

SEGAL DESIGN INSTITUTE

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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 challenges proposed by project partners by identifying unmet needs, conducting research, generating and evaluating potential solutions, and finally, presenting a final design concept with supporting documentation. Students also enhance their abilities in equitable teamwork, 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. Prerequisite: Reserved for McCormick students only.

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. Prerequisite: DSGN 106-1.

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. This class is intended for first-year students, sophomores, and juniors. Prerequisite: Reserved for First-Year Students, Sophomores, and Juniors. Non-McCormick students only.

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 230-0 Machining Basics (0.5 Unit) The intent of this class is to introduce students to a range of basic manufacturing techniques. Students will learn machine tool technology theory and gain familiarity through hands-on practice with manual machine tools and other shop

equipment. All the skills taught will culminate in a final project which each student is expected to manufacture on their own. All students will be expected to complete safety training modules.

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 241-0 Wireframing and App Design Basics (0.5 Unit) Translate your app ideas into real pixels. Whether you're interested in becoming a product designer, product manager, or just have an app idea— together we'll shape ideas into tangible mockups. This beginner class will take you from sketching on pen and paper to generating interfaces and flows in industry tools like Miro and Figma. You'll see how typography, hierarchy and unity play a role in the product design process, and continue on testing your app before handing it off to product teams or engineers.

DSGN 243-0 Visual Thinking for Design (0.5 Unit) Complements the traditional design research and ideation process using visual stimuli. Students will work with visual thinking methods to help expand their understanding of a problem space resulting in a greater generation of ideas and a more tangible organization of our thoughts. DSGN 220-0 and/or some experience with Adobe Photoshop is 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) Considers an approach to life as a series of design projects to help students craft a total life. 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) Project-based, human-centered design approach to service design, with a focus on the 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 User Experience Design (1 Unit) Project-based studio 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) A jointly offered CS and Segal learning initiative that empowers students to drive cutting-edge research that shapes new experiences with people and technology. 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. DTR adapts agile development and design-based research practices with scrums, sprints, studio critique, design logs, and pair research. This class may be repeated for credit.

DSGN 320-0 Introduction to Industrial Design Methods (1 Unit)

Introduces the process of product development from an industrial design perspective, with a focus on exploring form through design sketching.

DSGN 321-0 Advanced Solid Modeling (0.5 Unit) Provides advanced instruction on the use of CAD modeling using Solidworks software. Prerequisite: DSGN 240-0 or consent of instructor.

DSGN 322-0 Rendering (0.5 Unit) Provides an introduction to Keyshot software, a photorealistic rendering package.

DSGN 340-0 Performance and Technology: Composition Workshop (1 Unit) In this course students will use basic mechatronics to create compelling movement-based performances. The course will involve workshop exploration of technologies embedded in performance: robots, media, computer interface. Students will create performance projects and discuss theoretical and historical implications of technologies in performance. Hands-on making and engineering workshops will be incorporated to develop skills in technological crafts such as circuit design and fabrication, toward technologically enhanced performance.

DSGN 345-0 Computer-Aided Manufacturing (0.5 Unit) Teaches the NX manufacturing environment to program machining operations for CNC milling, as well as the operation of CNC milling machines. Teaches the complete path from part design to manufacture, including operations, tools, and geometry in NX, manufacturing setup and g-code generation, proper machine setup, operation, troubleshooting and optimization for both 2.5D machining and full CNC machining. Prerequisites: DSGN 106-1 and DSGN 106-2 and one of the following: DSGN 240-0 or MECH_ENG 240-0.

DSGN 346-0 Manufacturing Methods for Product Design (1 Unit) 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. In weekly hands-on labs, students apply theory of manufacturing processes to the design of parts and process tooling for various fabrication methods. Focus will be placed on adjusting design and process parameters to obtain an optimal outcome for a given manufacturing process. Prerequisites: DSGN 106-1 and 106-2, and MECH_ENG 240 or instructor approval of previous CAD experience. MaDE students may petition for this course to count in place of the of the ME 340-1 degree requirement.

DSGN 348-0 Rapid Prototyping (0.5-1 Unit) A survey of additive manufacturing methods and hands-on training in the operation of all equipment in the Northwestern Rapid Prototyping lab. Students review the fundamentals and theory behind rapid prototyping methods, materials, applications of RP technology, advanced CAD modeling, and reverse engineering methods. Includes lab work, where students will learn the operation of additive manufacturing machines, laser scanners, and CAD surfacing software. Prerequisites: DSGN 240-0 or MECH_ENG 240-0, or approval of instructor.

