

## Master of Science in Sustainability Management

Available Course Listing for Spring 2025

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### The MS in Sustainability Management program offers a variety of courses within five areas of study:

- 1: Integrative Courses on Sustainability Management
- 2: Economics and Quantitative Analysis (2 courses in Economics/ 1 course in Quantitative Analysis)
- 3: The Physical Dimensions of Sustainability Management
- 4: The Public Policy Environment of Sustainability Management
- 5: General and Financial Management

### Overview of all courses offered by the Sustainability Management program, by study area:

Area	Course Name	Pts	Professor	Time
1: Integrative Sustainability Management	SUMA PS4100 Sustainability Management	3	Howard Apsan (Sec 001)	Thursdays, 6:10-8:00 p.m.
			Wendy J Hapgood (Sec 002)	Wednesday, 6:10-8:00 p.m.
1: Integrative Sustainability Management	SUMA PS5180 Writing about Global Science for International Media	3	Claudia Dreifus	Wednesday, 6:10-8:00 p.m.
1: Integrative Sustainability Management	SUMA PS5200 Integrative Capstone Workshop	3	Kizzy Charles-Guzman, Thomas Abdallah, Susanne DesRoches, Chanda Burrage, Lynnette Widder, Chandler Precht, Dubois AKeen, Maria Gray	Tuesdays, 6:10-8:00 p.m.
1: Integrative Sustainability Management/ 2E: Economics	SUMA PS5150 Energy and Sustainable Development	3	Phil LaRocco & Jennye Greene	Wednesday, 6:10-8:00 p.m.  <b>ONLINE</b>
1: Integrative Sustainability Management/ 4: Public Policy	SUMA PS5250 Building a Sustainable Detroit: A Case Study in Urban Resilience	3	Donna Givens Davidson	Wednesday, 6:10-8:00p.m.  <b>ONLINE</b>
1: Integrative Sustainability Management/ 4: Public Policy	SUMA PS4490 Women in Cities: Integrating Needs, Rights, Access and Opportunity into Sustainable Urban Design, Planning and Management	3	Susan Blaustein	Wednesdays, 6:10-8:00 p.m.

1: Integrative Sustainability Management/ 4: Public Policy	SUMA PS5888: Geographies of Environmental Justice & Sustainability	3	John E. Williams	Tuesdays, 6:10-8:00p.m.
1: Integrative Sustainability Management/ 4: Public Policy	SUMA PS4310 Practicum in Innovative Sustainability Leadership	3	Wendy Hapgood and Sophia Huda	Thursdays, 6:10-8:00 p.m.
1: Integrative Sustainability Management/3: Physical Dimensions/ 4: Public Policy	SUMA PS4130 Sustainable Cities	3	Dong Guo	Thursdays, 6:10-8:00 p.m.
1: Integrative Sustainability Management/ 5: General and Financial Management	SUMA PS5025 Corporate Sustainability Reporting and Strategy	3	Celine Ruben-Salama <b>(Sec 001)</b>  Carl Otto <b>(Sec 002)</b>	Thursdays, 4:10-6:00 p.m.  Wendesdays, 6:10-8:00 p.m.
1: Integrative Sustainability Management / 5: General and Financial Management	SUMA PS5525 Consumerism and Sustainability	3	TBD	Thursdays, 6:10-8:00 p.m.
1: Integrative Sustainability Management/ 5: General and Financial Management	SUMA PS5170 Sustainable Operations	3	TBD	Mondays, 6:10-8:00 p.m.
<b>2: Economics</b>	SUMA PS4190 Economics of Sustainability Management	3	Alexander Heil	Mondays, 6:10-8:00 p.m.
2: Economics	SUMA PS5710 Electrification and Decarbonization - Regulatory approaches and strategies	3	Rory Christian	Mondays, 4:10-6:00 p.m.

2: Economics/ 5: General and Financial Management	SUMA PS5445 Impact Finance for Sustainability Practitioners	3	Bhakti Mirchandani	Thursdays, 6:10-8:00 p.m.  <b>ONLINE</b>
2: Economics/ 5: General and Financial Management	SUMA PS5195 Accounting, Finance and Modeling of Sustainable Investments	3	Brad Schwartz	Mondays, 6:10-8:00 p.m.
2: Economics/ 5: General and Financial Management	SUMA PS5220 Sustainable Entrepreneurship	3	Jonathan Hollander	Mondays, 6:10 - 8:00 p.m.
2: Economics/ 3: Physical Dimensions/ 5: General and Financial Management	SUMA PS5650 Solar Project Development	3	Daniel Giuffrida	Tuesdays, 6:10-8:00 pm.
2: Economics/ 5: General and Financial Management/ 3: Physical Dimensions	SUMA PS5155 Energy Markets and Innovation	3	Travis Bradford <b>(Sec 001)</b>  Travis Bradford <b>(Sec 002)</b>	Tuesdays, 4:10-6:00 p.m.  Tuesdays, 6:10-8:00 p.m.
<b>2: Quantitative Analysis</b>	SUMA PS5193 Core Data Science Concepts for Sustainable Finance (Previously called: Statistics for Sustainability Management)	3	Bruce Kahn	Wednesdays, 6:10-8:00 p.m.
2: Quantitative Analysis/ 4: Public Policy	SUMA PS5168 Sustainability Metrics: Corporate Decisions and Use of Data	3	Sonay Aykan	Wednesdays, 6:10-8:00 p.m.
2: Quantitative Analysis/ 3: Physical Dimensions	SUMA PS5021 Theory and Practice of Life Cycle Assessment	3	Christoph Meinrenken <b>(Sec 001)</b>  Adriana Kliegman <b>(Sec 002)</b>  Kim Matsoukas <b>(Sec 003)</b>	Thursdays, 4:10-6:00 p.m.  Thursdays, 6:10-8:00 p.m.  Wednesdays, 6:10-8:00 p.m.

2: Quantitative Analysis/ 3: Physical Dimensions	SUMA PS5035 GHG Emissions: Measuring and Minimizing the Carbon Footprint	3	Jeffery Irvine & Katrina Prutzman <b>(Sec D01)</b>  Peter Clarke <b>(Sec 001)</b>  Jonathan Dickinson & Ryan Meinke <b>(Sec 002)</b>	Mondays, 6:10-8:00 p.m. <b>ONLINE</b>  Mondays, 6:10-8:00 p.m.  Wednesdays, 6:10-8:00 p.m.
2: Quantitative Analysis/ 3: Physical Dimensions	SUMA PS5135 Analysis for Energy Efficiency	3	Thomas Sahagian	Tuesdays, 6:10-8:00p.m.
2: Quantitative Analysis/ 3: Physical Dimensions	SUMA PS5255 Data Analysis & Visualization in Sustainability	3	Greg Yetman	Tuesdays, 6:10-8:00 p.m.
2: Quantitative Analysis/ 5: General and Financial Management	SUMA PS5033 Decision Models and Management	3	Lucius Riccio	Mondays, 6:10-8:00 p.m.
2: Economics/ 2: Quantitative Analysis/ 3: Physical Dimensions	SUMA PS6132 Climate Risk & Scenario Analysis	3	Satyajit Bose & Dong Guo	Tuesdays, 6:10-8:00 p.m.
2: Quantitative Analysis/ 2: Economics/ 5: General and Financial Management	SUMA PS5020 Cost Benefit Analysis	3	Amin Mohseni-Cheraghloou <b>(Section D01)</b>  Anyi Wang <b>(Section 002)</b>	Wednesdays, 6:10-8:00 p.m. <b>ONLINE</b>  Mondays, 6:10- 8:00 p.m.
2: Economics/ 2: Quantitative Analysis/ 5: General and Financial Management	SUMA PS5320 Sustainable Investing and Economic Growth	3	Satyajit Bose	Thursdays, 6:10-8:00 p.m.
<b>3: Physical Dimensions</b>	SUMS PS4147 Water Resources and Climate	3	Nicole Davi & Indrani Pal	Thursdays, 6:10-8:00 p.m.

3: Physical Dimensions	SUMA PS4235 The Science of Urban Ecology	3	Amy Karpati	Mondays, 6:10-8:00 p.m.
3: Physical Dimensions	SUMA PS4236 Reversing the Biodiversity Crisis	3	Amy Karpati	Mondays, 8:10-10:00 p.m.
3: Physical Dimensions	SUMA PS4238 Biodiversity, Climate Change and Sustainable Management of Natural Ecosystems	3	Ralph Schmidt	Tuesdays, 6:10-8:00 p.m.
3: Physical Dimensions	SUMA PS5140 Sustainability Science	3	Jenna Lawrence	Thursdays, 6:10-8:00 p.m.
3: Physical Dimensions/ 5: General and Financial Management	SUMA PS5245 Smart Agriculture for a Changing Climate	3	TBD	Thursdays, 6:10-8:00 p.m.
3: Physical Dimensions	SUMA PS5210 Solid Waste Management	3	Haralambos Vasiliadis	Tuesdays, 6:10-8:00 p.m.
3: Physical Dimensions	SUMA PS5230 Earth's Climate System	3	Benjamin Cook	Tuesdays, 4:10-6:00 pm.
3: Physical Dimensions/ 4: Public Policy	SUMA PS6140 Applied Energy Methods in Affordable Housing Development	3	Kenyetta Lovings	Wednesdays, 6:10-8:00 p.m.
<b>4: Public Policy</b>	SUMA PS5720 Policy and Legal Context of Sustainability Management	3	Clara (Charlie)Cibrario Assereto	Mondays, 6:10-8:00 p.m.
4: Public Policy	SUMA PS5725 Business & Climate Change: Law, Policy and Practice	3	Perry Teicher	Wednesdays, 4:10-6:00 p.m.
4: Public Policy	SUMA PS6120 Equity, Policy and Sustainability	3	Dan Mathis	Tuesdays, 6:10-8:00 p.m.
4: Public Policy	SUMA PS5301 International Environmental Law	3	Eran Sthoeger	Wednesdays, 4:10-6:00 p.m.

5: General and Financial Management	SUMA PS5040 ESG-Aligned Corporate Governance	3	Jessica Wasser <b>(Sec 001)</b>  Bridget Murphy <b>(Sec 002)</b>	Wednesdays, 6:10-8:00 p.m.  Mondays, 6:10-8:00 p.m.
5: General and Financial Management	SUMA PS5060 Sustainable Fashion & Startup Strategy	3	Ammar Belal	Tuesday, 6:10-8:00 p.m.
5: General and Financial Management	SUMA PS5470 Circular Economy for Sustainability Professionals <i>(This course is <u>not</u> approved for the Area 2: Economics Requirement)</i>	3	Diana Trushell	Mondays, 4:10-6:00 p.m.
5: General and Financial Management	SUMA PS5197 Financing the Clean Energy Economy	3	Curtis Probst <b>(Sec 001)</b>  Barbara Chapman <b>(Sec 002)</b>	Wednesdays, 6:10-8:00 p.m.  Tuesdays, 6:10-8:00 p.m.
5: General and Financial Management	SUMA PS5045 ESG Corporate Strategy	3	Pamela Gill-Alabaster	Thursdays, 6:10-8:00 p.m.
5: General and Financial Management	SUMA PS5446 Sustainability Value Creation in Private Markets	3	Angela Jhanji	Mondays, 4:10-6:00 p.m.

