COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

Engineering: The Profession

Engineers are the link between scientific knowledge and practical applications. Engineers combine various roles and functions in their job. What are engineers?

- Engineers are science-knowledgeable individuals who use mathematics, chemistry, and physics for an applied purpose.
- Engineers invent, design, or improve products that people want to buy or use.
- Engineers are business people who design, manufacture, or sell a technical product or service to customers, taking into consideration safety, cost, quality, reliability, societal impact, and ease of use.
- Engineers are planners and integrators who bring together skills and knowledge from many disciplines and fields for some technical purpose or application.
- Engineers are creative problem-solvers and doers: they make decisions and get things done in a combined science/technical/business/applied profession.
- Engineers analyze problems, develop design solutions, and pay close attention to detail.
- Engineers interact with a variety of people, including clients, scientists, other engineers, technicians, managers, and government officials.
- Engineers are interested in how and why things work and like practical challenges.
- Successful engineers are known for their analytical, imaginative, and creative skills, for using common sense, for being team players, for being able to pick up new knowledge and skills quickly, and for their commitment to continue to improve and learn.

The College of Engineering and Computer Science offers undergraduate engineering degrees in eight fields: Bioengineering, Computer Engineering, Electrical Engineering, Human Centered Engineering Design, Industrial and Systems Engineering, Manufacturing Engineering, Mechanical Engineering, and Robotics Engineering.

Computer Science: The Profession

Computer and information scientists offer expertise in the effective and efficient use of computers for tackling a broad spectrum of practical challenges, usually in a team environment. Computer and information science includes the following sub-specialties: operating systems, compilers, computer graphics, computer game design, computer networks and network administration, security, enterprise computing technologies, information and database systems and database administration, information retrieval, artificial intelligence and machine learning, robotics, theoretical computer science, programming languages, software engineering and web technologies. Software engineering is the area within computer science that is concerned with the theoretical and practical aspects of the detailed design, building, testing, modification, optimization, and maintenance of large, high quality, software systems for a wide range of applications across society. Software engineers analyze users' needs and work as part of a core team to design, create, and implement high quality and cost effective new software, computer applications, and utility programs. A core team may be composed of software engineering, manufacturing, design, management, and marketing people who work together until the software product is released and implemented.

Data scientists use programming, mathematics/statistics, and modeling skills to convert data for companies, governments, and other institutions into actionable information and insight. Cybersecurity and Privacy is the area of computer science concerned with fundamental security and privacy concepts including confidentiality, integrity, access control, security architecture and systems, and attack/defense in various application areas, ranging from computer security to network security, from wired security to wireless security, from data security to application security, from every day security to enterprise security.

The College of Engineering and Computer Science offers undergraduate degrees in four computer science fields: Computer and Information Science, Cybersecurity and Information Assurance, Data Science, and Software Engineering.

Career Choice

What can help students to decide to pursue a career in engineering or computer science? Some of the clues are an interest in and successful completion of science, mathematics, and computer science courses; a desire and ability to investigate the "why" as well as the "how" of things; and an interest in the creative development of devices or systems that meet specific needs. Not all of these signs or interests will fit everyone, but they can be used as a guide.

Individuals with interests in using science and mathematics to benefit others will find that engineering and computer science professions offer a wide variety of career and employment choices and opportunities.

Admissions counselors at UM-Dearborn and academic advisors of the College of Engineering and Computer Science are glad to talk with students about career choices or choosing the school that best suits their interest and abilities. Prospective students are welcome to contact the College of Engineering and Computer Science and to read the information on the College's web page.

Educational Goals and Programs

The mission of the College of Engineering and Computer Science is to be a leader in providing quality undergraduate and graduate programs in an environment integrated with engineering practice, research, and continuing professional education, in close partnership with the industrial community.

The College of Engineering and Computer Science (CECS) prepares its students to take positions of leadership commensurate with their interests and abilities in a world where science, engineering, and human relations are of basic importance.

Programs of study integrate fundamental mathematical and scientific theory with experiments, advanced analysis, and design practice to produce the coherent educational preparation required of professional engineers and computer scientists.

Both the CECS academic curriculum and experiential learning opportunities are planned to prepare students to become practicing engineers or computer scientists, administrators, or investigators. The knowledge, skills, and discipline gained from the CECS degree programs are broad and fundamental and also constitute excellent preparation for other careers, such as law and medicine.

