SUSTAINABILITY SCIENCE AND PRACTICE

Courses offered by the Sustainability Science and Practice program are listed under the subject code SUST on the Stanford Bulletin's ExploreCourses (https://explorecourses.stanford.edu) website.

Mission of the Coterminal Program in Sustainability Science and Practice.

The Sustainability Science and Practice program is an interdisciplinary program hosted by the School of Earth, Energy and Environmental Sciences (http://exploredegrees.stanford.edu/schoolofearthsciences). As the global human population climbs toward 11 billion this century and consumption demands increase, we must find ways to meet the needs of people in ways that do not forgo possibilities for future generations. These sustainability challenges are marked by extreme complexity, urgency, conflicting demands, and often a paucity of resources or political will to address them.

The program integrates theoretical and conceptual knowledge with practical skills and tools to prepare students to both envision a prosperous future for all, and know how to design the practices and cultivate partnerships essential to building that future.

The curriculum covers three main elements:

Understanding complex social-environmental systems

Students develop a "systems perspective", deepening their awareness of the dynamic and interrelated nature of social-environmental systems. They explore tools to measure, map, and model five capital assets – social, natural, human, manufactured, and knowledge capital – and their complex interactions in order to recognize potential feedbacks, thresholds, and unintended consequences, as well as to identify leverage points and opportunities for interventions that can have transformative leaders, and examine business, government and non-profit strategies for advancing sustainability. Students develop a range of skills, including decision-making in the context of complexity and uncertainty, the application of holistic metrics and evaluation tools, and communication and stakeholder engagement.

Understanding decision making and developing strategies for change

Students examine the roles of diverse actors who influence change in social-environmental systems and explore strategies to align decision making and behavior with sustainability. They explore mindsets and attributes of transformative leaders and their organizations while building a range of skills, including decision making, the use of inclusive metrics and evaluation approaches, and communication approaches.

Designing innovations with impact at scale

Students develop understanding of how to intervene in complex systems for transformative impact by exploring frameworks and tools from systems thinking, design thinking, social cognitive theory, behavioral economics, and partnership strategies. They develop practical skills in mapping complex systems and designing creative, high-leverage interventions that realign systems with the goal of intergenerational well-being.

In addition, students complete a 4-unit (120 hour) practicum placement, which provides an opportunity to apply the leadership mindsets, knowledge and skills from the curriculum to a practical experience working on complex sustainability challenge with a partner organization.

Learning Outcomes

The Sustainability Science and Practice program integrates theoretical and conceptual knowledge, mindsets and practical skills to enable students to understand and manage complex systems, understand decision making and develop strategies for change, and develop partnerships and design innovations with potential for large scale impact.

The program prepares students to become effective participants and agents of change as individuals and within organizations across all sectors of society, contributing to the advancement of the goal of sustainability – i.e. the well-being of people around the world and across generations. Using a conceptual framework that connects human well-being with key underlying assets, students learn how social-environmental systems work, how decisions are and can be made to influence system dynamics in a way that supports sustainability goals, and how to engage with others to design new ways of managing these systems.

University requirements for master's degrees are described in the "Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees/#masterstext)" section of this bulletin.

Coterminal Master's Degrees in Sustainability Science and Practice

The Sustainability Science and Practice program offers current Stanford University undergraduates the opportunity to apply to a one-year coterminal master's program. Sustainability Science and Practice offers both a coterminal Master of Arts (M.A.) and a coterminal Master of Science (M.S.) degree.

Application and Admission

The Earth Systems Program has quarterly coterminal degree application deadlines: November 6, 2018; February 19, 2019; and May 14, 2019. To apply, students should submit an online application. The application includes the following:

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- The online Stanford coterminal application (https://www.applyweb.com/stanterm)
- A statement of purpose
- A resume
- A current Stanford unofficial transcript
- Two letters of recommendation, one of which must be from the master's advisor (who must be an Academic Council member)
- Master's program proposal (https://stanford.box.com/progpropma): a list of proposed courses that fulfill degree requirements, signed by the master's adviser.

Applications must be submitted no later than the quarter prior to the expected completion of the bachelor's degree and within quarterly application deadlines) An application fee is assessed by the Registrar's Office for coterminal applications once students are matriculated into the program.

Students applying to the coterminal master's program must have completed a minimum of 120 units towards graduation with a minimum overall Stanford GPA of 3.4.