DSGN 350-0 Intellectual Property and Innovation (1 Unit)

Explores the critical role of designers, business strategists and engineers in the invention/creative process. All issues relating to patents and patentability of inventions, copyrights and the protection of the expressions of ideas, trademarks and source identifiers are reviewed and analyzed in the context of multiple engineering domains.

DSGN 365-0 Bay Area Design Practicum (1 Unit) For Bay Area Immersion Program Participants. This course is an opportunity to immerse in a critical area of need and make the most of our opportunity to engage with people in the Bay Area, joining them as visionaries, thought leaders and activists concerned with shaping our communities and world. This is a dynamic, hands-on studio course requiring project-

based work and team collaboration. In this 300-level class, you are expected to be able to rapidly engage in the design process, working with multidisciplinary teams on uncovering opportunities, exploring ideas, prototyping solutions (whether physical, digital or interpersonal), and interacting with users.

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

DSGN 376-0 Leonardo, Geometry, and the Art of Manufacturing (1 Unit)

In Walter Isaacson's 2017 biography of Leonardo da Vinci, the topic of geometry is referenced over 80 times. The only drawings by Leonardo that were published during his lifetime were illustrations for a textbook on geometry. The artist's final journal entry, written only days before his death, included attempts at a geometric proof. A friend of the artist once lamented in a letter, "He devotes much of his time to geometry, and has no fondness at all for the paintbrush." What compelled Leonardo's fascination with this subject? In this interdisciplinary class, we will explore Leonardo's geometric studies, using them as a vehicle for our own studies of artistic and industrial processes. Students will collaborate with artists, manufacturers, and technologists to produce sculptural objects in a range of materials. The course will culminate in a public iron pour in which we will attempt to translate several of Leonardo's sketches into cast-iron 3D pieces using a historical furnace in honor of the artist's work.

DSGN 380-1 Industrial Design Projects I (1 Unit) Design thinking, user-centric principles of design and DFM. Development of an industrial design project for your personal portfolio. Concept ideation and sketching; use of discovery research and data visualization; problem framing and prototyping; design for manufacturing, Keyshot rendering, rapid prototyping. Pt 1 in two-course sequence; sequence must be taken in consecutive quarters. 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. Development of an industrial design project for your personal portfolio. Concept ideation and sketching; use of discovery research and data visualization; problem framing and prototyping; design for manufacturing, Keyshot rendering, rapid prototyping. Prerequisite: DSGN 380-1.

DSGN 381-0 Digital Product Development (2 Units) "In this digital product development course, students will experience the full end-to-end product development lifecycle through ideation, build, and continuous improvement. Students will have an opportunity to explore and apply design thinking and agile/scrum methodologies to a client sponsored project. This class is by application only. Prerequisite: Students must have taken DSGN 106 or 208 and be in junior or senior standing."

DSGN 382-1 Service Design Studio I (1 Unit) Explores the human centered approach to the design of services. Students will apply design thinking to client sponsored projects and synthesize both user and client needs to the design of tangible consumer touch points. This includes experience plans, digital interface designs, communication models, organizational designs, systems and/or brand tonality deliverables. Pt 1 in two-course sequence; sequence must be taken in consecutive quarters. 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) Explores the human centered approach to the design of services. Students will apply design thinking to client sponsored projects and synthesize both user and client

needs to the design of tangible consumer touch points. This includes experience 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. 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; sequence must be taken in consecutive quarters. 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. Implementation, evaluation, communication, documentation. Prerequisite: DSGN 384-1.

DSGN 386-0 Manufacturing Engineering Design (1 Unit) A hands-on, team-based survey of lean manufacturing concepts such as DFA (design for assembly), DFM (design for manufacturing), automation, quality control, process planning, tooling design, concurrent engineering, and continuous improvement. Students are given the components of an existing product and are challenged to 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 a final pilot run of the manufacturing process by each team. Prerequisite: Any IEMS 300 level, MECH_ENG 340-1, DSGN 308, or consent of instructor. Reserved for Juniors and Seniors.

DSGN 388-1 MaDE Capstone Sequence I (1 Unit) The first quarter of a three-quarter, year-long product design and development experience for students in the MaDE program. Senior standing and instructor permission are required.

DSGN 388-2 MaDE Capstone Sequence II (1 Unit) The second quarter of a three-quarter, year-long product design and development experience for students in the MaDE program. Senior standing and instructor permission are required.

DSGN 388-3 MaDE Capstone Sequence III (1 Unit) The third and final quarter of a three-quarter, year-long product design and development experience for students in the MaDE program. Senior standing and instructor permission are required.

DSGN 395-0 Special Topics (1 Unit)

Topics relevant to design 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 design topic supervised by a faculty member. Prerequisite: consent of instructor.