**Details for courses offered by the Sustainability Management program and other departments, by study area:**

**1: Integrative Courses on Sustainability Management (9 pts.)**

1 Required Introductory Course

1 Capstone Course

1 Approved Integrative Elective Course

**Courses That Fulfill the Field Requirement for Integrative Courses on Sustainability Management:**

**Offered by the Sustainability Management Program:**

**SUMA PS4100 Sustainability Management**

Offered by MS in Sustainability Management Program

### **Area 1: Integrative Sustainability Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The introductory course will provide an overview of sustainability concepts and practices and how they are applied in real-world contexts. This course will begin by clearly defining what sustainability management is and determining if a sustainable economy is actually feasible. Students will learn to connect environmental protection to organizational management by exploring the technical, financial, managerial, and political challenges of effectively managing a sustainable environment and economy. This course is taught in a case-based format and will seek to help students learn the basics of management, environmental policy and sustainability economics. The literature and case material focus on lessons learned in government, non-profits and the private sector. The course will emphasize management in public and nonprofit organizations and the role of public policy in sustainability, but it will also explore how these two sectors interact with private interests to promote sustainable practices.

### **SUMA PS4130 Sustainable Cities**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management/** Area 3: Physical Dimensions/ Area 4: Public Policy

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** For the first time in history over half the world's population lives in urban areas. Today there are over 400 cities of more than million residents compared to 12 in 1900. By 2050 the share of the world's urban population is expected to reach 70 percent, and most growth will occur in the developing world. As urban population growth continues, urban centers face the problems of aging infrastructure, economic growth, changing climate, congestion, pollution, and demands of inhabitants to enhance their quality of life. Cities consume 75 percent of the world's energy and produce almost 80 percent of global GHG emissions. In response many cities are striving to be low carbon cities while sustaining healthy economic and social life. But addressing the new urban agenda requires a new model of cooperation across sectors and all tiers of government to redirect the urban economic development into paths that are restorative. The purpose of this course is to prepare its students to understand, analyze, and develop policies and procedures to address the sustainability issues being faced by urban centers of developed and developing world, their decision-makers and inhabitants.

### **SUMA PS4310 Practicum in Innovative Sustainability Leadership**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management/** Area 4: Public Policy

**Points:** 1-3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course deals with a fundamental question of sustainability management: how to change organizations and more complex systems, such as communities, industries, and markets, by integrating sustainability concerns in the way that they operate. The course poses this question to a dozen leading sustainability practitioners, who answer it by discussing management strategies that they use in their own work. Through these guest lectures, extensive class discussion, readings, and writing assignments, students identify and simulate applying practical ways for transforming how organizations and complex systems work. The practitioners, who work in the public, private, and nonprofit sectors and in a wide variety of organizations, make presentations in the first hour of the course. Students then have time to ask questions and speak informally with the guest practitioners, and will participate in an instructor-led class discussion, geared toward identifying management strategies, better understanding their application, and considering their effectiveness. By the end of the course, the students gain an understanding of management tools and strategies that they, themselves, would use to integrate sustainability in organizations.

### **SUMA PS4490 Women in Cities: Integrating Needs, Rights, Access and Opportunity into Sustainable Urban Design, Planning and Management**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management /** Area 4: Public Policy

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The course will examine both acknowledged indicators of women's and girls' inclusion in the conceptualization and life of a city (e.g., access to shelter, clean water, sanitation, safe transport, healthcare, education, jobs and leadership positions), and those not sufficiently acknowledged (stability and tenure in housing, labor force inclusion and wage parity, physical, mental and environmental health, sexual and reproductive rights, freedom from violence, assured levels of participation in policy- and decision-making, etc.). Migrating between multiple cultural and sociopolitical contexts, and between the individual and metropolitan, national and indigenous levels of policymaking, the course will look at how today's cities have evolved; the consequential disconnect between enshrined legal frameworks, regulatory and administrative structures, and concrete urban realities; and at how, through a sustainable process of inclusive community and private sector engagement, responsive design, and strategic budgeting to realize select well-defined priorities, tomorrow's cities can be better attuned to the human scale of their primary constituents by becoming more aware, inclusive, accommodating and enabling of women and families. Each week, one or more leading and cutting-edge thinkers and practitioners in the areas of urban and environmental design and management, corporate social responsibility, landscape architecture and planning, sustainable engineering, and urban health, wellbeing and women's rights will share their experience, current thinking and ideas in featured guest lectures; these will be followed by wide-ranging conversations among the instructor, lecturers and students, enabling students to hear firsthand how private, public and non-profit sector managers, policymakers and designers approach and deal with such issues as (for instance) making transport hubs equally navigable for women with strollers, walkers or young children, or implementing green or family-friendly CSR policies.

### **SUMA PS5025 Corporate Sustainability Reporting and Strategy**

Offered by the MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management/** Area 5: General and Financial Management

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The purpose of this course is to provide an overview of trends and best practices in corporate communications relating to sustainability, with a particular focus on global sustainability reporting frameworks and green marketing communications. It is designed for those who hold/will hold positions in organizations with responsibilities for communicating the sustainability goals, challenges and achievements, as well as accurately and honestly communicating the environmental aspects of an organization's products and services. Increasingly, large corporations are creating c-suite roles or dedicated departments to oversee this function. More typically, multiple functions contribute information such as: Corporate Communications, Marketing, Community Affairs, Public Policy, Environmental Health & Safety, R&D, Facilities, Operations and Legal. Benefits of reporting range from building trust with stakeholders, and uncovering risks and opportunities; to contributing to stronger long-term business strategy, and creating new products and services.

### **SUMA PS5150 Energy and Sustainable Development**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management/** Area 2: Economics

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course explores the tension and ambiguity that characterizes energy and development issues in the world's most marginal markets; the inadequacies of "business-as-usual" energy planning and implementation in these markets; and, the potential of non-traditional energy businesses, projects and programs to reach beyond "business as usual" approaches. It mixes the topics of cleaner energy production & use, energy efficiency & waste reduction and energy access & energy poverty in a way that points participants to a different framework for analyzing options to combat climate change, reduce waste and reach un-served and under-served populations. Its entry point and theme is "energy through enterprise". It uses individual enterprise examples to examine resources & technologies, business & program models, policies & institutional approaches and the analysis of macro (country), meso (sector) and micro (transactions). Participants learn and use a set of "frameworks" to achieve a more balanced view of activities at all three of the levels. Students work individually on country analysis and propose a relevant enterprise for the assigned country. Students work in groups to



compare similarities and differences among the assigned countries and to collaborate on enterprise development ideas and issues.

### **SUMA PS5170 Sustainable Operations**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management/** Area 5: General and Financial Management

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** In this course, students will work to understand and communicate the importance of identifying and incorporating sustainability at each step along the value chain, including product design, procurement, distribution, manufacturing, product use and end-of-life disposition. By considering the organization holistically, students will perform analyses of the value chain, including Life Cycle and Cost/Benefit Analyses, and incorporate effective sustainability strategies into the organizational culture and day-to-day operations. Students will conduct risk analyses and implement risk reduction measures in an effort to develop, produce, and distribute more sustainable products and services, aligned with overall business goals. In addition to technical sustainability considerations such as climate change, energy, water and waste, students will be able to implement sustainability initiatives within operating organizations through innovative change management, culture change and other organizational strategies. Importantly, students will be challenged to think concretely about making choices and balancing elements of the triple bottom line in an overall business context.

### **SUMA PS5180 Writing about Global Science for International Media**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This is an interdisciplinary workshop for scientists, future NGO workers and journalists seeking skills in communicating 21st-century global science to the public. Scientists will be given journalism skills; journalists will learn how to use science as the basis of their story-telling. The course is designed to give students exercises and real-world experiences in producing feature stories on global science topics. While most scientists and international affairs professionals have been trained to write in the style of peer-reviewed journals, we will focus on journalism techniques, learning how to translate global science into accessible true stories that reach wide audiences. Science is performed by passionate individuals who use their intelligence and determination to seek answers from nature. By telling their histories and uncovering the drama of discovery, we believe that there are ways for science to be successfully communicated to readers who might otherwise fear it.

### **SUMA PS5200 Integrative Capstone Workshop in Sustainability Management**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management**

**Points:** 3

**Instructors:** varies, see above

**Day/Time:** see above

**NOTE:** The evening capstone workshop section for which you register now does not determine your final project or faculty advisor assignment. Evening capstone workshop sections will meet together during the first class session; students will hear presentations about each workshop topic from the faculty advisor and then each student will submit a workshop preference form. You will receive your workshop assignment via email with next steps on registering for your assigned section. **You must have completed 1 course in each of the curriculum areas or be in your final semester in order to enroll in the capstone workshop. Capstone project topics will be announced in mid-August.**

**Course Description:** The capstone course is a client-based workshop that will integrate each element of the curriculum into an applied project, giving students hands-on sustainability management experience. Workshop projects are necessary and appropriate elements of a balanced professional degree program. In this course students will learn how others manage programs and conduct analysis; they will apply what they have learned in the introductory course and other curricular areas to projects with real-world clients. Students will serve on teams and undertake a special analytic project and serve as

consultants for public and nonprofit agencies, and therefore increase their understanding of the real-world constraints under which sustainability managers operate. The workshop also serves the purpose of sharpening the students analytical and communication skills, by allowing them to apply their previous experience and knowledge gained from the program to real-world problems. The required outputs for the workshop are a project control plan (PCP), a midterm briefing to the class, a final briefing to the class and the client, and a final report. The specific form of the report generated by each project is negotiated between the agency, the faculty advisor and the members of each consulting team.

### **SUMA PS5250 Building a Sustainable Detroit: A Case Study in Urban Resilience**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management** / Area 4: Public Policy

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Once the arsenal of Democracy and the birthplace of the automobile assembly line, Detroit now symbolizes deindustrialization, decay, and insolvency. Following the largest municipal bankruptcy in US history, Detroit is being reframed as a comeback city for urban pioneers, global investors, new professionals, and suburbanites. Despite these narratives, Detroit remains highly segregated—racially, geographically, economically, and socially. While downtown prospers, neighborhoods are still blighted and contaminated with unremediated legacy uses. Over 30,000 structures have been demolished in the past eight years, contributing to environmental and infrastructure harm. New investments, though improving some areas, displace long-term residents at risk of eviction or foreclosure. Detroit remains one of the poorest large cities in America, with only 36% of residents earning a living wage. The city's condition is rooted in a history of racist laws and policies that deny full citizenship to Black Detroiters, undermine democracy, and position the city as a poor colony within a thriving metropolis. Racism has disfigured Detroit's social, physical, and economic landscape, resulting in wealth extraction, housing insecurity, food and water scarcity, educational malpractice, and environmental destruction, all within the framework of wealth attraction, tax incentives, subsidized growth, and capital accumulation in the greater downtown. This course examines the thesis that sustainability and racism cannot coexist. Sustainability is rooted in inclusive social wellbeing, while racism is rooted in hoarding power and resources. Detroit serves as an example of how racist public policy leads to depopulation, blight, abandonment, and concentrated risks that cannot be fixed through neoliberal redevelopment strategies. We will explore grassroots efforts, community development, and alternative approaches to restructuring local economies. Students will learn advocacy, management, and political tools and strategies for pursuing sustainability in a place fraught with racism, including community organizing, coalition building, stakeholder engagement, resident-driven planning, community benefits agreements, and models for alternative economic development.

### **SUMA PS5525 Consumerism and Sustainability**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management** /Area 5: General and Financial Management

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** In our current global political economic context, extractive resource consumption 1) drives environmental degradation and climate change and 2) shapes our livelihoods, wellbeing, daily comforts, and cultural practices. In the face of this incompatibility, many call for the need for transformative changes across economies, institutions, and cultures. This course aims to provide a broad overview of the many ways through which scholars theorize consumerism and sustainability and practitioners work toward change on the ground. Together we will review popular models of consumer behavior, explore the links between individual behavior and collective action, and examine how professionals across a diverse sample of sectors and industries integrate sustainability into their work. More importantly, this course will encourage students to think critically about consumerism and sustainability in the context of their own fields and interests. While in class lectures, discussions, and activities will provide a high-level overview of many complex and challenging issues, students will individually delve deeper into material that they find intellectually stimulating. We will unpack challenges along the way in a supportive environment, brainstorming creative solutions and learning from each other.

