

# Bulletin of Duke University

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Nicholas School of the Environment  
2023-2024

# Duke University

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### 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, Actionators, 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 Occaneechi 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.

## 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 Ocean 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.

## 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 2023-2024 and is accurate and current, to the greatest extent possible, as of August 2023. 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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- School of Law: Frances Curran
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# Duke University

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- Pratt School of Engineering Professional Programs: Cherie Creten
- Sanford School of Public Policy: Anita Lyon
- Undergraduate Instruction: Heather Settle

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This publication is available in alternative format on request. Call (919) 684-2813.

## About Duke University

### 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



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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."

## Duke University Leadership

Full leadership profiles for those listed below are available at [duke.edu/about/leadership](https://duke.edu/about/leadership).

### Executive Leadership

Vincent Price, President | [president.duke.edu](https://president.duke.edu)

Daniel Ennis, Executive Vice President

Jennifer Francis, Interim Provost

# Duke University

A. Eugene Washington, Chancellor for Health Affairs, Duke University, President and CEO, DUHS

## 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

Gary Bennett, Dean, Trinity College of Arts and Sciences

William Boulding, Dean, Fuqua School of Business

Edgardo Colón-Emeric, Dean, Divinity School

Vincent Guilamo-Ramos, Dean, School of Nursing and Vice Chancellor for Nursing Affairs

Judith Kelley, Dean, Sanford School of Public Policy

Mary E. Klotman, Dean, School of Medicine

Jerome P. Lynch, Dean, Pratt School of Engineering

Toddi Steelman, Stanback Dean, Nicholas School of the Environment

### Vice Provosts

Edward Balleisen, Vice Provost for Interdisciplinary Studies

Abbas Benmamoun, Vice Provost for Faculty Advancement

John Brown, Vice Provost for the Arts

Yakut Gazi, Vice Provost for Learning Innovation and Digital Education

Mohamed Noor, Interim Vice Provost for Academic Affairs

Mary Pat McMahon, Vice Provost/Vice President of Student Affairs

Amy Oates, Interim Vice Provost for Finance & Administration

Noah Pickus, Associate Provost

Joseph Salem, Rita DiGiallonardo Holloway University Librarian and Vice Provost for Library Affairs

Candis Watts Smith, Interim Vice Provost for Undergraduate Education

## University Administration

Pamela J. Bernard, Vice President and General Counsel

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 Satterfield, Vice President for Finance

Chris Simmons, Interim Vice President for Public Affairs & Government Relations

Russell Thompson, Interim Vice President for Operations

Neal Triplett, President, DUMAC

Stelfanie Williams, Vice President for Durham & Community Affairs

## The Faculty



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Duke faculty are chosen from among the most competitive selection processes in the country, having demonstrated excellence in their fields of research. Duke currently has two Nobel Laureates among its faculty. Many others hold appointments in the National Academy of Sciences. Their books and publications are numerous and influential.

Duke professors are also excellent teachers. There is an 8-to-1 ratio of students to faculty. Professors are committed to giving students the individual attention that pushes them to excel while nurturing their ideas. Undergraduates, even in their first year, interact with senior faculty on a regular basis in efforts such as the Focus Program, a series of first-year interdisciplinary seminars focused on a theme. In addition, many serve as advisors to students, including those who choose to design their program of study and as mentors to undergraduates who pursue hands-on research.

Profiles of Duke's faculty members are available via [Scholars@Duke](mailto:Scholars@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 the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 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](http://police.duke.edu/news-stats/clery) for more details.

## Duke's Commitment to Diversity and Inclusion

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.

### Excellence, Diversity, and Inclusion: A statement by the faculty, Provost, and President

To achieve our mission and meet the needs of a rapidly changing world, Duke strives to create a climate of collaboration, creativity, and innovation within and across disciplines. Our success depends upon the robust exchange of ideas – an exchange that flourishes best when the rich diversity of human knowledge, perspectives, and experiences is heard. We nonetheless acknowledge that our policies and practices have often failed to ensure equality of participation within our community. Our renewed commitment and responsibility to one another is articulated in the following statement.

### Duke University Community Commitment

Because diversity is essential to fulfilling the university's mission, Duke is committed to building an inclusive and diverse university community. Every student, faculty, and staff member —whatever their race, gender, age, ethnicity, cultural heritage or nationality; religious or political beliefs; sexual orientation or gender identity; or socioeconomic, veteran or ability status—has the right to inclusion, respect, agency and voice in the Duke community. Further, all members of the University community have a responsibility to uphold these values and actively foster full participation in university life.

## 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](mailto: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 the The Duke Community Standard in Practice: A Guide for Students.

### 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 [ed.gov/policy/gen/guid/fpco/ferpa/index.html](http://ed.gov/policy/gen/guid/fpco/ferpa/index.html). For Duke's full FERPA policy, visit [registrar.duke.edu/student-resources/family-educational-rights-and-privacy-act-ferpa](http://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. The institution prohibits discrimination on the basis of age, color, disability, gender, gender identity, gender expression, genetic information, national origin, race, religion, sex, sexual orientation, or veteran status, in the administration of its educational policies, admission policies, financial aid, employment, or any other institution program or activity. It admits qualified students to all the rights, privileges, programs, and activities generally accorded or made available to students.

Sexual harassment and sexual misconduct are forms of sex discrimination and prohibited by the institution. 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. The Office for Institutional Equity is located in Smith Warehouse, 114 S. Buchanan Blvd., Bay 8, Durham, North Carolina 27708, and can be contacted at (919) 684-8222.

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

#### **Discrimination in employment or educational programs and activities:**

Cynthia Clinton, AVP Harassment and Discrimination Prevention and Compliance  
Title IX Coordinator  
Office for Institutional Equity

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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

Additional information, including the complete text of Duke's Policy on Prohibiting Discrimination, Harassment and Related Misconduct and appropriate complaint procedures, may be found here. For further information visit the U.S. Department of Education Office for Civil Rights, or call 1-800-421-3481.

## University Resources, Campus Life & Activities

### Agreements with other Universities

#### **Neighboring Universities (Interinstitutional Agreement)**

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. Under the same conditions, one interinstitutional course per summer may be taken at a neighboring institution participating in this agreement provided that the student is concurrently enrolled at Duke for one full course credit. This agreement does not apply to contract programs such as the American Dance Festival or to study abroad programs.

Approval forms for courses to be taken at these neighboring institutions may be obtained from the offices of the academic deans and the university registrar. Forms are also available online at the Office of the University Registrar website ([registrar.duke.edu](http://registrar.duke.edu)), in the Registration section. Only those courses not offered at Duke will be approved. Approval must be obtained at Duke from the director of undergraduate studies of the subject of the course and the student's academic dean. 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. The courses may be eligible for Areas of Knowledge and Modes of Inquiry coding. The student pays any special fees required of students at the host institution.

Courses taken at The University of North Carolina at Chapel Hill by Duke students in the Robertson Scholarship Program (a joint scholarship program for students at Duke and The University of North Carolina at Chapel Hill) are interinstitutional courses. However, the restriction on the number of courses and the kind of courses (i.e., those not offered at Duke) permitted does not always apply. Robertson Scholars should refer to program materials for specific regulations.

#### **Domestic Exchange Programs**

Trinity College has exchange programs with two domestic institutions: Howard University in Washington, DC, and Spelman College in Atlanta, Georgia. Duke students may study for a semester at either institution, while students from these institutions enroll for the same period at Duke. Students may enroll in a wide variety of courses at either Howard University or Spelman College for which they will receive transfer credit at Duke. Transfer credits earned under this exchange program do not count against the maximum allowable domestic or study abroad transfer credits. For more information about these programs, visit [011.Allen](http://011.Allen).

#### **Career Center**

The Career Center, working in partnership with faculty and colleagues, provides career advising to all Duke undergraduates, graduate students, and alumni. Recognizing the unique talents and needs of each individual, the Career Center encourages students to make the most of their Duke experience by accessing relevant campus resources, developing career interests and values, and establishing and maintaining important human relationships with their peers as well as Duke faculty, staff, and alumni. The Career Center works to build and maintain relationships with alumni and employers who can provide internships and learning opportunities, entry-level positions, and opportunities for experienced professionals. For more information, visit [careerhub.students.duke.edu](http://careerhub.students.duke.edu).

## Continuing Studies

### 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 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 the Office of Continuing Studies and Summer Session, and are subject 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 through the Office of Continuing Studies for admission as a nondegree, full-time visiting student for one or two semesters. Students with unique circumstances should contact the Office of Continuing Studies.

**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 Continuing Studies (see the Satisfactory Continuation Requirements outlined on page 51 of 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	<ul style="list-style-type: none"><li>• Earned D or D-in at least one course</li><li>• Earned F in one course, and C-or better in at least two courses</li></ul>
Academic Dismissal	<ul style="list-style-type: none"><li>• Earned F in at least one course</li></ul>

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 from Duke Continuing Studies. 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 certificate programs offered include human resource management, management accounting, digital media and marketing, big data and data science, technical communications, business communications, business ethics, paralegal studies, financial planning, event development, Six Sigma Green Belt, entrepreneurship, supply side management, sustainable management, online learning, finance essentials, legal nurse consulting, and others.

### Nonprofit Management Program

Students 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/

## Duke University

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 fall and spring retreats, language tables, reading groups, film and lecture series, and volunteer opportunities.

### Duke Youth Programs

For more than thirty-five years, Duke Youth Programs has offered academic enrichment opportunities for middle and high school students in the summer. Current offerings range from camps in biosciences and engineering, forensic science, game design, drones, math, cryptography, neurosciences, creative writing, SAT preparation, video production, and a college admissions boot camp.

For more information, call the Office of Continuing Studies and Summer Session at (919) 684-6259, or visit [learnmore.duke.edu](http://learnmore.duke.edu).

## Institutes, Initiatives & Centers

### University Institutes

- **Bass Connections** bridges the classroom and the world beyond the university, giving students from all of Duke's schools a chance to tackle complex societal problems alongside our superb faculty. For more information, visit [bassconnections.duke.edu](http://bassconnections.duke.edu).
- **The Duke Global Health Institute (DGHI)** brings together knowledge and resources from across the university to address the most important global health issues of our time. DGHI faculty, staff and students are engaged in research and educational projects in more than 40 countries, including the United States. For more information, visit [globalhealth.duke.edu](http://globalhealth.duke.edu).
- **The Duke Institute for Brain Sciences (DIBS)** provides a vibrant hub for all who share our vision of making neuroscience greater than the sum of its parts by integrating schools, disciplines, analysis and education to accelerate breakthroughs and benefit society. For more information, visit [dibs.duke.edu](http://dibs.duke.edu).
- **The John Hope Franklin Humanities Institute (FHI)** is built on a fundamentally collaborative model befitting the Duke University emphasis on knowledge in the service of society. Through interdisciplinary cross-fertilization, we seek to encourage the conversations, partnerships, and collaborations that continually stimulate creative and fresh humanistic research, writing, teaching, and practice at Duke. For more information, visit [fhi.duke.edu](http://fhi.duke.edu).
- **The Kenan Institute for Ethics** is an interdisciplinary think and do tank committed to promoting moral reflection and commitment, conducting interdisciplinary research, and shaping policy and practice at Duke and beyond. For more information, visit [kenan.ethics.duke.edu](http://kenan.ethics.duke.edu).
- **The Nicholas Institute for Energy, Environment & Sustainability** advances the university's mission to build a more sustainable world by developing transformative educational experiences; galvanizing and conducting impactful research; and engaging with key decision makers at the global, national, state, and local levels. For more information, visit [nicholasinstitute.duke.edu](http://nicholasinstitute.duke.edu).
- **The Social Science Research Institute (SSRI)** brings together researchers with interests in problems that cross the various social and behavioral sciences, including problems that connect with the humanities and natural sciences. For more information, visit [ssri.duke.edu](http://ssri.duke.edu).

### Initiatives

- **The Duke Initiative for Science & Society** ("Science & Society") fosters research, education, communication, democratic deliberation, and policy engagement on the ethical progress of science and technology in society. For more information, visit [scienceandsociety.duke.edu](http://scienceandsociety.duke.edu).
- **Innovation & Entrepreneurship Initiative (I&E)** believes all Duke students benefit from learning about innovation and entrepreneurship—from those who wish to found a company, to those who want to change the world with innovation, to those who simply want to cultivate a more creative and entrepreneurial mindset. I&E partners with schools and departments across Duke to offer interdisciplinary, experience-based education. For more information, visit [entrepreneurship.duke.edu](http://entrepreneurship.duke.edu).
- **MEDx** (Medicine + Engineering at Duke) was forged in 2015 to enhance existing ties and foster new interdisciplinary collaborations between the School of Medicine and Pratt School of Engineering. An initiative rather than an institute, MEDx is structured to enhance existing ties and encourage new collaborations among faculty from both schools as well as other schools,

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institutes and initiatives at Duke. For more information, visit [medx.duke.edu](http://medx.duke.edu).

- **The Rhodes Information Initiative at Duke (iiD)** is an interdisciplinary program designed to increase "big data" computational research and expand opportunities for student engagement in this rapidly growing field. For more information, visit [bigdata.duke.edu](http://bigdata.duke.edu).

## Centers

- **The Center for Documentary Studies (CDS)** offers an interdisciplinary program in the documentary arts—photography, audio, film/video, narrative writing, new media, and other means of creative expression—that emphasizes active engagement in the world beyond the university campus. For more information, visit [documentarystudies.duke.edu](http://documentarystudies.duke.edu).
- **The Dewitt Wallace Center for Media and Democracy (DWC)** is Duke University's hub for the study of journalism. DWC studies the interaction between news media and policy, supports watchdog and accountability reporting in the United States and around the world, and teaches about the media's role in democracy. The center is part of the Sanford School of Public Policy, and shares in the Sanford School's mission of teaching, research, and policy engagement, with the goal of putting knowledge in service to society. For more information, visit [dewitt.sanford.duke.edu](http://dewitt.sanford.duke.edu).
- **Duke Civic Engagement (DCE)** strengthens and connects the ways in which Duke partners with communities. DCE supports Duke's collaborations on pressing social challenges by increasing the capacity of the campus to sustain partnerships and sharing best practices in community engagement. For more information, visit [civic.duke.edu](http://civic.duke.edu).
- **The Duke University Center for International and Global Studies (DUCIGS)** grounds its research, teaching, and programming on the deep, region and culture-specific knowledge and experience of its organizational units while exploring global topics, pursuing interdisciplinary and cross-regional collaboration, and welcoming new approaches within areas studies and global studies. DUCIGS is home to various international area studies centers, councils, and initiatives. Visit the DUCIGS website at [igs.duke.edu](http://igs.duke.edu) to learn more about the many centers and initiatives it houses.
- **DukeEngage** provides fully-funded opportunities that enable students and faculty to collaborate with organizations across the globe to address critical societal needs through an immersive summer of civic engagement. For more information, visit [dukeengage.duke.edu](http://dukeengage.duke.edu).
- **The Margolis Center for Health Policy** catalyzes Duke University's leading capabilities including interdisciplinary academic research and capacity for education and engagement, to inform policy making and implementation for better health and health care. The Center has offices and staff on Duke University's campus in Durham, North Carolina and at the Duke in DC offices in the heart of the nation's capital. For more information, visit [healthpolicy.duke.edu](http://healthpolicy.duke.edu).

## Libraries & Technology

### 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, the Pearse Memorial Library at the Duke Marine Lab 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.

#### All Libraries

- Perkins & Bostock Libraries ([library.duke.edu](http://library.duke.edu))
- David M. Rubenstein Rare Book & Manuscript Library ([library.duke.edu/rubenstein](http://library.duke.edu/rubenstein))
- Duke University Archives ([library.duke.edu/rubenstein/uarchives](http://library.duke.edu/rubenstein/uarchives))
- Lilly Library ([library.duke.edu/lilly](http://library.duke.edu/lilly))
- Music Library ([library.duke.edu/music](http://library.duke.edu/music))
- Marine Lab Library ([library.duke.edu/marine](http://library.duke.edu/marine))
- Library Service Center ([library.duke.edu/lsc](http://library.duke.edu/lsc))
- Divinity School Library ([library.divinity.duke.edu](http://library.divinity.duke.edu))
- Duke Kunshan University Library ([dukekunshan.edu.cn/en/academics/library](http://dukekunshan.edu.cn/en/academics/library))
- Ford Library, Fuqua School of Business ([library.fuqua.duke.edu](http://library.fuqua.duke.edu))
- Goodson Law Library ([law.duke.edu/lib](http://law.duke.edu/lib))
- Medical Center Library ([mclibrary.duke.edu](http://mclibrary.duke.edu))

### Technology Resources



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- The Office of Information Technology ([oit.duke.edu](http://oit.duke.edu))
- Computing and Networking ([wireless.duke.edu](http://wireless.duke.edu))
- Printing and Labs ([oit.duke.edu/services-tools/printers-labs](http://oit.duke.edu/services-tools/printers-labs))
- Support and Training ([oit.duke.edu/services-tools/support-training](http://oit.duke.edu/services-tools/support-training))

## Student Disability Access Office (SDAO)

The Student Disability Access Office (SDAO) recognizes disability as an aspect of diversity that is integral to society and to our campus community. Accessibility is an essential feature of the Duke campus, and we strive to create an inclusive community for our students. We strive to ensure that students with disabilities are provided the tools they need to fully access all aspects of student life inside and outside of the classroom.

### Core Functions of SDAO

- Partner with students with disabilities to establish services for their access and inclusion on campus
- Manage, coordinate, implement and evaluate accommodation/service programs
- Serve as a resource to students/faculty/staff to ensure effective provision of services
- Provide educational and resource support to the campus community to increase awareness regarding how to create and sustain access and inclusion for students with disabilities in all aspects of the university
- Provide resource and referral information to the campus community and prospective student and their families

SDAO works with each student individually to establish academic adjustments and auxiliary aids and services, more frequently referred to as academic accommodations for the purpose of eliminating the environmental barriers impacting the student's equitable access to the campus facilities, programs and activities. To find out more information about how to establish services with SDAO you can contact us in the following ways.

