

HUMAN CENTERED DESIGN AND ENGINEERING

The program may be completed entirely on campus, entirely online, or through a combination of on-campus and online courses.

About the Program

MS in HCDE is 31 semester hours graduate degree designed for students who want to pursue leadership roles in user experience research and design and /or explore, extend, and integrate theoretical and practical issues in design using human centered approach. The proposed program also addresses strong need in industry for highly qualified individuals who can research, identify, document and translate user requirements and needs, generate creative ideas, implement and evaluate the products or services in a scientific way.

MS in HCDE is an interdisciplinary program offered by the Department of Industrial and Manufacturing Systems Engineering in the College of Engineering and Computer Science with the participation of the Department of Behavioral Sciences in the College of Arts, Science and Letters at the University of Michigan-Dearborn.

Human centered design related jobs are on the rise and appear under various titles, such as user experience designer, user interface designer, interaction designer, usability analyst, and product designer.

Program Goals

- Provide knowledge to research, explore, extend, and integrate theoretical and practical issues in design using human centered approach.
- Provide students with the ability to function in multidisciplinary teams and develop innovative solutions to real life design problems.
- Prepare students for the carrier opportunities in human centered/ experience design.

Degree Requirements

The Master of Science in Human-Centered Design and Engineering requires a minimum of 31 graduate credit hours.

- Courses in which grades of C- or below are earned cannot be used to fulfill degree requirements.
- A minimum of a 3.0 cumulative GPA or higher is required at the time of graduation.

Accelerated 4+1 Option for Human Centered Design and Engineering

The accelerated undergraduate/master's studies option in human-centered design and engineering (including 4+1 option) allows the most qualified UM-Dearborn undergraduate human-centered engineering design (BS HCED) students to pursue a program of study in which BSE and MS degrees are earned in a five-year accelerated format. This is achieved by combining a portion of undergraduate and graduate coursework as described below.

Eligibility and Admission

Applying to the 4+1/Accelerated option is a two-stage process coordinated with both your undergraduate and graduate advising teams. For detailed instructions and application links, please visit the central 4+1

programs webpage (<https://umdearborn.edu/academics/program/41-programs/>).

Double Counting and Transfer Credits

1. The accelerated option allows current UM-Dearborn BS HCED majors to complete both the BSE HCED and MS human-centered design and engineering (MS HCDE) degrees in an accelerated format. Admitted students can double-count up to 9 credits of 500-level or above HCDE core or concentration courses taken during their junior or senior years.
2. In practice with the usual graduate student program rules, students may also transfer a maximum of 6 additional 500-level credits toward the 31-credit hours master's degree. These additional transfer credits can be taken during the junior and senior years and cannot be used for any portion of the undergraduate degree.
3. Depending on the number of double-counted and transfer credits, 16-22 credits of graduate coursework would be needed to complete the master's program after completion of the undergraduate degree.
4. Students must attain a grade of B or better in each 500-level class taken as an undergraduate student and used for graduate credit in the accelerated option. Failure to do so may result in removal from the accelerated option.

Curriculum Requirements

Code	Title	Credit Hours
Core Courses (16 credits)		
HCDE 501	Human Factors and Ergonomics	3
HCDE 510	Foundation of HCDE	3
HCDE 520	Research Methods in HCDE	3
HCDE 590	Capstone Project I	2
HCDE 591	Capstone Project II	2
IMSE 577	Human-Computer Interaction	3

Concentration Requirements (9 credits)

A minimum of 9 credit hours form the two concentration areas (A) and (B) listed below. All three courses must be taken from one concentration.

A. User Experience Design:

Focuses on how to balance user's needs with business objectives and technology constraints.

Code	Title	Credit Hours
ART 510	Advanced Digital Design	3
HCDE 530	Information Visualization	3
HCDE 540	Integrated Design Thinking and Implementation in Business	3
MKT 515	Marketing Management	3
MKT 582	Understanding Customers	3
MKT 602	Advanced Marketing Management	3
PSYC 561	Learning and Memory	3
PSYC 575	Bio Foundations of Health Psyc	3
PSYC 563	Sensation and Perception	3

ANTH 570	Doing Anthropology: Ethnographic Methods and Applied Practice	4
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B. Design and Manufacturing

Focuses on how to design and build human-centered products with consideration of materials and manufacturing constraints.

Code	Title	Credit Hours
HCDE 518	Human-Centered AI and Human-AI Teaming	3
IMSE 511	Design and Analysis of Exp	3
IMSE 545	Vehicle Ergonomics I	3
IMSE 548	Res.Meth.Human Fctrs/Ergonomic	3
IMSE 561	Tot Qual Mgmt and Six Sigma	3
IMSE 586	Big Data Aanal & Visuliztn	3
IMSE 593	Vehicle Package Engineering	3
EMGT 580	Mgt of Prod and Proc Design	3
AENG 589	Auto Assembly Systems	3
AENG 588	Design&Manufac for Environment	3
ME 595	Digital Manufacturing	3

Electives

The remaining 6 credit hours may be selected with the approval of the graduate advisor.

