Bass Connections Year-long Project Team. Topics vary depending on semester and section. Teams of undergraduate and graduate students work with faculty to address critical energy and environmental challenges. Teams may also include postdoctoral fellows and experts from business, government and the non-profit sector. A team's work may run in parallel with or contribute to an on-going research project. Teams will participate in seminars, data collection and analysis, lab work, field work and other learning experiences relevant to the project. Requires final paper or product containing significant analysis and interpretation. Instructor consent required. Taught in Beaufort.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENERGY797 - Time Series Analysis for Energy and Environment Applications

Course Description
This course focuses on time series analysis, modeling, and forecasting, specifically within the context of energy and the environment. Lectures will include theory and applications using R programming language. Datasets from organizations like US Energy Information Administration (EIA), National Oceanic and Atmospheric Administration (NOAA), National Renewable Energy Laboratory (NREL) and US Geological Survey (USGS) will be used. Upon completion of the course, students will be able to use R to carry out basic statistical modeling and analysis as well as fitting models to data. The primary objective of the course is to empower students to extract meaningful predictions and insights from data.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON797 TIME SERIES ENERGY ENV APPLI

ENERGY811 - Business and Environment

Course Description
Theoretical grounding on Sustainable Systems (SS) thinking and overview of national and international frameworks that have led to development and use of sustainable systems modeling, life cycle analysis and policy decision models. Topics include socio-metabolic consumption, sustainability as a field of inquiry, systems thinking, industrial ecology, earth systems engineering, complexity and resiliency. Explore current drivers and implications of sustainable systems with specific focus on nexus of industry and environmental systems including examining cumulative impacts and benefits resulting from shifting supply chains, green engineering, technological designs and consumer behavior.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON811 BUSINESS AND ENVIRONMENT

ENERGY811D - Business and Environment

Course Description
Theoretical grounding on Sustainable Systems (SS) thinking and overview of national and international frameworks that have led to development and use of sustainable systems modeling, life cycle analysis and policy decision models. Topics include socio-metabolic consumption, sustainability as a field of inquiry, systems thinking, industrial ecology, earth systems engineering, complexity and resiliency. Explore current drivers and implications of sustainable systems with specific focus on nexus of industry and environmental systems including examining cumulative impacts and benefits resulting from shifting supply chains, green engineering, technological designs and consumer behavior. Instructor consent required.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON811D BUSINESS AND ENVIRONMENT

ENERGY830 - Building Energy on Campus: Evaluating Efficiency and Conservation Measures at Duke

Course Description
Buildings use more than 40% of the energy consumed in the US, and are a natural target of energy efficiency and conservation measures. Building owners and facility managers, as well as the policy community, are therefore interested in identifying means of reducing energy consumption in the current building stock and taking advantage of the embodied energy already sunk into its construction. Using the campus as a laboratory, course examines energy use in existing Duke buildings. Students will learn about the relationship between building design and energy use, and gain hands-on experience conducting energy audits and evaluating energy saving measures in campus facilities.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON830 BUILDING ENERGY ON CAMPUS

ENERGY835 - Environmental Law

Course Description
Examination of rapidly growing body of law concerned with interrelationships between human activities and the larger environment. Focus on rationales for environmental protection; risk assessment and priorities.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENVIRON835 ENVIRONMENTAL LAW

ENERGY891 - Topics in Environmental Regulation

Course Description
In-depth analysis of current issues in environmental regulation. Topics vary. Course may be repeated.

Grading Basis
Graded

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ENVIRON891 TOPICS IN ENVL REGULATION

ENERGY910 - Environment and Energy Economics

Course Description
This course surveys the analytical tools and methods used to identify suboptimal environmental outcomes and policies to correct them. It also introduces students to energy markets and the economic and environmental regulations that govern them. Students will apply microeconomic concepts to contemporary challenges confronting the environment and energy market participants. Consent of instructor is required. Prerequisite: Economics 701D and 705D.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL910 ENVIRONMENT AND ENERGY ECON

ENERGY590-1 - Special Topics in Energy

Course Description
Topics vary by semester.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1.5

Max Units:
1.5

ENERGY790-1 - Special Topics in Energy

Course Description
Topics vary by semester.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1.5

Max Units:
1.5

ENERGY795-1 - Connections in Energy: Interdisciplinary Team Projects

Course Description
Teams of undergraduate and graduate students work with faculty supervisors to identify, refine, explore and develop solutions to pressing energy issues. Teams may also include postdoctoral fellows, visiting energy fellows, and other experts from business, government, and the non-profit sector. A team's work may run in parallel with or contribute to an on-going research project. Teams will participate in seminars, lectures, field work and other learning experiences relevant to the project. Requires final paper or product containing significant analysis and interpretation. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1.5

Max Units:
1.5

ENERGY796-1 - Connections in Energy: Interdisciplinary Team Projects

Course Description
Teams of undergraduate and graduate students work with faculty supervisors to identify, refine, explore and develop solutions to pressing energy issues. Teams may also include postdoctoral fellows, visiting energy fellows, and other experts from business, government, and the non-profit sector. A team's work may run in parallel with or contribute to an on-going research project. Teams will participate in seminars, lectures, field work and other learning experiences relevant to the project. Requires final paper or product containing significant analysis and interpretation. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1.5

Max Units:
1.5

ENVIRON501 - Environmental Toxicology

Course Description
An introduction to the field of environmental toxicology. Study of environmental contaminants from a broad perspective encompassing biochemical, ecological, and toxicological principles and methodologies. Discussion of sources, environmental transport and transformation phenomena, accumulation in biota and ecosystems. Impacts at various levels of organization, particularly biochemical and physiological effects. Prerequisites: organic chemistry and an upper-level biology course, or consent of instructor.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON501A - Environmental Toxicology

Course Description
An introduction to the field of environmental toxicology. Study of environmental contaminants from a broad perspective encompassing biochemical, ecological, and toxicological principles and methodologies. Discussion of sources, environmental transport and transformation phenomena, accumulation in biota and ecosystems. Impacts at various levels of organization, particularly biochemical and physiological effects. Taught in Beaufort at Duke Marine Lab. Prerequisite: organic chemistry and an upper-level biology course, or consent of instructor.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
(NS) Natural Sciences

ENVIRON501D - Environmental Toxicology

Course Description
An introduction to the field of environmental toxicology. Study of environmental contaminants from a broad perspective encompassing biochemical, ecological, and toxicological principles and methodologies. Discussion of sources, environmental transport and transformation phenomena, accumulation in biota and ecosystems. Impacts at various levels of organization, particularly biochemical and physiological effects. Prerequisites: organic chemistry and an upper-level biology course, or consent of instructor.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
(NS) Natural Sciences

ENVIRON502S - Climate Change and the Law

Course Description
This seminar will examine global climate change and the range of actual and potential responses by legal institutions, in the U.S. and internationally. In so doing it will also explore fundamental questions about legal response to looming crises using climate change as the focal point of a broader discussion. Can legal institutions deal with such mega-problems? Will doing so lead to basic changes in legal institutions?

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
2

Max Units:
2

ENVIRON503 - Forest Ecosystems

Course Description
Emphasis on the processes by which forests circulate, transform, and accumulate energy and materials through interactions of biologic organisms and the forest environment. Ecosystem productivity and cycling of carbon, water, and nutrients provide the basis for lecture and laboratory.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECS503 FOREST ECOSYSTEMS

General Education Curriculum Codes
NS - (NS) Natural Sciences

ENVIRON504A - Marine Protected Area Monitoring and Management

Course Description
An interdisciplinary course that addresses concepts, issues, and approaches relevant to marine protected areas (MPAs) and their impacts on marine ecosystems and coastal people. Course will address key topics on MPA design, implementation, management, monitoring, and evaluation. Attention will be given to sensitive marine ecosystems (e.g. coral reefs) and resource-dependent fishing and tourism communities. Using real world case studies, students will apply introduced concepts and quantitative approaches to questions on MPA monitoring and evaluating their impacts. Students will engage with the course material primarily through group discussions, problem sets, and lectures. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
MARSCI504A MARINE PROTECTED AREAS, ETHICS504A MARINE PROTECTED AREAS

General Education Curriculum Codes
EI - (EI) Ethical Inquiry, NS - (NS) Natural Sciences, SS - (SS) Social Sciences

ENVIRON505 - Functional Ecology of Plants

Course Description
This course is designed for graduate and undergraduate students with interest in plant functional ecology. We explore how (woody) plants function and respond to changing climate. We focus on plant functional traits (e.g., leaf properties, wood density, maximum height) and the main tradeoffs controlling plant form and function in various environments.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY505 FUNCTIONAL ECOLOGY OF PLANTS

General Education Curriculum Codes
NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON505D - Functional Ecology of Plants

Course Description
This course is designed for graduate and undergraduate students with interest in plant functional ecology. We explore how (woody) plants function and respond to changing climate. We focus on plant functional traits (e.g., leaf properties, wood density, maximum height) and the main tradeoffs controlling plant form and function in various environments.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY505D FUNCTIONAL ECOLOGY OF PLANTS

General Education Curriculum Codes
(NS) Natural Sciences

ENVIRON506 - Environmental Justice: Theory and Practice for Environmental Scientists and Policy Professionals

Course Description
Examination of concepts related to theory and practice of environmental justice including: data and analytics used by researchers, decision-makers and other parties; concepts related to meaningful engagement with special attention to American Indian tribes and Indigenous peoples; and broader perspectives on environmental justice related to climate change, cumulative impacts, and other topics. Investigate recent case studies involving food, energy, water, and climate through readings, guest speakers, and classroom discussion. Required field trip.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON507DS - The Amazon: Evolution of Its Climate, Landscape, Ecology, and Human Civilizations

Course Description
Introduction to the natural and human evolution of the Amazon region of South America, from the Andes Mountains, to the rain forests, to the Amazon River delta. Exploration of the interactions among changes in landscapes, ecology, biota, climate, and human civilizations through time. Topics include human impacts on biodiversity, landscape processes, and resources from pre-history to modern societies, and their future outlook.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECS507DS THE AMAZON

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NS - (NS) Natural Sciences

ENVIRON507S - The Amazon: Evolution of Its Climate, Landscape, Ecology, and Human Civilizations

Course Description
Introduction to the natural and human evolution of the Amazon region of South America, from the Andes Mountains, to the rain forests, to the Amazon River delta. Exploration of the interactions among changes in landscapes, ecology, biota, climate, and human civilizations through time. Topics include human impacts on biodiversity, landscape processes, and resources from pre-history to modern societies, and their future outlook.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECS507S THE AMAZON

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NS - (NS) Natural Sciences

ENVIRON514 - Machine Learning in Environmental Science

Course Description
This course provides an introduction to machine learning (ML) techniques with a focus on applications in environmental and climate science. Students will learn fundamental ML concepts and apply them to real-world environmental challenges, such as climate modeling, remote sensing analysis, and ecosystem management. The course emphasizes hands-on experience, using Python-based ML libraries such as scikit-learn and Keras to analyze environmental datasets.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
QC - (QC) Quant & Comp Reasoning: A&S Curriculum, QS - (QS) Quantitative Studies

ENVIRON516 - Global Change Biology: From Molecules to Organisms

Course Description
The course provides students with a foundational understanding of organismal response at the cellular and molecular level to changes in the environment due to climate change and pollution. Increased emissions of greenhouse gases and continuous release of other anthropogenic chemical pollutants are profoundly impacting organismal health. Are some species more vulnerable? What molecular and biochemical toolkits are needed to withstand rapid

environmental changes? Discussion will focus on the physiological stress resulting from and the adaptive responses made to changes in temperature, salinity, dissolved oxygen and ocean acidity combined with various chemical stressors in a range of species. Prerequisites in organic chemistry and biology strongly recommended.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON517 - Tropical Ecology

Course Description
Ecosystem, community, and population ecology of tropical plants and animals with application to conservation and sustainable development. Prerequisite: a course in general ecology.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY561 TROPICAL ECOLOGY

General Education Curriculum Codes
(NS) Natural Sciences

ENVIRON517D - Tropical Ecology

Course Description
Ecosystem, community, and population ecology of tropical plants and animals with application to conservation and sustainable development. Prerequisite: a course in general ecology.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY561D TROPICAL ECOLOGY

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (NS) Natural Sciences

ENVIRON520 - Resource & Environmental Economics I

Course Description
Part 1 of a survey course in environmental and natural resource economics. Part 1 focuses on basic theory and methods of economic analysis of environmental problems including benefit-cost analysis, non-market valuation, and instrument choice. Open only to graduate students. Recommended prerequisite: Introductory course in microeconomics and one semester of calculus.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ECON530 RESOURCE & ENVIRON ECON I, PUBPOL576 RESOURCE & ENVIRON ECON I, ENERGY520 RESOURCE & ENVIRON ECON I

General Education Curriculum Codes
SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON520D - Resource & Environmental Economics I

Course Description
Part 1 of a survey course in environmental and natural resource economics. Part 1 focuses on basic theory and methods of economic analysis of environmental problems including benefit-cost analysis, non-market valuation, and instrument choice. Prerequisite: Introductory course in microeconomics and one semester of calculus. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ECON530D RESOURCE & ENVIRON ECON I, PUBPOL575D RESOURCE & ENVIRON ECON I, ENERGY520D RESOURCE & ENVIRON ECON I

General Education Curriculum Codes
SS - (SS) Social Sciences

ENVIRON521 - Resource & Environmental Economics II

Course Description
Part 2 of a survey course in environmental and natural resource economics. Part 2 focuses on basic theory and methods of economic analysis of natural resource problems including extraction of non-renewable resources over time, fisheries economics and forest economics. Prerequisite: Environment 520.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
0.5

Max Units:
1.5

Crosslisted Courses
ECON531 RESOURCE & ENVIRON ECON II, PUBPOL584 RESOURCE & ENVIRON ECON II

General Education Curriculum Codes
SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON521D - Resource & Environmental Economics II

Course Description
Part 2 of a survey course in environmental and natural resource economics. Part 2 focuses on basic theory and methods of economic analysis of natural resource problems including extraction of non-renewable resources over time, fisheries economics and forest economics. Prerequisite: Environment 520.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
0.5

Max Units:
1.5

Crosslisted Courses
ECON531D RESOURCE & ENVIRON ECON II, PUBPOL584D RESOURCE & ENVIRON ECON II

General Education Curriculum Codes
(SS) Social Sciences

ENVIRON524 - Water Quality Health

Course Description
Explore basic concepts of water quality and human health with focus on the global water cycle, global water demand and availability, chemical properties of water, contaminants in water, health implications, and environmental isotope hydrology. Highlights relationships between human activities, water scarcity, water quality degradation, and ecological and health consequences. Addresses some policy implications related to conflicts over water resources and impact of energy production on water resources. Prerequisites: prior knowledge of introductory calculus and chemistry or consent of instructor.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
GLHLTH534 WATER QUALITY HEALTH, ENERGY524 WATER QUALITY HEALTH, ECS524 WATER QUALITY HEALTH

ENVIRON528SA - Community-Based Marine Conservation

Course Description
Experiential education course on community-based conservation. Students learn first-hand about the challenges (accomplishments, failures, and promises) involved in its design and practice in developing countries of high biological diversity. Learn about the unique natural and political history, and social characteristics of the places where conservation takes place. Students link local context to broader perspectives through key readings and class discussions. Taught in Beaufort at Duke Marine Lab. Instructor consent required, visit DUML website for details.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
MARSCI528SA COMMUNITY-BASED CONSERVATION

General Education Curriculum Codes
CCI - (CCI) Cross Cultural Inquiry, STS - (STS) Science, Technology, and Society, SS - (SS) Social Sciences

ENVIRON530 - Remote Sensing in Coastal Environments

Course Description
Introduction to the field of remote sensing and image processing with focus on applications to coastal monitoring and currently open research questions. Students will acquire an operational knowledge of various remote-sensing tools and data types, with emphasis on their application in coastal areas. Content will include theory, in-class laboratory exercises, and projects with environmental applications. Prerequisite: introductory or AP physics preferred or permission of instructor.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
CEE574 REMOTE SENSING COASTAL ENV, ECS530 REMOTE SENSING COASTAL ENV

General Education Curriculum Codes
NS - (NS) Natural Sciences, QS - (QS) Quantitative Studies

ENVIRON531L - Economic Valuation of the Environment

Course Description
Quantitative course with focus on economic valuation of changes in environmental quality. Covers theoretical foundations of major nonmarket valuation methods and, through a series of problem sets, provides opportunities to develop skills applying those methods. Also covers a range of regression methods commonly employed in valuation studies. Prerequisite: Environment 520 or equivalent and Environment 710 or equivalent.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
(SS) Social Sciences

ENVIRON532 - Evaluation of Public Expenditures

Course Description
Basic development of cost benefit analysis from alternative points of view, for example, equity debt, and economy as a whole. Techniques include: construction of cash flows, alternative investment rules, inflation adjustments, optimal timing and duration of projects, private and social pricing. Adjustments for economic distortions, foreign exchange adjustments, risk and income distribution examined in the context of present value rules. Examples and cases from both developed and developing countries.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECON521 EVALUATION PUBLIC EXPENDITURES, PUBPOL596 EVALUATION PUBLIC EXPENDITURES

General Education Curriculum Codes
(SS) Social Sciences

ENVIRON532D - Evaluation of Public Expenditures

Course Description
Basic development of cost benefit analysis from alternative points of view, for example, equity debt, and economy as a whole. Techniques include: construction of cash flows, alternative investment rules, inflation adjustments, optimal timing and duration of projects, private and social pricing. Adjustments for economic distortions, foreign exchange adjustments, risk and income distribution examined in the context of present value rules. Examples and cases from both developed and developing countries.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECON521D EVALUATION PUBLIC EXPENDITURES, PUBPOL596D EVALUATION PUBLIC EXPENDITURES

General Education Curriculum Codes
(SS) Social Sciences

ENVIRON533A - Marine Fisheries Policy

Course Description
Principles, structure, and process of public policy-making for marine fisheries. Topics include local, regional, national, and international approaches to the management of marine fisheries. A social systems approach is used to analyze the biological, ecological, social, and economic aspects of the policy and management process. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
MARSCI533A MARINE FISHERIES POLICY

General Education Curriculum Codes
EI - (EI) Ethical Inquiry, SS - (SS) Social Sciences

ENVIRON536S - Food, Agriculture and the Environment: Law and Policy

Course Description
The course focuses on (1) the interrelationship of food and agricultural production and environmental sustainability and (2) the influence of a complex array of laws on the development of sustainable, local foods-based markets. Students will explore readings from a variety of sources, hear from guest speakers, and delve into a research project of their own choosing. Students will gain an understanding of how laws govern and interact with food safety research, physical infrastructure, personal consumption habits, patterns of private sector investment, race-based and other structural inequalities, and how the law affects notions of community and reflects underlying cultural values.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
2

Max Units:
2

General Education Curriculum Codes
SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON537 - Environmental Health and Epidemiology

Course Description

Introduction to environmental effects on human health. Focus on chronic effects of exposure to pollution on key health endpoints, including cancer, neurological health, reproduction and development, cardiovascular and pulmonary health, the interaction between anthropogenic environmental changes and infectious diseases, and the relationship between human health and ecosystem health. Fundamental concepts of epidemiology are introduced in the context of environmental health, methods for statistical analysis of epidemiologic data are presented and contemporary environmental health issues are discussed. Includes discussions and lectures from a variety of experts from the Triangle region.