In order to receive consideration for reasonable accommodations under Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990 (ADA), and the ADA Amendments Act of 2008, a student must have a physical or mental impairment that substantially limits one or more major life activities. Students requesting accommodations under the provisions of the ADA, ADA Amendments Act of 2008, and Section 504 of the Rehabilitation Act of 1973 (e.g., academic, accessibility, housing) must contact the Student Disability Access Office to explore possible coverage. Students with medical conditions not covered under the provisions of the ADA and the ADA Amendments Act may wish to contact Duke Student Health Service. Additional information and requests for accommodations may be found on the SDAO website.

For more information, visit [access.duke.edu/students](http://access.duke.edu/students).

## Housing, Dining, & Transportation

### Housing and Residence Life (HRL)

**Undergraduate Housing.** Housing, Dining and Residence Life manages all aspects of the university's three-year undergraduate residency requirement. Residential programs are designed to build positive communities that value learning, create new opportunities for faculty engagement, and generate positive social connections. HRL, student residents and others in the Duke community develop and maintain environments that support classroom learning and encourage students to seek learning opportunities in the world around them. HRL promotes opportunities for students to connect with others and develop a strong and enduring sense of belonging; and intentionally provide opportunities for students to grow and develop as they continue to negotiate developmental issues related to identity, autonomy, and responsibility. HRL programs are rooted in the concepts of mutual respect and civility, and recognize and celebrate the dignity and self-worth of all members. For more information, visit [studentaffairs.duke.edu/hdrl](http://studentaffairs.duke.edu/hdrl).

**Graduate and Professional Student Apartments.** Limited on-campus housing is available to full-time graduate students. For more information on graduate student housing application timeline and facility amenities, visit [students.duke.edu/living/housing/graduate-professional-housing](http://students.duke.edu/living/housing/graduate-professional-housing). Assignments are made in the order of receipt of completed applications.

**Off-Campus Housing.** The Duke Community Housing Office maintains a listing of rental apartments, rooms, and houses provided by property owners or real estate agencies in Durham at [durhamgradhousing.com](http://durhamgradhousing.com).

Duke Housing and Residence Life (HRL) operates a website specifically to simplify the off-campus housing search for students, parents, faculty and staff, and for area property owners and managers at [nearduke.com/housing](http://nearduke.com/housing).

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**Duke Dining.** Duke is home to one of the most innovative, dynamic, and cutting edge collegiate dining programs in the country, with access to over 50 dining locations that include 33 on-campus locations, Merchants-on-Points (off-campus restaurants that deliver), and food trucks. Find more information at [students.duke.edu/living/dining](https://students.duke.edu/living/dining).

### DukeCard

All Duke students are issued electronic Duke University identification cards through their mobile devices. This identification should be carried at all times. DukeCards are the means of identification for library privileges, athletic events, and other university functions or services open to them as university students. Students will be expected to present their cards on request to any university official or employee. DukeCards are not transferable and fraudulent use may result in loss of student privileges or suspension. For more information, visit [dukecard.duke.edu](https://dukecard.duke.edu).

### Parking & Transportation

Duke Parking & Transportation provides the Duke community with parking options that balance price and convenience while managing supply and demand across the parking system. A valid permit is required in all locations; most locations are gated and the permit activates the entry and exit gates. Visitors who do not have a permit pay by the hour in facilities specially set aside for them. Accommodations are also available for patrons that require accessible parking or transportation.

Options include annual permits and short-term permits that allow for flexible or occasional parking. Anyone affiliated with Duke is eligible to purchase on-campus parking in available locations. There are also many transportation options available at Duke, including Duke Transit (buses), vans, city and regional buses, private taxi service, and a ride-hailing program. For more information, visit [parking.duke.edu](https://parking.duke.edu).

## Student Affairs & Organizations

The Division of Student Affairs is critically engaged in supporting the holistic engagement and personal growth of all students who attend Duke. The Division collaborates with student leaders, faculty, families, community members and many others in the delivery of key services.

Its programs and services are designed to support holistic wellbeing, foster an inclusive and dynamic community, and complement Duke's commitment to academic excellence. For more information, visit [studentaffairs.duke.edu](https://studentaffairs.duke.edu).

The Student Affairs Identity and Cultural Centers also serve as important resources and places of connection and support for many of our students. The centers are offering programming and support throughout the year, including summer. ICCs include:

- Center for Multicultural Affairs
- Center for Muslim Life
- Center for Sexual and Gender Diversity
- Duke International Student Center
- Jewish Life at Duke
- Mary Lou Williams Center for Black Culture
- Women's Center

### Graduate and Professional Student Government

The Graduate and Professional Student Government of Duke University (GPSG) is the umbrella student government organization for Duke's nine graduate and professional schools. Its purpose is to: represent and advocate on behalf of graduate and professional students at Duke University; serve as a liaison among the student governments of the graduate and professional schools of the University; serve as a liaison between graduate and professional students and the University Administration; nominate graduate and professional student representatives to University committees; program events of interest to the graduate and professional student community; and financially support the programming of graduate and professional student groups.

Visit the GPSG website at [gpsg.duke.edu](https://gpsg.duke.edu). Contact GPSG ([gpsgexec@duke.edu](mailto:gpsgexec@duke.edu)) for additional details on how students can become involved.

### The Black Graduate and Professional Student Association

The Black Graduate and Professional Student Association (BGPSA) represents all minority graduate and professional students on the Duke University campus. The association's primary mission is to enhance the Duke experience for its members through community service, social, and academically based programming events. As an umbrella organization, the association welcomes students from groups including the Black & Latino MBA Organization, Black Law Students Association, Black Seminarians Union, Bouchet Society,

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Hurston-James Society, and Student National Medical Association. Through its academic forums, luncheons, community service initiatives, social events, and recognition ceremony the group hopes to assist in the development of future minority leadership in the Duke community and in the world.

### Religious Life

In partnership with the Division of Student Affairs, the Chapel convenes, supports, and advocates for all of the officially recognized Religious Life groups on campus that serve students, including Buddhist, Catholic, Hindu, Jewish, Latter-Day Saints, Muslim, Orthodox, and Protestant organizations and groups. There are about two dozen Religious Life groups at Duke; find a listing of them at [chapel.duke.edu/religiouslife](http://chapel.duke.edu/religiouslife).

With a mission of “bridging faith and learning,” the Chapel holds ceremonies, concerts, Christian worship services, and more. It is a sanctuary open to all people for important personal moments of prayer, reflection, grief, and gratitude. The Chapel’s Student Ministries provides opportunities for undergraduate students to hear and respond to God’s call for their lives on campus, in Durham, and beyond through study, artistic expression, counsel, service, and community. Learn more at [chapel.duke.edu](http://chapel.duke.edu).

### Intercollegiate Athletics

The Athletic Department fosters intercollegiate athletics by striving for excellence and by providing the best possible framework within which highly accomplished student-athletes can compete. The department has a dual responsibility to provide a high-quality athletic program and environment so that all students have the opportunity to compete to the fullest extent of their abilities. Duke is a member of the National Collegiate Athletic Association (NCAA) and the Atlantic Coast Conference (ACC).

## Student Health & Safety

### Campus Police

It is the mission of the Duke University Police Department to protect and serve the people and property of Duke. We are guardians of a community of world class education, research and healthcare and must prevent violence, reduce fear, and build relationships. For more information, visit [police.duke.edu](http://police.duke.edu).

### Counseling & Psychological Services (CAPS)

CAPS helps Duke students enhance their strengths and learn to cope with the trials of living, growing, and learning. CAPS offers many services to Duke undergraduate, graduate, and professional students, including brief individual counseling/psychotherapy, consultation, couples and group counseling, and assistance with referrals. CAPS' staff also provide outreach education programs to student communities, promoting an empathic and supportive culture. Staff members are available for consultation with faculty concerning students or other matters relating to mental health in the university community. The CAPS staff includes psychologists, clinical social workers, and psychiatrists experienced in working with college-age adults. CAPS' staff carefully adhere to professional standards of ethics, privacy, and confidentiality. For more information, visit [studentaffairs.duke.edu/caps](http://studentaffairs.duke.edu/caps).

### DukeReach

DukeReach provides direct case management services including interventions, advocacy, referrals and follow-up services for students who are experiencing significant difficulties related to mental health, physical health, and/or psycho-social adjustment. The Assistant and Associate Deans in DukeReach coordinate student services and provide connections with campus departments as well as outside agencies and providers. For more information, visit [studentaffairs.duke.edu/dukereach](http://studentaffairs.duke.edu/dukereach).

### DuWell

DuWell works to enhance the educational experience for Duke students by addressing substance use and abuse issues and promoting healthy physical, emotional and social development, including issues related to sexual health. It offers one-on-one screening (for substance use) and health coaching, workshops and trainings on the different topic areas of wellness (including Social Host Education, Stress and Sexual Health workshops) and programs for student groups upon request. Consultation on prevention of high-risk behavior and promotion of wellness is available to students, faculty, professionals and staff. DuWell is dedicated to fostering a living/learning environment on campus and within the surrounding community that encourages the full development of the individual as an engaged member of the community. For more information, visit [studentaffairs.duke.edu/duwell](http://studentaffairs.duke.edu/duwell).

### Student Health

Student Health Services at Duke University is jointly supported by the Division of Student Affairs and the Department of Pediatrics. The Duke Student Health Center is the primary source for a wide range of healthcare services, many of which are covered by the Student

Health Fee. Its mission is to provide evidence-based, patient-centered health care to the Duke student community in a professional and compassionate manner that directly contributes to the student's well-being and overall success. For more information, visit [studentaffairs.duke.edu/studenthealth](http://studentaffairs.duke.edu/studenthealth).

## 2023-2024 Academic Calendar

<b>SUMMER 2023</b>
<b>February</b> February 20 (M) Registration begins for all summer sessions
<b>May</b> May 17 (W) Term 1 classes begin (Monday class meeting schedule is in effect on this day) May 18 (Th) Regular class meeting schedule begins. Thursday class schedule is followed May 19 (F) Drop/Add for Term 1 ends May 29 (M) Memorial Day holiday. No classes
<b>June</b> June 19 (M) Juneteenth holiday. No classes June 26 (M) Term 1 classes end June 27 (Tu) Reading period June 28-29 (W-Th) Final exams
<b>July</b> July 3 (M) Term 2 classes begin July 4 (Tu) Independence Day holiday. No classes July 6 (Th) Drop/Add for Term 2 ends
<b>August</b> August 10 (Th) Term 2 classes end August 11 (F) Reading period August 12-13 (Sa-Su) Final exams
<b>FALL 2023</b>
<b>August</b> August 21 (M) New graduate student orientation begins August 23 (W, 4pm) Welcome Reception for new graduate and professional school students August 28 (M) Fall semester classes begin
<b>September</b> September 4 (M) Labor Day. No classes are held September 8 (F) Drop/Add ends for fall September 28-October 1 (Th-Su) Founders' Weekend
<b>October</b> October 14-17 (Sa-Tu) Fall break October 18 (W) Classes resume October 24 (M) Shopping carts open for Spring 2024
<b>November</b> November 1 (W) Registration begins for Spring 2024 November 22-26 (W-Su) Thanksgiving recess
<b>December</b> December 1 (F) Graduate classes 700 and above end December 2-12 (Sa-Tu) Graduate reading period December 13-18 (W-M) Final exams
<b>SPRING 2024</b>
<b>January</b> January 10 (W) Spring semester classes begin (Monday class meeting schedule is in effect on this day) January 15 (M) Martin Luther King, Jr. Day holiday. No classes January 24 (W) Drop/Add ends for spring

<b>SUMMER 2023</b>
<b>February</b> February 19 (M) Registration begins for Summer 2024
<b>March</b> March 9-17 (Sa-Su) Spring recess March 18 (M) Classes resume March 25 (M) Shopping carts open for Fall 2024
<b>April</b> April 3 (W) Registration begins for Fall 2024 April 17 (W) Graduate classes 700 and above end April 18-28 (Th-Su) Graduate reading period April 29-May 4 (M-Sa) Final exams
<b>May</b> May 10 (F) Commencement begins May 12 (Su) Graduation exercises; conferring of degrees
<b>SUMMER 2024</b>
<b>February</b> February 19 (M) Registration begins for Summer 2024
<b>May</b> May 15 (W) Term 1 classes begin (Monday class meeting schedule is in effect on this day) May 17 (F) Drop/Add for Term 1 ends May 27 (M) Memorial Day holiday. No classes
<b>June</b> June 19 (W) Juneteenth holiday. No classes June 24 (M) Term 1 classes end June 25(Tu) Reading period June 26-27 (W-Th) Final exams
<b>July</b> July 1 (M) Term 2 classes begin July 3 (W) Drop/Add for Term 2 ends July 4 (Th) Independence Day holiday. No classes
<b>August</b> August 8 (Th) Term 2 classes end August 9 (F) Reading period August 9-11 (Sa-Su) Final exams

## 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 (MEM), and the master of arts

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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 three divisions: environmental sciences and policy, 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 science, 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. Certificate programs are offered in energy and the environment, and sustainability engagement. 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 three 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 Sciences and Policy

With focal areas in ecosystem science and management, environmental health, wetlands, and environmental economics and policy, the Division of Environmental Sciences and Policy (ESP) is headquartered in Grainger Hall. Faculty with training in the biological, physical, chemical, and social sciences work on applied and basic environmental research problems. The division stresses interdisciplinary approaches to environmental problem solving.

#### 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

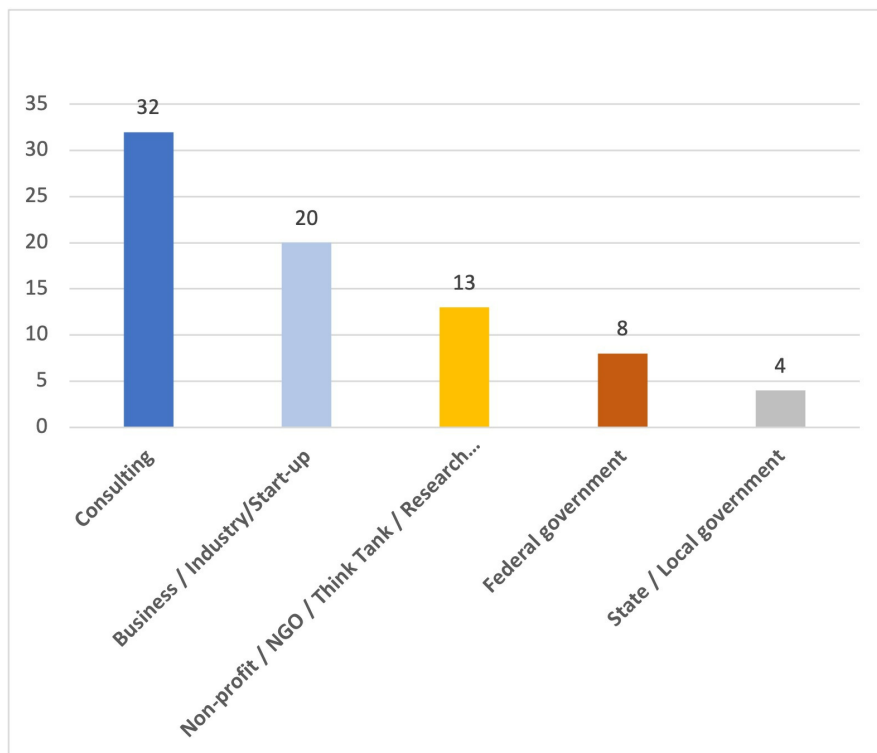
The variety and geographic distribution of organizations that employ Nicholas School graduates demonstrate the value and relevance of the Master of Environmental Management and the Master of Forestry programs. Graduates' career success confirms the marketability of a professional/graduate degree from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

The following employment statistics are based on data collected for the Nicholas School class of 2022 six months following graduation.

### 2022 Distribution of Employment by Sector

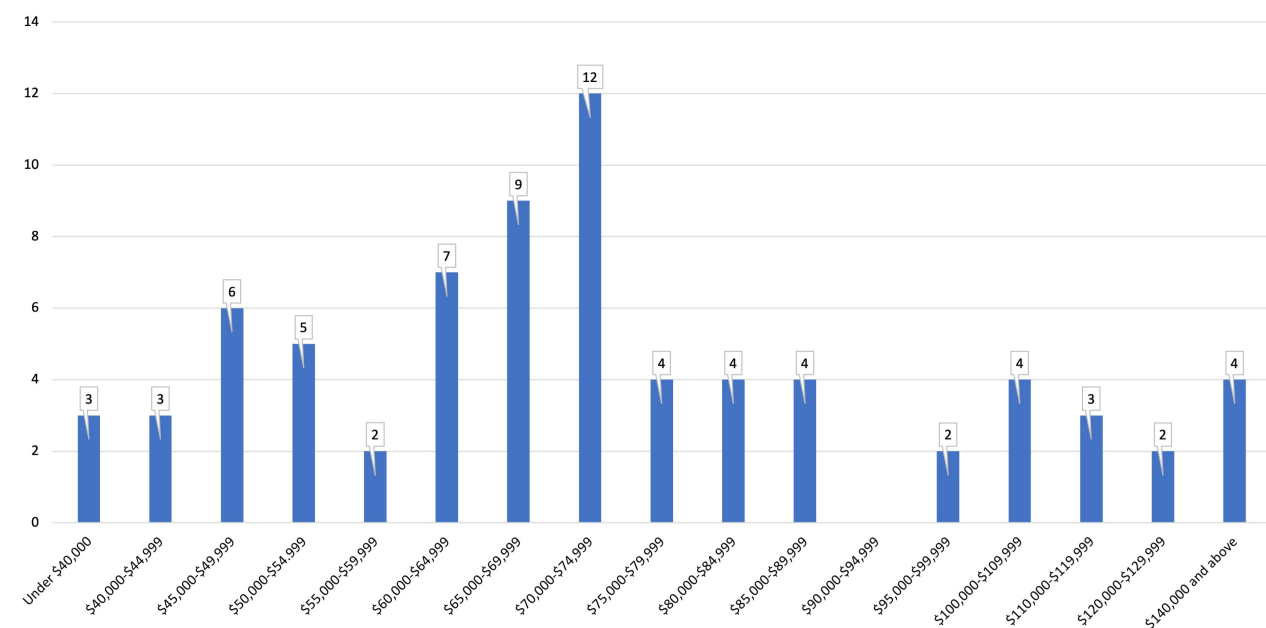


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2022 Distribution of Employment by Sector

## 2022 Salary Ranges



2022 Salary Ranges

## Salary

The average reported salary was \$75,169 for this population. The reported annual salary mode for respondents was in the range of \$70,000 to \$74,000 (13% of respondents). Reported salaries vary widely depending on the type of employer, employment sector, individual qualifications, previous experience(s), and employment location.

