

Minor in Innovation and Transformational Change

The global population has never been larger, and it's still growing. We need students like you—now more than ever—to solve our most pressing problems in business, government, the non-profit sector, and academia. We need to solve Grand Challenges. Ending poverty, providing safe drinking water for all, and restoring our crumbling urban infrastructure might seem like daunting feats, but the Minor in Innovation and Transformational Change will teach you world-class methods and techniques to transform these challenges into opportunities to make a significant impact. Innovation is commonly associated with the creation of new and different technologies. While we certainly need to innovate technology, we must do so by seeing the bigger picture of how technologies interact with organizations and people; and we must be driven not just by the originality of our ideas but also by their potential to affect change. Innovation science provides insight into ways of thinking, planning, and acting that can be applied across a broad range of domains to drive impact. We can innovate business models, human behavior, and complex systems like cities and schools. Innovation is both an art and a science. It's both creativity and pattern recognition. The Minor in Innovation and Transformational Change will equip you with the mindsets, behaviors, attributes, tools, and methods you need to obtain leadership roles and make large-scale, positive impact wherever you may go in your career.

Tailor Your Minor Plan of Study

Choose your own path to obtain the Minor in Innovation and Transformational Change. Achieving the Minor requires 18 credits drawn from three categories of classes: Core Courses, Selectives, and Electives, with the latter two categories offering numerous opportunities to ensure you are linking your new knowledge and skills to problems you care about.

CORE COURSES.....6 credits

The CORE COURSES are required, and bookend the Minor experience providing an introduction to problem framing, solution space development, innovation, and design fundamentals at the onset of the program, and an in-depth experiential learning opportunity to apply your skills to a real grand challenge problem as you prepare to graduate. There are no prerequisites for the core courses; however, ENGR490 must be the last course in the course sequence for the Minor.

- ENGR305 Fundamentals of Innovation Theory and Practice.....3 credits
- ENGR490 Breakthrough Thinking for Complex Challenges.....3 credits

SELECTIVES.....9 credits

SELECTIVES provide an opportunity for you to develop mindsets and capabilities that are critical to driving the innovative change necessary to address complex socio-technical challenges. You choose one course in each of three key areas to build your background:

- ✓ employ systems thinking and rigorous innovation processes to DESIGN HOLISTIC SOLUTIONS,
- ✓ help realize a shift in paradigm by MOTIVATING CHANGE, and
- ✓ ensure your ideas are viable by DEVELOPING STRATEGIES FOR FINANCIAL SUSTAINABILITY

DESIGN HOLISTIC SOLUTIONS3 credits

		<i>Prerequisites</i>
• AAE 56000	System-of-Systems Modeling and Analysis	None
• EEE 25000	Environmental, Ecological and Engineering Systems	None
• ME 55300	Product and Process Design	None
• TECH 53300	Design Theory and Technology	None
• TLI 52000	Foundations of Innovation Studies	None
• CE 39800	Intro CE Systems Design	≥ C- in (MA 26100, MA 26300, MA 27100, MA 18200, or MA 17400)
• EPCS-Any level	Engr Proj Cmity Service	None for EPCS 10100; for others, ≥ D- in ENGR13300 AND prior EPCS level

MOTIVATE CHANGE.....3 credits

• COM 30300	Intercultural Communication	None
• COM 31800	Principles of Persuasion	None
• CSR 33100	Consumer Behavior	None
• MGMT 44362	Leadership and Organizational Change	None
• OBHR 33000	Introduction to Organizational Behavior	None
• PHIL 22100	Introduction to Philosophy Science	None
• TLI 25400	Leading Change in Technology Organizations	None
• TLI 31400	Leading Innovation in Organizations	None
• COM 21000	Debating Public Issues	≥ D- in (COM 11400, COM 21700, or COMM R1100)
• COM 44400	Introduction to Communication and Social Entrepreneurship	≥ D- in (ENTR 20000 or ENTR 31000)
• ECON 47100	Behavioral Economics	≥ C- in ECON 34000 OR (MA 16200 or MA 16600)
• MGMT 42710	Digital and Social Media Marketing	≥ C- in MGMT 32400
• PSY 27200	Introduction to Industrial-Organizational Psychology	≥ D- in PSY 12000
• TLI 35600	Global Technology Leadership	≥ C in TLI 31400

DEVELOP STRATEGIES FOR FINANCIAL SUSTAINABILITY3 credits

• CE 59601	Entrepreneurship and Business Strategy in Engineering	None
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• ENTR 20000	Introduction to Entrepreneurship and Innovation	None
• IET 45100	Monetary Analysis for Industrial Decisions	None
• MGMT 30400	Introduction to Financial Management	None
• MGMT 42310	Global Marketing Management	None
• MGMT 48400	Management of New Enterprises	None
• POL 23500	International Relations Among Rich and Poor Nations	None
• SOC 33900	Introduction to the Sociology of Developing Nations	None
• ENTR 31000	Marketing and Management for New Ventures	> D- in (ENTR 20000 or Professional level ENTR 20000)
• MGMT 35200	Strategic Management	≥ C- in MGMT 20100 AND ECON 25100
• SOC 31600	Industry and Society	≥ D- in (SOC 10000, SOC S1610 or, SOC R1000)

ELECTIVES.....3 credits

ELECTIVES enable you to further contextualize your minor by gaining depth in an area that will enhance your potential to drive innovation and transformational change in industry, academia, or the non-profit sector. Accumulate 3 credits from any of the following areas:

Learn versatile RESEARCH METHODS to gain insight into human behavior.....