### **SUMA PS5888 Geographies of Environmental Justice & Sustainability**

Offered by MS in Sustainability Management Program

**Area 1: Integrative Sustainability Management** /Area 4: Public Policy

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The origin of the American Environmental Justice Movement can be traced back to the emergence of the American Civil Rights Movement of the 1960s, and more specifically to the U.S. Civil Rights Act of 1964. These historical moments set the stage for a movement that continues to grow with present challenges and widening of economic, health and environmental disparities between racial groups and socioeconomic groups. The environmental justice movement builds upon the philosophy and work of environmentalism, which focuses on humanity's adverse impact upon the environment, entailing both human and non-human existence. However, environmental justice stresses the manner in which adversely impacting the environment in turn adversely impacts the population of that environment. At the heart of the environmental justice movement are the issues of racism and socioeconomic injustice. This course will examine the intersections of race, equity, and the environment – focusing on history and the growing role and impact of the environmental justice movement in shaping new sustainability discourses, ethics, policies, and plans for the twenty-first century. Environmental Justice embeds various disciplines into its analytical framework ranging from human geography and history to urban studies, economics, sociology, environmental science, public policy, community organizing, and more. Drawing from these disciplines, as well as from recent policies, advocacy, and regulations, students will develop a deeper understanding of equity, sustainability, social impact, and environmental justice in places and spaces across the nation. Building on the broadness of environmental justice and sustainability, this course will use the geography lens and frameworks, building on the concept that geography brings together the physical and human dimensions of the world in the study of people, places, and environments. Geography will set the stage for us to explore a variety of environmental justice topics and issues in different regions across the nation, from the Black Belt South to the Rust Belt to Cancer Alley, New Orleans, and Atlanta; then back to New York City and the metropolitan area, introducing students to initiatives, policies, stakeholders, research, community groups, and advocacy involved in the development and implementation of environmental laws, policies, practices, equity-based solutions, and sustainable infrastructure. Throughout the course, we will review the impact and implications of particular policies, as well as assess case studies of particular communities. The course will also invite guest scholars currently working in the field to share their views and expertise.

### **ENVP U6320 Political Context of Environmental Management**

Offered by the School of International and Political Affairs

**Area 1: Integrative Sustainability Management**/ Area 4: Public Policy

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** Many of the decisions we make and actions we take have profound environmental effects, yet economic and political considerations often dominate decision-making in a way that fails to take into account the environmental foundation of our livelihoods. A slow, yet steady extension of environmental imperatives into previously 'non' environmental sectors such as agriculture, trade and energy production, provide some movement towards sustainability. This class explores how the political system identifies public issues as problems requiring public action, and creates and implements policy solutions. It assesses what conditions foster change by anticipating likely outcomes and effective points of intervention to achieve policy goals. It emphasizes the politics of environmental policymaking, using energy, agriculture and forestry as cases of global enterprises with local to global scales of inquiry. We will explore the tension between the market and economic models and politics and political models of policy making; interests and interest-group politics; the connections among expertise, knowledge, and policymaking; and the particular politics of policy issues that cross jurisdictional boundaries, including federalism and globalization. We will start the semester considering two contrasting theories of policy making: an economic, market-based approach with application in environmental policy issues and a political approach. The latter constitutes a critique of the economic paradigm and sets up the tension between the concerns for policy efficiency and effectiveness stemming from the economic model, and those of equity, representation, and consensus derived from the political model. Participants will develop a sense of the history of environmental activism, relevant actors in environmental politics and management, their roles, sources of power and influence, the effects of formal political processes and the sources of potential conflicts.

## 2: Economics and Quantitative Analysis (9 pts)

2 Courses in General and Sustainability Economics

1 Course in Quantitative Analysis

### A. Courses That Fulfill the Field Requirement in General and Sustainability Economics:

#### Offered by the Sustainability Management Program:

##### **SUMA PS4190 Economics for Sustainability Management**

Offered by MS in Sustainability Management Program

##### **Area 2: Economics**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course builds on core economics courses and addresses issues of environmental, resource and sustainable economics. It focuses on the interaction between markets and the environment; policy issues related to optimal extraction and pricing; property rights in industrial and developing countries and how they affect international trade in goods such as timber, wood pulp, and oil. An important goal of the class is to have students work in groups to apply economic concepts to current public policy issues having to do with urban environmental and earth systems. The use of the world's water bodies and the atmosphere as economic inputs to production are also examined. The economics of renewable resources is described and sustainable economic development models are discussed and analyzed. Some time will also be devoted to international trade and regulation, and industrial organization issues. Students not only learn economic concepts, but they will also learn how to explain them to decision-makers.

##### **SUMA PS5155 Energy Markets & Innovation**

Offered by MS in Sustainability Management Program

**Area 2: Economics / Area 3: Physical Dimensions / Area 5: General and Financial Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Existing energy sources and the infrastructures that deliver them to users around the world are undergoing a period of rapid change. Limits to growth, rapidly fluctuating raw material prices, and the emergence of new technology options all contribute to heightened risk and opportunity in the energy sector. The purpose of this course is to establish a core energy skill set for energy students and prepare them for more advanced energy courses by providing a basic language and toolset for understanding energy issues. Using theoretical and practical understanding of the process by which energy technologies are developed, financed, and deployed, this course seeks to highlight the root drivers for change in the energy industry, the technologies that are emerging, and the factors that will determine success in their commercialization. Understanding these market dynamics also informs good policy design and implementation to meet a broad range of social welfare goals. Upon completing the course, students should not only understand the nature of conventional and emerging energy generation and delivery, but also the tools for determining potential winners and losers and the innovative pathways to drive their further deployment.

##### **SUMA PS5195 Accounting, Finance, and Modeling of Sustainable Investments**

Offered by MS in Sustainability Management Program

**Area 2: Economics/ Area 5: General and Financial Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course examines traditional and emerging financial and cost accounting practices, non-financial sustainability performance metrics, their interdependencies and influence on corporate management, corporate reporting, and other systems. Students begin learning how financial performance is presented within traditional financial reports and

analyzed using benchmarks, ratios and through interconnections with real world trends. They obtain critical insights and an appreciation of how financial and non-financial accounting data and sustainability performance metrics influence shareholder and corporate management investment decisions, strategic priorities, budget allocations and capital investments.

### **SUMA PS5220 Sustainable Entrepreneurship**

Offered by MS in Sustainability Management Program

**Area 2: Economics/** Area 5: General and Financial Management

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

Entrepreneurship is all the rage in conversations on Wall Street and Main Street. Everyone and their neighbor seem to want the glitz and glamor of starting a successful company and being their own boss, but few take the plunge because of the inherent risks and tiresome challenges of developing an early-stage company. This course applies entrepreneurial thinking to different business models as seen through a social, environmental, and economic sustainability perspective. The course will explore the relationship between society's need for business development and costs to the environment. You will study ways in which sustainable entrepreneurship can significantly diminish dependency on fossil fuels and toxic substances. The course will challenge you to conceive and pitch a sustainable entrepreneurial or intrapreneurial business concept. Guest lectures, readings, case studies, activities, and group work will support the development of your entrepreneurial venture. This course is distinctive from others at Columbia in several ways. This course puts sustainability concepts to work by inspiring students to think about value creation through the lens of ecological and social stewardship; then to test market their ideas, evaluate the business landscape, and create a thoughtful business plan and execution strategy. The class is appropriate for those with an interest in the unique challenges of starting a social good or clean technology company.

### **SUMA PS5320 Sustainable Investing and Economic Growth**

**Area 2: Economic/ Quantitative Analysis/** Area 5: General and Financial Management

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The course provides a grounding in modern portfolio theory, the capital asset pricing model and the framework to evaluate hypotheses and accepted techniques in sustainable investing. We examine the financial economics foundations of modern portfolio theory and the standard factor-based return and risk attribution framework in order to provide a context for responsible investment practices in the marketplace. It examines the relationship between investment return expectations, economic growth and sustainability initiatives. The course has three related goals:

To provide a set of performance attribution tools to detect the incremental impact of sustainable investing approaches; To examine the potential and pitfalls of the standard measures of growth, risk and return; To review the links between the proper function of financial markets and the sources of economic growth.

This course will primarily focus on tying ESG performance evaluation to investment management practices based on the standard empirical finance research and on connecting investment choices with macro-outcomes.

### **SUMA PS5445 Impact Finance For Sustainability Practitioners**

Offered by the MS in Sustainability Management Program

**Area 2: Economics/** Area 5: General and Financial Management

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This survey course examines a range of sustainable and impact investing fixed income and equity products before transitioning to the asset owner perspective on sustainable and impact investing. Each class session includes elements of financial analysis, financial structure, social or environmental impact, and policy and regulatory context. Brief guest lectures, podcasts, and three experiential exercises bring these topics to life. At the end of the course, each student will be able to (i) construct a diversified portfolio of impact investments based on the range of products tackled in class, (ii) integrate ESG into debt and equity valuation, (iii) develop an impact investing product that an asset manager or investment bank could launch, (iv) develop an impact investing strategy for an asset owner, and (v) lead either

side of the investor-corporate dialogue on sustainability. The lectures are designed to prepare students for both the impact investing product development exercise and the impact investing asset owner strategy exercise, and these two exercises are designed to prepare students for impact investing leadership over the course of their careers. As an early innovator in social finance, dating back 24 years, the instructor provides students with a practical toolkit, honed by making mainstream financial institutions and products more beneficial to a broader range of stakeholders and making specialist impact investment firms more relevant to and integrated with mainstream markets. The course has no prerequisites; however, an understanding of finance and completing the SUMA Foundations Module will be useful background. Homework assignment 0 is a mandatory review of introductory finance. This course satisfies the M.S. in Sustainability Management program's Area 5: General and Financial Management requirement.

### **SUMA PS5650 Solar Project Development**

Offered by the MS in Sustainability Management Program

**Area 2: Economics/ Area 5: General and Financial Management**

**Points: 3**

**Instructor:** see above

**Day/Time:** see above

**Course Description:** At the end of this course, students will be prepared to fully evaluate the technical and financial aspects of a solar project. They will be equipped with skills allowing them to either develop or rigorously vet solar project proposals. The course introduces and provides students with a holistic understanding of the end-to-end solar development process. The course has two goals: A) To provide students a deep understanding of the dozens of critical interrelated steps critical to developing a successful operating solar project. B) To equip the students with the tools and understanding of the skills necessary to develop a solar project beginning with site selection encompassing the entire process to commissioning and operations. We begin the course providing the students with an understanding of the different segments of the solar industry; covering the upstream business, the main players both upstream and downstream and then outlining the different downstream markets: utility, commercial, and residential. We will then hone in on the distributed generation segment of the market; commercial, and residential. To begin, we will cover the critical value drivers of solar: sunlight resource, grid energy cost, tax credits, state and utility incentives including renewable energy credit markets. Energy consumption and production, despite what critics will say about renewables, is the main value driver of the move to renewables. In that light, we will cover in detail, net metering, national and local electricity markets, and electric utility tariff structure to understand how value is generated and measured. We will conduct energy consumption analysis for different end-users to see how solar can and will be deployed and valued across different geographic and utility tariff classes.

