Human-Centered Design Projects

The Segal Design Institute is the unit of the McCormick School that promotes the importance of design throughout the undergraduate curriculum and is dedicated to fostering innovation among engineering and non-engineering students and faculty. Our students work on projects that produce tangible results and improve the lives of people around the world. Our team-based approach to education encourages students to use design thinking together to solve complex, authentic problems in product, interaction, service, and business design.

Programs of Study

- Manufacturing and Design Engineering Degree (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/segal-design-institute/manufacturing-design-engineering-degree/)
- Segal Design Certificate (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/segal-design-institute/segal-design-certificate/)

DSGN 106-1 Design Thinking and Communication (0.5 Unit) Integrated introduction to the user-centered design process and technical communication. Students will address current challenges experienced by project partners. This course will guide students through identifying unmet needs, conducting research, generating and evaluating potential solutions, presenting a final design concept with supporting justification and documentation for design decisions. Students will also enhance their abilities of contributing to an equitable team, project management, fabrication skills, and producing written, oral, graphical, and interpersonal communication. One lecture, two section meetings, and lab. Co-registration with ENGLISH 106-1 required. Primarily intended for first-year engineering students.

DSGN 106-2 Design Thinking and Communication (0.5 Unit) Integrated iteration on the user-centered design process and technical communication. This course will build on the learning objectives from DTC-1 while adding more focus on ethics in design and communication, equitable distribution of teamwork, project management, documenting and communicating progress, and exploring a wider variety of project topics. One lecture, two section meetings, and lab. Co-registration with ENGLISH 106-2 required. Primarily intended for first-year engineering students.

DSGN 208-0 Design Thinking and Doing (1 Unit) Project-based introduction to design, structured as a hands-on studio course. Students learn methods of design innovation and work in teams, exploring ideas, prototyping solutions, and interacting with users. Intended for non-McCormick students. Prerequisite: Reserved for First-Year Students, Sophomores, and Juniors.

DSGN 220-0 Introduction to Design Sketching (0.5 Unit) Design sketching to increase one’s skills as a basic but essential form of communication. It is the medium for preliminary ideation. Basic rules and skills in a design studio setting.

DSGN 221-0 Advanced Sketching (0.5 Unit) Advanced sketching techniques. Further development of skills for the design studio setting. Prerequisite: DSGN 220-0 or consent of instructor.

DSGN 240-0 Introduction to Solid Modeling: Solidworks (0.5 Unit) Solid modeling by creating three-dimensional shapes through two-dimensional sketches. Assemblies of individual parts. CAD modeling theory; modeling objects using different approaches for creating identical features. Lecture balanced with hands-on use of SolidWorks.

DSGN 243-0 Visual Thinking for Design (0.5 Unit) Often times when we confront a new problem space we choose to build up our understanding through research, readings and lectures. Visual Thinking for Design will focus upon complementing this understanding through the use of visual stimulus. We will work with visual thinking methods to help expand our understanding of a problem space resulting in a greater generation of ideas and a more tangible organization of our thoughts. No formal prerequisites. DSGN 220-0, Intro to Sketching, and some experience with Adobe Photoshop would be helpful but not necessary.

DSGN 295-0 Introductory Topics in Design (0.5-1 Unit) Topics suggested by students or faculty members and approved by the institute; taught at an intermediate level.

DSGN 297-0 Intermediate Topics in Engineering Design (0.5 Unit) Topics suggested by students and faculty and approved by the institute.

DSGN 300-0 Designing Your Life (1 Unit) The course will approach life as a series of design projects to help students craft a total life. It includes seminar-style discussions, role-playing, short writing assignments, hands-on making, guest speakers, and individual mentoring and coaching. Prerequisite: Reserved for Juniors and Seniors.

DSGN 305-0 Human-Centered Service Design (1 Unit) This is a project-based course for students interested in a human-centered design approach to service design. Outcomes may include organizational structures, new service designs, and possibly designed products to support the service. Will design of new or improved services that tap deeply into people’s needs for connectedness, belonging, and autonomy. Project outcomes may include organizational structures, service designs, and designed products. Prerequisite: DSGN 106-1 or DSGN 208-0.

DSGN 306-0 UX Design (1 Unit) Hands-on course covering the full range of user experience design, from screen-based experience to interaction with physical products to end-to-end environment design. Prerequisite: DSGN 106-1 or DSGN 208-0.