• ANTH 38000	Using Anthropology in the World	None
• ANTH 38500	Community Engagement in Anthropology	None
• SOC 38300	Introduction to Research Methods in Sociology	None
• AD 51200	Interaction Design Studies	Instructor approval
• AGECE 45100	Applied Econometrics	≥ D- in (STAT 22500, STAT 26000, STAT 30100, STAT 30100, STAT 31100, STAT 35000, STAT 35000, STAT 41600, STAT 50100, STAT 50300, STAT 51100, STAT 51100, STAT 51600, or STAT E2700)
• ANTH 41800	Field Methods in Cultural Anthropology	≥ D- in ANTH 20500
• COM 32500	Interviewing: Principles and Practice	≥ D- in (COM 11400, COM 21700, or COMM R1100)
• ECON 36000	Econometrics	≥ C- in (MGMT 30500, ECON E2700, STAT 35000, or STAT 51100)
• MGMT 42110	Marketing Analytics	≥ C- in (MGMT 30500 or STAT 35000) AND (MGMT 32400)

Gain a deeper understanding of the cultural and social aspects of GRAND CHALLENGES.....

GENERAL

• AGEC 20400	Introduction to Resource Economics and Environmental Policy	None
• ANTH 20500	Human Cultural Diversity	None
• ANTH 21000	Technology and Culture	None
• ANTH 32700	Environment and Culture	None
• ANTH 57500	Economic Anthropology	None
• ENE 55300	Introduction to Globalization and Engineering	None
• ENGR 31000	Engineering in Global Context	None
• HIST 33300	Science and Technology in Western Civilization I	None
• HIST 33400	Science and Technology in Western Civilization II	None
• ME 49200	Technology and Values	None
• PHAD 55600	Healthcare Economics and Public Policy	None
• SOC 57200	Comparative Healthcare Systems	None
• AGEC 34000	International Economic Development	≥ D- in (AGEC 20300, AGEC 20400, AGEC 21700, ECON 21700, ECON 25100, ECON E1030, ECON E2010, ECON 25200, ECON E1040, or ECON E2020)
• AGEC 40600	Natural Resource and Environmental Economics	≥ D- in (AGEC 20300, AGEC 20400, ECON 25100, ECON E1030, or ECON E2010)

EDUCATION

• EDCI 56500	Principles of Adult Education	None
• EDST 51200	Foundations of Educational Policy	None
• EDST 51400	Economics of Education	None
• EDPS 30102	Social-Emotional Aspects of Learning in Diverse Environments	≥ D- in EDPS 23500

ENVIRONMENT

• AGEC 52500	Environmental Policy Analysis	None
• ASM 33600	Environmental Systems Management	None
• BCM 41900	Sustainable Construction	None

• BCM 51000	Topics in Environmentally Sustainable Construction, Design and Development	None
• EAPS 32700	Climate, Science And Society	None
• EEE 35500/ CE 35500	Engineering Environmental Sustainability	None
• FNR 30200	Global Sustainability Issues	None
• FNR 48800	Global Environmental Issues	None
• HIST 39400	Environmental History of the United States	None
• HTM 37000	Sustainable Tourism And Responsible Travel	None
• PHIL 29000	Environmental Ethics	None
• POL 22300	Introduction to Environmental Policy	None
• POL 32700	Global Green Politics	None
• POL 42300	International Environmental Policy	None
• POL 32300	Comparative Environmental Policy	None
• BIOL 48300	Great Issues: Environmental And Conservation Biology	≥ D- in (BIOL 11000, BIOL 11100, BIOL 12100, BIOL 24100, BIOL 28600, or BIOL 58500)
• EAPS 36000	Great Issues In Science And Society	≥ D- in (COM 21700, BIOL 23200, or BIOL 27100)

ENERGY

• EAPS 37500	Great Issues-Fossil Fuels, Energy, and Society	None
• EAPS 30100	Oil!	≥ D- in (ENGL 10100, ENGL 10200, ENGL 10300, ENGL 10400, ENGL 10600, ENGL 10800, ENG W1310, ENG W1320, ENG W1400, ENG W1500, or ENG W2330)
• ME 44000	Automotive Prime Movers: Green Engines and Clean Fuel	≥ D- in ME 30000

FOOD







• AGECE 25000	Economic Geography of World Food and Resources	None
• AGECE 52800	Global Change and the Challenge of Sustainably Feeding a Growing Planet	None
• AGECE 41000	Agricultural Policy	≥ D- in AGECE 22000 AND (AGECE 21700, ECON 25200, ECON E1040, or ECON E2020)