Grading Basis

Graded

Course Typically Offered

Spring Only

Units

Min Units:

3

Max Units:

3

General Education Curriculum Codes

STS - (STS) Science, Technology, and Society, NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON538 - Global Environmental Health: Economics and Policy

Course Description

Social science perspective on global environmental health. Students will learn to identify primary environmental causes of high burden diseases such as malaria, diarrhea, and respiratory infections; describe how to measure socio-economic impacts of global environmental health diseases; discuss key policies to control global environmental health problems based on private prevention and therapeutic behaviors; and propose frameworks to empirically monitor and evaluate global environmental health policies. A sub-module will focus on climate change and water-borne diseases. Prerequisites: Introductory course in statistics.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

Crosslisted Courses

GLHLTH538 ENVIRON HEALTH: ECON AND POLIC, PUBPOL582 ENVIRON HEALTH: ECON AND POLIC, HLTHPOL582 ENVIRON HEALTH: ECON AND POLIC

General Education Curriculum Codes

STS - (STS) Science, Technology, and Society, SS - (SS) Social Sciences

ENVIRON539 - Human Health and Ecological Risk Assessment

Course Description

Topics central to both health and ecological risk assessment are explored. Basic concepts of hazard identification, dose-response relationships, exposure assessment, and risk characterization and communication are discussed in the context of both human health and environmental assessment. The basis and rationale for using specific, as well as extrapolated, scientific information and expert judgment, and the strengths and weaknesses of alternative approaches, are evaluated. Applications emphasizing real cases are used to illustrate the interdisciplinary process and products of risk assessment, as well as the regulatory use of the information. Group projects emphasized.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

ENVIRON540 - Chemical Fate of Organic Compounds

Course Description
This course will review environmental organic chemistry basics with a focus on contaminant chemistry. We will discuss quantitative processes used in predicting the fate and distribution of organic chemicals in the environment with regards to equilibrium/thermodynamics and some kinetic considerations. Topics include: equilibrium partitioning among air, water, sediments and biological tissues; factors affecting bioaccumulation and biomagnification; processes influencing the ultimate fate of organic contaminants in rivers and lakes; and processes influencing global transport. Prerequisites: University-level general chemistry and organic chemistry within last four years.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
CEE563 CHEM FATE ORG COMPOUNDS

General Education Curriculum Codes
NW - (NW) Investigating Natural World: A&S Curriculum

ENVIRON540D - Chemical Fate of Organic Compounds

Course Description
Equilibrium, kinetic, and analytical approaches applied to quantitative description of processes affecting the distribution and fate of anthropogenic and natural organic compounds in surface and ground waters, including chemical transfers between air, water, soils/sediments, and biota; and thermochemical and photochemical transformations. The relationships between organic compound structure and environmental behavior will be emphasized. Sampling, detection, identification, and quantification of organic compounds in the environment. Prerequisite: university-level general chemistry and organic chemistry within last four years.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
CEE563D CHEM FATE ORG COMPOUNDS

ENVIRON541 - Soils and Regoliths

Course Description
An analysis of fundamental physical, chemical, and biological soil properties and processes important to plant growth, carbon cycling, water relations, drainage, gas exchange, and mineral dissolution from the boreal zone to the tropics, from wildlands to cities. The course covers the science and management of soils and regoliths, classification and taxonomy, natural and human-altered formations, soil degradation and restoration, and soil quantitative problem solving. Field trips give reality to soil properties, soil geomprphologies, and land-use histories. Field trips on campus, Duke Forest and Duke Campus Farm.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECS541 SOILS AND REGOLITHS

General Education Curriculum Codes
NS - (NS) Natural Sciences

ENVIRON542L - Environmental Aquatic Chemistry

Course Description
Principles of chemical equilibria and kinetics as applied in environmental engineering and science processes. Topics include acid-base equilibrium, the carbonate system, metal complexation, oxidation/reduction reactions, mineral phase solubility and surface sorption. Applied environmental systems include water treatment, soil remediation, air pollution and green engineering. Graduate-level requirements include specific laboratory work and written assignments. Open to graduate students; instructor consent required for undergraduates. Not open to students who have taken CEE 461L.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
CEE561L ENVIRONMENTAL AQUATIC CHEM

ENVIRON545 - Design Climate I: Discover

Course Description
Over the two-semester Design Climate course sequence, student teams use Design Thinking to create triple bottom line startups to address climate challenges posed by industry professionals or faculty. In Design Climate I (fall), student teams develop business ideas by working through the first three phases of Design Thinking: stakeholder empathizing, opportunity definition, and solution ideation. The semester culminates with a pitch on the startup idea that will be further vetted in Design Climate II (spring). Through this process, students learn directly from industry professionals and cultivate capabilities in Design Thinking, entrepreneurship, project management, sustainable product development, climate fundamentals, and business competencies. For more information, visit our website at https://designclimate.duke.edu. We highly encourage students to only register if you plan on taking both Design Climate I and II.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
I&E545 DESIGN CLIMATE I: DISCOVER, EGR545 DESIGN CLIMATE I: DISCOVER

General Education Curriculum Codes
R - (R) Research

ENVIRON546 - Design Climate II: Develop

Course Description
Over the two-semester Design Climate sequence, student teams use design thinking to develop triple bottom line startups that address climate challenges posed by industry professionals or faculty. In Design Climate II, student teams develop their business ideas by prototyping, gathering market validation data, and developing their business model. The semester culminates in a pitch of the startup ideas to members of the entrepreneurship community. Students cultivate capabilities in design thinking, entrepreneurship, project management, sustainable product development, climate fundamentals & business competencies. Includes local field trips.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
EGR546 DESIGN CLIMATE II: DEVELOP, I&E546 DESIGN CLIMATE II: DEVELOP

ENVIRON549 - California Water Crises: A Case Study Approach

Course Description
Reviews history of California's water dependent economy, leading to a capture, storage system with conveyances extending thousands of miles to deliver water for agriculture, industry and homes. Examines recent political change coupled with chronic issues of a water-rich north, an expanding urban population and a water-poor but politically strong south. Emphasis includes climate change, seismic vulnerability, redirection of river flows, and large scale water reuse. Course will cover specific water crises in other states and nations, providing in depth coverage of aspects of the international crisis in quantity and quality of freshwater.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON550 - Land Use Principles and Policy

Course Description
The purpose of the course is to improve your understanding of how land is used, the key factors shaping those uses, the environmental, social and cultural impacts of different land uses, and how land use could be more sustainable. The course covers a wide range of land use issues and topics, from agriculture and forestry to zoning, property rights and natural disasters. Students will examine historical uses, current trends, and likely future uses of land. The main focus of the course will be on land use principles and practices in the United States, but we will also explore examples from other parts of the world.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL578 LAND USE PRINCIPLES/POL

General Education Curriculum Codes
SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON550D - Land Use Principles and Policy

Course Description
The purpose of the course is to improve your understanding of how land is used, the key factors shaping those uses, the environmental, social and cultural impacts of different land uses, and how land use could be more sustainable. The course covers a wide range of land use issues and topics, from agriculture and forestry to zoning, property rights and natural disasters. Students will examine historical uses, current trends, and likely future uses of land. The main focus of the course will be on land use principles and practices in the United States, but we will also explore examples from other parts of the world.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL578D LAND USE PRINCIPLES/POL

General Education Curriculum Codes
(SS) Social Sciences

ENVIRON551DA - International Conservation and Development

Course Description
Interrelated issues of conservation and development. Topics include the evolution of the two concepts and of theories regarding the relationship between them, the role of science, values, ethics, politics and other issues in informing beliefs about them, and strategies for resolving conflicts between them. While attention will be given to all scales of interaction (i.e. local, regional, national, international), the focus will be on international issues and the 'north-south' dimensions of the conservation and development dilemma. Examples from marine and coastal environments will be highlighted. Consent of instructor required. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
MARSCI551DA CONSERVATION AND DEVELOPMENT, ETHICS551DA CONSERVATION AND DEVELOPMENT

General Education Curriculum Codes
CCI - (CCI) Cross Cultural Inquiry, SS - (SS) Social Sciences

ENVIRON552 - Climate and Society

Course Description
Advanced, interdisciplinary course on causes, consequences, and future trajectory of climate change. Course will cover physical observations of past climate change, role of human activities in driving climate change to date, and impacts of climate change on human and natural systems. Course will analyze how socioeconomic choices affects future climate as well as factors influencing those choices, including risk analyses, geoengineering proposals, intergenerational equity, climate metrics and the media.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECS550 CLIMATE AND SOCIETY

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NS - (NS) Natural Sciences

ENVIRON552D - Climate and Society

Course Description
Advanced, interdisciplinary course on causes, consequences, and future trajectory of climate change. Course will cover physical observations of past climate change, role of human activities in driving climate change to date, and impacts of climate change on human and natural systems. Course will analyze how socioeconomic choices affects future climate as well as factors influencing those choices, including risk analyses, geoengineering proposals, intergenerational equity, climate metrics and the media.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECS550D CLIMATE AND SOCIETY

General Education Curriculum Codes
EI - (EI) Ethical Inquiry, NS - (NS) Natural Sciences

ENVIRON554 - Graduate Rainforest Engineering

Course Description
An open-format project-based class for graduate student team design with a focus on rainforests and related environments. Engages graduate students in cross-disciplinary team challenges that will teach them to work together with other students of differing backgrounds and skills. Design challenges are similar to the XPRIZE contests, or the NAE Grand Challenges. Graduate students taking this class will collaborate with undergraduates taking a similar class and are expected to provide mentorship and leadership for their undergraduate collaborators. Prerequisite: Graduate student standing.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECE534 GRAD RAINFOREST ENGINEERING

ENVIRON556 - Environmental Conflict Resolution

Course Description
Practical techniques and scholarly underpinnings of environmental conflict resolution, including interest-based negotiation, mediation, public disputes, science-intensive disputes, and negotiation analysis. In-class time will be spent conducting negotiation role plays of increasing complexity and then debriefing them. Outside of class, students will prepare for the role plays and read background material to aid in debriefing.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON556D - Environmental Conflict Resolution

Course Description
Practical techniques and scholarly underpinnings of environmental conflict resolution, including interest-based negotiation, mediation, public disputes, science-intensive disputes, and negotiation analysis. In-class time will be spent conducting negotiation role plays of increasing complexity and then debriefing them. Outside of class, students will prepare for the role plays and read background material to aid in debriefing.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON557 - Social Science Surveys for Environmental Management

Course Description
Social science research methods for collecting data for environmental management and policy analysis. Sampling, survey design, focus groups, pretesting, survey implementation, coding, and data analysis. Team projects emphasize development and practice of survey skills. Prerequisite: introductory applied statistics or equivalent.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON557D - Social Science Surveys for Environmental Management

Course Description
Social science research methods for collecting data for environmental management and policy analysis. Sampling, survey design, focus groups, pretesting, survey implementation, coding, and data analysis. Team projects emphasize development and practice of survey skills. Prerequisite: introductory applied statistics or equivalent.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON558L - Remote Sensing for Environmental Analysis

Course Description
Environmental analysis using satellite remote sensing. Theoretical and technical underpinnings of remote sensing (corrections/pre-processing, image enhancement, analysis) with practical applications (land cover mapping, change detection e.g. deforestation mapping, forest health monitoring). Strong emphasis on hands-on processing and analysis. Will include variety of image types: multi-spectral, hyper-spectral, radar and others. Recommended prerequisite: familiarity with GIS.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences, QS - (QS) Quantitative Studies

ENVIRON559 - Fundamentals of Geospatial Analysis

Course Description
Fundamental aspects of geographic information systems and satellite remote sensing for environmental applications. Covers concepts of geographic data development, cartography, image processing, and spatial analysis. Gateway into more advanced training in geospatial analysis curriculum. Consent of instructor required.

Grading Basis
Graded

Units

Min Units:
4

Max Units:
4

General Education Curriculum Codes
NW - (NW) Investigating Natural World: A&S Curriculum, QS - (QS) Quantitative Studies

ENVIRON560 - Environmental Health: Pollutant Chemistry and Toxicology

Course Description
The course provides an overview of chemical pollutants and their impacts on ecological and human health. The course provides an overview of chemical pollutants and their impacts on ecological and human health. Topics include chemical pollutant classes, their sources, and the chemical properties that impact their fate and transport in the environment. Molecular, cellular, and organismal responses following exposure to pollutants, using case studies. Pollutant impacts on human health will be discussed and cover areas such as cancer, cardiovascular health, fertility, and brain development. Recommended prerequisites: Biology and Chemistry.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON563 - Cost-Benefit Analysis for Health and Environmental Policy

Course Description
Course considers the importance of economic analysis, or cost-benefit analysis (CBA), for public policy assessments. Specific focus is on health and environmental policy, and the steps in identification / cataloguing, quantification, and monetization of impacts of potential policies and projects. Covers: Economic rationale for CBA; Basic principles for assessing the economic effects of projects; Techniques for valuing health and environmental impacts; Intergenerational/philosophical concerns related to CBA; Social discounting; Risk and uncertainty; Comparisons of CBA with other approaches (i.e. cost effectiveness analysis, multi-objective analysis).

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
GLHLTH531 COST-BENEFIT ANALYSIS/HLTH&ENV, PUBPOL607 COST-BENEFIT ANALYSIS/HLTH&ENV

General Education Curriculum Codes
R - (R) Research, SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON564 - Biogeochemistry

Course Description
Processes controlling the circulation of carbon and biochemical elements in natural ecosystems and at the global level, with emphasis on soil and surficial processes. Topics include human impact on and social consequences of greenhouse gases, ozone, and heavy metals in the environment. Prerequisite: Chemistry 101DL or equivalent; Recommended: Chemistry 210DL.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY564 BIOGEOCHEMISTRY

ENVIRON564D - Biogeochemistry

Course Description
Discussion version of Biology 564. Processes controlling the circulation of carbon and biochemical elements in natural ecosystems and at the global level, with emphasis on soil and surficial processes. Topics include human impact on and social consequences of greenhouse gases, ozone, and heavy metals in the environment. Recommended prerequisite: Chemistry 101DL and 210DL.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY564D BIOGEOCHEMISTRY

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (NS) Natural Sciences

ENVIRON566 - Environmental Analytical Chemistry

Course Description
This course covers the fundamentals and applications of analytical chemistry as applied to detection, identification, and quantification of anthropogenic contaminants in environmental samples including air, water, soil, sediment, and biota. The topics include both sample preparation methods (i.e. wet chemistry) and instrumental analysis (e.g. mass spectrometry, chromatography, and optical spectroscopy). Particular emphasis is placed on current advancements in measurement science as applied to environmental chemistry. The material includes both theoretical and practical aspects of environmental analysis. Prerequisite: CHEM 131 or CHEM 151L or consent of instructor.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
CEE565 ENVIRON. ANALYTICAL CHEM.

ENVIRON567 - Spatial Ecology

Course Description
Spatial ecology is concerned with spatial heterogeneity (pattern) on landscapes-what generates pattern, its characteristic scaling in space and time, and why it matters for populations, communities, and ecosystems. As essentially all agencies that manage land now profess an aim to manage functional, resilient, & sustainable landscapes, this course provides the foundational knowledge to support these applications in conservation planning and ecosystem management. The course consists of lectures, computational sessions, group exercises and discussions - emphasizing key concepts & applying these to real-world scenarios. Recommended prerequisite: Ecology; Statistics and R programming experience preferred.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON568S - Integrated Assessment Modeling—Examining Strategies for Meeting Energy and Environmental Goals

Course Description
The primary objective is to provide students with a hands-on opportunity to use an Integrated Assessment Model—the Global Change Assessment Model with state-level resolution (GCAM-USA)—to examine the air quality and GHG implications of new and emerging energy system technologies. To facilitate the use of GCAM-USA, students will use the GLIMPSE decision support software being developed at EPA. GLIMPSE provides a user interface for GCAM, which facilitates developing and running scenarios as well as visualizing results. Team projects - examinations of electric vehicles, renewable electricity, energy efficiency in buildings and potentially other topics of interest to students.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECS568S INTEGRATED ASSESSMENT MODELING

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NS - (NS) Natural Sciences

ENVIRON569 - Should I Eat Fish? Economics, Ecology and Health

Course Description
Examines role that individual consumer can play in promoting marine conservation. Course considers array of issues that confront seafood consumers and tradeoffs that only an informed consumer can assess. In context of evaluating seafood students will learn to evaluate tradeoffs systematically, assess how different policy options affect incentives for users and polluters. This process allows students to place consumer initiatives in context of other approaches to marine conservation. Interdisciplinary approach but economic themes will inform course. Course intended for Master of Environmental Management students, but open to advanced undergraduates with permission. This course is intended for MEM students and is based on a Marine Conservation Leadership Certificate capstone course offered previously to undergraduates. Advanced undergraduates permitted pending space availability.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON571A - Sojourn in Singapore: Urban Tropical Ecology

Course Description
The mix of human ecology, tropical diversity, disturbed habitats and invasive species in Singapore. How Singapore maintains and enhances the quality of life of its citizens while radically modifying its environment. Research on politics, management or biology. Travel to Singapore required. Taught in Beaufort at Duke Marine Lab. Consent of instructor required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY571A URBAN TROPICAL ECOLOGY, MARSCI571A URBAN TROPICAL ECOLOGY

General Education Curriculum Codes
CCI - (CCI) Cross Cultural Inquiry, STS - (STS) Science, Technology, and Society, NS - (NS) Natural Sciences, SS - (SS) Social Sciences

ENVIRON572 - Economic Evaluation of Sustainable Development

Course Description
Examines how one could rationally defend a choice of 'sustainable development' policy. Applies cost-benefit thinking in environment-natural-resources and development contexts. Presents microeconomic concepts emphasizing logic and principles more than mechanics. Intertemporal equity is a focus and equity-efficiency tradeoffs are a theme. Microeconomics prerequisite not required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL574 ECON EVAL OF SUSTAINABLE DEVEL