DSGN 308-0 Human-Centered Product Design (1 Unit) Project-based course focusing on user needs: observational methods, brainstorming, prototyping, business models, and the social and engineering concerns for product design. Prerequisite: DSGN 106-1 or DSGN 208-0.

DSGN 315-0 Design, Technology, and Research (1 Unit) Design, Technology, and Research (DTR) is an CS and Segal learning initiative that empowers students to drive cutting-edge research through the development of systems that shape new experiences with people and technology. Students participate in DTR through fast-paced, quarter-long programs (intended to be repeated). Students work with a mentor to identify a direction of research, explore and iterate over designs, prototype at varying fidelities, build working systems, conduct evaluative studies, and report findings through conference publications. As a cohort, each week students demo their prototypes, provide and receive feedback, and help each other resolve technical challenges. DTR adapts and extends agile development and design-based research practices with scrums, sprints, studio critique, design logs, and pair research.

DSGN 320-0 Introduction to Industrial Design Methods (1 Unit) Process of product development from an industrial design perspective.

DSGN 321-0 Advanced Solid Modeling (0.5 Unit) This course provides advanced instruction on the use of CAD modeling using Solidworks software. Prerequisite: DSGN 240-0 or consent of instructor.
DSGN 240-0 Rendering (0.5 Unit) This course provides an introduction to Keyshot software, a photorealistic rendering package. Prerequisite: DSGN 240-0 or MECH_ENG 240-0; or consent of instructor.

DSGN 345-0 Computer-Aided Manufacturing (0.5 Unit) Course Overview: Computer Aided Manufacturing will teach the NX manufacturing environment to program machining operations for CNC milling, as well as the operation of CNC milling machines. Students will learn the basics of NX manufacturing, various manufacturing steps such as operations, tools, and geometry, and the generation of g-code to machine a part. The class will then transition to machine shop lessons, where students will be taught safe operation of CNC milling centers. The goal of the class is to teach the complete path from part design to manufacturing setup and g-code generation, to proper machine operation and part manufacturing. Remote Learning Quarters: Each student enrolled will be provided with a small CNC milling center to be operated at home, using materials and tools provided to them. New curriculum will focus on the programming and operation of 2.5D cutting, machine setup, troubleshooting, and optimization of the CNC machine. Prerequisites: DSGN 106-1 and DSGN 106-2 and one of the following: DSGN 240-0, DSGN 245-0, or MECH_ENG 240-0.

DSGN 346-0 Manufacturing Methods for Product Design (1 Unit) Who takes it: DSGN 346 is taken by MaDE undergraduate students. MaDE students may petition for this course to count in place of the ME 340-1 degree requirement. Description: Design for fabrication is an introduction to manufacturing processes including casting, injection molding, additive manufacturing, extrusion, machining, joining, and forming, using materials commonly found in modern consumer and industrial products. Online lectures will be paired with weekly, hands-on labs where students will be able to apply theory of manufacturing processes to the design of parts and process tooling for various fabrication methods. Focus will be placed on the exploration of part design and process parameters, to obtain an optimal outcome for a given manufacturing process. Students will become proficient in both the advantages and limitations of various fabrication methods, in order to better prepare them for the design of a component and implementation into a production line. Prerequisites: DSGN 106-1 and DSGN 106-2 and one of the following: DSGN 240-0, DSGN 245-0, or instructor approval of previous CAD experience.

DSGN 348-0 Rapid Prototyping (0.5-1 Unit) Course Overview: DSGN 348 will cover the field of additive manufacturing methods, and instruct students on the operation of equipment in the Northwestern Rapid Prototyping lab. Students will review the fundamentals and theory behind rapid prototyping methods, different methods and materials used, applications of rapid prototyping technology, advanced CAD modeling, and reverse engineering methods. The course will include lab work, where students will learn the operation of additive manufacturing machines, laser scanners, and CAD surface software. Students completing this class will be qualified to operate all RP lab equipment, and be proficient at advanced reverse engineering and RP software. Remote Learning Quarters: Each student enrolled will be provided with a 3D printer and printing material to use at home, with coursework exploring the setup, troubleshooting, and optimization of extrusion-based printing. Prerequisites: DSGN 240-0 or DSGN 245-0, MECH_ENG 240-0, or approval of instructor.