All applicants must devise a program of study that shows a level of courses appropriate to the master's level, and determined in consultation with the master's advisor.

The student has the option of receiving the bachelor's degree after completing the degree's requirements, or receiving the bachelor's and

master's degrees concurrently upon the completion of the master's program.

If accepted, the student must submit a Graduate Authorization Petition through Axess; a $125 fee applies to a successful Graduate Authorization Petition.

University Coterminal Requirements

Coterminal master's degree candidates are expected to complete all master's degree requirements as described in this bulletin. University requirements for the coterminal master's degree are described in the "Coterminal Master's Program (http://exploredegrees.stanford.edu/cotermdegrees)" section. University requirements for the master's degree are described in the "Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees/#masterstext)" section of this bulletin.

After accepting admission to this coterminal master's degree program, students may request transfer of courses from the undergraduate to the graduate career to satisfy requirements for the master's degree. Transfer of courses to the graduate career requires review and approval of both the undergraduate and graduate programs on a case by case basis.

In this master's program, courses taken during or after the first quarter of the sophomore year are eligible for consideration for transfer to the graduate career; the timing of the first graduate quarter is not a factor. No courses taken prior to the first quarter of the sophomore year may be used to meet master's degree requirements.

Course transfers are not possible after the bachelor's degree has been conferred.

The University requires that the graduate adviser be assigned in the student's first graduate quarter even though the undergraduate career may still be open. The University also requires that the Master's Degree Program Proposal be completed by the student and approved by the department by the end of the student's first graduate quarter.

Master of Arts in Sustainability Science and Practice

Degree Requirements

The following are required of all M.A. students:

- A minimum of 45 units of course work.
- At least 34 units of the student's course work for the master's program must be at the 200 level or above.
- All remaining course work must be at the 100 level or above.
- All courses for the master's program must be taken for a letter grade; courses not taken for a letter grade must be approved by the master's adviser.
- A minimum overall GPA of 3.4 must be maintained.
- Remaining units to meet the 45 unit minimum must be designated as arts units. Course coding can be viewed on the Master Course List (https://stanford.app.box.com/v/sust-courses)

For the Master of Arts in Sustainability Science and Practice, an ethics course must be taken if not completed in the undergraduate degree program. This course does not have to be completed before applying to the coterm program. It can be taken as an elective.

Required Courses

Ethics

Select one of the following:

		Units
ETHICSOC 234R	Ethics on the Edge: Business, Non-Profit Organizations, Government, and Individuals	3
EARTHSYS 136/236	The Ethics of Stewardship	2-3

or approved alternative

		Units
SUST 210	Pursuing Sustainability: Managing Complex Social Environmental Systems	3
SUST 220	Case Studies in Leading Change for Sustainability	3
SUST 230	Innovating Large Scale Sustainable Transformations	3-4
SUST 240	Sustainability Science and Practice Practicum	1-4
EARTHSYS 111	Biology and Global Change	4
EARTHSYS 112	Human Society and Environmental Change	4
Minimum 1, Maximum 2 of the following:		
ME 206A & ME 206B	Design for Extreme Affordability and Design for Extreme Affordability	8
EARTHSYS 289	FEED Lab: Food System Design & Innovation	3-4
ME 377	Design Thinking Studio	4
Minimum 1, Maximum 2 of the following:		
PSYCH 215	Mind, Culture, and Society	3
PSYCH 216	Public Policy and Social Psychology: Implications and Applications	4
PSYCH 265	Social Psychology and Social Change (Must be taken for 3 units)	3
One of the following:		
LAW 7508	Problem Solving and Decision Making for Public Policy and Social Change	4
GSBGEN 367	Problem Solving for Social Change (Limited Enrollment-Check course description for details)	3
SUST 261	Art and Science of Decision Making	3-4
ENVRES 240	Environmental Decision-Making and Risk Perception (Must be taken for 3 units)	3

If required courses have been taken in the undergraduate career, students pursue additional electives.
A current list of electives can be found on the program's spreadsheet (https://stanford.box.com/v/sust-courses).