## Sample First Destination Employers (Class of 2022)

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CORPORATE/CONSULTING	PUBLIC SECTOR	NGO/RESEARCH/THINK TANK
Apex Clean Energy	Bureau of Ocean Energy Management (BOEM)	Citizens Climate Lobby
Bluesource	California Public Utilities Commission	Conservation International
ConEdison	City of Durham (NC)	Dartmouth Health
E3	National Oceanic and Atmospheric Administration (NOAA)	Duke University
ERM Consulting	New York City Department of Parks and Recreation (NY)	Environmental Defense Fund (EDF)
Goldman Sachs	North Carolina Land and Water Fund	Foothills Conservancy
Guidehouse	State of Alaska	Monterey Bay Aquarium
ICF Consulting	State of Vermont	Nicholas Institute for Environmental Policy Solutions
Ivy Energy	US Environmental Protection Agency (EPA)	North Carolina Coastal Federation
Kearns & West	US Forest Service	Oak Foundation
McKinsey and Co.		Oceana
NextEra		Resources for the Future
Nike		The Conservation Fund
Raftelis		The Nature Conservancy
Ramboll		The Watch Hill Conservancy
S&P Global		University of Tennessee
Target		Urban Ocean Lab
Tetra Tech		
The London Company		
Third Economy		
WAP Sustainability		
WestWater Research		
Wildlands Engineering		

## Career and Professional Development

The Nicholas School of the Environment operates its Career and Professional Development Center (CPDC) for MEM, MF, 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](https://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](https://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 internships. 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 2023, approximately 83 internship projects with 31 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) and Environmental Sciences and Policy (ESP) are housed across Grainger Hall and the LSRC. ECS maintains state-of-the-art facilities for geochemical analysis and climate modeling studies. ESP hosts extensive research facilities focusing on environmental health.

Duke University Marine Laboratory is home to the third 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 285,000 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.

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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](mailto:dukeforest@duke.edu). More information can also be found online at [dukeforest.duke.edu](http://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, and communication.

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

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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 Marguerite Kent 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. The Pearse Memorial Library at the Marine Lab is a component of the Duke University Library System. 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 new, 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. In 2015, the Marine Lab opened the Marine Robotics and Remote Sensing Lab 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 Australia, Mexico, Puerto Rico/ St. Croix, Panama, 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](http://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](http://biology.duke.edu/undergraduate/major/concentrations/marine-biology).

Facilities, Locations & Resources

## 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

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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 copublishes 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 [foresthstory.org](http://foresthstory.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](http://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](http://cse.unc.edu).

### Organization for Tropical Studies at Duke

The Organization for Tropical Studies (OTS) is a nonprofit consortium that has grown to include sixty-three 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 three biological stations in Costa Rica, and another in Kruger National Park, South Africa. For more information, visit [tropicalstudies.org](http://tropicalstudies.org).

### Nicholas Institute for Energy, Environment & Sustainability

The Nicholas Institute for Energy, Environment & Sustainability ([nicholasinstitute.duke.edu](http://nicholasinstitute.duke.edu)) accelerates solutions to critical energy and environmental challenges, advancing a more just, resilient, and sustainable world in which communities and nature thrive. The Nicholas Institute conducts actionable research and undertakes sustained engagement with policymakers, businesses, and communities—in addition to delivering transformative educational experiences to prepare future leaders.

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.

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

The Nicholas Institute has played a significant role in the launch of the Duke Climate Commitment ([climate.duke.edu](http://climate.duke.edu)) which unites the university's education, research, operations, and public service missions to address the climate crisis.

The Nicholas Institute for Energy, Environment, and Sustainability was created by the 2021 merger of two Duke units: the Nicholas Institute for Environmental Policy Solutions (founded in 2005) and the Duke University Energy Initiative (founded in 2011). 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](http://nicholasinstitute.duke.edu/newsletter).

### Opportunities for Students

The Nicholas Institute is committed to delivering high-impact educational opportunities for undergraduate and graduate students



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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.

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.
- **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:** 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.

Students interested in engaging with the Nicholas Institute are encouraged to sign up for the email list at [nicholasinstitute.duke.edu/newsletter](mailto: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 watershed hydrology, geomorphology, ecology, biogeochemistry, and environmental economics and social sciences. 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](http://dukerivercenter.org).

### Duke University Wetland Center

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

The goal of the Duke University Wetland Center is to provide sound scientific knowledge that will lead to sustainable wetland ecosystem functions and services locally, nationally, and globally. The center works toward this goal by conducting, sponsoring, and coordinating research and teaching on critical wetland issues, especially wetland and stream restoration, climate change effects on wetland nutrient cycling, carbon sequestration, invasive species, and the role of wetlands in improving water quality and retention on the landscape.

Perhaps no single environmental issue has so polarized public opinion as the protection of wetlands. Part land and part water, the wetlands are ecosystems in which water levels and low oxygen support a unique ecological habitat conducive to the development of specific plant and animal species. Wetlands improve water quality, provide flood control, supply habitat for fish, and are a vital link between surface water and groundwater. They also store over 30% of the world's carbon. Unfortunately, much of the public, not knowing about these functions and services, believe wetlands are of low value and should be drained or developed. As a result, the United States has lost over 50% of its wetlands.

By bringing together scientists, educators, and professionals, the Duke University Wetland Center is able to focus attention on wetland issues of regional, national, and international scale. Core researchers for the center are the director, faculty, visiting scholars, and graduate students. As part of a professional school within a private university, the Duke University Wetland Center works independently on wetland issues without the political pressures often brought to bear upon public institutions. Find more information at [wetland.nicholas.duke.edu](http://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 environmental stressors such as pollutants. The Superfund Research Center 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 chemicals that are widespread in the environment, including Superfund sites. Of particular concern are effects on wildlife and human development, 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 exposures, mechanisms of toxicity, health consequences in humans and ecosystems, and remediation strategies for specific toxic chemicals selected based on their potential importance as developmental toxicants. Of particular interest are selected pesticides, metals, 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](http://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, EOS) 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).

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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

**Coding for the Environment** is dedicated to furthering student knowledge and expertise in data sciences and coding applications for environmental science, economics, energy, and other related topics. The club provides coding workshops, supports students in their coursework by holding open hours to ask coding-related questions, and brings in speakers who use coding and data sciences for their work in the environmental field.

**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.

**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.

**Green Roof and Orchard Workforce (GROW)** is an inclusive, member-driven organization within NSOE that manages the rooftop garden space and orchard. The purpose of the group is to promote awareness and understanding of the functions and benefits of building-integrated green space, facilitate the proper and productive use of the Nicholas School's green roof and orchard for communal enjoyment and benefit, support the Nicholas School's spirit of community outreach and education, and promote community development and build social capital through shared stewardship and events.

**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. This means working with the Nicholas School administration and staff to increase the recruitment rates for students of different races, cultures, gender and sexual identities, levels of ability/disability, socioeconomic classes, countries of origin, religions, and ethnicities.

**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.

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**Nicholas School Naturalists (NicNats)** is a natural history and outdoors club within the Nicholas School of Environment. Outdoor trips, which include hiking, backpacking, climbing, rafting, canoeing, birding, scuba diving, and more, are open to any graduate students within the Nicholas School.

**FOREM** is the official unofficial social organization of the Nicholas School. It is a social professional organization for all Nicholas School graduate students, faculty, and staff. The group's purpose is to foster an environment in which students can balance their academic and social lives.

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

**Duke Environmental Law and Policy Forum (DELPPF)** began in 1991 as an interdisciplinary magazine published annually. Since then, the Forum has grown into a traditional environmental law journal. DELPPF has retained its interdisciplinary roots and presents scholarship that examines environmental issues by drawing on legal, scientific, economic, and public policy resources. DELPPF'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. DELPPF 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 DELPPF 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.

**Sustainable Oceans Alliance (SOA)**, Duke chapter, strives to equip students who have a passion for ocean conservation with the tools to help make a change. Duke SOA aims to enhance the university's ability to support the needs and interests of students who intend to pursue marine science and conservation, both educationally and professionally. SOA provides a forum for Duke students interested in marine science and conservation, education for the Duke community about opportunities in the marine sciences available at Duke and the Duke Marine Lab, and facilitation for those students wishing to study at the Duke Marine Lab.

**Duke Sustainability Board** initiates and supports activities to help the Duke community move towards a more sustainable existence.

**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.

**The Coastal Society (TCS)** is an organization of private sector, academic, and government professionals and students. TCS is dedicated to actively addressing emerging coastal issues by fostering dialogue, forging partnerships, and promoting communication and education. The Duke University Student Chapter of TCS seeks to fulfill this mission of coastal stewardship through education and

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restoration.

**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.

## 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.

As an early adopter of telepresence services at Duke University, 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](https://sites.nicholas.duke.edu/intranet/nicholas-it/quick-reference-links).

## 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.

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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](https://nicholas.duke.edu/admissions/how-apply).

### Accommodations

Students desiring accommodations to support their studies should contact the Student Disability Access Office ([access.duke.edu](https://access.duke.edu); email [sdao@duke.edu](mailto: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

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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](http://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. The charge for late registration is significant.

## 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



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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 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 Student Services 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 Student Services 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.

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- 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—On-Campus Students

All students must complete a capstone 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 and MF programs 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.

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, project advisors for individual master's projects are assigned by faculty committee, taking into account subject matter, experience, interest, as well as equitability of advising responsibilities.

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 Master's Project 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—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. A complete draft of the project must be delivered to the advisor before October 1 for those graduating in December, before March 1 for those graduating in May, and before July 1 for those graduating in September. The advisor is responsible for critical assessment and grading. Actual dates may fluctuate depending on possible changes to the organization of the MP process. All students are required to make a public presentation of their project at a Master's Project 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 \$680 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.

## Executive Education Short Courses

Non-degree short courses are offered through the Nicholas School's Environment+. View registration, enrollment, and availability policies at [nicholas.duke.edu/academics/environment-plus](https://nicholas.duke.edu/academics/environment-plus). Policies and course offerings are subject to change without notice.

## 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, 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 in order 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

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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](http://registrar.duke.edu/student-resources/transcripts) and complete the online form. No transcripts will be issued 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 registration is valid only for the semester for which it is filed. If the student does not receive the degree as expected, they must register 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 assistant dean for student services no later than four weeks prior to commencement to receive the degree in absentia.

## 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.

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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
- a college statistics course 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 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.** One semester of principles of ecology recommended.
- **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 C- 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 students 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, and 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](https://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

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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](https://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 mid-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](https://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](https://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 [admissions@nicholas.duke.edu](mailto:admissions@nicholas.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 education objectives 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 verify with Admissions regarding the application fee.

### Additional Procedures for International Students



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Each year the Nicholas School of the Environment welcomes international students among its professional degree candidates, including the Duke Environmental Leadership program. All applicants must meet the same criteria for admission, including a four-year bachelor's degree or its equivalent. All academic transcripts and other documents in support of admission must be provided in English (we respectfully request a certified translation for documents not originally written in English). Visit the admissions website for additional information on acceptable certifications. Verify with Admissions regarding the application fee, which must accompany the application for it to be considered.

### 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](https://ets.org/toefl). Official TOEFL scores should be reported to Duke University's institution code 5156; there is no department code.
- **International English Language Testing System (IELTS)**, [ielts.org](https://ielts.org)
  - A pdf of IELTS score reports should be uploaded in the "Supplemental Uploads" section of the application. Scores will be considered unofficial until NSOE staff verifies your scores through the testing service.
- **Duolingo**, [englishtest.duolingo.com](https://englishtest.duolingo.com)
  - 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" 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.

**Additional note for the on-campus Master of Environmental Management and Master of Forestry.** All non-native English speakers may be required to take proficiency exams in written and spoken English prior to the start of the semester; depending on these results, the student may be required to enroll in additional English language instruction. Students should be aware that if additional English language instruction is required, they may need to adjust their course load while being enrolled in English language instruction.

### 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 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.

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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 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](mailto: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.

### Concurrent Degrees

The most current information on all concurrent degree programs can be found at [nicholas.duke.edu/academics/masters-programs/concurrent-degree-programs](http://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.

### 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.

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- One master's project should combine the two areas of study.

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](http://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 at UNC should consult with a member of the Student Services team for additional details.

Detailed information on the MEM/MBA Program and requirements can be found at [nicholas.duke.edu/academics/masters-programs/concurrent-degree-programs](http://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. Doctoral candidates in the Nicholas School are also eligible to undertake the Master of Public Policy.

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 electing to pursue the MEM (or MF) concurrently with the MPP must complete the requirements for both degrees before either degree will be awarded.

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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, write to the Director of Graduate Studies, Sanford School of Public Policy, Duke University, Box 90243, Durham, NC 27708-0243, or visit the Sanford School of Public Policy website at [sanford.duke.edu](http://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 write to the Duke University School of Law, Admissions Office, Duke University, Box 90393, Durham, NC 27708-0393, [law.duke.edu](http://law.duke.edu).

### 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](http://educationprogram.duke.edu/MAT).

### 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 (MEM) 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 MEM 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

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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](http://pratt.duke.edu/grad/masters).

## Master of City and Regional Planning

The Master of Environmental Management & Master of City and Regional Planning (MEM/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/MCRP students must fulfill the core course requirements for each program and will earn separate degrees. The MEM requires at least 36 graduate credits, while the MCRP requires at least 42 graduate credits, allowing MEM-MCRP students to complete both degrees in three years (six full-time semesters).

The MEM 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/MCRP students apply separately to each institution, with admission to one program not guaranteeing acceptance into the other. The MEM/MCRP program requires three continuous years of full-time study and leads to a Master of Environmental Management 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.

## 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.

## 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.

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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](http://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 granted from school funds, which are in limited supply. Consequently, only highly qualified students can expect to receive awards. 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.

Fellowships are obtained from foundation grants, private industry, or individual donors. Donors of fellowship funds sometimes place restrictions on the use of the funds as well as on the amount of awards.

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. Assistantships awarded by the Nicholas School 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 senior 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](http://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 federal financial assistance for the equivalent of four full-time semesters only. Students who fail to meet the satisfactory academic progress requirements or need federal financial assistance for more than the equivalent of four semesters may appeal to the Admissions and Awards Committee.

## Assistantships

Merit-based assistantships may be awarded to a select number of professional degree on-campus MEM and MF students during their



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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 are taken out. For the 2023-2024 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 2024-2025, the student will receive the assistantship funds as scholarship applied directly to their bursar account toward their tuition for the second year.

## 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 mid-February preceding the Fall enrollment term. 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](https://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](https://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 7.05 percent for the 2023-2024 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, 2023.

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.

### 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 8.05 percent for the 2023-2024 academic year. A loan fee of approximately 4.228 percent (valid through September 30, 2023) 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

Merit-based awards depend on the generosity of donors. Merit-based awards depend on the generosity of donors. Students receiving merit-based awards may be supported by one of the following endowments. Any awards noted below were identified and assigned in spring 2023 for the 2023-24 academic year.

**Alumni Fellowship.** Established by graduates of the Nicholas School, the Alumni Fellowship Endowment provides fellowships to minority students and to rising second-year students to support master's project research.

**Lawrence E. Blanchard Society of Scholars and Fellows.** Established by Charles and Bernard Blanchard, this fund provides scholarships to undergraduates and fellowships to graduate students studying at the Duke University Marine Laboratory.

**Norman L. Christensen Jr. Fellowship.** This fellowship was established by Duke and Nicholas School alumni and friends in honor of the founding dean of the Nicholas School, Dr. Christensen.

**William Cleveland Fellowship.** Established by William Cleveland, this fellowship provides financial assistance to Nicholas School students.

**The Creem Scholarship Fund.** This fund was established to support Master of Forestry students.

**COLFUTURO Scholarship.** In partnership with the Fundación para el Futuro de Colombia, the Nicholas School provides tuition scholarship support to eligible admitted students with Colombian citizenship.

**Cummings Family Fellowship.** Established by Bruce and Myrna Cummings, this fellowship supports Nicholas School students.

**Barbara L. Dannenberg Fellowship.** Established by Richard Dannenberg, this fellowship is for Nicholas School students with a preference for the field of ecology.

**Kathryn M. Deane and Walter L. Deane Fellowship.** Established by Walter Deane and Kathryn Deane, this fellowship provides financial assistance to African American students during the summer session at the Marine Lab.

**Dean's Scholarship.** This fund was created by the Dean of the Nicholas School to recognize students with outstanding academic credentials.

**Field Fellowship Fund.** This fund was established by Marshall Field V, a close friend of the Nicholas School, to support students at the Nicholas School of the Environment.

**Virilis L. Fischer Student Recognition Endowment.** Established by Mrs. Bernice Fischer, this fund provides fellowships to second-year professional degree students at the Nicholas School and provides an award to the Master of Environmental Management graduate with the highest academic achievement.

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**Forestry and Environmental Studies Fellowship.** Established by the Cordelia S. May Trust, this fellowship provides financial support to Nicholas School students.