General Education Curriculum Codes
EI - (EI) Ethical Inquiry, SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON573 - Coastal and Marine Pollution

Course Description
Sources, fate, and effects of organic, inorganic, and particulate pollutants in the marine environment. Topics include oil spills, coastal eutrophication, marine debris, harmful algae, sewage contamination, dredging, and emerging contaminants. Methods for measuring pollution in the marine environment and consequences for human and ecological health will be discussed. Case studies of impacted marine environments will be highlighted. Short local field trips possible. Recommended prerequisite: introductory chemistry and biology, or consent of instructor.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
MARSCI573 COASTAL AND MARINE POLLUTION

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (NS) Natural Sciences

ENVIRON573A - Coastal and Marine Pollution

Course Description
Sources, fate, and effects of organic, inorganic, and particulate pollutants in the marine environment. Topics include oil spills, coastal eutrophication, marine debris, harmful algae, sewage contamination, dredging, and emerging contaminants. Methods for measuring pollution in the marine environment and consequences for human and ecological health will be discussed. Case studies of impacted marine environments will be highlighted. Short local field trips possible. Taught in Beaufort at Duke Marine Lab. Recommended prerequisite: introductory chemistry and biology, or consent of instructor.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
MARSCI573A COASTAL AND MARINE POLLUTION

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NS - (NS) Natural Sciences

ENVIRON575L - Biodiversity Science and Application

Course Description
Processes responsible for natural biodiversity from populations to the globe. Topics include species interactions (e.g., competition, predation, parasitism), natural and human disturbance, climate change, and implications for management and conservation. Lab section involving observation and data from large-scale manipulations, such as experimental hurricanes, fire, and herbivore exclosures.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY565L BIODIVERSITY SCI AND APP

General Education Curriculum Codes
R - (R) Research, NS - (NS) Natural Sciences

ENVIRON575S - Biodiversity Science and Application

Course Description
Non-lab version of Biology 565L. Processes responsible for natural biodiversity from populations to the globe. Topics include species interactions (e.g., competition, predation, parasitism), natural and human disturbance, climate change, and implications for management and conservation. Recommended prerequisite: Biology 209D-2 or equivalent.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY565S BIODIVERSITY SCI AND APP

General Education Curriculum Codes
NS - (NS) Natural Sciences

ENVIRON577 - Environmental Politics

Course Description
Environmental policy formation and implementation. Topics include interest groups, environmental movements and parties, public opinion, political systems and institutions.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL577 ENVIRONMENTAL POLITICS, ICS577 ENVIRONMENTAL POLITICS

General Education Curriculum Codes
SS - (SS) Social Sciences

ENVIRON579S - Collective Action, Environment, and Development

Course Description
Examines the conditions under which collective or participatory decisions may raise welfare in defined ways. Presents the growing empirical evidence for an environment and development setting including common property issues (tragedy of the commons and competing models). Identifies what evidence exists for sharing norms on a background of self-interested strategies. Definitions of and reactions to equity and/or its absence are a focus. Providing scientific information for policy is another. Experimental and behavioral economics are frequently applied.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL579S COLLECTIVE ACTION

ENVIRON581 - Global Environmental Health Problems: Principles and Case Studies

Course Description
Many environmental problems occur both locally & globally. Having insights and experience from different parts of the world is important for students to gain problem-oriented training. This course will cover fundamental principles on physical & chemical processes related to major environmental problems. These principles will then be integrated to discussions of case studies addressing a specific set of problems. The case studies will involve the participation of invited guest instructors who are experts on specific topics/cases. Depending on preference of guest instructors, they can introduce a case study via online lecturing/chatting or providing a pre-made video. Online course. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
GLHLTH581 GLOBAL ENVIRONMENTAL HEALTH

General Education Curriculum Codes
(NS) Natural Sciences, (SS) Social Sciences

ENVIRON581D - Global Environmental Health Problems: Principles and Case Studies

Course Description
Many environmental problems occur both locally & globally. Having insights and experience from different parts of the world is important for students to gain problem-oriented training. This course will cover fundamental principles on physical & chemical processes related to major environmental problems. These principles will then be integrated to discussions of case studies addressing a specific set of problems. The case studies will involve the participation of invited guest instructors who are experts on specific topics/cases. Depending on preference of guest instructors, they can introduce a case study via online lecturing/chatting or providing a pre-made video. Online course. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
GLHLTH581D GLOBAL ENVIRONMENTAL HEALTH

General Education Curriculum Codes
(NS) Natural Sciences, (SS) Social Sciences

ENVIRON581K - Global Environmental Health Problems: Principles and Case Studies

Course Description
Many environmental problems occur both locally & globally. Having insights and experience from different parts of the world is important for students to gain problem-oriented training. This course will cover fundamental principles on physical & chemical processes related to major environmental problems. These principles will then be integrated to discussions of case studies addressing a specific set of problems. The case studies will involve the participation of invited guest instructors who are experts on specific topics/cases. Depending on preference of guest instructors, they can introduce a case study via online lecturing/chatting or providing a pre-made video. Online course. Open to Duke Kunshan students only. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
GLHLTH581K GLOBAL ENVIRONMENTAL HEALTH

General Education Curriculum Codes
(NS) Natural Sciences, (SS) Social Sciences

ENVIRON585 - Fisheries Biogeography and Ecology

Course Description
Current status of the distribution and abundance of fisheries globally and current topics in fisheries ecology, explored through lecture and discussion of primary literature. Participation in leading discussions and mini literature review. Basic knowledge of ecology and oceanography. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
MARSCI585 FISHERIES BIOGEOGRAPHY & ECOLO

General Education Curriculum Codes
NS - (NS) Natural Sciences

ENVIRON585A - Fisheries Biogeography and Ecology

Course Description
Current status of the distribution and abundance of fisheries globally and current topics in fisheries ecology, explored through lecture and discussion of primary literature. Participation in leading discussions and mini literature review. Basic knowledge of ecology and oceanography. Intended for master and doctoral students. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
MARSCI585A FISHERIES BIOGEOGRAPHY & ECOLO

General Education Curriculum Codes
(NS) Natural Sciences

ENVIRON588 - A Practical Introduction to Solar Energy Project Development in The U.S.

Course Description
This course offers a practical exploration of the major aspects of renewable project development for students interested in pursuing a career in renewable energy. We will examine the major stakeholders and activities involved in siting, developing, permitting, engineering, financing and constructing a renewable power facility. Students will be introduced to tools commonly used in the industry, and hear directly from industry experts. Recommended prerequisite: ENVIRON 231 or ENVIRON 711.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY588 INTRO TO SOLAR PROJECT DEV

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, SB - (SB) Social & Behavioral Analysis: A&S Curriculum

ENVIRON590 - Special Topics

Course Description
Content to be determined each semester. May be repeated.

Grading Basis
Graded

Units

Min Units:
0.5

Max Units:
4

ENVIRON590D - Special Topics

Course Description
Content to be determined each semester. May be repeated.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
0.5

Max Units:
4

ENVIRON590L - Special Topics

Course Description
Content to be determined each semester. May be repeated.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
0.5

Max Units:
4

ENVIRON592 - UNFCCC Practicum

Course Description
The U.N. Climate Change Negotiations Practicum is a Bass Connections-affiliated course that examines the negotiation of international climate change agreements under the United Nations Framework Convention on Climate Change (UNFCCC).

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
PUBPOL592 UNFCCC PRACTICUM

General Education Curriculum Codes
IJ - (IJ) Institutions, Justice & Power: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON593 - Independent Studies and Projects

Course Description
Directed readings or research at the graduate level to meet the needs of individual students. Consent of instructor required. Units to be arranged.

Grading Basis
Graded

Units

Min Units:
0.5

Max Units:
6

ENVIRON593K - Independent Studies and Projects

Course Description
For iMEP students or Duke students studying abroad at Duke Kunshan University. Directed readings or research at the graduate level to meet the needs of individual students. Units to be arranged. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
3

ENVIRON600K - Key Areas in International Environmental Policy

Course Description
An overview of the key areas in international environmental policy. This course's seven modules cover international environmental economics, international environmental policy and politics, international environmental negotiations, policy debates and simulations. The principal goal of the course is to preview the application of social sciences (economics, public policy, and political science) to the environment, and to facilitate the translation of core curricular concepts into a variety of real-word applications. Students will engage in self-directed research and learning on international environmental policy. Taught at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
(SS) Social Sciences

ENVIRON601K - Building an NGO Toolkit: From Design to Monitoring

Course Description
Non-governmental organizations (NGOs) that address conservation issues in China face large, complex, and urgent problems. To be successful, these NGOs must be equipped with the skills to be efficient, effective, and transparent when planning, implementing, and monitoring their conservation initiatives. In this hands-on course, students will become familiar with decision-support tools that allow organizations to systematically address strategic planning, project design, project budgeting, implementation, monitoring, evaluation, communication, and donor transparency. Students will apply these tools to real-world conservation problems. Taught at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
(SS) Social Sciences

ENVIRON602K - Natural Resources and Protected Area Management

Course Description
Toolkit for practical natural resources management and understanding the challenges involved in protected area management. Wildlife monitoring, environmental change tracking, socio-economic surveys and stakeholders engagement. Combines lectures for essential survey methods and experiential education through a seven-day field course. Students will design their own group project to carry out in the local context. Taught in Kunshan, China, at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON605 - Air Quality Management: Linking Science to Policy

Course Description
Air quality management topics are discussed: the policy foundation and varied approaches used to address criteria air pollutants, air toxics, mobile sources and acid deposition. Management principles are based on science-backed policies. The course covers concepts and methods in atmospheric science, exposure science and health sciences that are used to support policy and management decisions. Relevant science is introduced to understand how air pollutants are generated, how individuals and populations are exposed to air pollution, how air pollution exposure affects health in the general and vulnerable populations and how air pollution and climate change interact in affecting human health.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
GLHLTH605 AIR QUALITY MGMT: SCI & POLICY

General Education Curriculum Codes
R - (R) Research, STS - (STS) Science, Technology, and Society, NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON610 - Ecotoxicology

Course Description
Overview of ecological and toxicological effects of chemicals on structure and function of ecosystems, primarily at population, community and ecosystem levels of biological organization. Topics include environmental fate and transport of contaminants, biomonitoring, biomarkers/bioindicators, evolution of resistance to pollution, and extrapolating from molecular interactions to ecosystems. Incorporates critical discussion of in-depth case studies to highlight application of ecotoxicological concepts to real-world scenarios. For graduate and advanced undergraduate students.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON614S - Coastal Resilience in the Face of Climate Change

Course Description
Recent hurricanes have highlighted the need for coastal communities to address a wide range of issues associated with climate change including increasing resilience when faced with storms and rising sea levels; information-gathering (maps, drones, and scientific research about coastal/ocean processes); law and policy refinements (statutes, regulations, and guidance); and the use of litigation to develop useful common law doctrines relevant to the tidelands and the public trust. Through the use of current cases and policy issues under debate, students will analyze relevant facts, laws, policies, socio-economic considerations, and local ordinances and prepare proposed solutions.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
2

Max Units:
2

ENVIRON617 - Restoration Ecology

Course Description
This course introduces students to the fundamental theory and principles of ecological restoration. A rich set of course readings will guide our discussions on the best practices for restoration projects across a variety of ecosystems and jurisdictions. We will actively engage in restoration projects and develop our restoration plans based on a rich set of case studies. Students will create StoryMaps, write three essays, and design their final projects. The course covers required topics for the Certified Ecological Restoration Practitioner In Training (CERP-IT) program of the Society for Ecological Restoration. Two Saturday off-campus field trips are required. Recommended prereq: Ecology recommended.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON623 - Ecological Diversity and Climate Change

Course Description
Evaluates the science of biodiversity and climate change, including changes happening now, in the past, and what we can expect in the future. Topics include forest diebacks, intensifying drought, increased wildfire, insect and pathogen outbreaks, and poleward migrations of land and marine populations. Analytical tools used to quantify change include elements of basic distribution theory, data manipulation in R, and examples of simulation methods. Course includes required travel. Prerequisites: calculus, statistics.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY623 ECOL DIVRSTY & CLIMATE CHNGE

General Education Curriculum Codes
NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences, QS - (QS) Quantitative Studies

ENVIRON630 - Transportation and Energy

Course Description
Examination of transportation-related energy use and its impact on the environment. Learn how technology, infrastructure, and policy, as well as personal and cultural preferences, interact to meet demands for personal mobility and freight movement. Cutting across these themes will be consideration of strategies to reduce transportation energy use and its environmental impacts, with an introduction to information resources and tools for evaluating both. Provides opportunities to hone problem solving and analytical skills, and challenges students to think critically and creatively about the trade-offs among complex transportation options.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY630 TRANSPORTATION AND ENERGY

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (SS) Social Sciences

ENVIRON630D - Transportation and Energy

Course Description
Examination of transportation-related energy use and its impact on the environment. Learn how technology, infrastructure, and policy, as well as personal and cultural preferences, interact to meet demands for personal mobility and freight movement. Cutting across these themes will be consideration of strategies to reduce transportation energy use and its environmental impacts, with an introduction to information resources and tools for evaluating both. Provides opportunities to hone problem solving and analytical skills, and challenges students to think critically and creatively about the trade-offs among complex transportation options.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY630D TRANSPORTATION AND ENERGY

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (SS) Social Sciences

ENVIRON631 - Energy Technology and Impact on the Environment

Course Description
Efficiencies and environmental impacts of both new and established energy sources and conversion methods. Consideration of alternative energy technologies, including electricity generation by fossil fuels, nuclear, solar, wind and water; space heating and cooling by traditional methods and by solar; and transportation energy in automobiles, mass transit and freight. Environmental consequences of energy choices on local, national and global scales, including toxic emissions, greenhouse gases and resource depletion. Prerequisite: Environment 231 or Environment 711. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY631 ENERGY TECHNOL ENVIRON IMPACTS

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, NS - (NS) Natural Sciences

ENVIRON631D - Energy Technology and Impact on the Environment

Course Description
Efficiencies and environmental impacts of both new and established energy sources and conversion methods. Consideration of alternative energy technologies, including electricity generation by fossil fuels, nuclear, solar, wind and water; space heating and cooling by traditional methods and by solar; and transportation energy in automobiles, mass transit and freight. Environmental consequences of energy choices on local, national and global scales, including toxic emissions, greenhouse gases and resource depletion. Prerequisite: Environment 231 or Environment 711. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY631D ENERGY TECHNOL ENVIRON IMPACTS

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (NS) Natural Sciences

ENVIRON632 - Environmental Education and Interpretation

Course Description
Course will provide students with foundational knowledge and practical communication skills drawn from five schools of environmental education (EE): natural resource interpretation, science education, European approaches to EE, placed-based learning, and nature connectedness. Through readings, program observations, practicums, and instructor-and peer-based evaluations, students learn to evaluate their audience, develop measurable goals for communication, and refine their presentation skills. Students will also be able to adapt presentations and programs based on the five schools of EE. Students successfully completing course will become NAI Certified Interpretive Guides.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON634 - Introduction to Ecosystem Services and Methods for Quantification

Course Description
An introduction to ecosystem services, which is increasingly recognized as a useful concept for decision-making, and provide an overview of the suite of methods that are used to quantify them. The course will also provide an overview of a suite of skills/courses needed for ecosystem services assessment and show how they contribute to quantifying ecosystem services. These skills include Structured Decision Making, Ecological Modeling, Bayesian Belief Networks, Multi-Criteria Decision Analysis, Monetary Valuation (non-market valuation methods), & Structural Equation Modeling. Prerequisites: ecology, microeconomics, Environment 520/521 or equivalent.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

General Education Curriculum Codes
(NS) Natural Sciences, (SS) Social Sciences

ENVIRON635 - Energy Economics and Policy

Course Description
Economics of markets and policies for various energy supply sources, energy demand and efficiency, their interactions with each other, and with the economy and environment. Will explore rationales for why markets for energy and related technologies have been subject to extensive government intervention. Course will analyze effects of policy responses, including energy price regulation, the interface of energy, environmental, and technology policy, and policy motivated by energy security concerns. Prerequisite: Introductory Microeconomics (Economics 101 or equivalent) and college calculus.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ENERGY635 ENERGY ECONOMICS AND POLICY

General Education Curriculum Codes
SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON635D - Energy Economics and Policy

Course Description
Economics of markets and policies for various energy supply sources, energy demand and efficiency, their interactions with each other, and with the economy and environment. Will explore rationales for why markets for energy and related technologies have been subject to extensive government intervention. Course will analyze effects of policy responses, including energy price regulation, the interface of energy, environmental, and technology policy, and policy motivated by energy security concerns. Prerequisite: Introductory Microeconomics (Economics 101 or equivalent) and college calculus.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ENERGY635D ENERGY ECONOMICS AND POLICY

General Education Curriculum Codes
(SS) Social Sciences

ENVIRON637S - Population and Environmental Dynamics Influencing Health

Course Description
Course examines population, health and environment (PHE) dynamics with focus on interactions in developing or transition economies. Theoretical and empirical approaches governing PHE dynamics from multidisciplinary perspectives, including geography, public health /epidemiology, demography, and economics. Students will obtain experience in design and analysis of PHE studies, and epidemiology of vector-born, chronic and enteric infections.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
GLHLTH637S POP/ENVR DYNAMICS & HEALTH

General Education Curriculum Codes
(NS) Natural Sciences, (SS) Social Sciences

ENVIRON638 - Environmental Life Cycle Analysis & Decision

Course Description
Provides theoretical foundations of environmental life cycle assessment tools and methods used for products and global supply chains. Introduces various life cycle inventory and life cycle assessment tools used by the community of scientists and industry. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY638 ENVIRONMENTAL LCA

General Education Curriculum Codes
R - (R) Research, STS - (STS) Science, Technology, and Society, NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON640 - Climate Change Economics and Policy

Course Description
This course explores the economic characteristics of the climate change problem, assesses national and international policy design and implementation issues, and surveys the economic tools necessary to evaluate climate change policies. Discussion-oriented requiring high degree of student participation. Course objectives are increased comprehension of economic aspects of climate change and ability to apply tools of economic analysis to climate policy and the responses of firms and households to it. Course designed for graduate and advanced undergraduate students.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL585 CLIMATE CHANGE ECON AND POLICY

ENVIRON640K - Climate Change Economics and Policy

Course Description
Explores the economic characteristics of the climate change problem, assesses national and international policy design and current implementation issues, and surveys the economic tools necessary to evaluate climate change policies.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL585K CLIMATE CHANGE ECON AND POLICY

General Education Curriculum Codes
STS - (STS) Science, Technology, and Society, SS - (SS) Social Sciences