Master of Science in Sustainability Science and Practice

Degree requirements

The following are required of all M.S. students:

- A minimum of 45 units of course work.
- At least 34 units of the student's course work for the masters program must be at the 200 level or above.
- All remaining coursework must be at the 100 level or above.
- All courses for the master's program must be taken for a letter grade; courses not taken for a letter grade must be approved by the master's adviser.
- A minimum overall GPA of 3.4 must be maintained.
- Remaining units to meet the 45 unit minimum must be designated as 'science' units. Course coding can be viewed here: Master Course List (https://stanford.app.box.com/v/sust-courses)

- For the Master of Science in Sustainability Science and Practice, the following courses must be taken if not completed in the undergraduate degree program. These courses do not have to be completed before applying to the coterm program. The ethics course can be taken as an elective. The Math and Stats courses may not be counted as part of the 45-unit master's degree.

Prerequisite Courses

Mathematics

Select one of the following:

		Units
MATH 51	Linear Algebra, Multivariable Calculus, and Modern Applications	5
CME 100	Vector Calculus for Engineers	5

Statistics

Select one of the following:

		Units
ECON 102A	Introduction to Statistical Methods (Postcalculus) for Social Scientists	5
STATS 110	Statistical Methods in Engineering and the Physical Sciences	4-5
STATS 116	Theory of Probability	3-5
CS 109	Introduction to Probability for Computer Scientists	3-5
EE 178	Probabilistic Systems Analysis	4

Required Courses

Ethics

Select one of the following:

		Units
ETHICSOC 234R	Ethics on the Edge: Business, Non-Profit Organizations, Government, and Individuals	3
EARTHSYS 136/236	The Ethics of Stewardship	2-3
or approved alternative		

		Units
SUST 210	Pursuing Sustainability: Managing Complex Social Environmental Systems	3
SUST 220	Case Studies in Leading Change for Sustainability	3
SUST 230	Innovating Large Scale Sustainable Transformations	3-4
SUST 240	Sustainability Science and Practice Practicum	1-4
EARTHSYS 111	Biology and Global Change	4
EARTHSYS 112	Human Society and Environmental Change	4
Minimum 1, Maximum 2 of the following:		
ME 206A & ME 206B	Design for Extreme Affordability and Design for Extreme Affordability	8
EARTHSYS 289	FEED Lab: Food System Design & Innovation	3-4
ME 377	Design Thinking Studio	4
Minimum 1, Maximum 2 of the following:		
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Graduate Advising Expectations

The Program in Sustainability Science and Practice is committed to providing academic advising in support of graduate student scholarly and professional development. When most effective, this advising relationship entails collaborative and sustained engagement by both the adviser and the advisee. As a best practice, advising expectations should be periodically discussed and reviewed to ensure mutual understanding. Both the adviser and the advisee are expected to maintain professionalism and integrity.

Faculty advisers guide students in key areas such as selecting courses, designing and conducting research, developing of teaching pedagogy, navigating policies and degree requirements, and exploring academic opportunities and professional pathways.

Graduate students are active contributors to the advising relationship, proactively seeking academic and professional guidance and taking responsibility for informing themselves of policies and degree requirements for their graduate program.

For a statement of University policy on graduate advising, see the "Graduate Advising (http://exploredegrees.stanford.edu/graduatedegrees/#advisingandcredentialstext)" section of this bulletin.

Director: Pamela Matson

Executive Director: Julia Novy-Hildesley

Affiliated Faculty and Lecturers:

- Kevin Arrigo (Earth System Science, Earth Systems Program)
- Nicole M. Ardoin (Education)
- Shilajeet Banerjee (Professor of Practice, Emmett Interdisciplinary Program in Environment and Resources)
- William Barnett (Business)
- Sally Benson (Energy Resources Engineering)
- Paul Brest (Law)
- Marshall Burke (Earth System Science)
- Gretchen C. Daily (Environmental Science)
- Jenna Davis (Civil and Environmental Engineering)
- Rob Dunbar (Earth System Science)
- Zephyr Frank (History)
- Pamela Hinds (Management Science and Engineering)
- Rob Jackson (Earth System Science)
- James Holland Jones (Earth System Science)
- Jeffrey R. Koseff (Civil and Environmental Engineering)
- Eric Lambin(Earth System Science)
- Hazel Markus (Psychology)
- Pamela Matson (Earth System Science)

- Rosamond Naylor (Earth System Science)
- Julia Novy-Hildesley (Professor of the Practice, Sustainability Science and Practice)
- Burke Robinson (Management Science and Engineering)
- Jenny Suckale (Geophysics)
- Barton Thompson (Law)
- Peter Vitousek (Biology)
- Jeremy Weinstein (Political Science)
- Mikael Wolfe (History)