INWORKS INNOVATION INITIATIVE (IWKS)

IWKS 2100 - Human-Centered Design, Innovation and Prototyping (3 Credits)
Introduces collaborative interdisciplinary design and innovation from a human perspective. Using the wide array of Inworks prototyping facilities, teams of students will design and implement human-oriented projects of increasing scale and complexity, in the process acquiring essential innovation and problem-solving skills. Prereq: none. Participants of all backgrounds are encouraged to register; no previous design or prototyping experience is required. Max hours: 3 Credits.
Grading Basis: Letter Grade
Typically Offered: Fall, Spring.

IWKS 2300 - Fundamentals of Computational Innovation (3 Credits)
Provides a foundation in computational thinking and practices. Students learn to take advantage of computational power in problem solving by writing simple programs, studying the underlying logic of hardware, and working with a variety of technologies. Cross-listed with ENGR 1100. Max hours: 3 Credits.
Grading Basis: Letter Grade
Typically Offered: Fall, Spring.

IWKS 3100 - 3D Design, Computation and Prototyping (3 Credits)
Introduces the design and computer-controlled fabrication of three-dimensional objects using both additive (3D printing) and subtractive (laser cutter, CNC router/mill) processes. Increasingly complex projects throughout the semester using various CAD/CAM software tools will explore design strategies for digital fabrication. Prerequisites: None; no previous design or prototyping experience is expected or required. Cross-listed with IWKS 5170 and ARCH 3706. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 3180 - Inworks: Choose Your Own Adventure: Experiences in Design, Innovation and Prototyping (1-3 Credits)
Provides weekly speakers, workshops and other experiences that educate and enrich across the design, innovation and prototyping landscape. Students may choose to participate in any five (for one credit), ten (for two credits) or fifteen (for three credits) activities. Each week, participating students will attend the scheduled activity, and then create a meaningful response that reflects the impact of that activity on their thinking or practice. Prerequisites: None. Repeatable. Max hours: 12 Credits.
Grading Basis: Letter Grade
Repeatable. Max Credits: 12.

IWKS 3200 - Data Science for Innovators (3 Credits)
Introduces techniques for capturing, processing, visualizing, and making meaning out of large datasets. With the exponential growth and decreasing cost of data collection tools such as genome sequencing, social media, crowd sourced data, mobile phone apps, remote sensors, and data from other publically available sources, innovators are able to harness a rich array of data in their designs. This course will introduce the fundamentals of working with online data and large data sets, introduce widely used data analysis and visualization tools, and culminate in a cumulative project that incorporates data in a significant way. Suggested Background: IWKS 2300 or similar experience. Max hours: 3 Credits.
Grading Basis: Letter Grade
Typically Offered: Fall, Spring.