### **SUMA PS5710 Electrification and Decarbonization: Regulatory Approaches and Strategies**

Offered by the MS in Sustainability Management Program

**Area 2: Economics**

**Points: 3**

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Electricity is the lifeblood of human society. Decarbonization of global economies through electrification is seen as the most viable path for reducing GHG emissions and addressing the worst effects of climate change. Though generally accepted as the best path forward, an understanding of the operational parameters of the electric system is essential to understanding both the benefits and limitations of current and future actions. This includes the highly visible investments in renewable energy generation, less visible but equally important investments in transmission and distribution infrastructure, and the largely personal, private choices of individual households and businesses.

## **B. Courses That Fulfill the Field Requirement in Statistics/Quantitative Analysis**

### **SUMA PS5021 Theory and Practice of Life Cycle Assessment**

Offered by the MS in Sustainability Management Program

**Area 2: Quantitative Analysis/ Area 3: Physical Dimensions**

**Points: 3**

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Life Cycle Assessment (LCA), a methodology to assess the environmental impact of products, services, and industrial processes is an increasingly important tool in corporate sustainability management. This course teaches both the theoretical framework as well as step-by-step practical guidelines of conducting LCAs in companies and organizations. Particular emphasis is placed on separating the more academic, but less practically relevant aspects of LCA (which will receive less focus) from the actual practical challenges of LCA (which will be covered in detail, including case studies). The course also covers the application of LCA metrics in a companies' management and discusses the methodological weaknesses that make such application difficult, including how these can be overcome. Product carbon footprinting (as one form of LCA) receives particular focus, owing to its widespread practical use in recent and future sustainability management.

### **SUMA PS5033 Decision Models and Management**

Offered by the MS in Sustainability Management Program

**Area 2: Quantitative Analysis/ Area 5: General and Financial Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course provides an introduction to computer-based models for decision-making. The emphasis is on models that are widely used in diverse industries and functional areas, including finance, accounting, operations, and marketing. Applications will include advertising planning, revenue management, asset-liability management, environmental policy modeling, portfolio optimization, and corporate risk management, among others. The applicability and usage of computer-based models have increased dramatically in recent years, due to the extraordinary improvements in computer, information and communication technologies, including not just hardware but also model-solution techniques and user interfaces. Twenty years ago working with a model meant using an expensive mainframe computer, learning a complex programming language, and struggling to compile data by hand; the entire process was clearly marked "experts only." The rise of personal computers, friendly interfaces (such as spreadsheets), and large databases has made modeling far more accessible to managers. Information has come to be recognized as a critical resource, and models play a key role in deploying this resource, in organizing and structuring information so that it can be used productively.

### **SUMA PS5035 Greenhouse Gas (GHG) Emissions: Measuring and Minimizing the Carbon Footprint**

Offered by the MS in Sustainability Management Program

**Area 2: Quantitative Analysis/ Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course provides students with the knowledge and skills to account for and manage greenhouse gas (GHG) emissions, which contribute to global climate change. The course will address the importance of using estimation techniques to create GHG emissions inventories for organizations as well as for economic activities, such as transportation. The course will provide students an understanding of the protocols that govern the practice of carbon accounting, and the standards by which GHG emissions inventories are verified and disclosed to the public. Moreover, the course will help students understand how to use carbon accounting as the basis for developing and prioritizing emissions reduction strategies for the purpose of mitigating climate change risks.

### **SUMA PS5135 Analysis for Energy Efficiency**

Offered by MS in Sustainability Management Program

**Area 2: Quantitative Analysis / Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course will provide real-world information on energy management issues from a practitioner's perspective. Through lectures, problem sets, and readings students will learn how to manage energy audits, analyze building energy performance, and evaluate the energy use and financial impacts of potential capital and operations improvements to building systems. The class will focus on understanding energy issues from a building owner's perspective, with discussions also examining energy issues from the perspective of utility companies, energy generators, and policy makers.

Best practice in energy management will always involve some level of complex engineering to survey existing conditions and predict energy savings from various improvement options. Sustainability managers need to understand how to manage and quality control these analyses and to translate to decision makers the opportunity they reveal. This course seeks to empower students to do that by providing an understanding of building systems and methods for quantitatively analyzing the potential benefit of various energy improvements.

### **SUMA PS5168 Sustainability Metrics**

Offered by the MS in Sustainability Management Program

**Area 2: Quantitative Analysis/** Area 4: Public Policy

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Over the past two decades, public and private institutions have set clear targets for environmental, economic, and social performance and they are increasingly using analytical tools to assess problems and measure progress. The advent of “Big Data” has accelerated this work – and opened up new possibilities and challenges. This course will examine the use of data and metrics to shape and implement sustainability policies and programs, and to assess and communicate their outcomes. The course will survey a range of real world sustainability challenges and evaluate the choices confronting public officials, private companies, NGO’s, advocates, and citizens – and the data that can be used to diagnose problems, develop solutions, and measure success. Particular focus will be given to urban sustainability efforts and corporate sustainability. We will explore how data can be used and misused in each of these domains. Throughout we will emphasize the importance of context, comparability, and completeness of information. Students will be required to critically evaluate what they read and hear. In addition, the course will give students an opportunity to learn how to express their ideas verbally and in written form and conduct critical analysis of how environmental data is used to develop and implement public policy. Assignments will give students the opportunity to use their technical and analytical skills while understanding the real world applications that will be important to their future work as planners, policymakers, advocates, architects, environmentalists or other professions. The course will feature guest lectures from speakers who are leaders in their fields. Lecture topics may be moved to accommodate speaker travel and availability. Notice will be provided to students in advance of any schedule changes. This course satisfies the M.S. in Sustainability Management's quantitative analysis requirement.

### **SUMA PS5193 Core Data Science Concepts for Sustainable Finance**

Offered by the MS in Sustainability Management Program

**Area 2: Quantitative Analysis**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The course introduces practitioners of sustainability management to the data analysis techniques and statistical methods which are indispensable to their work. The class teaches how to build statistical substantiation and to critically evaluate it in the context of sustainability problems. The statistics topics and examples have been chosen for their special relevance to sustainability problems, including applications in environmental monitoring, impact assessment, and econometric analyses of sustainable development. Students are assumed to have had no previous exposure to statistics. This course demonstrates how to conduct a quantitative analysis of an organization’s work processes and operations, resource utilization, and environmental impact necessary to create a rationale for implementing sustainability initiatives. Statistical topics, including probability and random variables, will be discussed in both theory and in their practical applications for sustainability managers. This course will provide students with the skills to conduct regression analysis, to conduct hypothesis and estimation testing, to design surveys, and to prepare statistics packages. These quantitative skills are necessary for a professional manager responsible for the management of people, finances and operations toward sustainability goals.

### **SUMA PS5255 Data Analysis & Visualization in Sustainability**

Offered by MS in Sustainability Management Program

**Area 2: Quantitative Analysis/** Area 3: Physical Dimensions

**Points:** 3

**Instructor:** see above



**Day/Time:** see above

**Course Description:** Data science is an exciting new field of applied research that takes advantage of the ever-growing volume of data being collected to support decision-making in both the public and private sectors. Similar to traditional statistical analysis, these new approaches have limits and issues that are important to understand before application to problem solving. This course aims to introduce the common methods used in data science, best practices in data management, and the basic scripting skills required to start analyzing data in R and Python. After introducing foundational scripting and data analysis methods, a case study approach will be used to highlight both what can be accomplished with data analysis and the limits of the data and methods used. Lab exercises will teach basic skills in scripting in Python and R and then move to a common approach for data analysis: adapting existing scripts and software libraries to solve applied data problems. The requirement to understand the interaction of social and natural systems requires data-driven policy decisions, and the ongoing assessment of policies requires rigorous, reproducible assessments of effectiveness for promoting sustainability. Both requirements can be met in part by data science approaches that are applicable to the natural and social sciences and reproducible in academic and applied settings. Data science techniques have been developed to derive insight from large volumes of available data that are often collected for purposes other than the interests of the data scientist. This flexibility in approach means that the techniques used in data science are well adapted to support gaining insights from data relevant for sustainability science. This course has been designed to introduce these techniques in anticipation of increased use in promoting sustainability. The course has no prerequisites; however, an understanding of statistics and probability will be a very useful background, and any previous programming or scripting skills will be applicable to the lab assignments.

#### **SUMA PS6132 Climate Risk & Scenario Analysis**

**Area 2: Economics/Area 2: Quantitative Analysis / Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

The course provides an overview of the scenario analysis and climate risk modeling process for corporate issuers and government entities. There is a brief introduction to the climate models utilized by the IPCC, both global and regional. There is a description of the scenario generation and analysis process, with linkages to benchmark scenarios outlined by international bodies. This is followed by a review of the linkages between climate models and socio-economic variables in the form of integrated assessment models, Ricardian models and economic input-output analysis. There is one module on the information systems needed to ensure good adaptation and a review of best practices and guidelines for climate risk management strategies. Integrated examples of climate risk and opportunities for specific issuers are discussed in the last 2 classes. The problem sets and exercises are designed to provide practice in applying high-level guidelines and climate damage relationships to the strategies and operations of specific countries, industries and companies.

### **C. Courses That Fulfill the Both Field Requirement in General and Sustainability Economics Statistics/Quantitative Analysis**

#### **SUMA PS5020 Cost-Benefit Analysis**

Offered by MS in Sustainability Management Program

**Area 2: Economics/Area 2: Quantitative Analysis**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course is about cost-benefit analysis and the economic evaluations of policies and projects. Cost benefit analysis (CBA) consists of a comprehensive set of techniques used to evaluate government programs. It is now routinely applied in such program areas as transportation, water projects, health, training and education, criminal justice, environmental protection, urban policy and even in the international arena such as foreign direct investment. Many of the techniques of CBA can also be applied to private sector decision-making. The objective of CBA is to determine whether the benefits of a particular program, policy or decision outweigh its costs. The techniques used to determine this are sometimes quite simple, but on other, increasingly frequent occasions are highly sophisticated. Sophisticated cost benefit studies are

based on a framework that utilizes the basic concepts of economic theory. In addition, statistical and econometric analyses are often needed to estimate program effects from diverse available data. The course has two parts: methodology and practice. The goal is for students to be practically adept to undertake an independent cost-benefit analysis.

### **SUMA PS5320 Sustainable Investing & Economic Growth**

Offered by MS in Sustainability Management Program

**Area 2: Economics/Area 2: Quantitative Analysis / Area 5: General and Financial Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The course provides a grounding in modern portfolio theory, the capital asset pricing model and the framework to evaluate hypotheses and accepted techniques in sustainable investing. We examine the financial economics foundations of modern portfolio theory and the standard factor-based return and risk attribution framework in order to provide a context for responsible investment practices in the marketplace. It examines the relationship between investment return expectations, economic growth and sustainability initiatives.

### **SUMA PS6132 Climate Risk and Scenario Analysis**

Offered by MS in Sustainability Management Program

**Area 2: Economics/Area 2: Quantitative Analysis / Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The course provides an overview of the scenario analysis and climate risk modeling process for corporate issuers and government entities. There is a brief introduction to the climate models utilized by the IPCC, both global and regional. There is a description of the scenario generation and analysis process, with linkages to benchmark scenarios outlined by international bodies. This is followed by a review of the linkages between climate models and socio-economic variables in the form of integrated assessment models, Ricardian models and economic input-output analysis. There is one module on the information systems needed to ensure good adaptation and a review of best practices and guidelines for climate risk management strategies. Integrated examples of climate risk and opportunities for specific issuers are discussed in the last 2 classes. The problem sets and exercises are designed to provide practice in applying high-level guidelines and climate damage relationships to the strategies and operations of specific countries, industries and companies.