**Friends of the Earth Scholarship Fund.** This fund was established to support students interested in creative environmental advocacy as exemplified by Friends of the Earth International

**FUNED Scholarship.** In partnership with the Fundación Mexicana para la Educación, la Tecnología y la Ciencia (FUNED), this scholarship supports students with Mexican citizenship.

**LeRoy George Scholarship.** Established by the LeRoy George Children's Nature Museum Inc., this fund provides fellowships to Nicholas School students, with preference given first to students from Haywood and Buncombe Counties and Hendersonville in North Carolina. Second preference will be given to students from the Southern Appalachian region.

**Verne Lester Harper Fellowship.** Established by Verne Lester Harper, this fellowship provides financial support to Nicholas School students.

**Charlotte and Robert Hay Fellowship.** Established by Charlotte and Robert Hay, this fellowship provides support to Nicholas School students.

**Richard Heintzelman Family Fellowship.** This fellowship was established by Richard Heintzelman to support students interested in environmental economics or forestry.

**Tim and Karen Hixon Wildlife Conservation Fellowship.** This fellowship was established by George C. and Karen Hixon to support students interested in wildlife management and conservation.

**Richard E. Hug Fellowship.** Established by Richard Hug, this fellowship provides financial support to Nicholas School students.

**International Paper Corporation Fellowship.** This fellowship was established to support students at the Nicholas School of the Environment.

**Thomas W. Keesee Jr. Fellowship.** Established by Thomas Keesee Jr., this fellowship is for Nicholas School students.

**Gorguze-Peters Family Fellowship Fund.** Established by Lynn Gorguze and Scott Peters, this fund provides fellowships to graduate professional Nicholas School students.

**Carolyn Odom Little School of the Environment Scholarship.** Established by Terry H. Little, provides scholarships for Nicholas School students.

**Melanie Lynn Memorial Scholarship.** Established by Peter Lynn and David Lynn, this fellowship is for graduate students studying at the Marine Lab, with first preference to female students.

**The Masselink Family Fellowship.** Established by Mark D. and Priscilla P. Masselink, this fund provides fellowships to graduate professional Nicholas School students.

**Andrew W. Mellon Fellowship.** Established by the Andrew W. Mellon Foundation, this fellowship provides financial support for research experience at the Nicholas School.

**Muchnic Foundation Fellowship.** Established by the foundation, this fellowship provides financial support to Nicholas School students.

**Mary Wade Myers and William D. Myers Scholarship Fund.** Established by Mary Wade and William Myers, this fund provides scholarships to professional Nicholas School students.

**The Nemergut Scholarship Fund.** This fund was established in memory of an outstanding ecologist, researcher, and educator, Diana Nemergut, wife of former dean, Alan Townsend, to support students at the Nicholas School of the Environment. The fund supports students who, through their background, can enrich the diversity perspectives in the academic life of the Nicholas School.

**Nicholas School Professional Student Fellowship.** Established by Sally S. Kleberg, this fellowship provides financial support to Nicholas School students.

**Nicholas School Service Volunteer Scholarship.** This scholarship recognizes the value the Nicholas School places on the diversity of experiences from our students who have served as volunteers in service organizations such as Americorps, City Year, Peace Corps, Teach for America, and others.

**Orvis Fellowship.** Established by the Perkins Charitable Foundation, the Orvis-Perkins Foundation, and the Leigh H. Perkins Charitable Lead Trust, this fellowship is offered to Nicholas School students.

**Nancy A. and Simon B. Rich Fellowship.** Established by Simon and Nancy Rich, this fellowship provides financial support to Nicholas School students.

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**Safrit Scholarship Fund.** This fund was established to support students at the Nicholas School of the Environment.

**Gary H. Salenger Fellowship.** Established by Gary Salenger, this fellowship is for Nicholas School students.

**William H. Schlesinger Scholarship.** This fund was established Duke and Nicholas School alumni and friends in honor of the second dean of the Nicholas School, Dr. Schlesinger.

**Semans Scholarship Fund.** This fund was established to support students at the Nicholas School of the Environment from Maryland.

**Bartow Shaw Family Fellowship.** This fellowship was established to support Master of Forestry students or students interested in forestry.

**Syngenta Crop Protection Inc. Fellowship.** This fellowship was established to support students interested in environmental toxicology or environmental risk assessment.

**Yasuomi Tanaka Memorial Fellowship.** This fellowship was established by Frances Tanaka to support international students.

**Thorensen Foundation Fellowship.** Established by Paul O'Connell, this fund provides fellowships for Nicholas School students.

**Wade Family Fund.** Established by Charles B. Wade, Jr. T'38, this fund provides scholarships for Nicholas School students studying at the Marine Lab.

**Dr. Larry R. Widell Memorial Fellowship.** Established by Christopher M. Widell, this fund provides scholarships to graduate professional Nicholas School students, with a preference given to doctoral students.

**Zirkle Fellowships.** Established by Sara and Lewis Zirkle, this fellowship is offered to Nicholas School students.

## Tuition & Fees

### Estimated Expenses for the Academic Year

The following approximate costs, applicable in 2023-2024, 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	\$44,460	\$44,460
Student health fee	\$945	-
Graduate student activity fee	\$37	-
Recreation fee	\$360	-
Graduate student services fee	\$24	-
Transcript fee (first semester only)	\$120	\$120
Housing	\$13,032	-
Food	\$4,086	\$4,086
Books and supplies	\$620	\$620
Transportation	\$1,962	\$1,962
Motor vehicle registration and parking	\$258-\$1,416	-
DEL-MEM Place-based Sessions Associated Costs (food, lodging, transportation)	-	\$8,540

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 \$70,000 to \$75,000 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](https://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

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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 (\$1,943 per unit for the 2023-2024 academic year). Students who are approved for part-time enrollment status are not eligible for school or federal financial aid. 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 part-time 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 2023-2024) 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 2023-2024) 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#monthly](https://finance.duke.edu/bursar/Payments#monthly).

### 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

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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.

### Late Registration

Students who register on a date later than that prescribed by the university must pay a late registration fee at the Office of the Bursar.

### Audit Fee

Students registered for a full course load may audit courses without charge. Otherwise, audit fees are \$680 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](http://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 health 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

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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](http://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 transcripts, 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.

## 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

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

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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](http://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](mailto:dgsa@nicholas.duke.edu). Information about the program and the faculty can be found at [nicholas.duke.edu/academics/doctoral-programs/environment-env](http://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 geomorphodynamics 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](mailto: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](http://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 (DURL) campus is located in the coastal town of Beaufort, NC, situated 180 miles from the main Durham campus. DURL is home to the Marine Science and Conservation (MSC) PhD Program established in 2008 with an interdisciplinary,



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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](http://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](mailto:rachel.lopiccolo@duke.edu) or (252) 504-7585. Additional DUML information can be found at [nicholas.duke.edu/marinelab](http://nicholas.duke.edu/marinelab).

## Cooperative University Programs

### Integrated Toxicology & Environmental Health Program (ITEHP)

The **Integrated Toxicology & Environmental Health Program (ITEHP)** provides students with the theoretical and practical bases for research, employment, and teaching in toxicology. This interdepartmental program brings together graduate students, postdoctoral fellows, and faculty members from a variety of scientific disciplines to address exposure, toxicological, and associated environmental health problems from their molecular basis to clinical and environmental consequences. 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:** If a student's primary interest is toxicology, then they 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](mailto: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 in toxicology.

Complete program details and contact information can be found at [nicholas.duke.edu/academics/doctoral-programs/university-program-integrated-toxicology-and-environmental-health-itehp](http://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](mailto: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

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(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](http://nicholas.duke.edu/marinelab)), Duke Forest ([dukeforest.duke.edu](http://dukeforest.duke.edu)), Duke Wetlands Center ([nicholas.duke.edu/wetland](http://nicholas.duke.edu/wetland)), the Organization for Tropical Studies ([tropicalstudies.org](http://tropicalstudies.org)), plus an extraordinary array of major analytical equipment and additional resources ([nicholas.duke.edu/marinelab/about/facilities](http://nicholas.duke.edu/marinelab/about/facilities), [biology.duke.edu/research-areas](http://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](mailto:dgsa@nicholas.duke.edu). Find more information at [nicholas.duke.edu/academics/doctoral-programs/university-program-ecology-upe](http://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 diverse 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](mailto: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](http://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

## Admissions

Applicants for the PhD must use The Graduate School's electronic application, available at [gradschool.duke.edu/admissions](http://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: If a student's primary interest is toxicology, then they 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](http://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](mailto:dgsa@nicholas.duke.edu). Find more information at [nicholas.duke.edu/academics/doctoral-programs/university-program-ecology-upe](http://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](mailto: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](http://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

## 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

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come from a variety of sources, using resources from 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. They 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.

Historically Excluded 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

W e b s i t e : [nicholas.duke.edu/academics/masters-programs/international-master-environmental-policy](http://nicholas.duke.edu/academics/masters-programs/international-master-environmental-policy) &  
[sanford.duke.edu/academics/masters-programs/international-master-environmental-policy](http://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.

International Master of Environmental Policy (Duke Kunshan University) (K-MEP-MEP)

## 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 15 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](mailto:dku-registrar@dukekunshan.edu.cn)). All withdrawals will be noted on the student's record with a grade of W (withdrew from a course).

### 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

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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, at the time the grades are reported. The student and instructor should coordinate a timeline for submission of the missing work to resolve an incomplete (I), not to exceed one year from the completion of the term for which the incomplete (I) was awarded. If the student does not satisfy the requirements within the agreed-upon timeline, the incomplete (I) will become part of the student's permanent academic record. Program or continuation fees may be assessed for students who must register for an additional semester to resolve an incomplete.
- **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.

For students in mainland China that have the capability of attending iMEP classes in person, all classes will be evaluated on a letter grade (A-F) basis. For students who are unable to enter mainland China and attend iMEP classes in person, but who have opted to participate in classes via online platforms, class evaluations may be on a pass/no-pass basis. To avail this option, students must submit a written request to the course instructor no later than the halfway point for the semester in which the student is enrolled.

## 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.

International Master of Environmental Policy (Duke Kunshan University) (K-MEP-MEP)

## 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

The program includes a statistics and economics prerequisite. Students are required to take two examinations prior to enrollment to ensure that they have the appropriate skills in statistics and economics. If the student does not pass the examination, they will take an online class prior to enrollment and take refresher courses during the two-week Boot Camp the summer before their first semester.

This program also administers an English reading and writing examination prior to enrollment. Because iMEP is an English-only program,

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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.

### 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.

- Air Quality: Management
- Applied Environmental Valuation Methods
- Building an NGO Toolkit
- Environmental Impact Evaluation
- Climate Change Law and Policy
- Climate Change Economics and Policy
- Fundamentals of Geospatial Analysis
- Environment and Development Economics
- Energy Economics and Policy
- 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 thesis. Research MPs follow the standard format for scientific research—abstract, introduction, methods, results, and discussion—and introduce a brand new idea or theory, 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 methods in their topic area. The research topic must be relevant to environmental policy, and involves rigorous quantitative and/or qualitative methodology. If analysis involves using data with human subjects, then students may need the Duke Kunshan University IRB to review and approve their protocol. Research MPs should be of publishable quality, although they do not need to be published.



### Client-Based Projects

This type of MP is designed to help a client decide what to do about an environmental policy problem. The purpose is to recommend a specific course of action. This project must also 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 identification of conclusions and recommendations. The student needs to identify a client or a policy problem as the first step. This project could follow from the summer internship, or an organization that the student would like to work with in the future. The student will conduct initial research into a general policy problem, then conduct relevant research to identify the specific policy problem. To be approved as an MP topic, the client must have a significant policy problem posed in the form of “What should the client do?” Students are encouraged to turn their MP into a case study for teaching purposes.

### 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 Yitian Gu at [yitian.gu@dukekunshan.edu.cn](mailto:yitian.gu@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.

International Master of Environmental Policy (Duke Kunshan University) (K-MEP-MEP)

## 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

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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](http://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](mailto:iMEP@dukekunshan.edu.cn) for mailing address. The IELTS is administered by Cambridge ESOL, British Council, and IDP: IELTS Australia. See [ielts.org](http://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

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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](mailto:iMEP@dukekunshan.edu.cn).

International Master of Environmental Policy (Duke Kunshan University) (K-MEP-MEP)

## 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.

### Bayeco Environment Fellowship

Bay Environmental Technology (Beijing) Corp (Bayeco) established the first fellowship program to support the iMEP Program at Duke Kunshan University. The establishment of the Bayeco Environment Fellowship will attract more talents with a global vision and focus on environmental challenges to enroll and study in the iMEP Program. The fellowship will create more opportunities for students to experience the global and innovative education model at Duke Kunshan and help to educate the next generation of environmental leaders for China and the world.

### Chancellor's Scholarship

In honor of LIU Jingnan and Mary Bullock, Duke Kunshan University's inaugural Chancellor, and inaugural Executive Vice Chancellor, the scholarship is named "Chancellor's Scholarship" and is the highest honor for incoming Duke Kunshan University students. The Chancellors' Scholarship is awarded in recognition of demonstrated academic achievement, leadership, and overall potential. The scholarship will be awarded to one top incoming student in each degree program, and can be awarded in conjunction with other types of merit-based and need-based scholarships.

### Fubon Scholarship

The Fubon Scholarship was created by the Fubon Group, an early supporter of the iMEP Program at Duke Kunshan. The scholarship aspires to groom innovative, skilled agents of change who can offer workable, highly impactful solutions for addressing the world's most pressing environmental dilemmas and creating a profound, lasting impact on environmental sustainability.

### Green Future Fund

The Green Future Fund was established in 2018 by Ms. Ma Lin, an important supporter of the iMEP Program at Duke Kunshan. Ma Lin and Duke Kunshan University share a vision of achieving a sustainable future by educating the next generation of environmental leaders; producing evidence-based, influential research; and cultivating socially and environmentally responsible entrepreneurs. The mission of the Green Future Fund is to provide dedicated financial support for Duke Kunshan University in contributing to a sustainable future in China and beyond.

### Guo Tingting Scholarship

All graduate program applicants from developing countries demonstrating financial difficulties will be considered for the scholarship.

### Jasmine Jiangsu Government Scholarship

The Jiangsu Provincial Government has set up the "Jasmine Jiangsu Government Scholarship" for international students. At Duke Kunshan University, this scholarship will be provided to those excellent international graduate students.

## Need-Based Financial Aid

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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](http://dukekunshan.edu.cn/en/student-life/residence-life#leadership-opportunities). Questions about RA should be addressed to [residencelife@dukekunshan.edu.cn](mailto: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.

International Master of Environmental Policy (Duke Kunshan University) (K-MEP-MEP)

## 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 2023-2024 Academic Year

Cost of Attendance for International Students (non-Chinese citizens)				
	FIRST-YEAR STUDENT		SECOND-YEAR STUDENT	
	Fall 2023 (Kunshan)	Spring 2024 (Kunshan)	Fall 2023 (Kunshan)	Spring 2024 (Duke)
Tuition	\$22,230	\$22,230	\$22,230	\$22,230
Health Insurance	\$1,334	-	\$598	\$1,230
Student Fees	-	-	-	\$797
• Health Fee	-	-	-	\$468
• Transcript Fee	-	-	-	\$120
• Activity Fee	-	-	-	\$18
• Graduate Student Service Fee	-	-	-	\$12
• Recreation Fee	-	-	-	\$179

<b>Total Tuition and Fees</b>	<b>\$22,664</b>	<b>\$22,230</b>	<b>\$22,828</b>	<b>\$24,257</b>
<b>Books &amp; Supplies</b>	<b>\$100</b>	<b>\$100</b>	<b>\$100</b>	<b>\$310</b>
Housing	\$1,727	\$1,727	\$1,727	\$7,240
Food	\$1,360	\$1,360	\$1,360	\$2,270
Domestic/International Travel	\$3,000	-	\$3,000	-
Local Transportation	-	-	-	\$1,090
Miscellaneous/Personal Expenses	\$863	-\$863	\$863	\$2,290
<b>Total Living Expenses</b>	<b>\$6,950</b>	<b>\$3,950</b>	<b>\$6,950</b>	<b>\$12,890</b>
<b>Total Cost of Attendance</b>	<b>\$30,714</b>	<b>\$26,280</b>	<b>\$29,877</b>	<b>\$37,457</b>

### Cost of Attendance for Domestic Students (Chinese Citizens)

Figures are in RMB.

	FIRST-YEAR STUDENT		SECOND-YEAR STUDENT	
	Fall 2023 (Kunshan)	Spring 2024 (Kunshan)	Fall 2023 (Kunshan)	Spring 2024 (Duke)
Tuition	¥90,000	¥90,000	¥90,000	¥90,000
Health Insurance	¥,800	-	¥,800	¥8,549
Student Fees	-	-	-	
• Health Fee	-	-	-	¥5,539
• Transcript Fee	-	-	-	¥834
• Activity Fee	-	-	-	¥125
• Graduate Student Service Fee	-	-	-	¥83
• Recreation Fee	-	-	-	¥1,244
<b>Total Tuition and Fees</b>	<b>¥90,800</b>	<b>¥90,000</b>	<b>¥90,800</b>	104,088
<b>Books &amp; Supplies</b>	<b>¥695</b>	<b>¥695</b>	<b>¥695</b>	<b>¥2,155</b>
Housing	¥12,000	¥12,000	¥12,000	¥50,318
Food	¥9,450	¥9,450	¥9,450	¥15,777
Domestic/International Travel	¥1,000	¥1,000	¥1,000	¥2,850
Local Transportation	-	-		¥7,576
Miscellaneous/Personal Expenses	¥6,000	¥7,500	¥7,500	¥15,916
<b>Total Living Expenses</b>	<b>¥28,450</b>	<b>¥28,450</b>	<b>¥28,450</b>	<b>¥110k 436</b>
<b>Total Cost of Attendance</b>	<b>¥119,145</b>	<b>¥119,145</b>	<b>¥119,145</b>	<b>¥216,678</b>

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.