IWKS 3300 - NAND to Tetris: Foundations of Computer Systems (3 Credits)
Introduces the principles of computer systems that underlie the global information age. Starting from first principles, students gradually construct a simple hardware platform and a modern software hierarchy, yielding a working basic yet powerful computer system. Only introductory programming experience is required. Suggested Background: IWKS 2300 or similar computing experience. Cross-listed with CSCI 2940. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 3400 - Game Design and Development I (3 Credits)
Introduces principles of computer game development, building on the rich interplay of computer science, graphics design, physics, music, and narrative. Students develop interactive 2D and 3D games and a final project. Substantial software development involved, but requires only introductory programming experience. Suggested Background: IWKS 2300 or similar computing experience. Cross-listed with CSCI 2941. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 3540 - Synthetic Biology for Innovators (3 Credits)
Introduces the fundamentals of synthetic biology for those who seek to use it as tool for innovation. Synthetic biology allows us to engineer new biological systems and redesign existing biological components by integrating aspects of biotechnology, evolutionary and molecular biology, systems biology, computer engineering, computational biology, and genetic engineering. Advancement in technological tools and techniques make this material accessible to motivated individuals from many disciplines, and no biology background is required. Culminates with a final team project focused on designing synthetic biology solutions that address human need. Suggested Background: None. No previous background in biology is required. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 3550 - Innovation Law and Policy (3 Credits)
Introduces legal and regulatory foundations related to innovation, including intellectual property, telecommunications, electronic commerce, the Internet, biotechnology, ethical and equity considerations, and financing. These issues are examined from the perspectives of the legal, business, capital, development, consumer, and policy-making communities. Suggested background: IWKS 2100. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 3600 - Innovating for the Developing World (3 Credits)
Explores the design and development of products and services that can be sustainably and gainfully used by the world's poorest citizens. Students in interdisciplinary teams will design, implement and evaluate viable solutions to a real problem faced by people in the developing world. The goal is to develop an understanding of the extraordinary challenges faced by individuals for whom basic survival is not a given, and the knowledge and skills necessary to create designs that respond appropriately to those unique circumstances. Provides a foundation for further study and practice in the area of technology and development. Suggested Background: IWKS 2100. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 3620 - Mobile App Development (3 Credits)
Introduces mobile application development, including front-end mobile application clients, data handling, connectivity to back-end services and cloud hosting. The course provides an overview and comparison of technical approaches employed by Apple iOS, Google Android, and cross-platform development environments. Students will install, develop, test, and distribute mobile applications while addressing challenges associated with development for any mobile platform: limited screen size and memory, gesture based GUI, varying connectivity, and the wide variety of target mobile devices. Suggested Background: IWKS 2300 or similar computing experience. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 3700 - Innovation and Society (3 Credits)
Analyzes impact of innovative design on work, sense of self and social systems, in education, healthcare, finance, and other sectors. Investigates how people customize / "hack" technologies they use, and the moral / ethical implications of being designers. Students will research the impact of an innovation of their choice and share via essays, models, videos, or another medium of their choice. Suggested Background: None. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 3850 - Product Design (3 Credits)
Explores the design requirements associated with creating a product that will be manufactured in large quantities and used by potentially thousands of users. These requirements are often very different from those associated with creating a working prototype. This gap between prototype creation and starting a business offers an interesting and unique set of design challenges. As part of the course, teams of students will engage in a realistic product design cycle. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 4100 - Human-Centered Design, Innovation and Prototyping (3 Credits)
Offers a graduate-level introduction to collaborative interdisciplinary design and innovation from a human perspective, as well as introducing key theoretical and computational foundations of innovation. Using the wide array of Inworks prototyping facilities, teams of students will design and implement human-oriented projects of increasing scale and complexity, in the process acquiring essential innovation and problem-solving skills. Prerequisite: None. No previous design or prototyping experience is expected or required. Cross-listed with IWKS 5100. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 4120 - IoT: The Internet of Things (3 Credits)
In a world where everything is connected to everything else, how does that work? This course introduces techniques for (1) designing systems that can sense the environment and respond to humans in meaningful ways and (2) creating networks of physical objects that collect and exchange data. Such systems might include wearable sensors, interactive art, and Internet-connected home devices. Working individually and in teams, students will develop projects using Inworks' materials, devices, and fabrication tools. The course involves considerable prototyping and software development but requires only introductory programming and prototyping experience. Suggested Background: IWKS 2100 & 2300. Cross-listed with CSCI 2942. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 4450 - Game Design and Development II (3 Credits)
Continuation of IWKS 3400, with increased emphasis on more advanced techniques including 3D rendering; lighting simulation; vertex, pixel and geometry shaders; shadows; terrain building; bump, parallax, and parallax occlusion mapping; shading; ray tracing; bloom; and high dynamic range lighting. Suggested Background: IWKS 3400. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 4500 - Bio-Design and Innovation (3 Credits)
Introduces the biodesign innovation process, which involves identifying important human needs and inventing meaningful solutions to address them. The course examines how biotechnology and bio-inspired innovation improve the form and function of our design world through innovative materials and novel approaches to developing buildings, food, medicine, infrastructure and more. Readings and in-class debates will raise critical issues in contemporary bioethics. For their final projects, students will choose to create and prototype a speculative biodesign concept, or work in the bio lab on the development of a real-world biodesign solution of their choosing. Suggested Background: IWKS 2100 & 3100. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 4520 - Design for Healthful Human Longevity (3 Credits)
Introduces contemporary studies, therapies, theories, and research on aging, age related disease, and innovations for longer healthier human lives. Guest lecturers, seminar discussions, readings and discussions will inform student projects that address challenges to prolonged, healthy, disease-free lives. Suggested Background: IWKS 2100 and 3700. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 4650 - Innovating for the Developing World (3 Credits)
Explores the design of products and services that can be sustainably used by the world's poorest citizens. Students design, implement and evaluate solutions to real problems in the developing world. Provides a foundation for further study and practice. Suggested Background: IWKS 3500 & 3600. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 4680 - Case Studies in Design (3 Credits)
Explores why some projects succeed and others fail. Many human-centered interventions fail to meet their designers' objectives, reflecting the unique challenges associated with matching human need with feasibility. Explores how innovators can increase their chances for success by examining several successful (and unsuccessful) designs. Suggested Background: IWKS 2100 & 3700. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 4700 - Unconventional Design for Online Learners (3 Credits)
Explores how design-thinking and user-centered design can be used to develop and improve technology-mediated learning. Using a team-based project-oriented approach, students design, develop, and evaluate new modalities for digital education. Projects include ways to educate both general and targeted audiences. Suggested Background: IWKS 3700. Max hours: 3 Credits.
Grading Basis: Letter Grade

IWKS 4800 - StartUp: Creating a New Venture from Scratch (4 Credits)
Teams of students are guided to create and launch a new company in a single semester. Culminates in a "pitchfest" to area entrepreneurs and venture capitalists. One of two alternative capstone courses for the Inworks Minor in Design and Innovation. Requires enrollment in the Inworks HCDI minor or certificate, or instructor permission. Suggested Background: Completion of at least three other Inworks courses. Max hours: 4 Credits.
Grading Basis: Letter Grade

IWKS 4900 - Undergraduate Capstone (4 Credits)
Working closely with project sponsors, students design, implement, and evaluate a project for use in local industry and non-profit organizations. One of two alternative capstone courses for the Inworks Minor in Design and Innovation. Prereq: IWKS 2100 and enrollment in the Inworks HCDI minor or certificate. Max hours: 4 Credits.
Grading Basis: Letter Grade
Prereq: IWKS 2100 and enrollment in the Inworks HCDI minor or certificate

IWKS 4930 - Special Topics in Human Centered Design and Innovation (1-4 Credits)
Emergent issues and professional developments in design, innovation and prototyping. Consult the current online Inworks Course List for semester offerings as new special topics courses are frequently added. With permission, may be repeated for credit. Repeatable. Max hours: 8 Credits.
Grading Basis: Letter Grade
Repeatable. Max Credits: 8.

IWKS 4970 - Independent Study in Human Centered Design and Innovation (1-4 Credits)
Studies initiated by students or faculty and sponsored by a faculty member to investigate a special topic or problem related to design, innovation and prototyping. With permission, may be repeated for credit. Enrollment requires permission of an Inworks faculty member. Repeatable. Max hours: 8 Credits.
Grading Basis: Letter Grade
Repeatable. Max Credits: 8.