ENVIRON646 - Urban Ecology

Course Description
Addresses how to understand urban areas as ecological and socio-ecological systems and the distinction between the study of ecology in and of cities. Examines both through theoretical lens of socio-ecological systems, in which humans and their actions are a component of, rather than disturbance imposed on, ecological systems. Applies theoretical and methodological tools to global, regional, and local urban issues. Prerequisites: One ecology course and one environmental social sciences course.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
R - (R) Research, W - (W) Writing, NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences, SS - (SS) Social Sciences

ENVIRON646D - Urban Ecology

Course Description
Addresses how to understand urban areas as ecological and socio-ecological systems and the distinction between the study of ecology in and of cities. Examines both through theoretical lens of socio-ecological systems, in which humans and their actions are a component of, rather than disturbance imposed on, ecological systems. Applies theoretical and methodological tools to global, regional, and local urban issues. Prerequisites: One ecology course and one environmental social sciences course.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
(R) Research, (W) Writing, (NS) Natural Sciences, (SS) Social Sciences

ENVIRON658 - Qualitative Methods

Course Description
This course will focus on the basics of qualitative research, including research design, data collection, data analysis, interpretation, and reporting. Students will gain exposure to selected qualitative methods, including interviews and focus groups, open-ended survey questions, participant observation; the course includes a grounding in NVivo, a qualitative data analysis software.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
R - (R) Research, SB - (SB) Social & Behavioral Analysis: A&S Curriculum

ENVIRON658A - Qualitative Methods

Course Description
This course will focus on the basics of qualitative research, including research design, data collection, data analysis, interpretation, and reporting. Students will gain exposure to selected qualitative methods, including interviews and focus groups, open-ended survey questions, participant observation; the course includes a grounding in NVivo, a qualitative data analysis software.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

General Education Curriculum Codes
R - (R) Research, SB - (SB) Social & Behavioral Analysis: A&S Curriculum

ENVIRON665 - Bayesian Inference for Environmental Models

Course Description
Formulation of environmental models and applications to data using R. Distribution theory, algorithms, and implementation. Topics include physiology, population growth, species interactions, disturbance, and ecosystem dynamics. Discussions focus on classical and current primary literature.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY665 BAYESIAN INFERENCE ENV MODELS

General Education Curriculum Codes
NW - (NW) Investigating Natural World: A&S Curriculum, NS - (NS) Natural Sciences

ENVIRON666 - Aquatic Geochemistry

Course Description
Geochemistry of the water-solid interface of soils, minerals, and particles in earth systems. Topics will cover the chemical composition of soils, geochemical specalation, mineral weathering and stability, sorption and ion exchange, soil redox processes, and chemical kinetics at environmental surfaces. Prerequisites: CEE 461L or CEE 561L/ENVIRON 542L or permission of instructor.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
CEE666 AQUATIC GEOCHEM

ENVIRON667 - Chemical Transformation of Environmental Contaminants

Course Description
Mechanisms and principles underlying organic contaminant transformations in the ambient environment. Topics include hydrolysis, oxidation/reduction, direct and indirect photolysis, and reactions with disinfectant chemicals. Reactions will be considered in context of both natural (e.g. surface water and cloudwater) and engineered (e.g. drinking water, wastewater, and groundwater remediation) systems. Approaches will include both qualitative (reaction mechanism and product identification) as well as quantitative (reaction kinetics and stoichiometry) aspects of environmental reaction chemistry. Prerequisites: CEE 563/ENVIRON 540 or one semester of organic chemistry.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
CEE667 CHEM TRANSFORM OF ENV CONTAM

ENVIRON680 - Economics of Forest Resources

Course Description
Core economic theory of forest management and application of theory to selected forestry policy issues. Course focuses on management of forests for timber production as well as for non-timber values. Concepts explored include policy challenges such as biodiversity conservation, deforestation, community forest management, and payments for ecosystem services. Two groups of economic tools will be used: non-market valuation methods and program evaluation techniques. Prerequisites: college-level calculus, microeconomics and statistics, as well as Excel proficiency.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

General Education Curriculum Codes
SB - (SB) Social & Behavioral Analysis: A&S Curriculum, SS - (SS) Social Sciences

ENVIRON680D - Economics of Forest Resources

Course Description
Core economic theory of forest management and application of theory to selected forestry policy issues. Course focuses on management of forests for timber production as well as for non-timber values. Concepts explored include policy challenges such as biodiversity conservation, deforestation, community forest management, and payments for ecosystem services. Two groups of economic tools will be used: non-market valuation methods and program evaluation techniques. Prerequisites: college-level calculus, microeconomics and statistics, as well as Excel proficiency.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

General Education Curriculum Codes
(SS) Social Sciences

ENVIRON690 - ENVIRON Special Topics

Course Description
Special Topics

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
0.5

Max Units:
4

ENVIRON690D - ENVIRON Special Topics

Course Description
Lecture/discussion special topics

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
0.5

Max Units:
4

ENVIRON690L - ENVIRON Special Topics

Course Description
Lecture/lab special topics

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
0.5

Max Units:
4

ENVIRON690S - ENVIRON Special Topics

Course Description
Seminar version of ENVIRON 690

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
0.5

Max Units:
4

ENVIRON701 - Forest Measurements

Course Description
Course is designed to provide field and analytical measurement skills expected of professionals working in forest ecosystem management. Additional emphasis on habitat assessment, forest vegetation, and wildlife identification. Extensive field work required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON702S - Ecology Seminar

Course Description
Presentation of current research by invited speakers, faculty, and students in the University Graduate Program in Ecology.

Grading Basis
Credit / No Credit

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

Crosslisted Courses
UPE703S ECOLOGY SEMINAR, BIOLOGY711S ECOLOGY SEMINAR, EVANTH743S ECOLOGY SEMINAR

ENVIRON703 - Conservation Biology: Theory and Practice

Course Description
An overview of biological diversity, its patterns, and the current extinction crisis. Historical and theoretical foundations of conservation, from human values and law to criteria and frameworks for setting conservation priorities; island biogeography theory, landscape ecology, and socioeconomic considerations in reserve design; management of endangered species in the wild and in captivity; managing protected areas for long term viability of populations; the role of the landscape matrix around protected areas; and techniques for conserving biological diversity in semiwild productive ecosystems like forests. Three field trips. Prerequisite: one ecology course or consent of instructor.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON704LA - Biological Oceanography

Course Description
Patterns of abundance, diversity and activity of organisms in major ocean ecosystems. Identifies major physical, chemical and ecological processes that affect these patterns, and analyzes the impact of biology on ecosystems. Uses 'flipped' classroom emphasizing hands-on data collection and quantitative analyses, field trips aboard DUML research vessels, and participatory activities to demonstrate core concepts in biological oceanography. Taught in Beaufort at Duke Marine Lab. Spring enrollment requires travel. Graduate section includes experimental design component and research paper on final project.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY704LA BIOLOGICAL OCEANOGRAPHY, ECS704LA BIOLOGICAL OCEANOGRAPHY

ENVIRON705A - Social Impact Analysis

Course Description
This course covers the theoretical, methodological and applied aspects of social impact analysis. Students will think sociologically about environmental issues and the social impacts they create. The course reviews key US policies and guidelines that require and inform social impact analysis. Students will understand and critique Key methods and approaches used in social impact analysis to generate inclusive decisions that protect the environment and the health of the human communities that share its abundance and meaning. The course will compare and critique a range of national and international social impact examples, including the ethical issues associated with the non-human world. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON705L - Ecological Management of Forest Systems (Silviculture)

Course Description

The aim of the course is to equip future resource managers and environmental consultants with knowledge allowing them to propose lower impact practices to individuals and organizations who need to balance wood production with maintenance of environmental quality. Underlying principles of growth, from seed to mature trees, and stand dynamics are explored. Various alternative methods of manipulating growth, stand structure and development, ranging from little to large perturbations of forest systems, are presented and assessed in terms of their effect on resource quality. Includes laboratory.

Grading Basis

Graded

Course Typically Offered

Spring Only

Units

Min Units:

4

Max Units:

4

ENVIRON706 - Wildlife Surveys

Course Description

With a focus on birds, reptiles, amphibians, and mammals, this course introduces students to a wide variety of wildlife survey methods and skills through both classroom lectures and hands-on experience in the field. Design, practical application, and post-survey data analyses for conducting wildlife surveys for research as well as for management. Limitations and advantages of various field monitoring techniques; learn to identify many common birds, herps, and mammals of season for this area. Significant time spent in the field.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

ENVIRON707 - Coastal and Marine Ecosystems

Course Description

This foundational course will 1) explore key principles and concepts important to understanding the structure, function and processes of coastal and marine ecosystems, 2) analyze key anthropogenic stressors on these ecosystems, and 3) apply knowledge of ecosystem science to assess management strategies. Students will engage with a series of case studies and participate in interactive discussions, lectures, and applied research projects/papers. This course will be taught in Durham with 2 required weekend field trips to the Duke Marine Lab.

Grading Basis

Graded

Course Typically Offered

Fall Only

Units

Min Units:

3

Max Units:

3

ENVIRON708L - Silviculture Prescription

Course Description

Professional foresters meet management objectives through stand manipulation by using appropriate methods. Silviculture prescription is an operational plan that describes the goals, the silvicultural manipulations needed to achieve these goals, and the development of the stands over the projected period. Facing diverse management objectives and stand conditions, success in this planning process depends on understanding the underlying principles of tree growth and stand dynamics, but also relies on the intuitive knowledge that aids in assessing stand conditions and future development. Class is designed to provide the practical experience needed for developing the intuitive knowledge.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
2

Max Units:
2

ENVIRON709 - Conservation Biology and Policy

Course Description
Introduction to the key concepts of ecology and policy relevant to conservation issues at the population to ecosystems level. Focus on the origin and maintenance of biodiversity and conservation applications from both the biology and policy perspectives (for example, endangered species, captive breeding, reserve design, habitat fragmentation, ecosystem restoration/rehabilitation). Open to undergraduates only under Biology 270. Recommended prerequisite: introductory biology; also suggested: a policy and/or introductory ecology course.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON709A - Conservation Biology and Policy

Course Description
Introduction to the key concepts of ecology and policy relevant to conservation issues at the population to ecosystems level. Focus on the origin and maintenance of biodiversity and conservation applications from both the biology and policy perspectives (for example, endangered species, captive breeding, reserve design, habitat fragmentation, ecosystem restoration/rehabilitation). Open to undergraduates only under Biology 270A. Taught in Beaufort at Duke Marine Lab. Prerequisite: introductory biology; suggested: a policy and/or introductory ecology course.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON710 - Applied Statistical Modeling for Environmental Management

Course Description
Graphical and exploratory data analysis; modeling, estimation, and hypothesis testing; analysis of variance; random effect models; regression and scatterplot smoothing; generalized linear models; resampling and randomization methods. Concepts and tools involved in data analysis. Special emphasis on examples drawn from the social and environmental sciences. Students to be involved in applied work through statistical computing using software, STATA or R.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON711 - Energy and Environment

Course Description
Overview of the challenges confronting humanity as a consequence of our reliance on energy. Challenges include dwindling supplies, rising demand and environmental degradation. Realistic responses require an understanding of the complexity of the energy system, including energy resources, uses, and impacts, in the context of social, political and economic imperatives. Lectures will be augmented by presentations from guest speakers from industry, government and non-profit organizations.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY711 ENERGY & ENVIRONMENT

ENVIRON713A - Clean Energy Field Trip

Course Description
Field study of the clean energy industry around the San Francisco Bay area, California, with first-hand perspective from renewable energy experts. Includes a field trip with a required fee for the trip.

Grading Basis
Graded

Units

Min Units:
1

Max Units:
1

Crosslisted Courses
ENERGY713A CLEAN ENERGY

ENVIRON714 - Landscape Ecology

Course Description
Landscape ecology is concerned with spatial heterogeneity (pattern) on landscapes-what generates pattern, its characteristic scaling in space and time, and why it matters for populations, communities and ecosystem processes. As essentially all agencies that manage land now profess an aim to manage functional, resilient and sustainable landscapes, this course provides the foundational knowledge to support these applications in conservation planning and ecosystem management. The course consists of lectures, small-group exercises and discussions with an emphasis on understanding key concepts and applying these to real-world applications mgmt scenarios. Prerequisite: ecology; statistics preferred.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON714D - Landscape Ecology

Course Description
Landscape ecology is concerned with spatial heterogeneity (pattern) on landscapes-what generates pattern, its characteristic scaling in space and time, and why it matters for populations, communities and ecosystem processes. As essentially all agencies that manage land now profess an aim to manage functional, resilient and sustainable landscapes, this course provides the foundational knowledge to support these applications in conservation planning and ecosystem management. The course consists of lectures, small-group exercises and discussions with an emphasis on understanding key concepts and applying these to real-world applications mgmt scenarios. Prerequisite: ecology; statistics preferred.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON716L - Modeling for Energy Systems

Course Description
Introduction to computer programming and operations research in energy systems analysis with emphasis on formulation of optimization problems and simulation models. Applications and case studies dealing with energy systems problems, their externalities, and government policies that affect them. Data analysis, spreadsheet modeling, VBA programming in Excel; linear programming (lp), post-optimality and sensitivity analysis, multi-period lp, stochastic lp, network models for minimum path, maximum flow and optimal planning problems; probabilistic analysis Monte Carlo simulation, including generation of independent and correlated random variables, and goodness of fit tests.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY716L MODELING FOR ENERGY SYSTEMS

ENVIRON717 - Markets for Electric Power

Course Description
Examines basic concepts and tools in economics and engineering necessary to understand the operation of power markets. Includes physical systems; industry structure and economic models to understand the supply side; operational reliability; long-term reliability; and integration of renewables.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON718K - Environmental Sciences

Course Description
This course introduces students to the core concepts and topics of environmental sciences. It will give an in-depth overview of main themes in the field of environmental studies: global environmental challenges, human population trends, global atmospheric changes, air, land and water resources and pollution, the ocean and fisheries, key ecosystems (forests, grasslands, wetlands, freshwater and marine environment), biodiversity and conservation, non-renewable and renewable energy, agriculture and sustainable production. Quantitative and qualitative research methods will be introduced with case studies. Taught at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON719 - Aquaculture

Course Description
The major environmental, social and economic drivers of increasing global aquaculture, with a focus on marine systems. Quantitative evaluation and comparison of the range of species for aquaculture, locations where operations occur, operational aspects including environmental impacts and management considerations. Investigation of alternative approaches and potential future areas for aquaculture expansion as well as social, economic and technical barriers to implementation.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON719A - Aquaculture and the Environment

Course Description
The major environmental, social and economic drivers of increasing global aquaculture, with a focus on marine systems. Quantitative evaluation and comparison of the range of species for aquaculture, locations where operations occur, operational aspects including environmental impacts and management considerations. Investigation of alternative approaches and potential future areas for aquaculture expansion as well as social, economic and technical barriers to implementation. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON720S - Land Conservation in Practice

Course Description
Provides an overview of the applied skills and techniques currently used to conserve land in the land trust movement. covers a variety of topics from setting priorities for conservation, completing land transactions, working with private landowners, fundraising, land monitoring and stewardship, evaluating conservation success, etc. Course leverages the experience of guest speakers from regional land trust and conservation organizations to provide working examples of how land conservation is done.

Grading Basis
Pass/Fail Grading

Units

Min Units:
1

Max Units:
1

ENVIRON721 - Soil Resources

Course Description
Emphasis on soil resources as central components of terrestrial ecosystems, as rooting environments for plants, and as porous media for water. Soil physics and chemistry provide the basis for the special problems examined through the course. Laboratory emphasizes field and lab skills, interpretive and analytical.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON722 - Hydrologic and Environmental Data Analysis

Course Description

Course will focus on acquisition of skills necessary to extract information from observations of hydrological and environmental processes, connect the extracted information with the physical processes generating the data, and estimate physical quantities at ungauged location/times. Emphasis on process understanding via data analysis techniques. Applications used as a way to understand the general concepts, with examples drawn from water science. Prerequisites: Basic computer skills, Algebra, Calculus are required. Experience with computational software (e.g. Matlab or R) is helpful but not required.

Grading Basis

Graded

Course Typically Offered

Occasionally

Units

Min Units:

3

Max Units:

3

Crosslisted Courses

CEE761 HYDROLOGIC DATA ANALYSIS, ECS722 HYDROLOGIC DATA ANALYSIS

ENVIRON723A - Offshore Renewable Energy & Wildlife Conservation

Course Description

This course will take a holistic approach to evaluating offshore renewable energy development: benefits and challenges of traditional vs. renewable offshore energy including concerns for wildlife, development of environmental impact statements; permitting processes; consultations with industry, government and other stakeholders; and legal implications. Graduate section offered in conjunction with undergraduate course Marsci 323A. Graduate students will write a term-long research paper, conduct literature reviews, develop case studies, and participate in panel discussions. Taught in Beaufort at the Duke Marine Lab.

Grading Basis

Graded

Course Typically Offered

Fall Only

Units

Min Units:

3

Max Units:

3

ENVIRON724 - Landscape Analysis & Management

Course Description

This course presents a task-oriented perspective on landscape ecology, by introducing the fundamental tasks of landscape analysis and management. These tasks include habitat classification and species distribution modeling; sampling designs for landscapes; inventory and monitoring; site prioritization; change detection and forecasting landscape change; inferences on landscape data (an introduction to the analysis of multivariate and spatial data); and integrated assessment. The course consists of lectures and computer labs. Prerequisites: Environment 714 and Environment 710 or equivalent, or consent of instructor.