M.S. Thesis Option

With the approval of their graduate advisor, students may substitute a master's thesis (i.e., HCDE 699) for no more than seven credit hours of graduate course work. HCDE 699, Master's thesis will replace three credits of program electives, Capstone Project I and Capstone Project II requirements in the program.

Learning Goals

1. Provide knowledge to research, explore, extend, and integrate theoretical and practical issues in design using a human centered approach.
2. Provide students with the ability to function in multidisciplinary teams and develop innovative solutions to real life design problems.
3. Prepare students for the carrier opportunities in human centered/ experience design.

HCDE 501 Human Factors and Ergonomics 3 Credit Hours

This course is designed to provide an understanding of ergonomics as a science and process, with an emphasis on people at work. Discussion of ergonomic methods for measurement, assessment, and evaluation, with major topics including manual materials handling, cumulative trauma disorders, environmental stresses, and safety issues. (F,W)

Restriction(s):

Can enroll if Level is Rackham or Graduate

HCDE 510 Foundation of HCDE 3 Credit Hours

Full Course Title: Foundation of Human-Centered Design and Engineering
This course introduces human-centered design principles and process. Students learn to apply the process and principles to generate innovative design solutions. Topics include empathy, defining design problem, ideation, emotional design, product prototyping and testing. A semester long team based project allows students to apply classroom learnings to real life design problem. (F)

Restriction(s):

Can enroll if Level is Rackham or Graduate

HCDE 518 Human-Centered AI and Human-AI Teaming 3 Credit Hours

This graduate-level course explores the principles and practices of Human-Centered Artificial Intelligence (HCAI) and effective Human-AI collaboration. Students will examine the dynamics of human-AI interaction, focusing on user-centered design, ethical considerations, and the cognitive challenges associated with AI technologies. Through research, practical projects, and simulations, participants will design and evaluate AI systems that prioritize human needs and values, preparing them to engage critically with the evolving landscape of AI technologies in various domains. This course is not solely focused on AI development; rather, it centers on designing UX and systems for effective collaboration between AI and humans. Depending on their skill levels, students may utilize pseudo-AI for their projects to facilitate this learning experience.

Restriction(s):

Can enroll if Class is Graduate

HCDE 520 Research Methods in HCDE 3 Credit Hours

Full Course Title: Research Methods in Human-Centered Design and Engineering
This course surveys qualitative and quantitative research methods in human-centered design and engineering. Different data collection and measurement techniques are covered for different types of data, including subjective, behavioral, and physiological data. Human subject involved experiment design and introduction to basic statistics are also be covered in this course. Other topics include cognitive task analysis, physiological computing in emotional design and sentiment analysis in user needs elicitation process. Students learn to formulate research questions and hypotheses, design and conduct a research study, and present research results through various case studies. (W)

Restriction(s):

Can enroll if Level is Graduate or Rackham or

HCDE 530 Information Visualization 3 Credit Hours

This course introduces information visualization techniques and process which produce effective visualization and help people understand and analyze data. Topics include basics of information visualization, including its history and necessity, human aspects to understand how human perceives visual stimuli, considerations to present data, strategic techniques to summarize and display information, and evaluation of information design. (W, S).

Restriction(s):

Can enroll if Level is Rackham or Graduate

**HCDE 540 Integrated Design Thinking and Implementation in Business
3 Credit Hours**

This course introduces the business implications of using Human-Centered Design (HCD) skills/tools to drive Integrated problem solving. The course covers the “whys and hows” of each topic with an opportunity to practice the application during in class exercises and projects. The major topics of the course are business-related integrated thinking approaches, including practical applications on how to select and apply appropriate methods to successfully progress through the framework. The course includes case studies and in class workshops. Discussions with industry experts are utilized to supplement course elements as required. A semester-long project is used that requires students to apply the HCD skills to drive an integrated problem solving in the context of related businesses. (W).

Prerequisite(s): HCDE 510

HCDE 590 Capstone Project I 2 Credit Hours

Students form project teams, develop capstone topics, initial concepts, deliverables, schedules and necessary pilot study for the HCDE capstone project. (F,W)

Prerequisite(s): HCDE 520 and IMSE 577 and HCDE 501

Restriction(s):

Can enroll if Level is Graduate

Can enroll if College is Engineering and Computer Science

HCDE 591 Capstone Project II 2 Credit Hours

Students, working in teams under the supervision of individual faculty members, integrate and apply knowledge acquired in various courses of the HCDE program to a design problem of their choosing. (F,W)

Prerequisite(s): HCDE 590

Restriction(s):

Can enroll if College is Engineering and Computer Science

HCDE 699 Master's Thesis Project 1 to 7 Credit Hours

Graduate students electing this course, while working under the general supervision of a member of the department faculty, are expected to plan and conduct the work themselves, to submit a thesis for review and approval, and to present an oral defense of the thesis. Students must satisfactorily complete 7 credit hours in HCDE 699, but these hours may be spread over more than one term. Graduate standing or special permission. (YR).

Restriction(s):

Can enroll if Level is Graduate

Can enroll if College is Engineering and Computer Science

Can enroll if Major is