HEALTH

- ANTH 34000 Global Perspectives on Health None
- HK 58100 International Health None
- BIOL 31200 Great Issues Genomics And Society Department consent
- HK 36500 Principles of Community Health Promotion \geq D- in (HK 21500, HK 21900, or SPEA H1200)

Summary of Requirements

In order to complete the minor, you must:

-  Accumulate 18 credits from the [approved course options](#) <Link available on Minor website>
-  Complete ENGR 305: Fundamentals of Innovation Theory and Practice (3 credits, counts toward the 18 credit total)
-  Achieve breadth by completing 3 credits in each category of approved SELECTIVES (9 credits in total)
-  Achieve depth by completing 3 credits from approved ELECTIVES
-  Complete ENGR490: Breakthrough Thinking for Complex Challenges (3 credits, counts toward the 18 credit total) after completing all other program requirements
-  Achieve a grade point average of at least 2.0 across the courses pursued for the minor

Note that the majority of the course options listed above can likely be used to concurrently satisfy general education or technical elective requirements of your school.

Enroll

To learn more about the enrollment process and requirements, please speak with your academic advisor. Questions? Contact innovation@purdue.edu.

CORE COURSES

ENGR305: Fundamentals of Innovation Theory and Practice

The foundational course for the Minor in Innovation and Transformational Change is ENGR 305: Fundamentals of Innovation Theory and Practice, taught by Professor Joe Sinfield, the Director of the Innovation and Leadership Studies Program. This 3 credit course introduces you to the fundamental patterns and methods of innovation through the study and application of emerging innovation techniques that address technological, economic, and societal challenges. You will join a cross-disciplinary team to design solutions to a series of socio-technical challenges, in an experiential learning setting, addressing the full breadth of functional, social, and emotional factors that shape use and adoption of your solution. Through case discussions of historical and contemporary innovations, you will learn how to identify opportunities and design, test, and iterate solutions. By the end of the course, you will understand and effectively use techniques from many fields, such as business, design, problem-solving, engineering, and social sciences.

This course is currently offered in both Fall and Spring semesters.

[Download the syllabus for ENGR305](#) <Link available on Minor website>

ENGR490: Breakthrough Thinking for Complex Challenges

Breakthrough Thinking for Complex Challenges is a 3-credit, experiential learning course which is typically taken in the final year of the Minor in Innovation and Transformational Change. In this course, you have the opportunity to reflect on the collection of courses that you have pursued for the Minor and selectively apply key learning from these experiences to a real-world challenge in an action-oriented group problem solving setting. The course focuses on developing solutions to major challenges - often referred to as complex problems, grand challenges, or wicked problems. These categories of problems require solutions that span technical, economic, social, and cultural domains and thus impede approaches derived from only one perspective. This course will enable you to apply methods from varying fields and integrate differing ways of thinking to frame major challenges and design and advance holistic solutions. You will have the opportunity to engage in problem exploration and participatory design in close partnership with an external organization. This experience will help you put your knowledge into practice and develop adaptive expertise. Conceived solutions must incorporate not only means to address technical challenges, but also aspects of stakeholder education and awareness, cultural adoption, resource availability and access, economic and operational sustainability, and governance. Collectively, co-designing holistic solutions inclusive of all of the aforementioned components, in collaboration with involved stakeholders, will help you build critical awareness and skills consistent with the College's vision to prepare Purdue engineers for leadership roles in the 21st century.

Course projects vary year-to-year depending upon the portfolio of needs on- and off-campus that are being addressed more broadly in the Innovation and Leadership Studies Program. The course is typically offered in the Spring semester. Enquire at innovation@purdue.edu to learn more about the focal problem of the course this year.

[Download the syllabus for ENGR490](#) <Link available on Minor website>

Breakthrough Thinking Project Example: Providing Potable Water in the Rural Dominican Republic

Almost 800 million people world-wide lack access to clean water. Students in Breakthrough Thinking addressed this problem holistically in the rural Dominican Republic by partnering with students in another course at Purdue, CE 597: Water Supply in Developing Countries. For two semesters, students utilized systematic innovation methods and techniques to:

- Understand the comprehensive set of issues that define the success of any water system
- Uncover hidden assumptions in current and prior attempts to provide potable water to those in need
- Map complex relationships among community members, local and national organizations, and the forces that shape the acquisition, delivery, perception, and awareness of water and sanitation
- Identify potential partnerships and conflicts in the water provision ecosystem based on stakeholders' motivations
- Document circumstances specific to rural Dominican Republic that would affect the solution, such as intermittent electricity, significant wealth disparity among residents, and the cultural importance of extended family
- Integrate solution components into comprehensive, system-level solutions that simultaneously address all key issues across technical, economic, social, and cultural domains

These system-level solutions are now ready for rapid in-field testing, refinement, and eventual implementation at scale.