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- 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](http://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](http://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](http://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 (CMS):** 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.

## Academic Requirements

### Specific to Your Path

The Master of Environmental Management curriculum allows you to customize your education to what is important to you by selecting 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 your chosen concentration
- Management Concentration Courses: 12 credits (4 courses) in your 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.

## 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](http://nicholas.duke.edu/academics/masters-programs/master-environmental-management/mem-degree-curriculum).

### Coastal and Marine Systems (CMS)

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 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)

1. ENVIRON 501 Environmental Toxicology
2. ENVIRON 537 Environmental Health
3. ENVIRON 539 Human Health & Ecological Risk Assessment



4. ENVIRON 540 Chemical Fate of Organic Compounds **OR** ENVIRON 542L Environmental Aquatic Chemistry
5. Two courses from your selected EEH Area of Specialization: In addition to the four required core courses, students pursuing the EEH environment concentration must select one of three areas of specialization, each of which requires an additional two classes (6 credits minimum). These specialization courses reduce the number of free electives available to EEH students.
  - **Environmental 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 753LA Sensory Physiology and Behavior of Marine Animals (offered at the Duke Marine Laboratory in Beaufort, 4 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)
  - **Environmental Chemistry Specialization** – ENVIRON 540 and ENVIRON 542L are required courses for students specializing in environmental chemistry. Suggested additional courses are listed below; other alternative courses may be substituted with approval by the EEH Chair.
    - ENVIRON 566 Environmental Analytical Chemistry (3 credits)
    - ENVIRON 573A Coastal and Marine Pollution (Beaufort, 3 credits)
    - ENVIRON 667 Chemical Transformation of Environmental Contaminants (3 credits)
    - ENVIRON 790 Environmental Cheminformatics (3 credits)
    - ECS 525 Ocean and Freshwater Pollution (3 credits)
    - ECS 571 Isotopes in Earth and Environmental Sciences (3 credits)
    - CEE 560 Environmental Transport Phenomena (3 credits)
    - CEE 666 Aquatic Geochemistry (3 credits)
  - **Environmental Health Specialization** – Two additional courses (not including the one required core environmental health class) in a graduate level field are required. Suggested additional classes are listed below, but not all classes are offered on a regular basis. 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 581 Global Environmental Health: Principles and Case Studies (3 credits)
    - ENVIRON 605 Air Quality Management (3 credits)
    - ENVIRON 637S Population Environmental Dynamics & Health (3 credits)
    - GLHLTH 571 Intro to Global Maternal and Child Health (3 credits)
    - GLHLTH 705 Biostatistics and Epidemiology I (4 credits)
    - GLHLTH 707 Biostatistics and Epidemiology II (4 credits)
    - GLHLTH 795T Bass Connections in Global Health: Interdisciplinary Team Projects (3 credits)
    - CEE 690 Advanced Topics in CEE Air Pollution (variable credits)

## 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), Landscape Ecology (ENVIRON 714), 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:

## Duke University

- 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)

## 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](https://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. Complete at least one of the following courses:
  - ENVIRON 506: Environmental Justice: Theory and Practice for Environmental Scientists and Policy Professionals: typically taught in the fall semester
  - ENVIRON 790: Environmental Justice: typically taught in the fall semester
  - ENVIRON 860SA: Political Ecology: typically taught in the spring semester at the Duke University Marine Lab
3. Complete at least one of the following courses:
  - ENVIRON 528SA: Community-Based Marine Conservation in the Gulf of California: typically taught in the spring semester through the Duke University Marine Lab
  - ENVIRON 795: Practicum in Community Engagement in the Environmental Field: typically taught in the spring semester; prerequisite course: ENVIRON 755 (fall course).
  - ENVIRON 869: Environmental Law and Policy Clinic: typically taught fall and spring semesters
4. 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 632: Environmental Education and Interpretation
  - ENVIRON 590: Evaluating Environmental Programs
  - ENVIRON 590: Indigenous Land and Water
  - ENVIRON 590S: Narrating Nature Documentary and Environmental Studies
  - ENVIRON 658/A: Applied Qualitative Research Methods
  - ENVIRON 705A: Social Impact Analysis
  - ENVIRON 754A: Research Design for Environmental Social Sciences
  - ENVIRON 820S: Conservation Ethics
  - ENVIRON 887/A: Theory and Methods for Policy Analysis of the Commons

## Environmental Analytics and Modeling (EAM)

## Duke University

1. ENVIRON 710 Applied Statistical Modeling for Environmental Management (3 credits, spring year one)
2. ENVIRON 872L Environmental Data Exploration (3 credits, fall)
3. Choose two of the following:
  - ENVIRON 558L Remote Sensing for Environmental Analysis (4 credits, fall)
  - ENVIRON 559 Fundamentals of Geospatial Analysis (4 credits, fall/spring)
  - ENVIRON 658/A Applied Qualitative Research Methods (3 credits)
  - ENVIRON 665 Bayesian Inference in Environment Models (3 credits)
  - ENVIRON 716L Modeling for Energy Systems (3 credits, fall)
  - ENVIRON 797 Time Series Analysis for Energy and Environment Applications (3 credits, spring)
  - ENVIRON 832 Environmental Decision Analysis (3 credits)
  - ENVIRON 859/A Geospatial Data Analytics (3 credits, fall)

## 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](https://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](mailto:nicholas-admissions@duke.edu) or (919) 613-8070 or visit [nicholas.duke.edu/academics/masters-programs/duke-environmental-leadership-master-environmental-management](https://nicholas.duke.edu/academics/masters-programs/duke-environmental-leadership-master-environmental-management).

Master of Environmental Management in Environmental Leadership (N-DEL-MEM)

## 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: Program Management for Environmental Professionals

## Duke University

- 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 in Forest Resource Management

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](http://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](http://nicholas.duke.edu/academics/masters-programs/master-forestry).

Master of Forestry in Forest Resource Management (N-FRM-MF)

### 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. An asterisk (\*) indicates courses that are usually taught every other year.
    - 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 714 Landscape Ecology, 3 credits (F)
        - ENVIRON 721 Soil Resources, 3 credits (F)
        - ENVIRON 732 Hydrology in Environmental Management, 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: 8.5 credits
      - ENVIRON 705L Silviculture, 3 credits (S)
      - ENVIRON 708L Silviculture Prescription, 2 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)
    - 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 790 Valuing Ecosystems for Investment and Conservation, 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**

## 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](https://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.

Climate Science and Applications Certificate (N-CCS-C)

## 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](https://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](https://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 add the program through their Stellic account.

Geospatial Analysis Certificate (N-GIS-C)

## 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 3.5 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](https://nicholas.duke.edu/academics/certificate-programs/geospatial-analysis-certificate-program).

- Fundamentals: 1 course
- Topical Course: 1 course
- Elective: 1 course
- Field Skills Module: 1 course
- Master's Project/Dissertation/Independent Research

## Undergraduate Programs

The Nicholas School cooperates with the Trinity College of Arts & Sciences in awarding six undergraduate degrees, three minors, and two certificates. 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](mailto:undergradadmin@nicholas.duke.edu)) or through the program website at [nicholas.duke.edu/academics/undergraduate-programs](https://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 Certificates

- Energy and the Environment
- Sustainability Engagement

## 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 Marine Science and Conservation Award** is given annually by the Duke University Marine Lab to a graduating senior with a demonstrated passion and commitment to marine science and conservation and the Marine Lab community in Beaufort and Durham.

## 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](mailto:ml_enrollment@nicholas.duke.edu) to apply for a summer tuition scholarship. Applicants are required to submit a letter of recommendation from academic faculty and a brief statement of purpose, i.e., the reason for taking the particular course and demonstrate a need for the scholarship. The deadline is March 22. Details are available online at [nicholas.duke.edu/marinelab/academics/undergraduate/scholarships-financial-aid](http://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](http://nicholas.duke.edu/careers/students/stanback-fellowship-program).

## All Courses

### ECS701S - Research Orientation Seminar

Subject	Catalog Number	Title
ECS	701S	Research Orientation Seminar

#### 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.

### ECS704LA - Biological Oceanography

Subject	Catalog Number	Title
ECS	704LA	Biological Oceanography

#### 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 DUMML 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.

### ECS715 - Introduction to Coastal Environmental Change Processes

Subject	Catalog Number	Title
ECS	715	Introduction to Coastal Environmental Change Processes

#### 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.

### ECS716A - Beach and Island Geological Processes

Subject	Catalog Number	Title
ECS	716A	Beach and Island Geological Processes

#### 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.

## ECS722 - Hydrologic and Environmental Data Analysis

Subject	Catalog Number	Title
ECS	722	Hydrologic and Environmental Data Analysis

### 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.

## ECS723 - Hydrology in Environmental Management

Subject	Catalog Number	Title
ECS	723	Hydrology in Environmental Management

### 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.

## ECS723D - Hydrology

Subject	Catalog Number	Title
ECS	723D	Hydrology

### 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.

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

Subject	Catalog Number	Title
ECS	785DS	Analyzing Current Contributions in Earth, Atmospheric and Climate Sciences

### 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.

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

Subject	Catalog Number	Title
ECS	785S	Analyzing Current Contributions in Earth, Atmospheric and Climate Sciences

### 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.

## ECS790 - Special Topics in Earth and Climate Sciences

Subject	Catalog Number	Title
ECS	790	Special Topics in Earth and Climate Sciences

### Description

Content to be determined each semester.

## ECS790S - Advanced Topics in Geology

Subject	Catalog Number	Title
ECS	790S	Advanced Topics in Geology

### Description

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

## ECS791 - Independent Study

Subject	Catalog Number	Title
ECS	791	Independent Study

### Description

Consent of instructor required.

## ECS792S - Microgrid Seminar

Subject	Catalog Number	Title
ECS	792S	Microgrid Seminar

### 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.

## ENERGY520 - Resource & Environmental Economics I

Subject	Catalog Number	Title
ENERGY	520	Resource & Environmental Economics I

### 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.

## ENERGY520D - Resource & Environmental Economics I

Subject	Catalog Number	Title
ENERGY	520D	Resource & Environmental Economics I

### 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.

## ENERGY524 - Water Quality Health

Subject	Catalog Number	Title
ENERGY	524	Water Quality Health

### 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.

## ENERGY578 - Environment, Social, Governance (ESG) Investing

Subject	Catalog Number	Title
ENERGY	578	Environment, Social, Governance (ESG) Investing

### 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.

## ENERGY579 - Climate Tech Startups and Investors

Subject	Catalog Number	Title
ENERGY	579	Climate Tech Startups and Investors

### 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.

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

Subject	Catalog Number	Title
ENERGY	588	A Practical Introduction to Solar Energy Project Development in The U.S.

### 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.

## ENERGY590 - Special Topics in Energy

Subject	Catalog Number	Title
ENERGY	590	Special Topics in Energy

### Description

Content to be determined each semester. May be repeated.

## ENERGY590-1 - Special Topics in Energy

Subject	Catalog Number	Title
ENERGY	590-1	Special Topics in Energy

### Description

Topics vary by semester.

## ENERGY590S - Advanced Topics in Energy

Subject	Catalog Number	Title
ENERGY	590S	Advanced Topics in Energy

### Description

Selected topics vary by semester.

## ENERGY620 - Energy Finance

Subject	Catalog Number	Title
ENERGY	620	Energy Finance

### 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.

## ENERGY630 - Transportation and Energy

Subject	Catalog Number	Title
ENERGY	630	Transportation and Energy

### 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.

## ENERGY630D - Transportation and Energy

Subject	Catalog Number	Title
ENERGY	630D	Transportation and Energy

### 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.

## ENERGY631 - Energy Technology and Impact on the Environment

Subject	Catalog Number	Title
ENERGY	631	Energy Technology and Impact on the Environment

### 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.

## ENERGY631D - Energy Technology and Impact on the Environment

Subject	Catalog Number	Title
ENERGY	631D	Energy Technology and Impact on the Environment

### 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.

## ENERGY635 - Energy Economics and Policy

Subject	Catalog Number	Title
ENERGY	635	Energy Economics and Policy

### 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.



## ENERGY635D - Energy Economics and Policy

Subject	Catalog Number	Title
ENERGY	635D	Energy Economics and Policy

### 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.

## ENERGY638 - Environmental Life Cycle Analysis & Decision

Subject	Catalog Number	Title
ENERGY	638	Environmental Life Cycle Analysis & Decision

### 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.

## ENERGY711 - Energy and Environment

Subject	Catalog Number	Title
ENERGY	711	Energy and Environment

### 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.

## ENERGY713A - Clean Energy Field Trip

Subject	Catalog Number	Title
ENERGY	713A	Clean Energy Field Trip

### 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.

## ENERGY716L - Modeling for Energy Systems

Subject	Catalog Number	Title
ENERGY	716L	Modeling for Energy Systems

### 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.

## ENERGY727 - Energy Law

Subject	Catalog Number	Title
ENERGY	727	Energy Law

### 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.

## ENERGY790 - Special Topics in Energy

Subject	Catalog Number	Title
ENERGY	790	Special Topics in Energy

### Description

Topics vary by semester.

## ENERGY790-1 - Special Topics in Energy

Subject	Catalog Number	Title
ENERGY	790-1	Special Topics in Energy

### Description

Topics vary by semester.

## ENERGY790K - Special Topics in Energy

Subject	Catalog Number	Title
ENERGY	790K	Special Topics in Energy

### Description

Topics vary by semester. Offered at Duke Kunshan University.

## ENERGY795 - Connections in Energy: Interdisciplinary Team Projects

Subject	Catalog Number	Title
ENERGY	795	Connections in Energy: Interdisciplinary Team Projects

### 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.

## ENERGY795-1 - Connections in Energy: Interdisciplinary Team Projects

Subject	Catalog Number	Title
ENERGY	795-1	Connections in Energy: Interdisciplinary Team Projects

### 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.

## ENERGY795A - Connections in Energy: Interdisciplinary Team Projects

Subject	Catalog Number	Title
ENERGY	795A	Connections in Energy: Interdisciplinary Team Projects

### 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.

## ENERGY795T - Bass Connections Energy & Environment Research Team

Subject	Catalog Number	Title
ENERGY	795T	Bass Connections Energy & Environment Research Team

### 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.

## ENERGY795TA - Bass Connections Energy & Environment Research Team

Subject	Catalog Number	Title
ENERGY	795TA	Bass Connections Energy & Environment Research Team

### 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.

## ENERGY796 - Connections in Energy: Interdisciplinary Team Projects

Subject	Catalog Number	Title
ENERGY	796	Connections in Energy: Interdisciplinary Team Projects

### 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.

## ENERGY796-1 - Connections in Energy: Interdisciplinary Team Projects

Subject	Catalog Number	Title
ENERGY	796-1	Connections in Energy: Interdisciplinary Team Projects

### 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.

## ENERGY796A - Connections in Energy: Interdisciplinary Team Projects

Subject	Catalog Number	Title
ENERGY	796A	Connections in Energy: Interdisciplinary Team Projects

### 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.

## ENERGY796T - Bass Connections Energy & Environment Research Team

Subject	Catalog Number	Title
ENERGY	796T	Bass Connections Energy & Environment Research Team

### 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.

## ENERGY796TA - Bass Connections Energy & Environment Research Team

Subject	Catalog Number	Title
ENERGY	796TA	Bass Connections Energy & Environment Research Team

### 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.

## ENERGY811 - Business and Environment

Subject	Catalog Number	Title
ENERGY	811	Business and Environment

### 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.

## ENERGY811D - Business and Environment

Subject	Catalog Number	Title
ENERGY	811D	Business and Environment

### 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.

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

Subject	Catalog Number	Title
ENERGY	830	Building Energy on Campus: Evaluating Efficiency and Conservation Measures at Duke

### 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.

## ENERGY835 - Environmental Law

Subject	Catalog Number	Title
ENERGY	835	Environmental Law

### 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.

## ENERGY891 - Topics in Environmental Regulation

Subject	Catalog Number	Title
ENERGY	891	Topics in Environmental Regulation

### Description

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

## ENERGY910 - Environment and Energy Economics

Subject	Catalog Number	Title
ENERGY	910	Environment and Energy Economics

### 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.

## ENVIRON501 - Environmental Toxicology

Subject	Catalog Number	Title
ENVIRON	501	Environmental Toxicology

### 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.

## ENVIRON501A - Environmental Toxicology

Subject	Catalog Number	Title
ENVIRON	501A	Environmental Toxicology

### 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.

## ENVIRON501D - Environmental Toxicology

Subject	Catalog Number	Title
ENVIRON	501D	Environmental Toxicology

### 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.



## ENVIRON502 - Climate Change and the Law

Subject	Catalog Number	Title
ENVIRON	502	Climate Change and the Law

### 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?

## ENVIRON504A - Marine Protected Area Monitoring and Management

Subject	Catalog Number	Title
ENVIRON	504A	Marine Protected Area Monitoring and Management

### 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.

## ENVIRON503 - Forest Ecosystems

Subject	Catalog Number	Title
ENVIRON	503	Forest Ecosystems

### 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.

## ENVIRON505 - Functional Ecology of Plants

Subject	Catalog Number	Title
ENVIRON	505	Functional Ecology of Plants

### 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.

## ENVIRON505D - Functional Ecology of Plants

Subject	Catalog Number	Title
ENVIRON	505D	Functional Ecology of Plants

### 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.

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

Subject	Catalog Number	Title
ENVIRON	506	Environmental Justice: Theory and Practice for Environmental Scientists and Policy Professionals

### 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.

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

Subject	Catalog Number	Title
ENVIRON	507DS	The Amazon: Evolution of Its Climate, Landscape, Ecology, and Human Civilizations

### 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.

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

Subject	Catalog Number	Title
ENVIRON	507S	The Amazon: Evolution of Its Climate, Landscape, Ecology, and Human Civilizations

### 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.

## ENVIRON512A - Deep-Sea Science and Environmental Management

Subject	Catalog Number	Title
ENVIRON	512A	Deep-Sea Science and Environmental Management

### Description

Explores ecosystems in the deep sea, including fundamental aspects of geology, chemistry, and biodiversity; behavioral, physiological, and biochemical adaptations of organisms (primarily invertebrate, but may include microbial and vertebrate components) to deep-sea benthic and benthic-pelagic environments will be introduced. Students will gain an understanding of the ecosystem services of the deep sea; issues in deep-sea environmental management arising from exploitation of deep-sea resources will be discussed. Taught in Beaufort at Duke Marine Lab.