### **ECON GU4251 Industrial Organization**

Offered through Economics, Graduate School of Arts and Sciences

Area 2: Economics

**Points:** 3

**Instructor:** TBD

**Dates and Times:**

**Course Description:** Prerequisites: ECON UN3211 and ECON UN3213 The study of industrial behavior based on game-theoretic oligopoly models. Topics include pricing models, strategic aspects of business practice, vertical integration, and technological innovation.

### **ECON GU4370 Political Economy**

Offered through Economics, Graduate School of Arts and Sciences

**Area 2: Economics**

**Points:** 3

**Instructor:**

**Dates and Times:**

**Course Description:** Prerequisites: ECON UN3211 and ECON UN3213 and STAT UN1201 or POLS 4710 for those who declared prior to Spring 2014. The course studies the interaction between government and markets. The first part discusses market failures and the scope and limits of government intervention, including the use of modified market-type tools (for example, cap-and-trade regulations for pollution). The second part discusses collective decision-making, in particular voting

and its properties and pathologies. The final part discusses economic inequality and the government's role in addressing it.

## QUANTITATIVE

### **EAAE E4001 Industrial Ecology of Earth Resources**

Offered through Earth and Environmental Engineering, The Fu Foundation School of Engineering and Applied Science

**Area 2: Quantitative Analysis/** Area 3: Physical Dimensions

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** Industrial ecology examines how to reconfigure industrial activities so as to minimize the adverse environmental and material resource effects on the planet. Engineering applications of methodology of industrial ecology in the analysis of current processes and products and the selection or design of environmentally superior alternatives. Home assignments of illustrative quantitative problems.

### **STAT GU4204 Statistical Inference**

Offered by the Graduate School of Arts and Sciences

**Area 2: Quantitative Analysis**

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** Prerequisites: STAT GU4203. At least one semester of calculus is required; two or three semesters are strongly recommended. Calculus-based introduction to the theory of statistics. Useful distributions, law of large numbers and central limit theorem, point estimation, hypothesis testing, confidence intervals maximum likelihood, likelihood ratio tests, nonparametric procedures, theory of least squares and analysis of variance.

### **STAT GU4261 Statistical Methods in Finance**

Offered by the Graduate School of Arts and Sciences

**Area 2: Quantitative Analysis**

**Points:** 3

**Instructor:**

**Day/Time:**

**Course description:** Prerequisites: STAT GU4205 or the equivalent. A fast-paced introduction to statistical methods used in quantitative finance. Financial applications and statistical methodologies are intertwined in all lectures. Topics include regression analysis and applications to the Capital Asset Pricing Model and multifactor pricing models, principal components and multivariate analysis, smoothing techniques and estimation of yield curves statistical methods for financial time series, value at risk, term structure models and fixed income research, and estimation and modeling of volatilities. Hands-on experience with financial data.

## **3: The Physical Dimensions of Sustainability Management (9 pts.)**

*0, 1 or 2 Courses in Earth and Environmental Engineering*

*0, 1 or 2 Courses in Environmental Planning, Design, or Architecture*

*0, 1 or 2 Courses in Ecology or Earth and Environmental Sciences*

### **A. Courses That Fulfill the Field Requirement in Earth and Environmental Engineering**

**Offered by the Sustainability Management program:**

**SUMA PS4147 Water Resources and Climate**

**Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course will cover the science needed to understand hydrology, the link between hydrology and climate, and why climate change will affect the hydrologic cycle. It will then look at what changes have occurred in the past, and what changes are projected for the future and how these changes may affect other sectors, such as agriculture. The final module of the course will look at adaptation measures to adapt to climate change. The course will be formatted to be a mixture of lectures and seminars, with the lecture portion used to introduce scientific concepts and the seminar portion to discuss and evaluate the readings assigned. At the end of this course, students will the hydrologic cycle and its connection to climate, how changes in climate have affected/will affect how much water is available on land, how water impacts ecosystem services, and how to diagnose the cause of a climate-related water problem and develop solutions to address it.

### **SUMA PS4235 The Science of Urban Ecology**

#### **Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Urban ecology is the study of both the interactions between organisms in an urban environment and the organisms' interactions with that environment. This course facilitates learning about 1) basic principles related to ecological interactions of life on Earth, 2) the causes and consequences of biological patterns and processes in urban environments, and 3) how ecology can inform land use decisions and applied management strategies of natural resources (e.g. water, air, biodiversity), particularly in urban environments. This course aims to provide students with an understanding of the ways in which ecological perspectives can contribute to an interdisciplinary approach to solving environmental problems facing human society. Towards that end, this course covers topics ranging from applied ecology and conservation biology to sustainable development. It uses a cross-disciplinary approach to understand the nature of ecology and biological conservation, as well as the social, philosophical and economic dimensions of land use strategies. Although in some ways cities may seem to be isolated from what we would otherwise call "nature," they are not, and this is a major theme of this course. This course includes discussion of biodiversity, ecosystem function, evolutionary processes, nutrient cycling, and natural resource availability in cities. Students will acquire an understanding of the ecology of human-dominated landscapes, the theory and study of urban ecology, and the application of ecological principles to building sustainable urban communities. Students will also explore timely and important urban ecology issues including ecological restoration, invasive species, and biodiversity conservation.

### **SUMA PS4236 Reversing the Biodiversity Crisis**

#### **Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Often described as "twin crises," climate change and biodiversity loss are among the most urgent sustainability challenges to be addressed in our modern era. While much focus has rightfully been placed on climate change mitigation actions at local, regional, and global scales, biodiversity loss is less often addressed by governments, institutions, industries, and individuals as a critical piece of the sustainability puzzle. In 2021, COP 15, the fifteenth meeting of the Conference of the Parties to the UN Convention on Biological Diversity, received far less media attention than COP 26, the Conference of the Parties to the UN Convention on Climate Change. Yet climate change and biodiversity loss are inextricably linked, and without biodiversity and the associated ecosystem services and biospheric resilience upon which human society relies, a sustainable world is not possible. Moreover, certain climate change mitigation actions can actually be to the detriment of biological diversity. Unlike a traditional conservation biology course geared towards ecologists and biologists, this course will be taught through the lens of sustainability management, equipping sustainability managers with the knowledge and direction needed to begin integrating biodiversity conservation and restoration into their professions. This course will illuminate the critical importance of biodiversity to sustainability and human well-being, the science and politics behind the current biodiversity crisis, and proposals, policies, and actions for bending the curve of biodiversity loss to create more sustainable and equitable outcomes for both humans and the non-humans with which we share our planet.

## **SUMA PS4238 Biodiversity, Climate Change and Sustainable Management of Natural Ecosystems**

### **Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Biodiversity, a term popularized in the 1980s, refers to the variety of life at the genetic, species, and ecosystem levels. It is crucial for sustainability, as it supports ecosystems that underpin human life, economic activities, and ecological stability. The loss of biodiversity threatens essential ecosystem services like clean air, water filtration, climate regulation, and food security. This course explores how climate change, both current and projected, impacts biodiversity and how natural ecosystems influence greenhouse gas concentrations. Human survival depends on these ecosystems, yet there is uncertainty about how much biodiversity loss can be tolerated. Climate change now poses as serious a threat to biodiversity as direct development activities. Understanding the science behind these threats is essential for sustainability students, and this course aims to provide that knowledge.

## **SUMA PS5140 Sustainability Science**

### **Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Achieving sustainability requires an understanding of the capacities and dynamics of ecosystems, including their long-term ability to produce resources and to assimilate waste. Students will learn not only the fundamentals of ecology and environmental science, but also how to reconcile the disconnect between human actions and ecological consequences – as well as why managers should care. We will explore the science behind current issues in biodiversity, energy, agriculture, equity, freshwater use, marine conservation, and climate change. This is a lecture-based elective that fulfills Area 3 (Physical Dimensions of Sustainability). No previous science knowledge is required. The course is in person and full semester. Space permitting, cross-registrants from other graduate programs are welcome.

## **SUMA PS5230 Earth Climate System**

Offered by MS in Sustainability Management Program

### **Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This class provides a broad, quantitative introduction to the science underlying our understanding of the Earth's climate system. Students will first learn the basic, fundamental concepts of energy transfer, the greenhouse effect, and general circulation in the climate system. We will then build on these ideas to explore more specialized topics, including climate variability now and in the past, the signs of climate change, climate models, extreme events, and projections of future climate. Lectures and slides will draw from the scientific literature, as well as the latest IPCC Assessment Report (AR6). By the end, students will have a working knowledge of the climate system, giving them the knowledge and skills to evaluate statements and claims in the media and from their peers. Limited math (basic algebra) will be necessary for some of the assignments. All lectures will be recorded, and all slide decks will be uploaded to Courseworks after class.

## **SUMA PS5245 Smart Agriculture for a Changing Climate**

Offered by MS in Sustainability Management Program

### **Area 3: Physical Dimensions / Area 5: General and Financial Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Agriculture is highly dependent on stable climate conditions to produce the world's food with sufficient nutritional quality at an affordable cost. Climate change is threatening the breadbaskets of the world with shifting rainfall, pests, and weather patterns. Farmers face enormous challenges in adapting to this volatility that is affecting their livelihoods and communities locally, and threatens the global food systems stability. Adaptation to these changes has become a high

priority for policy makers, corporations, and investors around the world. Climate smart agriculture presents solutions to the existential threat to the global food supply by utilizing a range of tech enabled methods for producing more food with less resources. The challenge is daunting because there is no “one size fits all” solution. Instead, localized solutions that meet the social, environmental, and economic realities of farmers need to be developed, accelerated, and implemented.

**SUMA PS5210 Solid Waste Management**

Offered by MS in Sustainability Management Program

**Area 3: Physical Dimensions / Area 5: General and Financial Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The main topics covered in this course include generation of solid waste in municipal, commercial and industrial sectors with proper identification and characterization of various waste streams involved with emphasis on waste prevention in terms of mass, volume and toxicity at the source, along the processing phase and at the disposal facility, as well as waste minimization by waste reuse and recycling in major commercial and industrial sectors (such as paper, glass, plastics, metals, wood, tire, electronics and construction/demolition wastes) including analysis of state-of-art technologies. In addition, various collection and transport methods are covered along with all typical disposal methods, including incineration, sanitary landfill, composting, recovery and reutilization. Economic evaluations of factors affecting selection of disposal methods and its impact of reuse/recycling along with all applicable local, state and national legislative trends and regulatory requirements.

**SUMA PS6140 Applied Energy Methods in Affordable Housing Development**

Offered by MS in Sustainability Management Program

**Area 3: Physical Dimensions / Area 4: Public Policy**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course looks at legal definitions of “low-income” and “disadvantaged community” codified in federal and state statutes to frame discussions on energy insecurity and resiliency risks. Using these guiding points, a cross-disciplinary approach is followed to explore how the construction of energy efficient and resilient buildings contribute to their affordability in operations and maintenance. The course primarily focuses on creating sustainable and affordable multifamily housing, a building type unique to urban areas located in the US Northeast. However, in view of recommended strategies to meet carbon reduction goals, such as building electrification, the parameters of the course are expanded to highlight best practices in equitable policy-making around the design of utility rates and rules for low-income electric customers.

**Offered by other departments:**

**EAAE E4001 Industrial Ecology of Earth Resources**

Offered through Earth and Environmental Engineering, The Fu Foundation School of Engineering and Applied Science

**Area 3: Physical Dimensions/ Area 2: Quantitative Analysis**

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** Industrial ecology examines how to reconfigure industrial activities so as to minimize the adverse environmental and material resource effects on the planet. Engineering applications of methodology of industrial ecology in the analysis of current processes and products and the selection or design of environmentally superior alternatives. Home assignments of illustrative quantitative problems.