Grading Basis

Graded

Course Typically Offered

Spring Only

Units

Min Units:

4

Max Units:

4

ENVIRON724L - Landscape Analysis & Management

Course Description
This course presents a task-oriented perspective on landscape ecology, by introducing the fundamental tasks of landscape analysis and management. These tasks include habitat classification and species distribution modeling; sampling designs for landscapes; inventory and monitoring; site prioritization; change detection and forecasting landscape change; inferences on landscape data (an introduction to the analysis of multivariate and spatial data); and integrated assessment. The course consists of lectures and computer labs. Prerequisites: Environment 714 and Environment 710 or equivalent, or consent of instructor.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
4

Max Units:
4

ENVIRON726DA - Evolutionary and Ecological Genetics/Genomics of Marine Mammals

Course Description
Graduate section of MARSCI 304LA. Graduate section will be offered as seminar and discussion. Students will participate in weekly seminar, literature review and discussion, quizzes, exercises, and will complete a research paper with a focus on how genomic tools can be used for conservation of marine mammals. Offered at the Duke Marine Lab in Beaufort.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON727DS - Forests in the Public Interest Seminar

Course Description
Discussion and analysis of current forestry issues of concern to the public—United States and abroad. Students propose discussion topics by identifying forest-related news stories reported in leading print or online sources during the current calendar year. Topics discussed in two parts. Students assess through class discussion the information reported in the news stories and generate questions for additional analysis. Teams then investigate the questions and make an oral presentation of their findings at the next class session; they also provide a list of sources they consulted. Particular themes highlighted in different years. May be taken up to three times for credit. Required for MF degree.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

ENVIRON727S - Forests in the Public Interest Seminar

Course Description
Discussion and analysis of current forestry issues of concern to the public—United States and abroad. Students propose discussion topics by identifying forest-related news stories reported in leading print or online sources during the current calendar year. Topics discussed in two parts. Students assess through class discussion the information reported in the news stories and generate questions for additional analysis. Teams then investigate the questions and make an oral presentation of their findings at the next class session; they also provide a list of sources they consulted. Particular themes highlighted in different years. May be taken up to three times for credit. Required for MF degree.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

ENVIRON729A - Oceans in Human and Environmental Health

Course Description
Focus on the concept of 'One Health' that the health of the environment and the people who live in it are linked. The basis (from a biological perspective) of threats facing the marine environment and interactions between environmental and human health and their role in global health disparities. For example, in discussing fisheries and aquaculture, the course will cover environmental impacts of these extractive industries and their importance in human and societal well-being. This course will embrace immersive field experiences in North Carolina that will contextualize classroom learning and develop connections with practitioners and residents. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON729DA - Oceans in Human and Environmental Health

Course Description
Focus on the concept of 'One Health' that the health of the environment and the people who live in it are linked. The basis (from a biological perspective) of threats facing the marine environment and interactions between environmental and human health and their role in global health disparities. For example, in discussing fisheries and aquaculture, the course will cover environmental impacts of these extractive industries and their importance in human and societal well-being. This course will embrace immersive field experiences in North Carolina that will contextualize classroom learning and develop connections with practitioners and residents. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON730S - Politics of Nature

Course Description
This is a graduate course on the concept of 'nature' in social theory and history. Against the presupposition that social theory has traditionally lacked a conceptual engagement with nature, this class will chart the genealogies of environmental thought that have developed within and through wider transformations of twentieth-century political economy, technology, and politics. The aim of this course is to both resituate contemporary calls for a critical theory of nature that has remained largely indifferent to its own conceptual and historical antecedents; while also developing new research on the history and politics of nature in a world transformed by climate catastrophe.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
HISTORY710S POLITICS OF NATURE, CULANTH710S POLITICS OF NATURE

ENVIRON731 - Dendrology

Course Description

This course aims to familiarize students with the secret lives of trees. We begin by learning to identify over 130 woody plants of the Piedmont. To do this, we will also grapple with dichotomous keys and plant systematics to help us identify plants anywhere in the world. We also address topics like the chemical communication of trees, the relationships among wildlife and trees, and the value of trees. Most of this course will be outside.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON732 - Hydrology in Environmental Management

Course Description

An introduction to hydrology by examining how rainfall and snowmelt become streamflow, evapotranspiration, and groundwater with emphasis on hydrological processes inside watersheds. Topic areas include: hydrologic cycle and water balances, evapotranspiration and snow energy balances, vadose zone hydrology, hydrogeology, hyporheic zones, riparian zones, streamflow generation mechanisms, biogeochemical budgets, and field measurement techniques. Linkages between physical hydrology and broader ecological and environmental sciences will be highlighted. Includes local field trips.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

ENVIRON733 - Risk Regulation in the United States, Europe, and Beyond

Course Description

Advanced, integrated analysis of the law, science and economics of societies' efforts to assess and manage risks of harm to human health, safety and the environment. Course examines the regulation of a wide array of risks, such as those from medical care and drugs, food, automobiles, drinking water, air pollution, energy, global climate change, and terrorism. The course explores the treatment of several basic issues confronting any regulatory system: risk assessment, risk management (including the debate over 'precaution' versus benefit-cost analysis), risk evaluations by experts vs. the public, and risk-risk tradeoffs.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
2

Max Units:
2

ENVIRON734 - Watershed Hydrology

Course Description

Introduction to the hydrologic cycle with emphasis on the influence of land use, vegetation, soil types, climate, and land forms on water quantity and quality and methods for control. Development of water balance models. Analysis of precipitation patterns, rainfall and runoff, and nonpoint source impacts. Statistical handling and preparation of hydrologic data, simulation and prediction models, introduction to groundwater flow, and field sampling methods.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON735 - Drones in Marine Biology, Ecology, and Conservation

Course Description
Includes a full overview of past and emerging applications for ecology and biology of marine species and coastal habitats with in-depth discussion on future of drone applications in coastal biological and ecological research. Comprehensive exploration of current drone technologies, including detection of target species, payloads, aeronautical concepts, rules and regulations, mission planning, aircraft design, maintenance, data collection, management and analysis. Components tailored to student interests: Active participation in megafaunal or environmental research and data analysis. Building, operating and maintaining aircraft, programming for manual and autonomous flight.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

ENVIRON735A - Drones in Marine Biology, Ecology, and Conservation

Course Description
Lab-based version of Environment 735LA. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

ENVIRON736K - Planetary Health and Environmental Epidemiology

Course Description
Study the human health impacts of accelerating environmental change through interdisciplinary approaches including environmental science, political science, public health and social science; engage in diverse materials from many types of examples of planetary health research, from nutrition and mental health, to infectious and non-communicable diseases. A special emphasis will be placed on environmental epidemiology. Taught in China at Duke Kunshan University. Recommended prerequisite: one quantitative methodology class (statistics, biostatistics, epidemiology, or econometrics).

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON737A - Ecology and Physiology of Extreme Marine Ecosystems

Course Description
Graduate section of MARSCI 337A. Graduate students will join daily lectures on extreme marine ecosystems, present a recent primary literature paper on their extreme ecosystem of choice, and lead the class discussion of one of the assigned research papers. Each student will produce a final project (research paper, policy brief, case study, podcast, etc.) and give a presentation on an extreme ecosystem, threat, or conservation challenge of their choosing. Taught at the Duke Marine Lab in Beaufort.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON738 - US Water Governance

Course Description
This course examines the governance systems that manage freshwater resources in the United States. American water policy is densely institutionalized, constrained by historical systems of rights and long-established patterns of water usage. It is also organizationally complex, with authority fragmented among myriad agencies and authorities at all jurisdictional levels. Our task will be first to understand current governing structures as a consequence of historical, functional, and political forces, and second to analyze contemporary efforts to promote collaboration, adaptive management, and market solutions within the framework of existing governance systems.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

ENVIRON738D - US Water Governance

Course Description
This course examines the governance systems that manage freshwater resources in the United States. American water policy is densely institutionalized, constrained by historical systems of rights and long-established patterns of water usage. It is also organizationally complex, with authority fragmented among myriad agencies and authorities at all jurisdictional levels. Our task will be first to understand current governing structures as a consequence of historical, functional, and political forces, and second to analyze contemporary efforts to promote collaboration, adaptive management, and market solutions within the framework of existing governance systems.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

ENVIRON740 - Water Resources Planning and Management

Course Description
This half-credit course is intended to give students a first exposure to ideas of planning and management of organizations related to water resources. The course will develop a very basic framework for strategic planning for environmental organizations with specific applications to water resources. It will provide some tools for forecasting future water conditions, as well as emerging tools for forecasting uncertain water conditions. Finally, it will expose students to approaches in water management, particularly adaptive management and scenario forecasting.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1.5

Max Units:
1.5

ENVIRON741 - Water Resources Finance

Course Description
This half-credit course is intended to provide students with applications of project finance to water assets, particularly municipal water/wastewater systems and irrigation infrastructure, financed primarily through municipal bonds. The primary concepts will be forecasting demand, revenue-generation, pricing effects, debt financing, and emerging alternative finance.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1.5

Max Units:
1.5

ENVIRON743 - Food Web Theory

Course Description
This class covers the fundamentals of Food Web Theory and their connections to modern takes on the discipline while also having a component of mathematical modeling, coding (in R and Mathematica), paper discussions, and visits from prominent Food Web Ecologists.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY732 FOOD WEB THEORY, EVANTH732 FOOD WEB THEORY, UPE732 FOOD WEB THEORY

ENVIRON744 - Freshwater Ecosystems

Course Description
Overview of ecological processes in flowing waters and application to conservation and management of these ecosystems. Lecture and discussion formats to integrate basic principles governing physical, chemical, and biological structure of streams and rivers with anthropogenic drivers of change and policy and management tools. Laboratories will provide hands-on experience in collection and analysis of physical, chemical, and biological data. Field and literature projects will enable students to focus on either basic or applied analysis techniques. Prerequisite: general ecology recommended.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON745A - Climate Change in the Marine Environment

Course Description
Exploration of climate change science focusing on marine ecosystems and inhabitants —specifically ocean acidification, warming and sea level rise. Factors causing climate change, and how those vary spatially, focusing on sensitive polar ecosys and mar mammal populations. Critical examination of climate change modeling using EdGCM (research-grade Global Climate Model), focusing on how scientists use models, observations/theory to predict climate, and assumptions/uncertainty implicit in modeling. Discussion of potential human impacts, including consequences of sea level rise and potential increases in disease due to climate change. Taught in Beaufort at Duke Marine Lab. Grad students responsible for research paper.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON746 - Cost-Benefit Analysis (Part II): Nonmarket Valuation

Course Description
Builds on Cost-Benefit Analysis Part I (GLHLTH 733), but can also be taken as a stand-alone module. Covers advanced topics in nonmarket valuation, including hedonic valuation, the travel cost method, stated preference methods, and averting expenditures or coping costs approaches. Emphasis is on environmental and health concepts and applications. Recommended prerequisite: Intermediate/advanced microeconomics; advanced econometrics.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
GLHLTH734 COST-BENEFIT II: VALUATION, PUBPOL734 COST-BENEFIT II: VALUATION

ENVIRON750 - Genomics of Microbial Diversity

Course Description
Graduate seminar explores the use of genomic approaches to illuminate microbial diversity and to clarify mechanisms generating variation within and among microbial lineages and communities. Course is targeted to Ph.D. students in the areas of genomics, genetics, environmental sciences, ecology, and/or computational biology. Discussions will focus on case studies from the primary literature, followed by computer labs allowing hands-on use of current programs.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
SCISOC750 GENOMICS OF MICROBIAL DIVRSITY

ENVIRON753LA - Sensory Physiology and Behavior of Marine Animals

Course Description
Sensory physiological principles with emphasis on visual and chemical cues. Laboratories will use behavior to measure physiological processes. Only open to undergraduates under Biology 373LA. Taught in Beaufort at Duke Marine Lab. Prerequisite: introductory biology and chemistry.

Grading Basis
Graded

Units

Min Units:
4

Max Units:
4

ENVIRON754A - Research Design for Environmental Social Sciences

Course Description
Examination of the concept of research (philosophy, epistemology, practice) along with methods used widely in the social sciences. Focus is on qualitative methods, and related research ethics, objectives, design, data collection, analysis, and presentation. Consideration of the relevance and utility of qualitative research methods for understanding human uses, values, interactions, and beliefs about the environment. Taught in Beaufort at Duke Marine Lab. Online course.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON755 - Introduction to Community-Based Environmental Management

Course Description
Goal of the course is to provide students with fundamental theory and methods that will allow them to identify some of the potential problems and pitfalls associated with community-based environmental management (CBEM) initiatives, both domestically and internationally, along with tools necessary to create and manage their own projects. To accomplish this, course will combine readings and discussion of academic literature with presentations of specific CBEM case studies, guest speakers, and interactions with local CBEM projects.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON755D - Introduction to Community-Based Environmental Management

Course Description
Goal of the course is to provide students with fundamental theory and methods that will allow them to identify some of the potential problems and pitfalls associated with community-based environmental management (CBEM) initiatives, both domestically and internationally, along with tools necessary to create and manage their own projects. To accomplish this, course will combine readings and discussion of academic literature with presentations of specific CBEM case studies, guest speakers, and interactions with local CBEM projects.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON756A - Spatio-Temporal Environmental Models

Course Description
Spatio-temporal models are now being widely used for inference on environmental data. This course will consist of weekly topics with readings of new literature and application of models and software to data sets. We will specifically focus on spBayes in R. Students will each volunteer to lead one week, track down and distribute a data set, set up a model and provide a short demo on computation. Taught in Beaufort at Duke Marine Lab. Online course.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
2

Max Units:
2

ENVIRON756S - Biogeodiversity and Climate, Past and Future

Course Description
This seminar course will consist of readings and discussions on past and future biodiversity. Readings will aim for synthesis of evidence from five main influences: 1) Climate and weather, 2) Drifting continents, 3) Food web interactions, 4) Evolution, and 5) Homo sapiens. Participants will lead discussions and generate written critiques on readings.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

ENVIRON758 - Cost-Benefit Analysis (Part I): Theory & Practice

Course Description
Covers theory and practice of cost-benefit analysis (CBA), or economic analysis, as an important tool for conducting public policy assessments, with emphasis on environmental and health policy interventions. Covers topics such as the economic and ethical rationale for CBA, basic principles for assessing the economic effects of projects, intergenerational and philosophical concerns as they relate to CBA, social discounting, equity analysis and poverty weights, and risk and uncertainty. Recommended prerequisite: Intermediate/advanced microeconomics.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
GLHLTH733 COST-BENEFIT I: THEORY, PUBPOL733 COST-BENEFIT I: THEORY

ENVIRON759K - Environmental GIS

Course Description
Core concepts and latest application of geographic information system in environment area; an in-depth overview of the key data types (raster and vector files) in this area, data collection and entry, data management, data analysis and output using ArcGIS; introduction of application of GIS in real world problem solving, such as species habitat mapping and conservation planning. Students will be exposed to Google Earth, QGIS and other open source GIS tools. Taught in China at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON760A - Western Field Trip

Course Description
One-week trip to observe land management and utilization practices in the western United States. Exposure to ecological, economic, and policy issues, as well as watershed, wildlife, and land use questions. May be repeated for credit. Consent of instructor required.

Grading Basis
Pass/Fail Grading

Units

Min Units:
1

Max Units:
1

ENVIRON761 - Geospatial Analysis for Land and Water Management

Course Description

Application course focusing on spatial analysis and image processing applications to support conservation management. Habitat mapping, spatial analysis of animal movements, habitat modeling, and the optimization of nature reserve selection. Requires a fundamental knowledge of geospatial analysis theory and analysis tools. Consent of instructor required. Prerequisite: Environment 559.

Grading Basis

Graded

Units

Min Units:

4

Max Units:

4

ENVIRON763 - Forest Management Traveling Seminar

Course Description

Covers current topics in the broad field of forest management. Taught as a set of coordinated field trips with expert contacts in sites in the Carolina piedmont, coastal plain, and mountains. Topics of past seminars include fiber utilization, best management practices, forest regeneration, the chip mill issue, forest-pest management, and forest preservation management. May be repeated for credit.

Grading Basis

Pass/Fail Grading

Units

Min Units:

1.5

Max Units:

1.5

ENVIRON764 - Applied Differential Equations in Environmental Sciences

Course Description

General calculus and analytic geometry review; numerical differentiation and integration; analytic and exact methods for first and second order ordinary differential equations (ODE); introduction to higher order linear ODE, numerical integration of ODEs and systems of ODEs; extension of Euler's method to partial differential equations (PDE) with special emphasis on parabolic PDE. Example applications include population forecasting, soil-plant-atmosphere water flow models, ground water and heat flow in soils, and diffusion of gases from leaves into the atmosphere. Prerequisite: Mathematics 21 or equivalent or consent of instructor.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

ENVIRON765 - Geospatial Analysis for Coastal and Marine Management

Course Description

Application course focusing on spatial analysis and image processing applications to support coastal and marine management. Covers benthic habitat mapping, spatial analysis of marine animal movements, habitat modeling, optimization of marine protected areas. Requires fundamental knowledge of geospatial analysis theory and analysis tools. Consent of instructor required. Prerequisite: Environment 559.

Grading Basis

Graded

Units

Min Units:

4

Max Units:

4

ENVIRON766A - Ecology of Southern Appalachian Forests

Course Description
Field trips to various forest ecosystems in the southern Appalachian Mountains. Species identification, major forest types, field sampling, and history of effects of human activities.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

ENVIRON766DA - Ecology of Southern Appalachian Forests

Course Description
Field trips to various forest ecosystems in the southern Appalachian Mountains. Species identification, major forest types, field sampling, and history of effects of human activities.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

ENVIRON767 - Entrepreneurial Experience

Course Description
Teaches marketing, finance and business planning within the context of forming a start-up. Core concepts include: establishing a value proposition; identifying an opportunity; intellectual property and technology management; marketing & financing a start-up; and exiting a company. The course has a technology focus, but many of the concepts apply to any start-up activity. Students will form teams to go through all the steps required to form a business, stopping short of executing legal agreements to do so. The experience is an ideal springboard for students who want to start a company or be part of an early-stage company in the future.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON767D - Entrepreneurial Experience

Course Description
Teaches marketing, finance and business planning within the context of forming a start-up. Core concepts include: establishing a value proposition; identifying an opportunity; intellectual property and technology management; marketing & financing a start-up; and exiting a company. The course has a technology focus, but many of the concepts apply to any start-up activity. Students will form teams to go through all the steps required to form a business, stopping short of executing legal agreements to do so. The experience is an ideal springboard for students who want to start a company or be part of an early-stage company in the future.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

ENVIRON770A - Physical Oceanography

Course Description
Fundamental physical principles of ocean circulation. Physical properties of seawater; forces acting on the ocean such as heat, pressure gradients, wind stress, rotation, and friction; and conservation equations for heat, mass and momentum. Applications include geostrophic balances, thermal wind, coastally trapped waves, El Nino/ENSO, and tidal circulation. Taught in Beaufort at Duke Marine Lab. Prerequisite: prior course work in calculus and physics or permission of instructor.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON771L - GIS Field Skills

Course Description
This course provides hands-on training in geospatial data collection and associated mapping skills, partitioned into three 1-credit modules. The first module will cover ArcGIS Online (AGO) apps coupled with ArcGIS Pro to collect data using your own smartphone. The second module is focused on employing survey-grade Global Navigation Satellite System (GNSS, e.g., GPS) instruments to collect high-resolution positional information of environmental parameters, including the use of real time kinematic correction techniques. The final module covers emerging tools in geospatial data collection, with a focus on unoccupied aircraft, and aerial and terrestrial LIDAR. Recommended prerequisite: Environment 559.