## ENVIRON516 - Global Change Biology: From Molecules to Organisms

Subject	Catalog Number	Title
ENVIRON	516	Global Change Biology: From Molecules to Organisms

### 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.

## ENVIRON517 - Tropical Ecology

Subject	Catalog Number	Title
ENVIRON	517	Tropical Ecology

### Description

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

## ENVIRON517D - Tropical Ecology

Subject	Catalog Number	Title
ENVIRON	517D	Tropical Ecology

### Description

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

## ENVIRON520 - Resource & Environmental Economics I

Subject	Catalog Number	Title
ENVIRON	520	Resource & Environmental Economics I

### 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.

## ENVIRON520D - Resource & Environmental Economics I

Subject	Catalog Number	Title
ENVIRON	520D	Resource & Environmental Economics I

### 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.

## ENVIRON521 - Resource & Environmental Economics II

Subject	Catalog Number	Title
ENVIRON	521	Resource & Environmental Economics II

### 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.

## ENVIRON521D - Resource & Environmental Economics II

Subject	Catalog Number	Title
ENVIRON	521D	Resource & Environmental Economics II

### 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.

## ENVIRON524 - Water Quality Health

Subject	Catalog Number	Title
ENVIRON	524	Water Quality Health

### 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.

## ENVIRON528SA - Community-Based Marine Conservation

Subject	Catalog Number	Title
ENVIRON	528 SA	Community-Based Marine Conservation

### 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 DURL website for details.

## ENVIRON530 - Remote Sensing in Coastal Environments

Subject	Catalog Number	Title
ENVIRON	530	Remote Sensing in Coastal Environments

### 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.

## ENVIRON531L - Economic Valuation of the Environment

Subject	Catalog Number	Title
ENVIRON	531L	Economic Valuation of the Environment

### 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.

## ENVIRON532 - Evaluation of Public Expenditures

Subject	Catalog Number	Title
ENVIRON	532	Evaluation of Public Expenditures

### Description

Basic development of cost benefit analysis is 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.

## ENVIRON532D - Evaluation of Public Expenditures

Subject	Catalog Number	Title
ENVIRON	532D	Evaluation of Public Expenditures

### Description

Basic development of cost benefit analysis is 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.

## ENVIRON533A - Marine Fisheries Policy

Subject	Catalog Number	Title
ENVIRON	533A	Marine Fisheries Policy

### 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.

## ENVIRON534D - Controlling Zoonotic Diseases Through the One Health Approach

Subject	Catalog Number	Title
ENVIRON	534D	Controlling Zoonotic Diseases Through the One Health Approach

### Description

This course introduces public health students to entomology, zoonotic diseases, and principals of modern food safety. Students will learn methods for conducting studies of mosquitoes and ticks, controlling zoonotic diseases, and protecting the food supply. A special focus will be upon modern food safety techniques in meat, dairy and produce production. Lectures will be complemented with considerable laboratory or field work.

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

Subject	Catalog Number	Title
ENVIRON	536S	Food, Agriculture and the Environment: Law and Policy

### 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.

## ENVIRON537 - Environmental Health and Epidemiology

Subject	Catalog Number	Title
ENVIRON	537	Environmental Health and Epidemiology

### 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.

## ENVIRON538 - Global Environmental Health: Economics and Policy

Subject	Catalog Number	Title
ENVIRON	538	Global Environmental Health: Economics and Policy

### 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.

## ENVIRON539 - Human Health and Ecological Risk Assessment

Subject	Catalog Number	Title
ENVIRON	539	Human Health and Ecological Risk Assessment

### 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.



## ENVIRON540 - Chemical Fate of Organic Compounds

Subject	Catalog Number	Title
ENVIRON	540	Chemical Fate of Organic Compounds

### 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.

## ENVIRON540D - Chemical Fate of Organic Compounds

Subject	Catalog Number	Title
ENVIRON	540D	Chemical Fate of Organic Compounds

### 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.

## ENVIRON542L - Environmental Aquatic Chemistry

Subject	Catalog Number	Title
ENVIRON	542L	Environmental Aquatic Chemistry

### 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.

## ENVIRON549 - California Water Crises: A Case Study Approach

Subject	Catalog Number	Title
ENVIRON	549	California Water Crises: A Case Study Approach

### 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.

## ENVIRON550 - Land Use Principles and Policy

Subject	Catalog Number	Title
ENVIRON	550	Land Use Principles and Policy

### 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.

## ENVIRON550D - Land Use Principles and Policy

Subject	Catalog Number	Title
ENVIRON	550D	Land Use Principles and Policy

### 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.

## ENVIRON551DA - International Conservation and Development

Subject	Catalog Number	Title
ENVIRON	551DA	International Conservation and Development

### 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.

## ENVIRON552 - Climate and Society

Subject	Catalog Number	Title
ENVIRON	552	Climate and Society

### 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.

## ENVIRON552D - Climate and Society

Subject	Catalog Number	Title
ENVIRON	552D	Climate and Society

### 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.

## ENVIRON554 - Graduate Rainforest Engineering

Subject	Catalog Number	Title
ENVIRON	554	Graduate Rainforest Engineering

### 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.

## ENVIRON556 - Environmental Conflict Resolution

Subject	Catalog Number	Title
ENVIRON	556	Environmental Conflict Resolution

### 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.

## ENVIRON556D - Environmental Conflict Resolution

Subject	Catalog Number	Title
ENVIRON	556D	Environmental Conflict Resolution

### 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.

## ENVIRON557 - Social Science Surveys for Environmental Management

Subject	Catalog Number	Title
ENVIRON	557	Social Science Surveys for Environmental Management

### 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.

## ENVIRON557D - Social Science Surveys for Environmental Management

Subject	Catalog Number	Title
ENVIRON	557D	Social Science Surveys for Environmental Management

### 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.

## ENVIRON558L - Remote Sensing for Environmental Analysis

Subject	Catalog Number	Title
ENVIRON	558L	Remote Sensing for Environmental Analysis

### 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.

## ENVIRON559 - Fundamentals of Geographic Information Systems and Geospatial Analysis

Subject	Catalog Number	Title
ENVIRON	559	Fundamentals of Geographic Information Systems and Geospatial Analysis

### 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.

## ENVIRON563 - Cost-Benefit Analysis for Health and Environmental Policy

Subject	Catalog Number	Title
ENVIRON	563	Cost-Benefit Analysis for Health and Environmental Policy

### 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).

## ENVIRON564 - Biogeochemistry

Subject	Catalog Number	Title
ENVIRON	564	Biogeochemistry

### 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.

## ENVIRON564D - Biogeochemistry

Subject	Catalog Number	Title
ENVIRON	564D	Biogeochemistry

### 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.

## ENVIRON566 - Environmental Analytical Chemistry

Subject	Catalog Number	Title
ENVIRON	566	Environmental Analytical Chemistry

### 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.

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

Subject	Catalog Number	Title
ENVIRON	568S	Integrated Assessment Modeling—Examining Strategies for Meeting Energy and Environmental Goals

### 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.

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

Subject	Catalog Number	Title
ENVIRON	569	Should I Eat Fish? Economics, Ecology and Health

### 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.

## ENVIRON571A - Sojourn in Singapore: Urban Tropical Ecology

Subject	Catalog Number	Title
ENVIRON	571A	Sojourn in Singapore: Urban Tropical Ecology

### 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.

## ENVIRON571A-1 - Urban SubTropical Ecology

Subject	Catalog Number	Title
ENVIRON	571A-1	Urban SubTropical Ecology

### 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.

## ENVIRON572 - Economic Evaluation of Sustainable Development

Subject	Catalog Number	Title
ENVIRON	572	Economic Evaluation of Sustainable Development

### 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.

## ENVIRON573 - Coastal and Marine Pollution

Subject	Catalog Number	Title
ENVIRON	573	Coastal and Marine Pollution

### 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.

## ENVIRON573A - Coastal and Marine Pollution

Subject	Catalog Number	Title
ENVIRON	573A	Coastal and Marine Pollution

### 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.

## ENVIRON575L - Biodiversity Science and Application

Subject	Catalog Number	Title
ENVIRON	575L	Biodiversity Science and Application

### 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.



## ENVIRON575S - Biodiversity Science and Application

Subject	Catalog Number	Title
ENVIRON	575S	Biodiversity Science and Application

### 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.

## ENVIRON579S - Collective Action, Environment, and Development

Subject	Catalog Number	Title
ENVIRON	579S	Collective Action, Environment, and Development

### 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.

## ENVIRON577 - Environmental Politics

Subject	Catalog Number	Title
ENVIRON	577	Environmental Politics

### Description

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

## ENVIRON581 - Global Environmental Health Problems: Principles and Case Studies

Subject	Catalog Number	Title
ENVIRON	581	Global Environmental Health Problems: Principles and Case Studies

### 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.

## ENVIRON581D - Global Environmental Health Problems: Principles and Case Studies

Subject	Catalog Number	Title
ENVIRON	581D	Global Environmental Health Problems: Principles and Case Studies

### 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.

## ENVIRON581K - Global Environmental Health Problems: Principles and Case Studies

Subject	Catalog Number	Title
ENVIRON	581K	Global Environmental Health Problems: Principles and Case Studies

### 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.

## ENVIRON585 - Fisheries Biogeography and Ecology

Subject	Catalog Number	Title
ENVIRON	585	Fisheries Biogeography and Ecology

### 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.

## ENVIRON585A - Fisheries Biogeography and Ecology

Subject	Catalog Number	Title
ENVIRON	585A	Fisheries Biogeography and Ecology

### 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.

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

Subject	Catalog Number	Title
ENVIRON	588	A Practical Introduction to Solar Energy Project Development in The U.S.

### 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.

## ENVIRON590 - Special Topics

Subject	Catalog Number	Title
ENVIRON	590	Special Topics

### Description

Content to be determined each semester. May be repeated.

## ENVIRON590D - Special Topics

Subject	Catalog Number	Title
ENVIRON	590D	Special Topics

### Description

Content to be determined each semester. May be repeated.

## ENVIRON590L - Special Topics

Subject	Catalog Number	Title
ENVIRON	590L	Special Topics

### Description

Content to be determined each semester. May be repeated.

## ENVIRON592 - UNFCCC Practicum

Subject	Catalog Number	Title
ENVIRON	592	UNFCCC Practicum

### 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).

## ENVIRON593 - Independent Studies and Projects

Subject	Catalog Number	Title
ENVIRON	593	Independent Studies and Projects

### Description

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

## ENVIRON593K - Independent Studies and Projects

Subject	Catalog Number	Title
ENVIRON	593K	Independent Studies and Projects

### 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.

## ENVIRON600K - Key Areas in International Environmental Policy

Subject	Catalog Number	Title
ENVIRON	600K	Key Areas in International Environmental Policy

### 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-world applications. Students will engage in self-directed research and learning on international environmental policy. Taught at Duke Kunshan University.

## ENVIRON601K - Building an NGO Toolkit: From Design to Monitoring

Subject	Catalog Number	Title
ENVIRON	601K	Building an NGO Toolkit: From Design to Monitoring

### 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.

## ENVIRON602K - Natural Resources and Protected Area Management

Subject	Catalog Number	Title
ENVIRON	602K	Natural Resources and Protected Area Management

### 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.

## ENVIRON603 - Air Quality: Management

Subject	Catalog Number	Title
ENVIRON	603	Air Quality: Management

### Description

Management systems are discussed, including varied approaches used to address criteria air pollutants, air toxics, mobile sources and acid deposition. Course prepares students to understand systems approach to apply science and technical information to inform policy decisions affecting air quality; understand and be conversant in varied approaches to manage air quality to meet policy objectives; be familiar with major common air pollutants and air quality management approaches applied to each and why approaches vary.

## ENVIRON604 - Air Quality: Human Exposure and Health Effects

Subject	Catalog Number	Title
ENVIRON	604	Air Quality: Human Exposure and Health Effects

### Description

Looks at how individuals and populations are exposed to air pollution and what adverse health effects the exposure will cause. Covers exposure analysis methods, toxicological and epidemiological studies that examine health effects of air pollution exposure. Students will be prepared to understand concept and major methodologies of analysis for air pollution; how toxicology is used to determine adverse effects of air pollution exposure and underlying biological mechanisms; collect evidence on air pollution health effects in supporting health risk assessment. Prerequisites: general biology, statistics.

## ENVIRON605 - Air Quality Management: Linking Science to Policy

Subject	Catalog Number	Title
ENVIRON	605	Air Quality Management: Linking Science to Policy

### 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.

## ENVIRON610 - Ecotoxicology

Subject	Catalog Number	Title
ENVIRON	610	Ecotoxicology

### 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.

## ENVIRON614S - Coastal Resilience in the Face of Climate Change

Subject	Catalog Number	Title
ENVIRON	614S	Coastal Resilience in the Face of Climate Change

### 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.

## ENVIRON623 - Ecological Diversity and Climate Change

Subject	Catalog Number	Title
ENVIRON	623	Ecological Diversity and Climate Change

### 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.

## ENVIRON617 - Restoration Ecology

Subject	Catalog Number	Title
ENVIRON	617	Restoration Ecology

### 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.

## ENVIRON630 - Transportation and Energy

Subject	Catalog Number	Title
ENVIRON	630	Transportation and Energy

### 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.

## ENVIRON630D - Transportation and Energy

Subject	Catalog Number	Title
ENVIRON	630D	Transportation and Energy

### 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.

## ENVIRON631 - Energy Technology and Impact on the Environment

Subject	Catalog Number	Title
ENVIRON	631	Energy Technology and Impact on the Environment

### 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.

## ENVIRON631D - Energy Technology and Impact on the Environment

Subject	Catalog Number	Title
ENVIRON	631D	Energy Technology and Impact on the Environment

### 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.

## ENVIRON632 - Environmental Education and Interpretation

Subject	Catalog Number	Title
ENVIRON	632	Environmental Education and Interpretation

### 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.



## ENVIRON634 - Introduction to Ecosystem Services and Methods for Quantification

Subject	Catalog Number	Title
ENVIRON	634	Introduction to Ecosystem Services and Methods for Quantification

### 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.

## ENVIRON635 - Energy Economics and Policy

Subject	Catalog Number	Title
ENVIRON	635	Energy Economics and Policy

### 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.

## ENVIRON635D - Energy Economics and Policy

Subject	Catalog Number	Title
ENVIRON	635D	Energy Economics and Policy

### 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.

## ENVIRON637S - Population and Environmental Dynamics Influencing Health

Subject	Catalog Number	Title
ENVIRON	637S	Population and Environmental Dynamics Influencing Health

### 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-borne, chronic and enteric infections.

## ENVIRON638 - Environmental Life Cycle Analysis & Decision

Subject	Catalog Number	Title
ENVIRON	638	Environmental Life Cycle Analysis & Decision

### 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.

## ENVIRON640 - Climate Change Economics and Policy

Subject	Catalog Number	Title
ENVIRON	640	Climate Change Economics and Policy

### 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.

## ENVIRON640K - Climate Change Economics and Policy

Subject	Catalog Number	Title
ENVIRON	640K	Climate Change Economics and Policy

### 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. Prerequisite: Public Policy 810 and 812, or equivalent, or consent of the instructor.

## ENVIRON646 - Urban Ecology

Subject	Catalog Number	Title
ENVIRON	646	Urban Ecology

### 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.

## ENVIRON646D - Urban Ecology

Subject	Catalog Number	Title
ENVIRON	646D	Urban Ecology

### 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.

## ENVIRON658 - Applied Qualitative Research Methods

Subject	Catalog Number	Title
ENVIRON	658	Applied Qualitative Research Methods

### Description

Broadly covers qualitative and mixed methods research design, analysis, and interpretation. Students gather a limited amount of their own data and produce a pilot research project throughout the semester. Students learn to use NVivo10, a qualitative research software program.

## ENVIRON658A - Applied Qualitative Research Methods

Subject	Catalog Number	Title
ENVIRON	658A	Applied Qualitative Research Methods

### Description

Broadly covers qualitative and mixed methods research design, analysis, and interpretation. Students gather a limited amount of their own data and produce a pilot research project throughout the semester. Students learn to use NVivo10, a qualitative research software program. Taught in Beaufort at Duke Marine Lab.

## ENVIRON665 - Bayesian Inference for Environmental Models

Subject	Catalog Number	Title
ENVIRON	665	Bayesian Inference for Environmental Models

### 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.

## ENVIRON666 - Aquatic Geochemistry

Subject	Catalog Number	Title
ENVIRON	666	Aquatic Geochemistry

### Description

Geochemistry of the water-solid interface of soils, minerals, and particles in earth systems. Topics will cover the chemical composition of soils, geochemical speciation, 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.

## ENVIRON667 - Chemical Transformation of Environmental Contaminants

Subject	Catalog Number	Title
ENVIRON	667	Chemical Transformation of Environmental Contaminants

### 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.

## ENVIRON680 - Economics of Forest Resources

Subject	Catalog Number	Title
ENVIRON	680	Economics of Forest Resources

### 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.

## ENVIRON680D - Economics of Forest Resources

Subject	Catalog Number	Title
ENVIRON	680D	Economics of Forest Resources

### 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.

## ENVIRON701 - Forest Measurements

Subject	Catalog Number	Title
ENVIRON	701	Forest Measurements

### 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.

## ENVIRON702S - Ecology Seminar

Subject	Catalog Number	Title
ENVIRON	702S	Ecology Seminar

### Description

Presentation of current research by invited speakers, faculty, and students in the University Graduate Program in Ecology.