**EAAE E4350 Planning/Management-Urban Hydrologic System**

Offered through Earth and Environmental Engineering, The Fu Foundation School of Engineering and Applied Science

**Area 3: Physical Dimensions**

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** Prerequisites: ENME E3161 or the equivalent. Introduction to runoff and drainage systems in an urban setting, including hydrologic and hydraulic analyses, flow and water quality monitoring, common regulatory issues, and mathematical modeling. Applications to problems of climate variation, land use changes, infrastructure operation and receiving water quality, developed using statistical packages, public-domain models, and Geographical Information Systems (GIS). Team projects that can lead to publication quality analyses in relevant fields of interest. Emphasis on the unique technical, regulatory, fiscal, policy, and other interdisciplinary issues that pose a challenge to effective planning and management of urban hydrologic systems.

### **EAAE E4550 Catalysis of Emissions Control**

Offered through Earth and Environmental Engineering, The Fu Foundation School of Engineering and Applied Science

**Area 3: Physical Dimensions**

**Points: 3**

**Instructor:**

**Day/Time:**

**Course Description:** Prerequisites, ENME E3161 and MSAE E3111 or the equivalent. Fundamentals of heterogeneous catalysis including modern catalytic preparation techniques. Analysis and design of catalytic emissions control systems. Introduction to current industrial catalytic solutions for controlling gaseous emissions. Introduction to future catalytically enabled control technologies.

## **B. Courses That Fulfill the Field Requirement in Environmental Planning, Design, or Architecture**

### **Offered by other departments:**

#### **CNAD PS5130 Green Building and Sustainability: Tools and Technology**

Offered by the School of Professional Studies

**Area 3: Physical Dimensions**

**Points: 3**

**Day/Time:**

**Instructor:**

**Course description:** This course is designed to provide a comprehensive overview of key concepts and approaches in green building and sustainability. Specific material will include best practices and trends in design, construction, and business; analysis tools; green building rating systems (with an emphasis on LEED and the Living Building Challenge); the paradigm of sustainable thinking; and applying sustainability in the real (working) world. The course will also provide a preparatory platform for individuals looking to take the LEED Green Associate exam (a precursor to the LEED AP). The course format is designed to support practical understanding, and will include presentations, discussions, guest lecturers, site visits, and a semester-long group project to apply the concepts as they are discussed. Students will be provided with resources and tools to facilitate self-directed exploration of the topics, and a forum to develop and communicate findings and considerations.

#### **INAF U6086 Green Buildings: Policies and Strategies for Success**

Offered by the School of International and Public Affairs

**Area 3: Physical Dimensions**

**Points: 3**

**Day/Time:**

**Instructor:**

**Description:** The construction and operation of buildings is the most environmentally damaging of all human activities in the United States and possibly the world. Coined in the late 80's, so-called "green buildings" have the potential to largely eliminate negative environmental externalities and, with emerging design practices and technologies, even prove to be a restorative force for nature. As the largest consumer of energy on the planet, climate change will not be solvable without full-scale implementation of green building programs and policies. This 14-week course will offer participants practical tools

to understand the benefits of green buildings and the barriers and policy and programmatic prescriptions that can deliver this vital solution at the necessary scale, scope and speed to implement 21c sustainable solutions.

### **C. Courses That Fulfill the Field Requirement in Ecology or Earth and Environmental Sciences**

#### **Offered by the Sustainability Management program:**

##### **SUMA PS5230 Earth's Climate System**

Offered by the MS in Sustainability Management Program

##### **Area 3: Physical Dimensions**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course examines the fundamental physical processes that control the primary features and patterns of variability of the Earth's climate system. Specific topics include energy balance and the greenhouse effect, the circulation of the oceans and atmosphere, land surface interactions and feedbacks, the role of the biosphere and cryosphere, paleoclimatology, climate modeling, and global and regional patterns of climate variability and change observed and expected as a consequence of anthropogenic influences. The goal of the course is to provide students with the opportunity to gain a fundamental understanding of the processes that give rise to observed climate variability at a range of temporal and spatial scales. Students will develop quantitative skills and knowledge to allow them to independently evaluate scientific claims about the state and behavior of Earth's climate system in the past, present and future. The course includes case study modules that integrate an understanding of the physical processes and important feedback in the context of policy- and management-relevant aspects of current and future climate change.

#### **Offered by other departments:**

##### **EAAE E4550 Catalysis of Emissions Control**

Offered through Earth and Environmental Engineering, The Fu Foundation School of Engineering and Applied Science

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** Prerequisites: One year of general college chemistry. Fundamentals of heterogeneous catalysis including modern catalytic preparation techniques. Analysis and design of catalytic emissions control systems. Introduction to current industrial catalytic solutions for controlling gaseous emissions. Introduction to future catalytically enabled control technologies.

##### **EESC GU4008 Introduction to Atmospheric Science**

Offered through Earth and Environmental Sciences, Graduate School of Arts and Sciences

**Points:** 3

**Instructor:**

**Day/Time:** **Course Description:** Prerequisites: advanced calculus and general physics, or the instructor's permission. Basic physical processes controlling atmospheric structure: thermodynamics; radiation physics and radiative transfer; principles of atmospheric dynamics; cloud processes; applications to Earth's atmospheric general circulation, climatic variations, and the atmospheres of the other planets.

##### **EESC GU4050 Global Assessment and Remote Sensing**

Offered through Earth and Environmental Sciences, Graduate School of Arts and Sciences

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** Priority given to graduate students in the natural sciences and engineering. Advanced level undergraduates may be admitted with the instructor's permission. Calculus I and Physics I & II are required for undergraduates who wish to take this course. General introduction to fundamentals of remote sensing; electromagnetic



radiation, sensors, interpretation, quantitative image analysis and modeling. Example applications in the Earth and environmental sciences are explored through the analysis of remote sensing imagery in a state-of-the-art visualization laboratory.

#### **EESC GU4925 Introduction to Physical Oceanography**

Offered through Earth and Environmental Sciences, Graduate School of Arts and Sciences

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** Prerequisites: Recommended preparation: a solid background in mathematics, physics, and chemistry. Physical properties of seawater, water masses and their distribution, sea-air interaction influence on the ocean structure, basic ocean circulation pattern, relation of diffusion and advection with respect to distribution of ocean properties, ocean tides and waves, turbulence, and introduction to ocean dynamics.

### **4: The Public Policy Environment of Sustainability Management (3 pts.)**

*1 Course in Environmental or Sustainability Policy or Law*

#### **Courses offered by the Sustainability Management Program:**

#### **SUMA PS5301 International Environmental Law**

**Area 4: Public Policy**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** International Environmental Law is a fascinating field that allows students to consider some of the most important questions of the 21st century –questions that have profound ramifications for the quality of life for our generation as well as future generations. Global environmental problems are real and urgent. Their resolution requires creative and responsible thought and action from many different disciplines. Sustainability practitioners must understand global environmental issues and their effects on what they are charged to do. At one level, this course will consider the massive challenge of the 21st century: how to alleviate poverty on a global scale and maintain a high quality of life while staying within the bounds of an ecologically limited and fragile biosphere --the essence of sustainable development. From a more practical perspective, the course will provide students with an understanding of international environmental policy design and the resulting body of law in order to strengthen their ability to understand, interpret, and react to future developments in the sustainability management arena.

#### **SUMA PS5720 Policy and Legal Context of Sustainability Management**

Offered by the MS in Sustainability Management Program

**Area 4: Public Policy**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Public policy shapes how the man-made and natural environments are managed and regulated. Sustainability practitioners must be able to understand public policy and its effects on what they are charged to do. This course will provide students with an understanding of environmental sustainability policy and the resulting law and regulations in order to strengthen their ability to understand, interpret, and react to future developments.

#### **SUMA PS6120 Equity, Policy & Sustainability**

Offered by the MS in Sustainability Management Program

**Area 4: Public Policy**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course will serve as an introduction to equity in sustainability policy: We will survey federal, state, and local policies and proposals to understand how we use policy to enhance urban resilience, mitigate environmental impacts, and also promote social and economic justice. Using an interdisciplinary approach that draws from economics, sociology, urban studies, critical theory, and more, students will develop their capacities to read and interpret policy, enhance their understanding of current policy frameworks, and strengthen their ability to engage with emerging policy developments.

#### **SUMA PS5725 Business and Climate Change: Law, Policy, and Practice**

Offered by the MS in Sustainability Management Program

##### **Area 4: Public Policy**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course will provide students with an understanding of the ways and extent to which climate change law and policy is relevant to businesses, as well as the role of sustainability professionals in practical implementation. The course is divided into several core topics, including: (i) an overview of international and U.S. climate change policy and law, including the Paris Agreement, the Inflation Reduction Act and energy transition policy support, and human rights/environmental justice; (ii) market-led, voluntary initiatives such as the Task Force on Climate-related Financial Disclosures (TCFD), and related developments including the mainstreaming of ESG investing, sustainable finance, and the proliferation of corporate net zero goals; (iii) corporate governance, shareholder activism, and the emergence of mandatory regulation on climate disclosures, such as the E.U.'s Taxonomy Regulation and the U.S. Securities & Exchange Commission's proposed climate disclosure rule; (iv) carbon pricing, carbon markets, and "offsets"; (v) greenhouse gas emissions accounting and data challenges; and (vi) climate-related litigation and enforcement actions against corporations and financial institutions in the U.S. and other key markets, including "greenwashing" litigation and "anti- energy company boycott" investigations by several U.S. states.

#### **Offered by other departments:**

#### **ENVP U6320 Political Context of Environmental Management**

Offered by the School of International and Political Affairs

**Area 4: Public Policy/ Area 1: Integrative Sustainability Management**

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** Many of the decisions we make and actions we take have profound environmental effects, yet economic and political considerations often dominate decision-making in a way that fails to take into account the environmental foundation of our livelihoods. A slow, yet steady extension of environmental imperatives into previously 'non' environmental sectors such as agriculture, trade and energy production, provide some movement towards sustainability. This class explores how the political system identifies public issues as problems requiring public action, and creates and implements policy solutions. It assesses what conditions foster change by anticipating likely outcomes and effective points of intervention to achieve policy goals. It emphasizes the politics of environmental policymaking, using energy, agriculture and forestry as cases of global enterprises with local to global scales of inquiry. We will explore the tension between the market and economic models and politics and political models of policy making; interests and interest-group politics; the connections among expertise, knowledge, and policymaking; and the particular politics of policy issues that cross jurisdictional boundaries, including federalism and globalization. We will start the semester considering two contrasting theories of policy making: an economic, market-based approach with application in environmental policy issues and a political approach. The latter constitutes a critique of the economic paradigm and sets up the tension between the concerns for policy efficiency and effectiveness stemming from the economic model, and those of equity, representation, and consensus derived from the political model. Participants will develop a sense of the history of environmental activism, relevant actors in environmental politics and management, their roles, sources of power and influence, the effects of formal political processes and the sources of potential conflicts.

**INAF U4409 Political, Social & Economic Development in Brazil**

Offered by the School of International and Public Affairs

**Area 4: Public Policy**

**Points:** 1.5

**Instructor:**

**Day/Time:**

**Course Description:** This course is a practicum, which has been designed to enable you to discuss major problems of contemporary Brazil with important political figures, business representatives, activists and analysts. Normally the guest speaker will make an opening statement of approximately 40 minutes and the rest of the time will be devoted to a discussion. Guest speakers may recommend one or two articles or documents they have written, or that they think are particularly relevant, for the policy issues they will discuss.