Grading Basis
Graded

Units

Min Units:
1

Max Units:
1

ENVIRON772LA - Coastal Restoration Ecology

Course Description
Restoration ecology and ecological restoration. Major ecological theories that guide restoration ecology as well as the unique considerations and techniques needed to restore the world's dominant coastal ecosystems (e.g., saltmarshes, seagrass beds, coral reefs, etc.). Graduate students will complete a restoration case study, and will be responsible for identifying new restoration literature topic to present to the class. Graduate section offered in conjunction with undergraduate course MARSCI 301LA. Students will participate in lectures, discussions, and local field trips around the Marine Lab. Taught at the Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
4

Max Units:
4

ENVIRON773A - Marine Ecology

Course Description
Ecology from a policy and management perspective. Recitations and discussions target a policy- and management-oriented graduate audience. Lecture topics include factors that influence the distribution, abundance and diversity of marine organisms, characteristics of marine habitats, adaptation to environment, species interactions, biogeography, larval recruitment, and communities found in rocky shore, tidal flats, beached, mangrove, coral reefs and subtidal areas. Recitations and discussions cover ecological principles form a policy and management perspective. Not open to students who have taken Biology 273LA and not open to undergraduates. Taught in Beaufort at Duke Marine Lab. Recommended prerequisite: introductory biology.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY773A MARINE ECOLOGY

ENVIRON773L - Marine Ecology

Course Description
Factors that influence the distribution, abundance, and diversity of marine organisms. Course structure integrates lectures, field excursions, lab exercises and an independent project. Lecture topics include physical characteristics of marine systems, adaptation to environment, species interactions, biogeography, larval recruitment, and biodiversity and conservation of communities found in rocky shores, tidal flats, beaches, marshes, mangrove, coral reefs, and subtidal areas. Taught fall, spring, and summer. (Spring enrollment requires travel to Caribbean.) Graduate students submit literature review. Recommended prerequisite: introductory biology.

Grading Basis
Graded

Course Typically Offered
Fall, Spring and Summer

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY773L MARINE ECOLOGY

ENVIRON773LA - Marine Ecology

Course Description
Factors that influence the distribution, abundance, and diversity of marine organisms. Course structure integrates lectures, field excursions, lab exercises and an independent project. Lecture topics include physical characteristics of marine systems, adaptation to environment, species interactions, biogeography, larval recruitment, and biodiversity and conservation of communities found in rocky shores, tidal flats, beaches, marshes, mangrove, coral reefs, and subtidal areas. Not open to students who have taken Biology 273LA. Taught in Beaufort at Duke Marine Lab. Taught fall, spring, and summer. Grad students submit literature review. Prerequisite: introductory biology.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY773LA MARINE ECOLOGY

ENVIRON774 - One Health: From Philosophy to Practice

Course Description
Interdisciplinary course introducing construct of One Health as increasingly important to a holistic understanding of prevention of disease and maintenance of health. Includes discussion of bidirectional impact of animal health on human health, impact of earth's changing ecology on health. Learning objectives include 1) to describe how different disciplines contribute to the practice of One Health, 2) to creatively design interdisciplinary interventions to improve Global Health using a One Health model. Course will include weekly 2-hour multi-campus seminar off-site at NC Biotechnology Center with on-campus discussion section using case studies to supplement the seminar.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
GLHLTH771 ONE HLTH: PHILOSOPHY/PRACTICE

ENVIRON775 - Ocean and Coastal Law and Policy

Course Description
Explores law, policies and attitudes that affect US ocean and coastal resources. Using case studies and other materials, examines use, management and protection of coasts and oceans. Government and private sector approaches to ocean and coastal resources such as, wetlands, estuaries, beaches, reefs, fisheries, endangered species and special areas. Instructor consent required.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON776 - Marine Mammals

Course Description
Ecology, social organization, behavior, acoustic communication, and management issues. Focused on marine mammals in the southeastern United States (for example, bottlenose dolphin, right whale, West Indian manatee). The biology of cetaceans, pinnipeds, sirenians, and sea otters. Detailed consideration given to the adaptations that allow these mammals to live in the sea. Evaluation of the scientific, ethical, and aesthetic factors influencing societal attitudes toward these animals and of their conservation management in light of domestic legislation and international treaties.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON776A - Marine Mammals

Course Description
Ecology, social organization, behavior, acoustic communication, and management issues. Focused on marine mammals in the southeastern United States (for example, bottlenose dolphin, right whale, West Indian manatee). Only open to undergraduates under Biology 376A. Taught in Beaufort at Duke Marine Lab. Prerequisite: introductory biology.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON776L - Marine Mammals

Course Description
Laboratory version of Environment 776. Laboratory exercises consider social organization and acoustic communication in the local bottlenose dolphin population. Recommended prerequisite: introductory biology.

Grading Basis
Graded

Units

Min Units:
4

Max Units:
4

ENVIRON776LA - Marine Mammals

Course Description
Laboratory version of Environment 776LA. Laboratory exercises consider social organization and acoustic communication in the local bottlenose dolphin population. Taught in Beaufort at Duke Marine Lab. Prerequisite: introductory biology.

Grading Basis
Graded

Units

Min Units:
4

Max Units:
4

ENVIRON777A - Biology and Conservation of Sea Turtles

Course Description
Essential biology of sea turtles (evolution, anatomy, physiology, behavior, life history, population dynamics) and their conservation needs, emphasizing their role in marine ecosystem structure and function. Will integrate basic ecological concepts with related topics including conservation and management of endangered species, contributions of technology to management of migratory marine species, role of research in national and international law and policy, and veterinary aspects of conservation. Taught in Beaufort at Duke Marine Lab. Field trip to Puerto Rico is required. Instructor permission is required. Prerequisite: introductory biology.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON777L - Biology and Conservation of Sea Turtles

Course Description
Biology including the anatomy, physiology, behavior, life histories, and population dynamics of sea turtles linked to conservation issues and management. Focus on threatened and endangered sea turtle species, with special attention to science and policy issues in United States waters. Includes field experience with the animals and with their habitat requirements. Sea turtle assessment and recovery efforts, fishery-turtle interactions, population modeling and state/national/international management efforts. Only to undergraduates as Biology 375L. Recommended prerequisite: introductory biology.

Grading Basis
Graded

Units

Min Units:
4

Max Units:
4

ENVIRON777LA - Biology and Conservation of Sea Turtles

Course Description
Biology including the anatomy, physiology, behavior, life histories, and population dynamics of sea turtles linked to conservation issues and management. Focus on threatened and endangered sea turtle species, with special attention to science and policy issues in United States waters. Includes field experience with the animals and with their habitat requirements. Sea turtle assessment and recovery efforts, fishery-turtle interactions, population modeling and state/national/international management efforts. Only open to undergraduates under Biology 375LA. Taught in Beaufort at Duke Marine Lab. Prerequisite: introductory biology.

Grading Basis
Graded

Units

Min Units:
4

Max Units:
4

ENVIRON778L - Comparative Physiology of Marine Animals

Course Description
Physiology of marine animals with emphasis on comparisons between marine vertebrates and humans. Focus on physiological processes including gas exchange, circulation, osmoregulation, metabolism, thermoregulation, endocrine, neural control and sensory systems. Lectures and laboratories illustrate the methodology, analysis techniques, and written reporting of physiological research. Open to undergraduates as Biology or Environment 278L.

Grading Basis
Graded

Course Typically Offered
Fall, Spring and Summer

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY778L COMP PHYSIOL MARINE ANIMALS

ENVIRON778LA - Comparative Physiology of Marine Animals

Course Description
Physiology of marine animals with emphasis on comparisons between marine vertebrates and humans. Focus on physiological processes including gas exchange, circulation, osmoregulation, metabolism, thermoregulation, endocrine, neural control and sensory systems. Lectures and laboratories illustrate the methodology, analysis techniques, and written reporting of physiological research. Open to undergraduates only under Biology or Environment 278LA. Four units (fall, spring); six units (summer). Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall, Spring and Summer

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY778LA COMP PHYSIOL MARINE ANIMALS

ENVIRON780 - Environmental Exposure Analysis

Course Description

Course will explore different routes by which people are exposed to contaminants through daily behaviors including exposure factors, inhalation exposure, dietary exposure, water exposures, statistical methods. Various experimental techniques used to measure exposure will be introduced, reviewed and discussed; will also explore statistical approaches used to evaluate variables contributing to exposure. Students will gain thorough understanding of how to develop an effective exposure assessment experiment and how to use various mathematical models to quantify this exposure. Prerequisites: ENVIRON 710 statistics; college level general chemistry, or consent of instructor.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

ENVIRON782 - Marketing for Environmental Professionals

Course Description

Focus of course is foundations of entrepreneurial activity within the context of environmental sciences and policy. Course concentrates on new enterprises based on substantial technology innovations with potential for high growth and funding by venture capitalists. Format is readings, lectures and case discussion with practical exposure to all basic operational tools required to start up and operate a company.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

ENVIRON782D - Marketing for Environmental Professionals

Course Description

Focus of course is foundations of entrepreneurial activity within the context of environmental sciences and policy. Course concentrates on new enterprises based on substantial technology innovations with potential for high growth and funding by venture capitalists. Format is readings, lectures and case discussion with practical exposure to all basic operational tools required to start up and operate a company.

Grading Basis

Graded

Course Typically Offered

Fall and/or Spring

Units

Min Units:

3

Max Units:

3

ENVIRON784LA - Sound in the Sea: Introduction to Marine Bioacoustics

Course Description

Fundamentals marine bioacoustics with focus on current literature and conservation issues. Topics include: intro acoustics; acoustic analysis methods and quantitative tools; production/recording of sound; ocean noise; propagation theory; active/passive acoustics; hearing, sound production and communication in marine organisms, potential impacts of anthropogenic noise; and regulation of marine sound. Lab focus on methodologies for generating, recording and analyzing marine sounds. Grad students responsible for additional acoustic analyses and results prep for student projects plus preparation additional lit review/critique. Taught in Beaufort at Duke Marine Lab. Prerequisite: AP or introductory biology or consent; Physics 41L or 161L (or equivalent) or consent.

Grading Basis

Graded

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY784LA MARINE BIOACOUSTICS, ECE784LA MARINE BIOACOUSTICS

ENVIRON785A - Conservation Biology & Service Learning: Coastal ecosystems, restoration and communities

Course Description
Marine conservation emphasizing community outreach at local schools focusing on issues in marine conservation and how they are addressed. Lectures cover principles of conservation, biodiversity, extinction risks, genetic tools, fishery by-catch, over-exploitation, habitat degradation, invasive species, climate change, marine protected areas. Students will develop and teach activities that address conservation topics for local school students. Graduate students will undertake an additional project evaluation component which will include the development of an evaluation rubric, conducting an evaluation, and assessing the results of the evaluation. Taught in Beaufort at the Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON786 - Marine Policy

Course Description
Formal study of policy and policy-making concerning the coastal marine environment. History of specific marine-related organizations, legislation, and issues and their effects on local, regional, national, and international arenas. Topics explored through use of theoretical and methodological perspectives, including political science, sociology, and economics.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON786A - Marine Policy (A)

Course Description
Formal study of policy and policy-making concerning the coastal marine environment. History of specific marine-related organizations, legislation, and issues and their effects on local, regional, national, and international arenas. Topics explored through use of theoretical and methodological perspectives, including political science, sociology, and economics. Consent of instructor required. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
PUBPOL849A MARINE POLICY, POLSCI707A MARINE POLICY

ENVIRON787A - Analysis of Ocean Ecosystems

Course Description
The history, utility, and heuristic value of the ecosystem; ocean systems in the context of Odum's ecosystem concept; structure and function of the earth's major ecosystems. Open to undergraduates only under Biology 272A. Taught in Beaufort at Duke Marine Lab. Prerequisite: one year of biology, one year of chemistry, or consent of instructor.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON788LA - Biodiversity of Marine Invertebrates

Course Description
An introduction to the biodiversity represented by major marine invertebrate groups, with emphasis on the diversity of body forms and behaviors and on anatomical structures and functions. Field trips primarily by boat allow students to explore invertebrates characteristic of a variety of coastal habitats in North Carolina, including mud flats, sandy beaches, salt marshes, oyster reefs, piers and docks, and the water column. Live invertebrates maintained in the laboratory serve as models for detailed study of form and function. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY777LA BIODIVERSITY OF MARINE INVERTS

ENVIRON789 - Community Engagement and Participatory Research Methods

Course Description
This course introduces students to community-engaged and participatory research methodologies and frameworks. The course emphasizes collaborative approaches to inquiry that integrate perspectives from both academic and non-academic stakeholders. Students will explore engaged research's theoretical, methodological, and empirical dimensions, focusing on equity, justice, and reciprocal knowledge generation. Topics include participatory action research, community-based participatory research, citizen science, and other collaborative frameworks. The course emphasizes research approaches that prioritize equity, inclusivity, and co-creation of knowledge with communities.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON790 - Special Topics

Course Description
Content to be determined each semester. May be repeated.

Grading Basis
Graded

Units

Min Units:
0.5

Max Units:
4

ENVIRON790A - Duke-Administered Study Away: Special Topics

Course Description
Content to be determined each session.

Grading Basis
Graded

Units

Min Units:
1

Max Units:
4

ENVIRON790D - Special Topics

Course Description
Content to be determined each semester. May be repeated.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
0.5

Max Units:
4

ENVIRON790L - Special Topics

Course Description
Content to be determined each semester. May be repeated.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
0.5

Max Units:
4

ENVIRON790LA - Duke-Administered Study Away: Special Topics

Course Description
Content to be determined each session.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
1

Max Units:
4

ENVIRON790S - Special Topics in Environ

Course Description
Content to be determined each semester. May be repeated.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
0.5

Max Units:
4

ENVIRON790SA - Duke-Administered Study Away: Special Topics

Course Description
Content to be determined each session.

Grading Basis
Graded

Units

Min Units:
1

Max Units:
4

ENVIRON791 - Independent Studies and Projects

Course Description
Directed readings or research at the graduate level to meet the needs of individual students. Consent of instructor required. Units to be arranged.

Grading Basis
Graded

Units

Min Units:
0.5

Max Units:
6

ENVIRON792 - Wetlands of Coastal North Carolina

Course Description
This field based course explores the ecology and management of coastal wetlands North Carolina. Wetlands included in the course include Pocosin bogs, bottomland hardwoods, cedar swamps, freshwater marshes and coastal saltmarshes. Field measurements are taken for water quality, soils and vegetation. Analysis includes the effects of sea level as well as urban coastal development, farming and forestry rise on coastal wetland communities. Students are required to be enrolled in or have taken a wetland or aquatic ecology course. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1

Max Units:
1

ENVIRON795 - Practicum in Community-Based Environmental Management

Course Description
Course is designed for students who wish to learn theory, skills and tools necessary for working with communities to manage their own environment. Course includes in-class lectures, discussions of readings, guest speakers and a client-driven service-learning project with a community-based organization in North Carolina. Topics will include: community organizing; assessing and capturing resources; participatory planning and evaluation; participatory monitoring; outreach and social marketing; and political action for environmental change. Second of two required courses for the Community-Based Environmental Management certificate (NSOE only). Prerequisite: Environment 755.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON796 - Financial Foundations for Environmental Managers

Course Description
An introductory finance course covering a broad range of topics with the goal of creating a financial conversation relevant to environmental management, financial comprehension and fluency. Closely related to the field of economics, finance entails the study and practice of asset pricing, money flows and the financial markets. From an applied perspective, it provides the means to understand pricing and the valuation of future cash flows, and comprises a critical underpinning of both professional and personal management. Financial decision-making fields of practice e.g. accounting, budgeting, and investing are cornerstones of modern society and have tremendous environmental implications.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON797 - Time Series Analysis for Energy and Environment Applications

Course Description
This course focuses on time series analysis, modeling, and forecasting, specifically within the context of energy and the environment. Lectures will include theory and applications using R programming language. Datasets from organizations like US Energy Information Administration (EIA), National Oceanic and Atmospheric Administration (NOAA), National Renewable Energy Laboratory (NREL) and US Geological Survey (USGS) will be used. Upon completion of the course, students will be able to use R to carry out basic statistical modeling and analysis as well as fitting models to data. The primary objective of the course is to empower students to extract meaningful predictions and insights from data.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY797 TIME SERIES ENERGY ENV APPLI

ENVIRON803K - Environmental Policy Process

Course Description
This course provides an introduction to and overview of the environmental policy process. The first part of the course introduces the environmental policy process with case studies from different countries exemplifying regional differences. The second part of the course introduces various aspects and challenges in the design and formation of environmental policies. The third part of the course focuses on implementation and tools to evaluate the impact of environmental policies. The fourth part of the course discusses the formation of international environmental policies and their impact on national priorities. Taught at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON805K - Environmental Economics

Course Description
An overview of environmental economics by introducing analytical methods and tools to analyze environmental problems and identify policy solutions; including 1) a microeconomic foundation of environmental economics, with a focus on market efficiency and market failures; 2) environmental policy decision tools, such as benefit-cost analysis and cost-effectiveness criterion; 3) environmental regulation, with topics covering command-and-control regulation, market-based approaches, and behavioral interventions.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON806 - Duke Forest Practicum

Course Description
Designed to focus on practical skills required of land managers in a variety of settings, including conservation organizations, government, and industrial and non-industrial forestland ownerships. The management plan of the Duke Forest will serve as a guide and example for specific resource and administrative considerations. Classroom and field settings provide hands-on experience with range of topics, including elements of a forest management plan, certification and best management practices, timber sales planning and administration, conservation easements, wildlife management, and recreation management. Open only to MEM and MF students. Instructor consent required.