## ENVIRON703 - Conservation Biology: Theory and Practice

Subject	Catalog Number	Title
ENVIRON	703	Conservation Biology: Theory and Practice

### 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.

## ENVIRON705A - Social Impact Analysis

Subject	Catalog Number	Title
ENVIRON	705A	Social Impact Analysis

### 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.

## ENVIRON704LA - Biological Oceanography

Subject	Catalog Number	Title
ENVIRON	704LA	Biological Oceanography

### 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 DUMML 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.

## ENVIRON705L - Ecological Management of Forest Systems (Silviculture)

Subject	Catalog Number	Title
ENVIRON	705L	Ecological Management of Forest Systems (Silviculture)

### 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.

## ENVIRON706 - Wildlife Surveys

Subject	Catalog Number	Title
ENVIRON	706	Wildlife Surveys

### 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.

## ENVIRON707 - Coastal and Marine Ecosystems

Subject	Catalog Number	Title
ENVIRON	707	Coastal and Marine Ecosystems

### 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.

## ENVIRON708L - Silviculture Prescription

Subject	Catalog Number	Title
ENVIRON	708L	Silviculture Prescription

### 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.

## ENVIRON709 - Conservation Biology and Policy

Subject	Catalog Number	Title
ENVIRON	709	Conservation Biology and Policy

### 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.

## ENVIRON709A - Conservation Biology and Policy

Subject	Catalog Number	Title
ENVIRON	709A	Conservation Biology and Policy

### 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.

## ENVIRON710 - Applied Statistical Modeling for Environmental Management

Subject	Catalog Number	Title
ENVIRON	710	Applied Statistical Modeling for Environmental Management

### 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.

## ENVIRON711 - Energy and Environment

Subject	Catalog Number	Title
ENVIRON	711	Energy and Environment

### 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.

## ENVIRON713A - Clean Energy Field Trip

Subject	Catalog Number	Title
ENVIRON	713A	Clean Energy Field Trip

### 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.



## ENVIRON714 - Landscape Ecology

Subject	Catalog Number	Title
ENVIRON	714	Landscape Ecology

### 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.

## ENVIRON714D - Landscape Ecology

Subject	Catalog Number	Title
ENVIRON	714D	Landscape Ecology

### 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.

## ENVIRON716L - Modeling for Energy Systems

Subject	Catalog Number	Title
ENVIRON	716L	Modeling for Energy Systems

### 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.

## ENVIRON717 - Markets for Electric Power

Subject	Catalog Number	Title
ENVIRON	717	Markets for Electric Power

### 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.

## ENVIRON718K - Environmental Sciences

Subject	Catalog Number	Title
ENVIRON	718K	Environmental Sciences

### 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.

## ENVIRON719 - Aquaculture

Subject	Catalog Number	Title
ENVIRON	719	Aquaculture

### 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.

## ENVIRON719A - Aquaculture and the Environment

Subject	Catalog Number	Title
ENVIRON	719A	Aquaculture and the Environment

### 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.

## ENVIRON720S - Land Conservation in Practice

Subject	Catalog Number	Title
ENVIRON	720S	Land Conservation in Practice

### 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.

## ENVIRON721 - Soil Resources

Subject	Catalog Number	Title
ENVIRON	721	Soil Resources

### 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.

## ENVIRON722 - Hydrologic and Environmental Data Analysis

Subject	Catalog Number	Title
ENVIRON	722	Hydrologic and Environmental Data Analysis

### 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.

## ENVIRON723A - Offshore Renewable Energy & Wildlife Conservation

Subject	Catalog Number	Title
ENVIRON	723A	Offshore Renewable Energy & Wildlife Conservation

### 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.

## ENVIRON724 - Landscape Analysis & Management

Subject	Catalog Number	Title
ENVIRON	724	Landscape Analysis & Management

### 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.

## ENVIRON724L - Landscape Analysis & Management

Subject	Catalog Number	Title
ENVIRON	724L	Landscape Analysis & Management

### 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.

## ENVIRON726DA - Evolutionary and Ecological Genetics/Genomics of Marine Mammals

Subject	Catalog Number	Title
ENVIRON	726DA	Evolutionary and Ecological Genetics/Genomics of Marine Mammals

### 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.

## ENVIRON727DS - Forests in the Public Interest Seminar

Subject	Catalog Number	Title
ENVIRON	727DS	Forests in the Public Interest Seminar

### 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.

## ENVIRON727S - Forests in the Public Interest Seminar

Subject	Catalog Number	Title
ENVIRON	727S	Forests in the Public Interest Seminar

### 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.

## ENVIRON729A - Oceans in Human and Environmental Health

Subject	Catalog Number	Title
ENVIRON	729A	Oceans in Human and Environmental Health

### 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.

## ENVIRON729DA - Oceans in Human and Environmental Health

Subject	Catalog Number	Title
ENVIRON	729DA	Oceans in Human and Environmental Health

### 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.

## ENVIRON731 - Dendrology

Subject	Catalog Number	Title
ENVIRON	731	Dendrology

### 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. Instructor consent required.

## ENVIRON732 - Hydrology in Environmental Management

Subject	Catalog Number	Title
ENVIRON	732	Hydrology in Environmental Management

### 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.

## ENVIRON733 - Risk Regulation in the United States, Europe, and Beyond

Subject	Catalog Number	Title
ENVIRON	733	Risk Regulation in the United States, Europe, and Beyond

### 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.

## ENVIRON734 - Watershed Hydrology

Subject	Catalog Number	Title
ENVIRON	734	Watershed Hydrology

### 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.

## ENVIRON735 - Drones in Marine Biology, Ecology, and Conservation

Subject	Catalog Number	Title
ENVIRON	735	Drones in Marine Biology, Ecology, and Conservation

### 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.

## ENVIRON735A - Drones in Marine Biology, Ecology, and Conservation

Subject	Catalog Number	Title
ENVIRON	735A	Drones in Marine Biology, Ecology, and Conservation

### Description

Lab-based version of Environment 735LA. Taught in Beaufort at Duke Marine Lab.

## ENVIRON736K - Planetary Health and Environmental Epidemiology

Subject	Catalog Number	Title
ENVIRON	736K	Planetary Health and Environmental Epidemiology

### 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).

## ENVIRON738 - US Water Governance

Subject	Catalog Number	Title
ENVIRON	738	US Water Governance

### 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.

## ENVIRON738D - US Water Governance

Subject	Catalog Number	Title
ENVIRON	738D	US Water Governance

### 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.

## ENVIRON740 - Water Resources Planning and Management

Subject	Catalog Number	Title
ENVIRON	740	Water Resources Planning and Management

### 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.

## ENVIRON741 - Water Resources Finance

Subject	Catalog Number	Title
ENVIRON	741	Water Resources Finance

### 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.

## ENVIRON744 - Freshwater Ecosystems

Subject	Catalog Number	Title
ENVIRON	744	Freshwater Ecosystems

### 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.

## ENVIRON745A - Climate Change in the Marine Environment

Subject	Catalog Number	Title
ENVIRON	745A	Climate Change in the Marine Environment

### 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.

## ENVIRON753LA - Sensory Physiology and Behavior of Marine Animals

Subject	Catalog Number	Title
ENVIRON	753LA	Sensory Physiology and Behavior of Marine Animals

### 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.



## ENVIRON754A - Research Design for Environmental Social Sciences

Subject	Catalog Number	Title
ENVIRON	754A	Research Design for Environmental Social Sciences

### 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.

## ENVIRON755 - Community Engagement in the Environmental Field

Subject	Catalog Number	Title
ENVIRON	755	Community Engagement in the Environmental Field

### 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.

## ENVIRON755D - Community Engagement in the Environmental Field

Subject	Catalog Number	Title
ENVIRON	755D	Community Engagement in the Environmental Field

### 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.

## ENVIRON756A - Spatio-Temporal Environmental Models

Subject	Catalog Number	Title
ENVIRON	756A	Spatio-Temporal Environmental Models

### 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.

## ENVIRON756S - Biogeodiversity and Climate, Past and Future

Subject	Catalog Number	Title
ENVIRON	756S	Biogeodiversity and Climate, Past and Future

### 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.

## ENVIRON760A - Western Field Trip

Subject	Catalog Number	Title
ENVIRON	760A	Western Field Trip

### 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.

## ENVIRON759K - Environmental GIS

Subject	Catalog Number	Title
ENVIRON	759K	Environmental GIS

### 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.

## ENVIRON761 - Geospatial Analysis for Land and Water Management

Subject	Catalog Number	Title
ENVIRON	761	Geospatial Analysis for Land and Water Management

### 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.

## ENVIRON763 - Forest Management Traveling Seminar

Subject	Catalog Number	Title
ENVIRON	763	Forest Management Traveling Seminar

### 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.

## ENVIRON764 - Applied Differential Equations in Environmental Sciences

Subject	Catalog Number	Title
ENVIRON	764	Applied Differential Equations in Environmental Sciences

### 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.

## ENVIRON765 - Geospatial Analysis for Coastal and Marine Management

Subject	Catalog Number	Title
ENVIRON	765	Geospatial Analysis for Coastal and Marine Management

### 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.

## ENVIRON766A - Ecology of Southern Appalachian Forests

Subject	Catalog Number	Title
ENVIRON	766A	Ecology of Southern Appalachian Forests

### 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.

## ENVIRON766DA - Ecology of Southern Appalachian Forests

Subject	Catalog Number	Title
ENVIRON	766DA	Ecology of Southern Appalachian Forests

### 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.

## ENVIRON767 - Entrepreneurial Experience

Subject	Catalog Number	Title
ENVIRON	767	Entrepreneurial Experience

### 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.

## ENVIRON767D - Entrepreneurial Experience

Subject	Catalog Number	Title
ENVIRON	767D	Entrepreneurial Experience

### 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.

## ENVIRON770A - Physical Oceanography

Subject	Catalog Number	Title
ENVIRON	770A	Physical Oceanography

### 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.

## ENVIRON771L - GIS Field Skills

Subject	Catalog Number	Title
ENVIRON	771L	GIS Field Skills

### Description

Covers integration of GPS and GIS technology for field data collection. Data is set up in ArcGIS in lab, exported to GPS units, field data to be collected, and imported back to GIS system. ArcGIS Personal Geodatabase is the fundamental data structure. Course covers data accuracy and precision and how to use base stations to correct data differentially for highest possible accuracy. Will discuss how to determine what GPS unit is necessary for project accuracy needs. Prerequisite: Environment 559.

## ENVIRON772LA - Coastal Restoration Ecology

Subject	Catalog Number	Title
ENVIRON	772LA	Coastal Restoration Ecology

### 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.

## ENVIRON773A - Marine Ecology

Subject	Catalog Number	Title
ENVIRON	773A	Marine Ecology

### 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 from 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.

## ENVIRON773L - Marine Ecology

Subject	Catalog Number	Title
ENVIRON	773L	Marine Ecology

### 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.

## ENVIRON773LA - Marine Ecology

Subject	Catalog Number	Title
ENVIRON	773LA	Marine Ecology

### 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.

## ENVIRON773LA-1 - Marine Ecology

Subject	Catalog Number	Title
ENVIRON	773LA-1	Marine Ecology

### 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.

## ENVIRON774 - One Health: From Philosophy to Practice

Subject	Catalog Number	Title
ENVIRON	774	One Health: From Philosophy to Practice

### 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.

## ENVIRON775 - Ocean and Coastal Law and Policy

Subject	Catalog Number	Title
ENVIRON	775	Ocean and Coastal Law and Policy

### 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.

## ENVIRON776 - Marine Mammals

Subject	Catalog Number	Title
ENVIRON	776	Marine Mammals

### 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.

## ENVIRON776A - Marine Mammals

Subject	Catalog Number	Title
ENVIRON	776A	Marine Mammals

### 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.

## ENVIRON776L - Marine Mammals

Subject	Catalog Number	Title
ENVIRON	776L	Marine Mammals

### Description

Laboratory version of Environment 776. Laboratory exercises consider social organization and acoustic communication in the local bottlenose dolphin population. Recommended prerequisite: introductory biology.

## ENVIRON776LA - Marine Mammals

Subject	Catalog Number	Title
ENVIRON	776LA	Marine Mammals

### 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.

## ENVIRON777A - Biology and Conservation of Sea Turtles

Subject	Catalog Number	Title
ENVIRON	777A	Biology and Conservation of Sea Turtles

### 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.

## ENVIRON777L - Biology and Conservation of Sea Turtles

Subject	Catalog Number	Title
ENVIRON	777L	Biology and Conservation of Sea Turtles

### 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.

## ENVIRON777LA - Biology and Conservation of Sea Turtles

Subject	Catalog Number	Title
ENVIRON	777LA	Biology and Conservation of Sea Turtles

### 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.

## ENVIRON778L - Comparative Physiology of Marine Animals

Subject	Catalog Number	Title
ENVIRON	778L	Comparative Physiology of Marine Animals

### 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.

## ENVIRON778LA - Comparative Physiology of Marine Animals

Subject	Catalog Number	Title
ENVIRON	778LA	Comparative Physiology of Marine Animals

### 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.

## ENVIRON780 - Environmental Exposure Analysis

Subject	Catalog Number	Title
ENVIRON	780	Environmental Exposure Analysis

### 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.



## ENVIRON782 - Marketing for Environmental Professionals

Subject	Catalog Number	Title
ENVIRON	782	Marketing for Environmental Professionals

### 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.

## ENVIRON782D - Marketing for Environmental Professionals

Subject	Catalog Number	Title
ENVIRON	782D	Marketing for Environmental Professionals

### 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.

## ENVIRON784LA - Sound in the Sea: Introduction to Marine Bioacoustics

Subject	Catalog Number	Title
ENVIRON	784LA	Sound in the Sea: Introduction to Marine Bioacoustics

### 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.

## ENVIRON785A - Conservation Biology & Service Learning: Coastal ecosystems, restoration and communities

Subject	Catalog Number	Title
ENVIRON	785A	Conservation Biology & Service Learning: Coastal ecosystems, restoration and communities

### 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.

## ENVIRON786 - Marine Policy

Subject	Catalog Number	Title
ENVIRON	786	Marine Policy

### 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.

## ENVIRON786A - Marine Policy (A)

Subject	Catalog Number	Title
ENVIRON	786A	Marine Policy (A)

### 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.

## ENVIRON787A - Analysis of Ocean Ecosystems

Subject	Catalog Number	Title
ENVIRON	787A	Analysis of Ocean Ecosystems

### 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.

## ENVIRON788LA - Biodiversity of Marine Invertebrates

Subject	Catalog Number	Title
ENVIRON	788LA	Biodiversity of Marine Invertebrates

### 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.

## ENVIRON790 - Special Topics

Subject	Catalog Number	Title
ENVIRON	790	Special Topics

### Description

Content to be determined each semester. May be repeated.

## ENVIRON790A - Duke-Administered Study Away: Special Topics

Subject	Catalog Number	Title
ENVIRON	790A	Duke-Administered Study Away: Special Topics

### Description

Content to be determined each session.

## ENVIRON790D - Special Topics

Subject	Catalog Number	Title
ENVIRON	790D	Special Topics

### Description

Content to be determined each semester. May be repeated.

## ENVIRON790L - Special Topics

Subject	Catalog Number	Title
ENVIRON	790L	Special Topics

### Description

Content to be determined each semester. May be repeated.

## ENVIRON790LA - Duke-Administered Study Away: Special Topics

Subject	Catalog Number	Title
ENVIRON	790LA	Duke-Administered Study Away: Special Topics

### Description

Content to be determined each session.

## ENVIRON790SA - Duke-Administered Study Away: Special Topics

Subject	Catalog Number	Title
ENVIRON	790SA	Duke-Administered Study Away: Special Topics

### Description

Content to be determined each session.