**INAF U6087 Environmental Advocacy****Area 4: Public Policy**

Offered by the School of International and Public Affairs

**Points:** 3

**Instructors:**

**Day/Time:**

**Course Description:** Recognition, prevention and resolution of environmental problems depends on effective environmental advocacy, but what constitutes effective collective action? Advocates typically argue that they represent the collective interests of the general public and underrepresented groups, and use a variety of tactics to express themselves over a range of scales. Government regulation and environmental science also often rely upon the product of advocacy to different degrees. How much has advocacy influenced environmental policy and political and civic engagement? This class examines the role of advocacy and science inside and outside the US environmental policy-making process, and addresses different approaches to environmental advocacy from the local to the global. Using both historical and contemporary sources, the course investigates how different groups experience the natural and built worlds, the interplay of citizens and science, the treatment of science by advocates and the media, and the role of advocates of various types in legislative, administrative and judicial decision making. It also takes a comparative approach of how other political systems (e.g. China) experience and respond to environmental advocacy. Along the way, we will explore connections between environmental change and social inequality, the rise of modern environmental politics, environmentalism and nationalism, and differing visions for the future of nature.

**INAF U6802 International Law**

Offered by the School of International and Public Affairs

**Area 4: Public Policy**

**Points:** 3

**Instructor:**

**Day/Time:**

**Course Description:** This course introduces students to the basic doctrines of public international law and considers their relationship to both international relations theory and a range of problems in current international politics. The course is aiming to provide a normative framework to understand the present dimensions of international relations. Students are asked to consider the theoretical arguments, processes and frameworks that provide the structure of international law, and to analyze their practical application to world issues of current concern. A problem-oriented approach to various case studies will be used in both lectures and discussion sessions, including international trade disputes, climate change agreements, cyber attacks, military interventions and responses to human rights violations. The course will integrate methods, substance and domestic application of the international legal system.

## 5: General and Financial Management (6 pts.)

2 Courses in Public, Private or Nonprofit General or Financial Management

### ***Offered by the Sustainability Management program:***

#### **SUMA PS4310 Practicum in Innovative Sustainability Leadership**

Offered by MS in Sustainability Management Program

**Area 5: General and Financial Management/** Area 1: Integrative Sustainability Management / Area 4: Public Policy

**Points:** 1-3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course deals with a fundamental question of sustainability management: how to change organizations and more complex systems, such as communities, industries, and markets, by integrating sustainability concerns in the way that they operate. The course poses this question to a dozen leading sustainability practitioners, who answer it by discussing management strategies that they use in their own work. Through these guest lectures, extensive class discussion, readings, and writing assignments, students identify and simulate applying practical ways for transforming how organizations and complex systems work. The practitioners, who work in the public, private, and nonprofit sectors and in a wide variety of organizations, make presentations in the first hour of the course. Students then have time to ask questions and speak informally with the guest practitioners, and will participate in an instructor-led class discussion, geared toward identifying management strategies, better understanding their application, and considering their effectiveness. By the end of the course, the students gain an understanding of management tools and strategies that they, themselves, would use to integrate sustainability in organizations.

#### **SUMA PS5025 Corporate Sustainability Reporting and Strategy**

Offered by the MS in Sustainability Management Program

**Area 5: General and Financial Management/** Area 1: Integrative

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The purpose of this course is to provide an overview of trends and best practices in corporate communications relating to sustainability, with a particular focus on global sustainability reporting frameworks and green marketing communications. It is designed for those who hold/will hold positions in organizations with responsibilities for communicating the sustainability goals, challenges and achievements, as well as accurately and honestly communicating the environmental aspects of an organization's products and services. Increasingly, large corporations are creating c-suite roles or dedicated departments to oversee this function. More typically, multiple functions contribute information such as: Corporate Communications, Marketing, Community Affairs, Public Policy, Environmental Health & Safety, R&D, Facilities, Operations and Legal. Benefits of reporting range from building trust with stakeholders, and uncovering risks and opportunities; to contributing to stronger long-term business strategy, and creating new products and services.

#### **SUMA PS5040 ESG-Aligned Corporate Governance**

Offered by the MS in Sustainability Management Program

**Area 5: General and Financial Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This elective course complements management and operations courses by focusing on the perspective and roles of the board and C-suite of corporations, financial institutions and professional firms in addressing ESG risks as well as promoting and overseeing governance aligned with ESG principles. The course focuses on the interchange between the external legal, competitive, societal, environmental and policy 'ecosystems' corporations face (which vary around the world) and a company's internal structure, operations and pressures. We will use the United Nations Guiding Principles on Business and Human Rights and the UN Global Compact Principles (which incorporate all aspects of ESG) as the central frameworks to explore the concept of a corporation's responsibility to respect and remedy human rights and environmental

harms. We will also examine the Equator Principles and other frameworks that spell out good practices for project finance and other investment decisions, and reference a wide range of the myriad indices, supplier disclosure portals and benchmarks that exist in this interdisciplinary field. Relevant regulations, corporate law regimes and court cases will be discussed from the point of view of what business managers need to know. While most of the course will deal with companies and firms serving global, regional or national markets, several examples will deal with the question of how the ESG ecosystem affects or offers opportunities to start-ups.

#### **SUMA PS5445 Impact Finance For Sustainability Practitioners**

Offered by the MS in Sustainability Management Program

**Area 5: General and Financial Management/ Area 2: Economics**

**Points: 3**

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This survey course examines a range of sustainable and impact investing fixed income and equity products before transitioning to the asset owner perspective on sustainable and impact investing. Each class session includes elements of financial analysis, financial structure, social or environmental impact, and policy and regulatory context. Brief guest lectures, podcasts, and three experiential exercises bring these topics to life. At the end of the course, each student will be able to (i) construct a diversified portfolio of impact investments based on the range of products tackled in class, (ii) integrate ESG into debt and equity valuation, (iii) develop an impact investing product that an asset manager or investment bank could launch, (iv) develop an impact investing strategy for an asset owner, and (v) lead either side of the investor-corporate dialogue on sustainability. The lectures are designed to prepare students for both the impact investing product development exercise and the impact investing asset owner strategy exercise, and these two exercises are designed to prepare students for impact investing leadership over the course of their careers. As an early innovator in social finance, dating back 24 years, the instructor provides students with a practical toolkit, honed by making mainstream financial institutions and products more beneficial to a broader range of stakeholders and making specialist impact investment firms more relevant to and integrated with mainstream markets. The course has no prerequisites; however, an understanding of finance and completing the SUMA Foundations Module will be useful background. Homework assignment 0 is a mandatory review of introductory finance. This course satisfies the M.S. in Sustainability Management program's Area 5: General and Financial Management requirement.

#### **SUMA PS5060 Sustainable Fashion & Startup Strategy**

Offered by the MS in Sustainability Management Program

**Area 5: General and Financial Management**

**Points: 3**

**Instructor:** see above

**Day/Time:** see above

**Course Description:** Fashion's consistent ranking among the top 3 global polluters has become a decades old fact struggling to gain a proportionate response among the brand startup and sourcing community. With industry revenues set to exceed \$1 trillion, there is an opportunity to critically address existing revenue models predicated on traditional metrics, such as constant growth, and singular bottom lines. The course attempts to create a nexus between the fashion entrepreneur and systems thinker to explore strategic solutions that address sustainability through an environmental, social and economic lens. The aim is to foster a mindful, yet critical discourse on fashion industry initiatives, past and present, and to practice various tools that help transition existing organizations and incubate new startups towards sustainable outcomes.

#### **SUMA PS5142 Sustainable Finance**

Offered by MS in Sustainability Management Program

**Area 5: General and Financial Management**

**Points: 3**

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course is an introduction to how sustainability/ESG (economic, environmental, social & governance) issues have become financially material to the global credit, underwriting, insurance, risk management,

venture capital and asset management capital markets. These issues have a direct impact on risk exposure and the quality of public, private and government debt/equity investments. By the end of the course, students should understand how these issues affect investment decisions made by institutional investors, corporate lenders, insurance companies, asset management funds, hedge funds, venture capitalists and retail investors, as well as business decisions made by corporate managers. They will be exposed to the global sources of environmental/sustainability corporate performance information, how “best-in-class” environmental investment relates to, and is different from, socially-responsible investing (SRI), and differences between European, North American and Asian markets. Risk management aspects of sustainable finance will be addressed, especially in regards to emerging finance areas such as carbon finance, corporate governance, sustainable development and agriculture/water development projects. SEC Reporting requirements for sustainability risks and opportunities, and the prospect of the issuance of “Integrated Corporate Reports” that combine financial and sustainability reporting will be discussed. The ethics of sustainability issues and their impact on management & finance will also be addressed.

### **SUMA PS5170 Sustainable Operations**

Offered by MS in Sustainability Management Program

**Area 5: General and Financial Management/** Area 1: Integrative Sustainability Management

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** In this course, students will work to understand and communicate the importance of identifying and incorporating sustainability at each step along the value chain, including product design, procurement, distribution, manufacturing, product use and end-of-life disposition. By considering the organization holistically, students will perform analyses of the value chain, including Life Cycle and Cost/Benefit Analyses, and incorporate effective sustainability strategies into the organizational culture and day-to-day operations. Students will conduct risk analyses and implement risk reduction measures in an effort to develop, produce, and distribute more sustainable products and services, aligned with overall business goals. In addition to technical sustainability considerations such as climate change, energy, water and waste, students will be able to implement sustainability initiatives within operating organizations through innovative change management, culture change and other organizational strategies. Importantly, students will be challenged to think concretely about making choices and balancing elements of the triple bottom line in an overall business context.

### **SUMA PS5195 Accounting, Finance, and Modeling of Sustainable Investments\***

Offered by MS in Sustainability Management Program

**Area 5: General and Financial Management/** Area 2: Economics

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**\*Note:** The course was formerly titled “Green Accounting.” If you previously took the “Green Accounting” course, you are not eligible to take this course.

**Course Description:** This course examines traditional and emerging financial and cost accounting practices, non-financial sustainability performance metrics, their interdependencies and influence on corporate management, corporate reporting, and other systems. Students begin learning how financial performance is presented within traditional financial reports and analyzed using benchmarks, ratios and through interconnections with real world trends. They obtain critical insights and an appreciation of how financial and non-financial accounting data and sustainability performance metrics influence shareholder and corporate management investment decisions, strategic priorities, budget allocations and capital investments.

### **SUMA PS5197 Financing the Clean Energy Economy**

Offered by MS in Sustainability Management Program

**Area 5: General and Financial Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** The green economy has grown significantly in the past several years. This course focuses on one aspect of that growth: the generation of clean energy. The course integrates finance, technology, and policy to provide an understanding of what has propelled the growth of clean energy, and what will be required to continue that growth in the context of the broader energy markets. The course will include a background on the existing electricity sector (nuclear, coal, natural gas) and how newer technologies (solar, wind, distributed generation) find a role. The course will cover some macro-issues (the role of government, for example), but will focus more on micro-level issues faced by companies developing and investing in clean energy projects. These issues include how existing electricity markets function and how individual plants function within those markets; how firms model the profitability of their clean energy investments; the role of new technologies; and how policies affect individual clean energy investments. Course assignments will include problem sets, writing, a team project, and financial modeling. The financial modeling will be designed to take into account the varying levels of student experience.