DSGN 350-0 Intellectual Property and Innovation (1 Unit) The course will explore the critical role of designers, business strategists and engineers in the invention/creative process. It is open to non STEM students as well. DSGN 350 will enlighten students through narrative case study examples each class to the process and practice of protecting your creations with intellectual property strategies.

DSGN 360-0 Design Competition (1 Unit) Undergraduate teams compete in McCormick's annual autonomous robot contest. Work begins winter quarter; teams must pass a qualifying milestone to register for credit in spring quarter. Students may register for this course no more than twice.

DSGN 370-0 Portfolio Development & Presentation (1 Unit) Creation of design projects that showcase engineering work and future career goals. The portfolio physically presents a story that embodies its creator's goals. Prerequisite: Reserved for Juniors and Seniors.

DSGN 375-0 Data as Art (1 Unit) Information visualization across multiple disciplines.

DSGN 380-1 Industrial Design Projects I (1 Unit) Design thinking; user-centric principles of design and DFM. Indus-trial design project for personal portfolio development. Concept ideation and sketching; use of discovery research and data visualization; problem framing and prototyping; design for manufacturing. Keystroke rendering, rapid prototyping. Pt 1 in two-course sequence. Prerequisites: DSGN 243-0 and either DSGN 240-0 or MECH_ENG 240-0 and either DSGN 220-0 or DSGN 320-0; or consent of the instructor. Reserved for Juniors and Seniors.

DSGN 380-2 Industrial Design Projects II (1 Unit) Design thinking; user-centric principles of design and DFM. Indus-trial design project for personal portfolio development. Concept ideation and sketching; use of discovery research and data visualization; problem framing and prototyping; design for manufacturing. Keystroke rendering, rapid prototyping. Prerequisite: DSGN 380-1.

DSGN 382-1 Service Design Studio I (1 Unit) This course explores the human centered approach to the design of services. Students will explore and apply design thinking to client sponsored projects and synthesize both user and client needs to the design of tangible consumer touch points. This includes experiences plans, digital interface designs, communication models, organizational designs, systems and/or brand tonality deliverables. Pt 1 in two-course sequence. Prerequisite: DSGN 305-0 or DSGN 306-0 or DSGN 308-0; or consent of instructor. Reserved for Juniors and Seniors.

DSGN 382-2 Service Design Studio II (1 Unit) This course explores the human centered approach to the design of services. Students will explore and apply design thinking to client sponsored projects and synthesize both user and client needs to the design of tangible consumer touch points. This may include experiences plans, digital interface designs, communication models, organizational designs, systems and/or brand tonality deliverables. Prerequisite: DSGN 382-1.

DSGN 384-1 Interdisciplinary Product Design Projects I (1 Unit) Open-ended, team-based product or system design projects in real-world settings. Sequence must be taken in consecutive quarters. Project research, concept development, professional communication, advanced topics in design. One of DSGN 305-0, DSGN 306-0, or DSGN 308-0 is recommended before taking this course. Pt 1 in two-course sequence. Prerequisite: DSGN 106-1 or DSGN 208-0. Reserved for Juniors and Seniors.

DSGN 384-2 Interdisciplinary Product Design Projects II (1 Unit) Open-ended, team-based product or system design projects in real-world settings. Sequence must be taken in consecutive quarters. Implementation, evaluation, communication, documentation. Prerequisite: DSGN 384-1.

DSGN 386-0 Manufacturing Engineering Design (1 Unit) Hands-on design project course addressing LEAN manufacturing engineering design topics, such as DFA (design for assembly), DFM (design for manufacturing), automation, quality control, process planning, tooling
design, concurrent engineering, and continuous improvement. In this course you are not challenged to design a new product, but you are given all the components of an existing product and you design the manufacturing specifications, and process. Design strategy, manufacturing modeling and optimization, engineering documentation, quality control, manufacturing costing and product manufacturing productivity skills are put into practice in the final pilot run of the manufacturing process by each team. Prerequisite: MECH_ENG 240-0, or consent of instructor. Reserved for Juniors and Seniors.

**DSGN 395-0 Special Topics (1 Unit)**
Topics relevant to design engineering and approved by the institute. Prerequisite: consent of instructor.

**DSGN 397-0 Advanced Topics in Design (0.5 Unit)**
Topics suggested by students and faculty and approved by the institute.

**DSGN 399-0 Independent Study Project (1 Unit)**
Independent study on a manufacturing engineering topic supervised by a faculty member. Prerequisite: consent of instructor.