## ENVIRON791 - Independent Studies and Projects

Subject	Catalog Number	Title
ENVIRON	791	Independent Studies and Projects

### Description

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

## ENVIRON792 - Wetlands of Coastal North Carolina

Subject	Catalog Number	Title
ENVIRON	792	Wetlands of Coastal North Carolina

### 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.

## ENVIRON795 - Practicum in Community Engagement in the Environmental Field

Subject	Catalog Number	Title
ENVIRON	795	Practicum in Community Engagement in the Environmental Field

### 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.

## ENVIRON796 - Financial Foundations for Environmental Managers

Subject	Catalog Number	Title
ENVIRON	796	Financial Foundations for Environmental Managers

### 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.

## ENVIRON803K - Environmental Policy Process

Subject	Catalog Number	Title
ENVIRON	803K	Environmental Policy Process

### 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.

## ENVIRON805K - Environmental Economics

Subject	Catalog Number	Title
ENVIRON	805K	Environmental Economics

### 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.

## ENVIRON806 - Duke Forest Practicum

Subject	Catalog Number	Title
ENVIRON	806	Duke Forest Practicum

### 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.

## ENVIRON806K - Environmental Economics II

Subject	Catalog Number	Title
ENVIRON	806K	Environmental Economics II

### 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.

## ENVIRON807 - International Fisheries Policy: Principles and Concepts Aiming to End Overfishing

Subject	Catalog Number	Title
ENVIRON	807	International Fisheries Policy: Principles and Concepts Aiming to End Overfishing

### 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.

## ENVIRON808 - Aquatic and Wetland Field Skills

Subject	Catalog Number	Title
ENVIRON	808	Aquatic and Wetland Field Skills

### 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.

## ENVIRON808L - Aquatic and Wetland Field Skills

Subject	Catalog Number	Title
ENVIRON	808L	Aquatic and Wetland Field Skills

### 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.

## ENVIRON809 - Wetland Restoration Ecology

Subject	Catalog Number	Title
ENVIRON	809	Wetland Restoration Ecology

### 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.

## ENVIRON811 - Business and Environment

Subject	Catalog Number	Title
ENVIRON	811	Business and Environment

### 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.

## ENVIRON811D - Business and Environment

Subject	Catalog Number	Title
ENVIRON	811D	Business and Environment

### 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.

## ENVIRON812 - Wetlands Ecology and Management

Subject	Catalog Number	Title
ENVIRON	812	Wetlands Ecology and Management

### 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.

## ENVIRON814 - Integrated Case Studies in Toxicology

Subject	Catalog Number	Title
ENVIRON	814	Integrated Case Studies in Toxicology

### 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.

## ENVIRON815 - Focused Topics in Toxicology

Subject	Catalog Number	Title
ENVIRON	815	Focused Topics in Toxicology

### 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.

## ENVIRON819 - Mechanisms in Environmental Toxicology

Subject	Catalog Number	Title
ENVIRON	819	Mechanisms in Environmental Toxicology

### 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.

## ENVIRON820S - Conservation Ethics

Subject	Catalog Number	Title
ENVIRON	820S	Conservation Ethics

### 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.

## ENVIRON821 - Advanced Readings in Soil Science

Subject	Catalog Number	Title
ENVIRON	821	Advanced Readings in Soil Science

### 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.

## ENVIRON822A - Coastal Watershed Management and Restoration

Subject	Catalog Number	Title
ENVIRON	822A	Coastal Watershed Management and Restoration

### 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.

## ENVIRON823D - Ecological Resilience and Ecosystem Management

Subject	Catalog Number	Title
ENVIRON	823D	Ecological Resilience and Ecosystem Management

### 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.



## ENVIRON824A - Marine Conservation Biology

Subject	Catalog Number	Title
ENVIRON	824A	Marine Conservation Biology

### 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.

## ENVIRON829D - Natural Resource Economics

Subject	Catalog Number	Title
ENVIRON	829D	Natural Resource Economics

### 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.

## ENVIRON826 - Global Environmental Politics

Subject	Catalog Number	Title
ENVIRON	826	Global Environmental Politics

### 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.

## ENVIRON830 - Building Energy on Campus: Evaluating Efficiency and Conservation Measures at Duke

Subject	Catalog Number	Title
ENVIRON	830	Building Energy on Campus: Evaluating Efficiency and Conservation Measures at Duke

### 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.

## ENVIRON831 - Sustainable Business Strategy

Subject	Catalog Number	Title
ENVIRON	831	Sustainable Business Strategy

### 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.

## ENVIRON831D - Sustainable Business Strategy

Subject	Catalog Number	Title
ENVIRON	831D	Sustainable Business Strategy

### 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.

## ENVIRON832 - Environmental Decision Analysis

Subject	Catalog Number	Title
ENVIRON	832	Environmental Decision Analysis

### 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.

## ENVIRON835 - Environmental Law

Subject	Catalog Number	Title
ENVIRON	835	Environmental Law

### 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.

## ENVIRON835K - Environmental Law

Subject	Catalog Number	Title
ENVIRON	835K	Environmental Law

### 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.

## ENVIRON836 - Seabird Survival and Dispersal Analysis

Subject	Catalog Number	Title
ENVIRON	836	Seabird Survival and Dispersal Analysis

### 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.

## ENVIRON841 - Ecological Perspectives: Evolution to Ecosystems

Subject	Catalog Number	Title
ENVIRON	841	Ecological Perspectives: Evolution to Ecosystems

### Description

This course surveys core concepts in evolutionary and ecosystems ecology, and it challenges students to develop intersections and creative syntheses across those disciplines.

## ENVIRON842 - Ecological Perspectives: Individuals to Communities

Subject	Catalog Number	Title
ENVIRON	842	Ecological Perspectives: Individuals to Communities

### 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.

## ENVIRON847S - Seminar in Toxicology

Subject	Catalog Number	Title
ENVIRON	847S	Seminar in Toxicology

### Description

A weekly research seminar throughout the year is required of participants in the Toxicology Program. Students, faculty, and invited speakers present their findings.

## ENVIRON848S - Seminar in Toxicology

Subject	Catalog Number	Title
ENVIRON	848S	Seminar in Toxicology

### Description

A weekly research seminar throughout the year is required of participants in the Toxicology Program. Students, faculty, and invited speakers present their findings.

## ENVIRON849A - Doctoral Student Seminar and Professional Development

Subject	Catalog Number	Title
ENVIRON	849A	Doctoral Student Seminar and Professional Development

### 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.

## ENVIRON859 - Geospatial Data Analytics

Subject	Catalog Number	Title
ENVIRON	859	Geospatial Data Analytics

### 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.

## ENVIRON859A - Geospatial Data Analytics

Subject	Catalog Number	Title
ENVIRON	859A	Geospatial Data Analytics

### 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.

## ENVIRON859D - Geospatial Data Analytics

Subject	Catalog Number	Title
ENVIRON	859D	Geospatial Data Analytics

### 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.

## ENVIRON859DA - Geospatial Data Analytics

Subject	Catalog Number	Title
ENVIRON	859DA	Geospatial Data Analytics

### 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.

## ENVIRON865SA - College Teaching and Course Design

Subject	Catalog Number	Title
ENVIRON	865SA	College Teaching and Course Design

### 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.

## ENVIRON869 - Environmental Law Clinic

Subject	Catalog Number	Title
ENVIRON	869	Environmental Law Clinic

### 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/>.

## ENVIRON860SA - Political Ecology

Subject	Catalog Number	Title
ENVIRON	860SA	Political Ecology

### 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.

## ENVIRON868 - Natural Resources Law

Subject	Catalog Number	Title
ENVIRON	868	Natural Resources Law

### Description

Focus on constitutional, statutory, and common law governing the legal status and management of federal lands and natural resources.

## ENVIRON869D - Environmental Law Clinic

Subject	Catalog Number	Title
ENVIRON	869D	Environmental Law Clinic

### 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/>.

## ENVIRON872L - Environmental Data Exploration

Subject	Catalog Number	Title
ENVIRON	872L	Environmental Data Exploration

### 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.

## ENVIRON872L-1 - Environmental Data Exploration

Subject	Catalog Number	Title
ENVIRON	872L-1	Environmental Data Exploration

### 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.

## ENVIRON876A - Data and Time Series Analysis in Marine Sciences

Subject	Catalog Number	Title
ENVIRON	876A	Data and Time Series Analysis in Marine Sciences

### 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.

## ENVIRON886 - Current Topics in Marine Conservation

Subject	Catalog Number	Title
ENVIRON	886	Current Topics in Marine Conservation

### 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.

## ENVIRON886A - Current Topics in Marine Conservation

Subject	Catalog Number	Title
ENVIRON	886A	Current Topics in Marine Conservation

### 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.

## ENVIRON887 - Theory and Methods for Policy Analysis of the Commons

Subject	Catalog Number	Title
ENVIRON	887	Theory and Methods for Policy Analysis of the Commons

### 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.

## ENVIRON887A - Theory and Methods for Policy Analysis of the Commons

Subject	Catalog Number	Title
ENVIRON	887A	Theory and Methods for Policy Analysis of the Commons

### 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.

## ENVIRON888 - Career Development for Environmental Professionals

Subject	Catalog Number	Title
ENVIRON	888	Career Development for Environmental Professionals

### 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.

## ENVIRON891 - Topics in Environmental Regulation

Subject	Catalog Number	Title
ENVIRON	891	Topics in Environmental Regulation

### Description

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

## ENVIRON893 - MEM/MF Internship Practical Training

Subject	Catalog Number	Title
ENVIRON	893	MEM/MF Internship Practical Training

### 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.

## ENVIRON895 - Master of Environmental Management/Forestry Internship/Project

Subject	Catalog Number	Title
ENVIRON	895	Master of Environmental Management/Forestry Internship/Project

### 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.

## ENVIRON896 - Professional Communications

Subject	Catalog Number	Title
ENVIRON	896	Professional Communications

### Description

This is the first of two half credit courses in professional communications. To be taken in the first fall of enrollment in the MEM or MF degree, this course focuses on skills-building in professional communication, emphasizing visual communication and speaking. Oral presentations, written document design, graphic display of information, presentation software, and giving and receiving constructive feedback on projects in these areas. Open only to MEM and MF students.

## ENVIRON897 - Writing a Master's Project

Subject	Catalog Number	Title
ENVIRON	897	Writing a Master's Project

### Description

This is the second of two half credit courses in professional communications. To be taken in the second fall of enrollment in the MEM or MF degree, this course addresses different aspects of writing a master's project. Course will include a mixture of lecture and in-class workshopping of written materials. Course covers writing introductions, background sections, methods, writing results, discussion, conclusions, executive summaries and developing a professional website. Open only to MEM and MF students.

## ENVIRON898 - Program Area Seminar

Subject	Catalog Number	Title
ENVIRON	898	Program Area Seminar

### Description

Required symposium in each program area. Students present master's project research. Pass/fail grading only.



## ENVIRON898A - Topic: Program Area Seminar - Duke University Marine Lab

Subject	Catalog Number	Title
ENVIRON	898A	Topic: Program Area Seminar - Duke University Marine Lab

### Description

Required symposium in each program area. Students present master's project research. Pass/fail grading only. Taught in Beaufort at Duke Marine Lab.

## ENVIRON898K - Master's Project International Master in Environmental Policy II

Subject	Catalog Number	Title
ENVIRON	898K	Master's Project International Master in Environmental Policy II

### 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.

## ENVIRON899 - Master's Project

Subject	Catalog Number	Title
ENVIRON	899	Master's Project

### 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.

## ENVIRON899K - Master's Project II

Subject	Catalog Number	Title
ENVIRON	899K	Master's Project II

### 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.

## ENVIRON909 - Survey of Environmental Leadership at Duke and Beyond

Subject	Catalog Number	Title
ENVIRON	909	Survey of Environmental Leadership at Duke and Beyond

### 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.

## ENVIRON931 - One Health: Introduction to the One Health Approach

Subject	Catalog Number	Title
ENVIRON	931	One Health: Introduction to the One Health Approach

### 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.

## ENVIRON932 - One Health: Introduction to Environmental Health

Subject	Catalog Number	Title
ENVIRON	932	One Health: Introduction to Environmental Health

### 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.

## ENVIRON938 - One Health: Introduction to Entomology, Zoonotic Diseases, and Food Safety

Subject	Catalog Number	Title
ENVIRON	938	One Health: Introduction to Entomology, Zoonotic Diseases, and Food Safety

### Description

Course introduces public health students to entomology, zoonotic diseases, and principals of modern food safety. Includes methods for conducting studies of mosquitoes and ticks, controlling zoonotic diseases, and protecting the food supply. Special focus on modern food safety techniques in meat, dairy and produce production. Lectures complemented with considerable laboratory and/or field work.

## ENVIRON939 - One Health: Public Health Laboratory Techniques

Subject	Catalog Number	Title
ENVIRON	939	One Health: Public Health Laboratory Techniques

### Description

Introduction to common laboratory techniques used in emerging infectious respiratory disease research and surveillance laboratories; emphasis on techniques for culturing, characterization, and serological surveillance of exposure to influenza viruses.

## ENVIRON955 - DEL: Community-Based Environmental Management

Subject	Catalog Number	Title
ENVIRON	955	DEL: Community-Based Environmental Management

### 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.

## ENVIRON959 - DEL: Intro to ArcGIS Pro Exercises

Subject	Catalog Number	Title
ENVIRON	959	DEL: Intro to ArcGIS Pro Exercises

### Description

Learn the essential concepts you need to jump-start your productivity with ArcGIS Pro. This course introduces the ribbon-style interface, project-based organization, key capabilities, and ArcGIS Pro terminology.

## ENVIRON960 - Duke Environmental Leadership: Orientation Course: Making a Difference in the World

Subject	Catalog Number	Title
ENVIRON	960	Duke Environmental Leadership: Orientation Course: Making a Difference in the World

### 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.

## ENVIRON961 - Duke Environmental Leadership: Ecosystem Science and Management

Subject	Catalog Number	Title
ENVIRON	961	Duke Environmental Leadership: Ecosystem Science and Management

### 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.

## ENVIRON962 - Duke Environmental Leadership: Economics of Environmental Management

Subject	Catalog Number	Title
ENVIRON	962	Duke Environmental Leadership: Economics of Environmental Management

### 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.

## ENVIRON963 - Strategic Planning for Environmental Leaders

Subject	Catalog Number	Title
ENVIRON	963	Strategic Planning for Environmental Leaders

### 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.

## ENVIRON964 - Duke Environmental Leadership: Environmental Law and Policy

Subject	Catalog Number	Title
ENVIRON	964	Duke Environmental Leadership: Environmental Law and Policy

### 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.

## ENVIRON965 - DEL: Environmental Leadership Module

Subject	Catalog Number	Title
ENVIRON	965	DEL: Environmental Leadership Module

### 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.

## ENVIRON966 - DEL: Professional Writing Course

Subject	Catalog Number	Title
ENVIRON	966	DEL: Professional Writing 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.

## ENVIRON973 - DEL: Business Strategy for Environmental Sustainability

Subject	Catalog Number	Title
ENVIRON	973	DEL: Business Strategy for Environmental Sustainability

### 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.

## ENVIRON974 - DEL: Seeing the Big Picture: Lessons from Watershed Management in California

Subject	Catalog Number	Title
ENVIRON	974	DEL: Seeing the Big Picture: Lessons from Watershed Management in California

### 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.

## ENVIRON975 - DEL: Community Based Environmental Management in Mexico

Subject	Catalog Number	Title
ENVIRON	975	DEL: Community Based Environmental Management in Mexico

### 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.

## ENVIRON976 - DEL: Restoration Ecology: Practice and Principles

Subject	Catalog Number	Title
ENVIRON	976	DEL: Restoration Ecology: Practice and Principles

### 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.

## ENVIRON979 - DEL: The Science of Climate Change

Subject	Catalog Number	Title
ENVIRON	979	DEL: The Science of Climate Change

### Description

This course will provide students with a broad, policy-relevant overview of contemporary scientific understanding of climate change. The recently released IPCC Fourth Assessment Report (IPCC AR4) titled 'Climate Change 2007' 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.

## ENVIRON980 - DEL: California Water Management Field Trip

Subject	Catalog Number	Title
ENVIRON	980	DEL: California Water Management Field Trip

### 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 Aqueduct, 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.

## ENVIRON982 - DEL: Sustainable Development in Colombia

Subject	Catalog Number	Title
ENVIRON	982	DEL: Sustainable Development in Colombia

### 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.

## ENVIRON983 - DEL: Green Development

Subject	Catalog Number	Title
ENVIRON	983	DEL: Green Development

### 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.



## ENVIRON990 - DEL: Special Topics

Subject	Catalog Number	Title
ENVIRON	990	DEL: Special Topics

### 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.

## ENVIRON995 - DEL: Leadership Seminar

Subject	Catalog Number	Title
ENVIRON	995	DEL: Leadership Seminar

### 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.

## ENVIRON996 - DEL MEM Capstone

Subject	Catalog Number	Title
ENVIRON	996	DEL MEM Capstone

### 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.

## ENVIRON997 - Duke Environmental Leadership: Independent Studies and Projects

Subject	Catalog Number	Title
ENVIRON	997	Duke Environmental Leadership: Independent Studies and Projects

### 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.

## ENVIRON998 - Program Area Seminar DEL MEM

Subject	Catalog Number	Title
ENVIRON	998	Program Area Seminar DEL MEM

### Description

This program seminar is required for all Duke Environmental Leadership (DEL) MEM students. The seminar will assist students in all phases of the master's project (MP) process, from developing research questions to presenting results. Instructor consent required.

## ENVIRON999 - Duke Environmental Leadership: Master's Project

Subject	Catalog Number	Title
ENVIRON	999	Duke Environmental Leadership: Master's Project

### 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.

## EOS701S - Research Orientation Seminar

Subject	Catalog Number	Title
EOS	701S	Research Orientation Seminar

### 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.

## EOS704LA - Biological Oceanography

Subject	Catalog Number	Title
EOS	704LA	Biological Oceanography

### 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.

## EOS715 - Introduction to Coastal Environmental Change Processes

Subject	Catalog Number	Title
EOS	715	Introduction to Coastal Environmental Change Processes

### 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.

## EOS716A - Beach and Island Geological Processes

Subject	Catalog Number	Title
EOS	716A	Beach and Island Geological Processes

### 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.

## EOS722 - Hydrologic and Environmental Data Analysis

Subject	Catalog Number	Title
EOS	722	Hydrologic and Environmental Data Analysis

### 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.

## EOS723 - Hydrology in Environmental Management

Subject	Catalog Number	Title
EOS	723	Hydrology in Environmental Management

### 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.

## EOS723D - Hydrology

Subject	Catalog Number	Title
EOS	723D	Hydrology

### 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.

## EOS785DS - Analyzing Current Contributions in Earth, Atmospheric and Climate Sciences

Subject	Catalog Number	Title
EOS	785DS	Analyzing Current Contributions in Earth, Atmospheric and Climate Sciences

### 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.

## EOS785S - Analyzing Current Contributions in Earth, Atmospheric and Climate Sciences

Subject	Catalog Number	Title
EOS	785S	Analyzing Current Contributions in Earth, Atmospheric and Climate Sciences

### 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.

## EOS790 - Special Topics in Earth and Ocean Sciences

Subject	Catalog Number	Title
EOS	790	Special Topics in Earth and Ocean Sciences

### Description

Content to be determined each semester. Consent of instructor required.

## EOS790S - Advanced Topics in Geology

Subject	Catalog Number	Title
EOS	790S	Advanced Topics in Geology

### Description

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

## EOS791 - Independent Study

Subject	Catalog Number	Title
EOS	791	Independent Study

### Description

Consent of instructor required.

## EOS792S - Microgrid Seminar

Subject	Catalog Number	Title
EOS	792S	Microgrid Seminar

### 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.