Grading Basis
Pass/Fail Grading

Units

Min Units:
1

Max Units:
2

ENVIRON806K - Environmental Economics II

Course Description
This course provides for continued development and practice of skills learned in Statistics and Program Evaluation and Environmental Economics. Students develop conceptual and professional skills related to environmental policy evaluation. The goal is to stimulate critical thinking about today's environmental problems and the public policies designed to improve them by implementing the theories and principles acquired in class. Prerequisites: Public Policy 870K and Environment 805K or instructor consent. Taught at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON807 - International Fisheries Policy: Principles and Concepts Aiming to End Overfishing

Course Description
Explore international policies to manage marine fisheries and end overfishing, with an emphasis on key principles and concepts agreed in the policies, and the challenges they aim to address. Overview of major international policies guiding where and how national governments manage marine fisheries & collaborations to manage shared and high seas fisheries. Policies & key challenges will be illustrated through case studies. Guest experts from United Nations Food and Agriculture will discuss current topics & efforts to implement policies. Principles and concepts underpinning fisheries mgmt. worldwide & major intl. policy instruments to challenges to ending overfishing.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON808 - Aquatic and Wetland Field Skills

Course Description
Introduces students to basic techniques of data collection and application of field indicators in wetlands. In the course students will monitor wetland hydrology, soils and plant communities for research purposes and for jurisdictional determination of wetland boundaries using U.S. Army Corps of Engineers protocols.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON808L - Aquatic and Wetland Field Skills

Course Description
Introduces students to basic techniques of data collection and application of field indicators in wetlands. In the course students will monitor wetland hydrology, soils and plant communities for research purposes and for jurisdictional determination of wetland boundaries using U.S. Army Corps of Engineers protocols.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON809 - Wetland Restoration Ecology

Course Description
Restoration of wetlands requires understanding of wetland hydrology, biogeochemical processes, decomposition, community habitat requirements and soil processes. Factors are discussed in an ecosystem context along with current restoration techniques. Course utilizes newly constructed wetlands in Duke Forest to explore wetland restoration principles. Students teamed together to develop restoration plan for a restored wetland. Final report and oral presentation required.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON811 - Business and Environment

Course Description

Theoretical grounding on Sustainable Systems (SS) thinking and overview of national and international frameworks that have led to development and use of sustainable systems modeling, life cycle analysis and policy decision models. Topics include socio-metabolic consumption, sustainability as a field of inquiry, systems thinking, industrial ecology, earth systems engineering, complexity and resiliency. Explore current drivers and implications of sustainable systems with specific focus on nexus of industry and environmental systems including examining cumulative impacts and benefits resulting from shifting supply chains, green engineering, technological designs and consumer behavior.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

Crosslisted Courses

ENERGY811 BUSINESS AND ENVIRONMENT

ENVIRON811D - Business and Environment

Course Description

Theoretical grounding on Sustainable Systems (SS) thinking and overview of national and international frameworks that have led to development and use of sustainable systems modeling, life cycle analysis and policy decision models. Topics include socio-metabolic consumption, sustainability as a field of inquiry, systems thinking, industrial ecology, earth systems engineering, complexity and resiliency. Explore current drivers and implications of sustainable systems with specific focus on nexus of industry and environmental systems including examining cumulative impacts and benefits resulting from shifting supply chains, green engineering, technological designs and consumer behavior. Instructor consent required.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

Crosslisted Courses

ENERGY811D BUSINESS AND ENVIRONMENT

ENVIRON812 - Wetlands Ecology and Management

Course Description

The study of bogs, fens, marshes, and swamps. Emphasis on processes within the ecosystem: biogeochemical cycling, decomposition, hydrology, and primary productivity. Ecosystem structure, the response of these systems to perturbations, and management strategies are discussed. A research project is required. Prerequisites: one course in ecology and chemistry.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

ENVIRON814 - Integrated Case Studies in Toxicology

Course Description

Students are assigned topics relative to their chosen research discipline in toxicology and are asked to develop case studies to present at a roundtable workshop. Emphasis on review and analysis of toxicological problems from a holistic (multidisciplinary) viewpoint. Offered on demand.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
1

Max Units:
1

Crosslisted Courses
PHARM814 CASE STUDIES TOXICOLOGY

ENVIRON815 - Focused Topics in Toxicology

Course Description
A contemporary advanced toxicology research area covered with readings from the current primary literature. An integrative review of the topic prepared as a collaborative effort. Consent of instructor required. Prerequisites: Pharmacology 533 and 847S.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
1

Max Units:
1

Crosslisted Courses
PHARM815 FOCUSED TOPICS IN TOXICOLOGY

ENVIRON817K - Life Cycle Assessment and Carbon Accounting

Course Description
Life cycle assessment (LCA) provides a standardized framework (ISO 14040-14044 series of standards) to quantify the potential environmental impacts of a wide range of products, processes, services, urban systems, human activities, and policy decisions. Carbon/greenhouse gas accounting utilizes standardized frameworks (e.g., GHG Protocol, ISO 14064) for organizations to quantify and report their total greenhouse gas emissions. This course will introduce you these frameworks, and their wide applications. You will gain hands-on experience in conducting LCA and carbon accounting.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON819 - Mechanisms in Environmental Toxicology

Course Description
Provides an in-depth examination of key molecular and biochemical mechanisms by which organisms defend themselves against environmental pollutants. Cellular mechanisms by which chemicals produce toxicity when the defense systems are overwhelmed will be addressed. Includes examinations of 'state of the art' approaches for experimentally elucidating these phenomena. Course format will be that of a graduate seminar, with lectures given and discussions led by the instructors, guest speakers, and course participants. Prerequisites: one course in biochemistry and one course in toxicology.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON820S - Conservation Ethics

Course Description

Students will delve into the tension between science and advocacy through the lens of environmental ethics. Students will gain a strong foundation in principles of environmental ethics, drawing from the rich literature on this topic from the fields of philosophy and ethics, environmental communications and education, and conservation ecology. Seminar-style course requires students to actively lead and participate in weekly discussions, write a series of essays and collaboratively design and initiate a semester project. Ultimately, the course is about reflecting on not just the academic literature and individual scenarios but seriously considering the role our own values play in our work.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

ENVIRON821 - Readings in Soil Science

Course Description

An advanced discussion course based on readings that concern current critical topics in the soil sciences. Readings are selected from both basic and applied aspects of the field.

Grading Basis

Graded

Units

Min Units:

1

Max Units:

1

ENVIRON822A - Coastal Watershed Management and Restoration

Course Description

This course will examine management of coastal watersheds and their biological function, focusing on the positive (restoration) and negative (degradation, eutrophication) ways that humans alter ecosystems. Local field trips are an integral part of this class to examine anthropogenic modifications to coastal ecosystems (e.g. farms, wetland restoration) as well as discussing these issues with stakeholders at NGOs, businesses and government. Graduate section offered in conjunction with undergraduate course MARSCI 321A. Graduate students will analyze watershed management plans and propose science and policy solutions. Taught in Beaufort at the Duke Marine Lab.

Grading Basis

Graded

Course Typically Offered

Spring Only

Units

Min Units:

3

Max Units:

3

ENVIRON823D - Ecological Resilience and Ecosystem Management

Course Description

Course provides an introduction to concepts of ecological resilience and its application to the management of ecological systems, and is intended for both PhD and MEM students. The course does not require formal mathematical training, but students are expected to engage the models used in this field. Course consists of lectures, discussion, and a group research project. Lectures will address fundamental theory, case studies, and empirical approaches used to understand the resilience of basic ideas, observations, and approaches to understanding the ecology of flowing water systems.

Grading Basis

Graded

Course Typically Offered

Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON824A - Marine Conservation Biology

Course Description
Introduction to marine conservation in a small island context with an exploration of how traditional and modern methods play out in practice. Most of the course will be taught in Palau, where students will meet traditional chiefs, fishers, state governors, NGO practitioners, scientists and politicians to hear their perspectives on marine conservation. The course will focus on the theory and practice of marine conservation, as exemplified by case studies in traditional management, marine protected areas, conservation of protected species and ecotourism. Taught in Beaufort at Duke Marine Lab. Trip to Palau required. Permission required.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON826 - Global Environmental Politics

Course Description
Course examines how states and non-states actors cooperate to resolved global environmental problems. Central focus is on the creation of international environmental regimes, their implementation, and effectiveness. Case studies include climate change, ozone depletion, water sharing and dams, fisheries, biodiversity, forestries, oil pollution, sustainable development, environmental security, and trade and the environment.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON829 - Natural Resource Economics

Course Description
Addresses questions about natural resource scarcity using modern capital theory and optimal control theory to derive core results. Two objectives: provide students with a solid foundation in theory of natural resource economics, emphasizing tools and theoretical breadth to enhance research and teaching. Second objective to highlight contemporary themes in theoretical and empirical resource economics. Designed for PhD students in economics, finance, agriculture and resource economics, or public policy (with economics concentration). Prerequisite: one year PhD-level microeconomic theory and econometrics; review of differential equations recommended. Consent of instructor required.

Grading Basis
Graded

Course Typically Offered
Occasionally

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ECON753 NATURAL RESOURCE ECONOMICS

ENVIRON830 - Building Energy on Campus: Evaluating Efficiency and Conservation Measures at Duke

Course Description
Buildings use more than 40% of the energy consumed in the US, and are a natural target of energy efficiency and conservation measures. Building owners and facility managers, as well as the policy community, are therefore interested in identifying means of reducing energy consumption in the current building stock and taking advantage of the embodied energy already sunk into its construction. Using the campus as a laboratory, course examines energy use in existing Duke buildings. Students will learn about the relationship between building design and energy use, and gain hands-on experience conducting energy audits and evaluating energy saving measures in campus facilities.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY830 BUILDING ENERGY ON CAMPUS

ENVIRON831 - Sustainable Business Strategy

Course Description
Businesses are increasingly applying strategic management tools to incorporate consideration of sustainability into decision-making and operations. While some businesses incorporate sustainable practices because of ethical convictions, most businesses are motivated to do so to address pressures from stakeholders such as regulators, shareholders, customers and neighbors and to exploit knowledge and experience for long term competitive advantage. Students will learn how businesses develop and implement strategies to promote sustainability by examining roles and responsibilities of sustainable strategic managers and applying tools of strategic business management to problems of sustainability. Permission of instructor required.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON831D - Sustainable Business Strategy

Course Description
Businesses are increasingly applying strategic management tools to incorporate consideration of sustainability into decision-making and operations. While some businesses incorporate sustainable practices because of ethical convictions, most businesses are motivated to do so to address pressures from stakeholders such as regulators, shareholders, customers and neighbors and to exploit knowledge and experience for long term competitive advantage. Students will learn how businesses develop and implement strategies to promote sustainability by examining roles and responsibilities of sustainable strategic managers and applying tools of strategic business management to problems of sustainability. Permission of instructor required.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON832 - Environmental Decision Analysis

Course Description
Quantitative methods for analyzing environmental problems involving uncertainty and multiple, conflicting objectives. Topics include subjective probability, utility, value of information, multi-attribute methods. Students will apply these tools to an environmental policy decision in a group project. Prerequisite: introductory applied statistics or equivalent.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON835 - Environmental Law

Course Description
Examination of rapidly growing body of law concerned with interrelationships between human activities and the larger environment. Focus on rationales for environmental protection; risk assessment and priorities.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
ENERGY835 ENVIRONMENTAL LAW

ENVIRON835K - Environmental Law

Course Description
Emphasizing the practical use and application of legal concepts within the context of pollution control and resource management; exploring the role of law, regulation and governance in protecting, managing and restoring the environment and natural resources. Taught in China at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON836 - Seabird Survival and Dispersal Analysis

Course Description
Client-inspired class held at the Dry Tortugas National Park (near Key West). The principal field activity will be catching, ringing and measuring sooty terns as part of a National Park Service effort. The graduate version of this course has close similarities to the undergraduate class. Both classes will travel together and be expected to catch, ring and process the same numbers of birds. The graduate version differs in the written expectations. These vary somewhat, but have included very extensive documents that eventually comprised the student's master's project and considerable post-trip involvement with the professor and Park Service personnel—such projects are encouraged but not guaranteed. Instructor consent required. Prerequisite: Environment 703.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
2

Max Units:
2

ENVIRON841 - Ecological Perspectives: Evolution to Ecosystems

Course Description
This course surveys core concepts in evolutionary and ecosystems ecology, and it challenges students to develop intersections and creative syntheses across those disciplines.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY841 EVOLUTION TO ECOSYSTEMS, UPE701 EVOLUTION TO ECOSYSTEMS, EVANTH741 EVOLUTION TO ECOSYSTEMS

ENVIRON842 - Ecological Perspectives: Individuals to Communities

Course Description
This course surveys core concepts in Physiological/Behavioral/Population Ecology and Community Ecology, and it challenges students to develop intersections and creative syntheses across those disciplines.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY842 INDIVIDUALS TO COMMUNITIES, UPE702 INDIVIDUALS TO COMMUNITIES, EVANTH742 INDIVIDUALS TO COMMUNITIES

ENVIRON847S - Seminar in Toxicology

Course Description
A weekly research seminar throughout the year is required of participants in the Toxicology Program. Students, faculty, and invited speakers present their findings.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
1

Max Units:
1

Crosslisted Courses
PHARM847S SEMINAR IN TOXICOLOGY

ENVIRON848S - Seminar in Toxicology

Course Description
A weekly research seminar throughout the year is required of participants in the Toxicology Program. Students, faculty, and invited speakers present their findings.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
1

Max Units:
1

Crosslisted Courses
PHARM848S SEMINAR IN TOXICOLOGY

ENVIRON849A - Doctoral Student Seminar and Professional Development

Course Description
Addresses topics of relevance to the professional development of PhD students in the Marine Science Conservation program. Topics addressed include: the nature of inter-disciplinary research, critical reading, grant writing, communicating results to the public, mentoring students, and preparing manuscripts for academic journals. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Pass/Fail Grading

Units

Min Units:
2

Max Units:
2

ENVIRON850 - Did The Policy Work? Quantitative Causal Inference In Environmental Policy

Course Description
Designed to give students foundation in methods and applications of quantitative program evaluation in environmental policy. Program evaluation seek to identify casual effect of program/regulation/policy on some outcome of interest using statistical methods. Students will learn major empirical methods in program evaluation and apply them to current environmental policies.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON859 - Geospatial Data Analytics

Course Description
Provide training in more advanced skills such as: GIS database programming, modeling applications, spatial decision support systems and Internet map server technologies. The course requires a fundamental knowledge of geospatial analysis theory, analysis tools, and applications. Consent of instructor required. Prerequisite: Environment 559 and Environment 761, 765, or 789.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON859A - Geospatial Data Analytics

Course Description
Provide training in more advanced skills such as: GIS database programming, modeling applications, spatial decision support systems and Internet map server technologies. The course requires a fundamental knowledge of geospatial analysis theory, analysis tools, and applications. Taught in Beaufort at Duke Marine Lab. Recommended prerequisite: Environment 559 and Environment 761, 765, or 789. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON859D - Geospatial Data Analytics

Course Description
Provide training in more advanced skills such as: GIS database programming, modeling applications, spatial decision support systems and Internet map server technologies. The course requires a fundamental knowledge of geospatial analysis theory, analysis tools, and applications. Consent of instructor required. Prerequisite: Environment 559 and Environment 761, 765, or 789.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON859DA - Geospatial Data Analytics

Course Description
Provide training in more advanced skills such as: GIS database programming, modeling applications, spatial decision support systems and Internet map server technologies. The course requires a fundamental knowledge of geospatial analysis theory, analysis tools, and applications. Taught in Beaufort at Duke Marine Lab. Recommended prerequisite: Environment 559 and Environment 761, 765, or 789. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON860SA - Political Ecology

Course Description
Seminar to examine concept of political ecology as means of conceptualizing conservation and development conflicts and solutions. Intended to engage students with political ecology to strengthen usefulness, enrich possibilities, and improve participants ongoing research, collaborations and critical inquiries. Enrollment limited to graduate students. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON865SA - College Teaching and Course Design

Course Description
Designed for graduate students seeking to teach an independent course at Duke and beyond; topics include models of course design, syllabus construction, critical thinking, college student development, clarifying learning objectives, variety in assignments, and classroom assessment techniques. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
2

Max Units:
2

ENVIRON868 - Natural Resources Law

Course Description
Focus on constitutional, statutory, and common law governing the legal status and management of federal lands and natural resources.

Grading Basis
Graded

Units

Min Units:
2

Max Units:
2

ENVIRON869 - Environmental Law Clinic

Course Description
Under Law faculty supervision, students work on interdisciplinary teams to solve nonprofit clients' legal and policy problems. Students gain hands-on, skills-based professional experience. Clinic follows Law School's academic calendar. Minimum 100 client work hours plus weekly seminar; mandatory, all-day intensive, typically 2nd Friday of semester; no dropping after 1st class. Nicholas School students may enroll starting in their second semester. Suggested corequisite: Environment 835. More information is available at: https://law.duke.edu/envlawpolicy/.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
4

Max Units:
4

ENVIRON869D - Environmental Law Clinic

Course Description
Under Law faculty supervision, students work on interdisciplinary teams to solve nonprofit clients' legal and policy problems. Students gain hands-on, skills-based professional experience. Clinic follows Law School's academic calendar. Minimum 100 client work hours plus weekly seminar; mandatory, all-day intensive, typically 2nd Friday of semester; no dropping after 1st class. Nicholas School students may enroll starting in their second semester. Suggested corequisite: Environment 835. More information is available at: https://law.duke.edu/envlawpolicy/.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
4

Max Units:
4

ENVIRON872L - Environmental Data Exploration

Course Description
Environmental data analytics introduces fundamental data skills needed to conduct research. We explore a variety of techniques and technologies for obtaining, re-formatting, managing, and visualizing diverse data sets with an emphasis on developing reproducible workflows and sharing both methods and results. We will use actual environmental data (hydrologic, demographic, energy, etc.) in class exercises, but students will have the opportunity to involve their own data sets.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON876A - Data and Time Series Analysis in Marine Sciences

Course Description
Analysis of environmental time-series and other data sets. Topics include discrete sampling issues, data rejection and interpolation, coordinate rotations and principal axes, curve fits, regression, error and propagation of uncertainty, bootstrapping, filtering, spectral analysis, harmonic analysis, EOFs, wavelets. Lectures, workshops and homework assignments will apply these methods to environmental data sets. Each student will complete a final project, applying methods covered in class to data sets they choose, as part of or related to their research. Taught in Beaufort at Duke Marine Lab. Consent of instructor required.

Grading Basis
Graded

Units

Min Units:
4

Max Units:
4

ENVIRON885 - Masters Project international Master of Environmental Policy II

Course Description
Follows after PUBPOL 897K, in which students conceived of, designed, and completed the initial steps of their master's project (MP). Students will complete their MP and present project findings. Students will review and revise project content in peer-to-peer and instructor-to-student settings, critically evaluate their methods and data, search for new ways to leverage their findings, and tighten their resulting analysis. Required course for iMEP students. Taught at Duke University.