### **SUMA PS5446 Sustainability Value Creation in Private Markets**

Offered by MS in Sustainability Management Program

#### **Area 5: General and Financial Management**

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** This course provides an overview of the way sustainability (environmental, social and governance) factors are analyzed in private markets. It focuses on preparing students to implement their understanding of the financial and societal risks and opportunities within the investment making process. In private markets, limited partners (pension funds, endowments, high net-worth individuals) have pushed the sustainability imperative and social consciousness of private equity funds and asset managers by seeking greater clarity around how their money is invested in both a responsible and financially meaningful way. Alongside this trend, an evolving regulatory environment globally has propelled the need to systemize evaluation frameworks for stakeholders within investment functions and advisors who support them. Unlike public markets, sustainability information is harder to glean in private markets and requires a skilled extraction and evaluation process. During this course, we examine a traditional ESG due diligence process embedded within the wider investment lifecycle (sourcing, diligence, hold and exit) through the lens of changing geographic regulatory landscape in financial investing and the market leading frameworks that quantify ESG factors for evaluation. The course culminates with a deal due diligence process that mimics an investment committee (IC) composed of private equity leaders that understand the commercial and purpose-driven viability of an investment.

The course has the following related goals:

- Understanding of ESG frameworks and global standards: Driving a comprehensive understanding of frameworks, disclosures and standards when evaluating investments
- Practical knowledge around investment decision making: Awareness of issues and investment implications when evaluating size, public/private nature of company, geography, and industrial sector
- Driving strategy from risk and value creation learnings: Understanding of ESG business case/strategy creation and the steps required to create value via ESG channels in a public or private company, and the implications of the competing nature of business
- Due diligence skills: Ability to conduct high-quality ESG

Who should take this course? This is an elective course for those who are looking to apply environmental, social and governance factors through the investment lens. Although there are no prerequisites for the course, it is recommended that students have a background in economics and finance.

This is a full semester course that will be open for cross-registration for other professional schools at Columbia and will be conducted in-person.

### **SUMA PS5470 Circular Economy for Sustainability Professionals**

Offered by MS in Sustainability Management Program

**Area 5: General and Financial Management** (*This course is not approved for the Area 2: Economics Requirement*)

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** A circular economy is an alternative economic model, that is restorative by design, and rather than relying on a constant throughput of newly extracted resources and non-renewable energy, aims to keep materials, products and components constantly at their highest utility and value. This course will delve into both the theory and practical applications of a circular economy. Achieving perfect circularity represents potentially transformative system change and will involve a fundamental rethink of many of our structures, systems and processes in the economy at large. At the same time, its value creation potential for businesses, households and the environment alike, is potentially extremely significant. For example, manufacturers can reclaim substantial value from the products they develop by introducing take-back schemes to reclaim components and resources for re-use or recycling, as opposed to allowing them to go to waste as would typically be the case in a linear system. We will explore the theoretical underpinnings of a circular economy, including the need for systems thinking (taking relevant learnings from biomimicry and industrial ecology). We will look at circular design principles and explore their use in different industries. We will pose the question of which stakeholders can help to facilitate this transition to circularity, and what enablers, in the form of policy and financing, will need to be in place to allow it to progress. The course will explore real-life examples of circular economic thinking in specific industries, such as the fashion and industry, as well as looking at its application in a geographic context through the lens of cities, and examining standalone infrastructure, such as waste management.

### **SUMA PS5650 Solar Project Development**

Offered by the MS in Sustainability Management Program

**Area 5: General and Financial Management/** Area 2: Economics

**Points:** 3

**Instructor:** see above

**Day/Time:** see above

**Course Description:** At the end of this course, students will be prepared to fully evaluate the technical and financial aspects of a solar project. They will be equipped with skills allowing them to either develop or rigorously vet solar project proposals. The course introduces and provides students with a holistic understanding of the end-to-end solar development process. The course has two goals: A) To provide students a deep understanding of the dozens of critical interrelated steps critical to developing a successful operating solar project. B) To equip the students with the tools and understanding of the skills necessary to develop a solar project beginning with site selection encompassing the entire process to commissioning and operations. We begin the course providing the students with an understanding of the different segments of the solar industry; covering the upstream business, the main players both upstream and downstream and then outlining the different downstream markets: utility, commercial, and residential. We will then hone in on the distributed generation segment of the market; commercial, and residential. To begin, we will cover the critical value drivers of solar: sunlight resource, grid energy cost, tax credits, state and utility incentives including renewable energy credit markets. Energy consumption and production, despite what critics will say about renewables, is the main value driver of the move to renewables. In that light, we will cover in detail, net metering, national and local electricity markets, and electric utility tariff structure to understand how value is generated and measured. We will conduct energy consumption analysis for different end-users to see how solar can and will be deployed and valued across different geographic and utility tariff classes.

**Offered by other departments:**

### **ERMC PS5100 Value-Based Enterprise Risk Management**

Offered through the School of Professional Studies

**Area 5: General and Financial Management**

**Points:** 3

**\*Please note: These courses are directly open to MS ERM students only. Non-ERM students must contact [erm@sps.columbia.edu](mailto:erm@sps.columbia.edu) for ERM program approval to register\***

**Instructor:**

**Dates and Times:**

**Course Description:** Foundational ERM course. Addresses all major ERM activities: risk framework; risk governance; risk identification; risk quantification; risk decision making; and risk messaging. Introduces an advanced yet practical ERM approach based on the integration of ERM and value-based management that supports integration of ERM into decision



making. Provides a context to understand the differences between (a) value-based ERM; (b) traditional ERM; and (c) traditional "silo" risk management.

#### **ERMC PS5200 Traditional Risk & ERM Practices**

Offered through the School of Professional Studies

##### **Area 5: General and Financial Management**

**Points:** 3

**\*Please note: These courses are directly open to MS ERM students only. Non-ERM students must contact [erm@sps.columbia.edu](mailto:erm@sps.columbia.edu) for ERM program approval to register\***

**Instructor:**

**Dates and Times:**

**Course Description:** Two distinct topics in this course: (1) Traditional ERM frameworks (such as COSO, ISO 31000) and their tools, techniques, and risk vocabulary; and (2) Traditional "silo" risk management grouped into the four risk categories – strategic, operational, financial, and insurance – as well as traditional risk management practices at banks and insurance companies. Provides familiarity with a range of current ERM and risk practices in the market.

#### **ERMC PS5340 Operational Risk Management**

Offered through the School of Professional Studies

##### **Area 5: General and Financial Management**

**Points:** 3

**Instructor:**

**Dates and Times:**

**Course Description:** Review of the types of operational risks, such as technology risk (e.g., cyber-security), human resources risk, disasters, etc. Includes case studies, risk analysis frameworks and metrics, and common mitigation techniques, such as insurance, IT mitigation, business continuing planning, etc.

#### **BUSI PS5001 Introduction to Finance**

Offered by the School of Professional Studies

##### **Area 5: General and Financial Management**

**Points:** 3

**Instructors:**

**Day/Time:**

**Course Description:** Students will be introduced to the fundamental financial issues of the modern corporation. By the end of this course, students will understand the basic concepts of financial planning, managing growth; debt and equity sources of financing and valuation; capital budgeting methods; and risk analysis, cost of capital, and the process of securities issuance.

#### **BUSI PS5003 Corporate Finance**

Offered by the School of Professional Studies

##### **Area 5: General and Financial Management**

**Points:** 3

**Instructors:**

**Day/Time:**

**Course Description:** Students will learn the critical corporate finance concepts including: financial statement analysis; performance metrics; valuation of stocks and bonds; project and firm valuation; cost of capital; capital investment strategies and sources of capital, and firm growth strategies. At the end of this course students will understand how to apply these concepts to current business problems.

Prerequisites: BUSI PS5001 Introduction to Finance/or Professor Approval is required.

#### **BUSI PS5008 Options and Futures**

Offered by the School of Professional Studies

##### **Area 5: General and Financial Management**

**Points:** 3

**Instructors:**

**Day/Time:**

**Course Description:** Students will learn about financial derivative securities: their role in financial management is becoming increasingly important, especially in portfolio management. By the end of this course students will be able to identify valuation of various options and futures as well as their use in risk management. By the end of this course, students will be able to understand option and futures pricing models, option strategies and index arbitraging. Prerequisites: BUSI K4001 Intro to Finance and BUSI K4003 Corporate Finance or Professor Approval required

### **BUSI PS5009 Financial Accounting**

Offered by the School of Professional Studies

**Area 5: General and Financial Management**

**Points:** 3

**Instructors:**

**Day/Time:**

**Course Description:** Students will examine the generally accepted account principles (GAAP) underlying financial statements and their implementation in practice. The perspective and main focus of the course is from the users of the information contained in the statements, including investors, financial analysts, creditors and management. By the end of this class students will be able to construct a cash flow statement, balance sheet and decipher a 10K report.

### **BUSI PS5010 Managing Human Behavior in the Organization**

Offered by the School of Professional Studies

**Area 5: General and Financial Management**

**Points:** 3

**Instructors:**

**Day/Time:**

**Course Description:** Students will gain an overview of major concepts of management and organization theory, concentrating on understanding human behavior in organization contexts, with heavy emphasis on the application of concepts to solve managerial problems. By the end of this course students will have developed the skills to motivate employees, establish professional interpersonal relationships, take a leadership role, and conduct performance appraisal.

### **BUSI PS5015 Leading Alignment and Agility**

Offered by the School of Professional Studies

**Area 5: General and Financial Management**

**Points:** 3

**Instructors:**

**Day/Time:**

**Course Description:** This course explains how leaders build competitive advantage within their organizations by creating a clear purpose; then balance it with agile practices that leverage, challenge and evolve that purpose. It explores how leaders use neuroscience-based techniques to unlock performance and adaptability as the speed of change continues to accelerate.

### **BUSI PS5020 Introduction to Marketing**

Offered by the School of Professional Studies

**Area 5: General and Financial Management**

**Points:** 3

**Instructors:**

**Day/Time:**

**Course Description:** Students will learn fundamental marketing concepts and their application. By the end of this class you will know: the elements of a market, company strategy, how to identify customers and competition, the fundamental elements of the marketing mix (product, price, placement and promotion) , how to research consumer behavior, and pricing strategies. Students will have extensive use of case study projects.

### **BUSI PS5025 Marketing Strategy**

Offered by the School of Professional Studies

**Area 5: General and Financial Management****Points:** 3**Instructors:****Day/Time:**

**Course Description:** Students will develop analytical skills used to formulate and implement marketing driven strategies for an organization. Students will develop a deeper understanding of marketing strategies and how to implement tactics to achieve desired goals. Students will work on case study projects in both individual and team based projects. By the end of this course you will be able to develop a marketing strategy based on market assessments and company needs.

Prerequisites: BUSI PS5020 Introduction to Marketing/or Professor Approval is required.

**BUSI PS5040 Security Analysis**

Offered by the School of Professional Studies

**Area 5: General and Financial Management****Points:** 3**Instructors:****Day/Time:**

**Course Description:** Students will learn about the valuation of publicly traded equity securities. By the end of the semester students will be able to perform fundamental analysis ("bottom-up," firm-level, business and financial analysis), prepare pro forma financial statements, estimate free cash flows and apply valuation models. Prerequisites: BUSI PS5001 Intro to Finance and BUSI KPS5003 Corporate Finance or Professor Approval required.

**INAF U6054 Petroleum Markets & Trading****Area 5: General and Financial Management**

Offered by the School of International and Public Affairs

**Points:** 3**Instructors:****Day/Time:**

**Course Description:** This course surveys the physical and paper components of the global oil market. It focuses on the geological, economic, financial, institutional, and political factors and processes through which global oil prices are determined. The course is only about oil - not about other energy or other commodities, though they may be discussed. The course is MARKET-focused. It does not deal with country development/planning, though it may be discussed in passing; nor does it deal with oil companies' financial statements and equity valuations.