Grading Basis
Credit / No Credit

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON886 - Current Topics in Marine Conservation

Course Description
Discussion of a topic of interest chosen by students with guidance from instructors. Topic is discussed from a social and natural science perspective. Open only to PhD students.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
2

Max Units:
2

ENVIRON886A - Current Topics in Marine Conservation

Course Description
Discussion of a topic of interest chosen by students with guidance from instructors. Topic is discussed from a social and natural science perspective. Open only to PhD students. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Units

Min Units:
2

Max Units:
2

ENVIRON887 - Theory and Methods for Policy Analysis of the Commons

Course Description
Survey course of main theories and methods used by scholars to understand how collective action problems and different institutional arrangements affect how common-pool resources and public goods are governed. Students are asked to design a project that incorporates some of the concepts and methodological approaches learned in class. Taught in Durham.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON887A - Theory and Methods for Policy Analysis of the Commons

Course Description
Survey course of main theories and methods used by scholars to understand how collective action problems and different institutional arrangements affect how common-pool resources and public goods are governed. Students are asked to design a project that incorporates some of the concepts and methodological approaches learned in class. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON888 - Career Development for Environmental Professionals

Course Description
This course surveys career development strategies, activities, and experiences for MEM/MF graduate students, specifically those with less than three years of work experience. It emphasizes use of these elements in a successful internship search. Students will apply these strategies to their own career journey and have opportunity to interact with alumni during this course. No prerequisites. Course offered as one credit that doesn't count toward graduation.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall Only

Units

Min Units:
1

Max Units:
1

ENVIRON889L - Forestry Capstone

Course Description
The Forestry Capstone focuses on silviculture prescriptions and forest finance and management planning. The silviculture section centers on forest mgmt planning built on field skills, modeling tools, and understanding of silvicultural principles. The forest finance section centers on the economic consequences of forest management plans under a multi-objective optimization framework with constraints. The two sections are integrated to inform landowners or land managers of the monetary tradeoffs of different forest management regimes. A mix of lectures, guest talks, labs, and fieldwork.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
4

Max Units:
4

ENVIRON891 - Topics in Environmental Regulation

Course Description
In-depth analysis of current issues in environmental regulation. Topics vary. Course may be repeated.

Grading Basis
Graded

Units

Min Units:
1.5

Max Units:
1.5

Crosslisted Courses
ENERGY891 TOPICS IN ENVL REGULATION

ENVIRON893 - MEM/MF Internship Practical Training

Course Description
Students gain practical environmental management or forestry experience/training by participating in a project-based internship. Open only to Master of Environmental Management and Master of Forestry students. Instructor consent required.

Grading Basis
No Grade Associated

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

ENVIRON895 - Master of Environmental Management/Forestry Internship/Project

Course Description
Students gain practical environmental management or forestry experience by participating in a project-based internship. Focus areas in the Stanback Program include energy, conservation, advocacy, policy, research, or other environmental management and/or forestry practical opportunities. Open only to Master of Environmental Management or Master of Forestry students.

Grading Basis
No Grade Associated

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

ENVIRON898 - Program Area Seminar

Course Description
Required symposium in each program area. Students present master's project research. Pass/fail grading only.

Grading Basis
Pass/Fail Grading

Units

Min Units:
1

Max Units:
1

ENVIRON898A - Topic: Program Area Seminar - Duke University Marine Lab

Course Description
Required symposium in each program area. Students present master's project research. Pass/fail grading only. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

ENVIRON898K - Master's Project International Master in Environmental Policy II

Course Description
Designed to help students develop a master's project (MP). Guide students in conceptualizing an idea, identifying key environmental policy question, writing a prospectus, finding an advisor, finding a client, designing an analytical approach, data collection, and a producing a draft of their project. Taught at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
3

Max Units:
3

ENVIRON899 - Master's Project

Course Description
An applied study of a forestry or environmental management problem or a theoretical research effort. A seminar presentation of the objectives, methodology, and preliminary findings is required. A written (or other medium) report at the conclusion of the project is also required. Undertaken with the guidance of the student's adviser. Consent of instructor required. Pass/fail grading only.

Grading Basis
Pass/Fail Grading

Units

Min Units:
1

Max Units:
6

ENVIRON899K - Master's Project II

Course Description
Follows after Environment 898K, in which students conceived of, designed, and completed the initial steps of their master's project (MP). Students will complete their MP and present project findings. Students will review and revise project content in peer-to-peer and instructor-to-student settings, critically evaluate their methods and data, search for new ways to leverage their findings, and tighten their resulting analysis. Required course for iMEP students. Taught at Duke Kunshan University.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

ENVIRON909 - Survey of Environmental Leadership at Duke and Beyond

Course Description
Students invite Duke faculty to share their perspectives on environmental leadership with a series of web conferences. Students will read a range of scholarly work from these faculty, as well as key readings in the environmental leadership literature. Grade will be based on participation in class meetings, online discussions, and a short summary paper. Consent of instructor is required. Online course.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

ENVIRON931 - One Health: Introduction to the One Health Approach

Course Description
6-day morning course introduces principles of employing the One Health approach in preventing and controlling infectious diseases. Includes practical overview of host factors, environmental factors, and microbiological factors that influence this dynamic field of study. Through lectures and exercises, introduces infectious disease surveillance, diagnostic tools, outbreak investigations, vaccine trials, public health interventions, biodefense, emerging infectious diseases and analytical approaches as they pertain to infectious disease prevention and control. Introduces wide array of reference material for practical application of course material.

Grading Basis
Graded

Units

Min Units:
2

Max Units:
2

Crosslisted Courses
GLHLTH731 INTRO TO ONE HEALTH APPROACH

ENVIRON932 - One Health: Introduction to Environmental Health

Course Description
Course provides a comprehensive overview of major topic areas in Environmental Health. Includes major sources of environmental health risks, such as microbial, chemical, and physical agents in natural and anthropogenic environments. Also covers topics of toxicology and ecotoxicology, risk assessment and risk management, water and sanitation issues, infectious diseases, food safety, and other emerging topics.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
GLHLTH732 INTRO TO ENVIRONMENTAL HEALTH

ENVIRON955 - DEL: Community-Based Environmental Management

Course Description
Course combines analysis of potential problems and pitfalls involved in community-based environmental management with discussion of the tools necessary to create and manage these projects. Focus is on discussion of academic literature with presentations of specific case studies and analysis of a community program in students' proximity. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students. Online course.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON959 - DEL: Intro to ArcGIS Pro Exercises

Course Description
This course introduces present and emerging geospatial technologies used to support research and management in the environmental sciences. Subjects covered will include geospatial data types, data collection and management, and the range of roles and responsibilities of various geospatial professionals. Also included, how to incorporate geospatial technologies into projects and organizations, novel applications of geospatial technologies, and how leaders can identify the application-readiness of emerging geospatial technology when considering adoption by their programs and organizations. Experiential work focused on data collection, processing, and display/visualization for decision-makers.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
1

Max Units:
2

ENVIRON960 - Duke Environmental Leadership: Orientation Course: Making a Difference in the World

Course Description
One-week course to introduce the curriculum of the Duke Environmental Leadership (DEL) program. Provides framework for program studies. Focus on real-world environmental challenges and timely case studies. Field studies in Durham and at Duke University Marine Lab, Beaufort, NC. Open to Duke Environmental Leadership Master of Environmental Management students only.

Grading Basis
Pass/Fail Grading

Units

Min Units:
1

Max Units:
1

ENVIRON961 - Duke Environmental Leadership: Ecosystem Science and Management

Course Description
This course will explore the challenges of managing ecosystems by focusing on both structure (i.e. species, populations, communities) and function (i.e. ecosystem services), grounded in the best available science. We will examine how humans have transformed landscapes and evaluate management strategies for both terrestrial and marine systems. Students will gain the scientific grounding and the practical skills necessary to evaluate the use of science in mgmt efforts through a semester-long case study project, mini-presentations, and writing assignments. Discussions will focus on current controversies in conservation science. Open to DEL-MEM students only. Online course.

Grading Basis
Graded

Course Typically Offered
Fall Only

Units

Min Units:
3

Max Units:
3

ENVIRON962 - Duke Environmental Leadership: Economics of Environmental Management

Course Description
An economic perspective on the management of env. resources. Conceptual topics emphasized include env. externalities, market failure, public goods, sustainability, and benefit-cost analysis. Applications illustrate the role of price signals in energy choices, managing renewable resource use over time, use of marketable pollution permits to encourage voluntary reductions in air and water pollution, and the political economy of env. policy formulation. Case studies examine carbon trading and taxes to address climate change, and economic incentives and values for biodiversity conservation. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students. Online course.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON963 - Strategy and Implementation for Environmental Leaders

Course Description
In the private and public sectors, as well as not-for-profit organizations, managerial effectiveness is central to environmental leadership. This course will focus on the development of management skills including decision-making, motivation, working in teams, organizational cultures, organizational design, learning organizations and change management. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students. Online course.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON964 - Duke Environmental Leadership: Environmental Law and Policy

Course Description
Environmental policies have evolved from strict reliance on command and control systems to experimentation with alternative approaches. In this course students study this evolution by first examining the history and context of U.S. policy development processes and institutions. Command approaches to air and water pollution and waste management are considered along with alternative approaches, such as market-based programs, public-private partnerships and voluntarism. Policies for managing land, natural resources, species protection and addressing transnational and global environmental problems are examined. Policy implementation and devolution of responsibilities to state and local governments and the private sector is stressed. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students. Online course.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON965 - DEL: Environmental Leadership Module

Course Description

One of the driving themes of the DEL-MEM Program is leadership. We believe that leadership is cultivated by each individual and requires time and effort; it is a process. Participation in the DEL-MEM program will put students one step closer in their leadership pursuit by providing opportunities to assess and enhance leadership skills, building confidence in critical and creative thinking, communication, collaboration and conflict resolution. This course is designed to orient students towards these goals. More specifically, to provide a framework and point of reference for students' leadership development. During the three-day session, we will explore leadership in a variety ways, including individual meetings with prominent leaders in the field, discussions, and case study project. Students will also experience Washington, D.C. through a tour of the Capitol, meetings with Congressional members and staff, and time on the Mall. Open to Duke Environmental Leadership Master of Environmental Management students only.

Grading Basis

Pass/Fail Grading

Units

Min Units:

1

Max Units:

1

ENVIRON966 - DEL: Professional Writing Course

Course Description

This course teaches skills and strategies to make the writing process less intimidating and written work more clear and powerful. Comprised of online writing modules that provide examples of excellent nonfiction writing with the goal of identifying what makes the writing successful. Students develop and sharpen their own writing skills through incorporating feedback from a series of drafts. Student writing is reviewed in various forums-including writing workshops, peer reviews, and teacher conferences-to provide detailed feedback, allowing students to rethink and revise their writing. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students. Online course.

Grading Basis

Graded

Units

Min Units:

1

Max Units:

1

ENVIRON973 - DEL: Business Strategy for Environmental Sustainability

Course Description

Businesses are increasingly applying strategic management tools to incorporate considerations of sustainability into decision-making and operations. Course focuses on the development and implementation of strategies to promote environmental sustainability. Students examine roles and responsibilities of sustainable strategic managers and learn how to apply the tools of strategic management: external analysis, forecasting and stakeholder management to problems of sustainability. Business case studies are used. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students. Online course.

Grading Basis

Graded

Units

Min Units:

3

Max Units:

3

ENVIRON974 - DEL: Seeing the Big Picture: Lessons from Watershed Management in California

Course Description

This course is an exploration of the interdisciplinary and often controversial nature of watershed management in California using examples from arguably the most manipulated and well-studied watershed in the US. These problems and their solutions are relevant to all watersheds. Topics include: host factors governing fish and wildlife responses and effects; fate, transport, and biogeochemistry of agricultural chemicals; exotic species introduction;

economics considerations governing water allocations storage; transport, and conservation; and conflict resolution efforts between competing interest groups. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students. Online course.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON975 - DEL: Community Based Environmental Management in Mexico

Course Description
Class offers students a focused introduction to the general history of rural common property governance and resource politics and management in Mexico and to the specific history and current context of community environmental management in Oaxaca. Requires participation in week long field trip (spring break) to Oaxaca (additional costs involved). Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students.

Grading Basis
Graded

Units

Min Units:
3

Max Units:
3

ENVIRON976 - DEL: Restoration Ecology: Practice and Principles

Course Description
Class explores the fundamental principles of ecological restoration with a socio-ecological lens. Students will use the restoration process as a framework for understanding how science informs practice, and vice versa. Case studies in both terrestrial and marine systems will be used, and students will apply lessons learned in an ecosystem of their choosing. Open to Duke Environmental Leadership Master of Environmental Management students, with department consent required of all other students.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
2

Max Units:
2

ENVIRON979 - DEL: The Science of Climate Change

Course Description
This course will provide students with a broad, policy-relevant overview of contemporary scientific understanding of climate change. The recently released IPCC Sixth Assessment Working Group 1 Report titled 'The Physical Science Basis' will provide the framework for discussion of various aspects of climate change, including the fundamental physical science basis, potential impacts and vulnerability, and mitigation of climate change. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students. Online course.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
1

Max Units:
1

ENVIRON980 - DEL: California Water Management Field Trip

Course Description

California has long been the poster child for conflict over water management and appropriation. Much of that conflict has focused on the diversion of water from the Sierra Nevada and the Great Central Valley. In this 5-day field course we will provide an overview of the hydrology and history of water development of the Central Valley, and focus on three case studies: Hetch Hetchy, the Californian Aquaduct, and the re-watering of the San Joaquin River. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students.

Grading Basis

Graded

Units

Min Units:

1

Max Units:

1

ENVIRON982 - DEL: Sustainable Development in Colombia

Course Description

The course will provide students with an international perspective and explores topics such as sustainable economy, renewable energy, conservation, ecotourism and sustainable rural development in Colombia. Currently Colombia is going through a systemic transition after decades of internal conflict. During spring break, students will travel to Colombia to assist in several meetings in Bogotá, and later to Barranquilla, Santa Marta and La Guajira to explore and experience ecotourism and conservation initiatives, energy transitions taking place from coal to solar and wind, as well as exchanging experiences with sustainable economies of indigenous peoples of Wayuu and Arhuaco communities.

Grading Basis

Graded

Course Typically Offered

Spring Only

Units

Min Units:

2

Max Units:

3

ENVIRON983 - DEL: Green Development

Course Description

This course will cover green building, smart cities, and related cleantech innovations. Students will explore these topics through the lenses of business strategy, corporate sustainability drivers, challenges and risks, global megatrends, investor perspectives, entrepreneurship, measures of success, and implementation tools. Teaching methods will include case studies, practice-oriented assignments, readings from industry and thought leaders, structured group discussions, and skill building such as professional memo writing. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students.

Grading Basis

Graded

Course Typically Offered

Spring Only

Units

Min Units:

3

Max Units:

3

ENVIRON990 - DEL: Special Topics

Course Description

Content to be determined each semester. May be repeated. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students.

Grading Basis

Graded

Units

Min Units:
0.5

Max Units:
4

ENVIRON995 - DEL: Leadership Seminar

Course Description
Leadership is both a way of doing things and a way of being in the world. Now, more than ever, leaders need to work collaboratively if we are to solve our greatest collective challenges. To do so effectively, those who aspire to lead must develop a deep sense of both internal and external awareness. Course focus areas: Developing a Toolkit, Defining a Leadership Journey, Ongoing Discussion of Leadership Challenges and Coaching through the use of various tools to identify personal characteristics and capacity for leadership.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
1

ENVIRON996 - DEL MEM Capstone

Course Description
Students will propose a Capstone Pathway and provide a detailed explanation why this choice meets their master's project goals. A final leadership capstone project, which will integrate all DEL leadership sessions, particularly the DC leadership seminar, capstone courses, and interviews; project not limited to an academic paper. An interview protocol will be developed to ensure thoughtful conversations around issues of leadership that the student is interested in. The Capstone must be a rigorous experience, integrating coursework, outreach, and reflection.

Grading Basis
Pass/Fail Grading

Course Typically Offered
Fall and/or Spring

Units

Min Units:
1

Max Units:
3

ENVIRON997 - Duke Environmental Leadership: Independent Studies and Projects

Course Description
Directed readings or research at the graduate level to meet the needs of individual students. Open to Duke Environmental Leadership-Master of Environmental Management students only. Instructor consent required.

Grading Basis
Graded

Units

Min Units:
1

Max Units:
3

ENVIRON999 - Duke Environmental Leadership: Master's Project

Course Description
An applied study of a forestry or environmental management problem or an original research effort. A seminar presentation of the objectives, methodology, and preliminary findings is required. A written (or other medium) report at the conclusion of the project is also required. Undertaken with the guidance of the student's adviser. Open to Duke Environmental Leadership Master of Environmental Management students only. Department consent required for all other students.

Grading Basis
Pass/Fail Grading

Units

Min Units:
4

Max Units:
4

ENVIRON571A-1 - Urban SubTropical Ecology

Course Description
Domestic version of MARSCI 571A Urban Tropical Ecology. The mix of human ecology, subtropical diversity, disturbed habitats and invasive species in the Eastern US. Comparing how Asian and US planners maintain and enhance the quality of life of citizens in radically modified environments. Research on politics, management, biology and social science of land use restoration and tourism. Travel in South Eastern US to experience solutions to disturbed environments required. Domestic travel required. Instructor consent required. Taught in Beaufort at Duke Marine Lab.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3

Crosslisted Courses
BIOLOGY571A-1 URBAN SUBTROPICAL ECOLOGY, MARSCI571A-1 URBAN SUBTROPICAL ECOLOGY

General Education Curriculum Codes
(STS) Sci, Tech, and Society, (NS) Natural Sciences

ENVIRON773LA-1 - Marine Ecology

Course Description
Factors that influence the distribution, abundance, and diversity of marine organisms. Course structure integrates lectures, field excursions, lab exercises and an independent project. Lecture topics include physical characteristics of marine systems, adaptation to environment, species interactions, biogeography, larval recruitment, and biodiversity and conservation of communities found in rocky shores, tidal flats, beaches, marshes, mangrove, coral reefs, and subtidal areas. Not open to students who have taken Biology 273LA. Taught in Beaufort at DUML. Spring enrollment requires travel. Visit DUML website for details. Grad students submit literature review. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
BIOLOGY773LA-1 MARINE ECOLOGY

ENVIRON790S-01 - Topics in Environmental History

Course Description
The department offers a series of rotating courses, covering various aspects of environmental and natural history. Written work is confined to methodological, conceptual, or historiographic essays. Topics vary, as do the instructors.

Grading Basis
Graded

Course Typically Offered
Fall and/or Spring

Units

Min Units:
4

Max Units:
4

Crosslisted Courses
HISTORY790S-08 TOPICS IN ENVIRONMENTAL HIST, CULANTH790S-02 TOPICS IN ENVIRONMENTAL HIST

ENVIRON872L-1 - Environmental Data Exploration

Course Description
Environmental data analytics introduces fundamental data skills needed to conduct research. We explore a variety of techniques and technologies for obtaining, re-formatting, managing, and visualizing diverse data sets with an emphasis on developing reproducible workflows and sharing both methods and results. We will use actual environmental data (hydrologic, demographic, energy, etc.) in class exercises, but students will have the opportunity to involve their own data sets. Instructor consent required.

Grading Basis
Graded

Course Typically Offered
Spring Only

Units

Min Units:
3

Max Units:
3