Undergraduate Requirements

The College of Engineering and Computer Science (CECS) offers undergraduate programs leading to the Bachelor of Science in Engineering (BSE) degree in the following fields: Bioengineering, Computer Engineering, Electrical Engineering, Human Centered Engineering Design, Industrial and Systems Engineering, Manufacturing Engineering, Robotics Engineering, and Mechanical Engineering. (Students in these BSE programs may also choose to earn a concurrent second degree in Engineering Mathematics.) The College also offers an undergraduate degree program leading to a Bachelor of Science (BS) in the following fields: Computer and Information Science, Cybersecurity and Information Assurance, Data Science, and Software Engineering. The CIS program has four concentrations: artificial intelligence, computer science, information systems, and game design. The CIA program has two concentrations: digital forensics and cybersecurity and privacy. (Students in these BS programs may also choose to earn a concurrent second degree in CIS Mathematics.)

The minimum credit-hour requirement for the degree programs in engineering is 125 to 128 credits, depending on the specific major. The BS in Software Engineering, Data Science, Cybersecurity and Information Assurance, or in Computer and Information Science requires a minimum of 120 to 123 credits of course work, depending on the specific major.

CECS students can choose from several concurrent undergraduate degree programs, an opportunity to earn two engineering or computer science degrees by completing an additional 15-18 credits. Undergraduate certificates are available for CECS students to pursue, depending on their academic major. And several CECS undergraduate programs offer accelerated master's (4+1) programs which provide a pathway to complete an undergraduate and graduate degree in an accelerated format.

Students have the option of earning a minor in addition to their major. CECS offers minors in Artificial Intelligence, Computer and Information Science, and Game Design. The College of Arts, Sciences, and Letters; the College of Business; and the College of Education, Health and Human Services offer various minors of interest to CECS students. See the relevant sections of this *Catalog*.

The scholastic requirements for graduation are given under the "Academics" sections of this *Catalog*. For the detailed requirements specified by the College of Engineering and Computer Science for each of its undergraduate programs, see the sections below.

The CECS Office of Advising and Academic Success (https://umdearborn.edu/cecs/undergraduate-programs/undergraduate-advising/), 313-593-5510, umd-cecs-undergrad@umich.edu, is the primary contact for undergraduate students for academic advising and for information about all undergraduate degree programs of the College of Engineering and Computer Science.

Admission to the College of Engineering and Computer Science

Undergraduate students interested in Engineering or Computer and Information Science majors can be admitted directly into their chosen major within the College of Engineering and Computer Science.

It is expected that students admitted into a CECS major have previously completed college credit of at least Pre-Calculus (MATH 105) **or** place into Calculus I (MATH 115) based upon the University Math Placement (https://umdearborn.edu/admissions/undergraduate/admitted-students/orientation/placement-exams/) criteria. Students who do not meet one of these Math requirements will participate in the **Dearborn Engineering Success** program.

What is Dearborn Engineering Success?

Dearborn Engineering Success is designed to support students in building a stronger math and science foundation to be successful in the rigorous CECS curriculum. Students will have excellent campus support in developing the fundamental knowledge our faculty have identified as key predictors of success in the engineering and computer science fields. Dearborn Engineering Success students will work closely with Academic Advisors to enroll in the appropriate classes to optimize their success in the intensive curriculum that lies ahead.

Students following the Dearborn Engineering Success path are required to complete **MATH 105 (Pre-Calculus) or MATH 101 with a C- grade or higher within 3 semesters from their admission**, excluding summer semester. Students that demonstrate good academic progress may be granted extension beyond the required timeline. Students that do not show satisfactory academic progress (in some cases prior to the 3 semester timeline) will be provided with alternative academic pathways at UM-Dearborn.

Students who place into Math courses below MATH 105 or MATH 101 will be required to enroll in ENGR 095, CECS First Year Seminar. This course is designed to provide students the opportunity to acquire the necessary skills for successful transition to engineering and computer science pathways through engaging and immersive activities. The course is open to all first semester freshmen in CECS majors.

All students following the Dearborn Engineering Success path are expected to be in good academic standing overall (2.0 GPA or higher).

CECS Office of Advising and Academic Success

The College of Engineering and Computer Science (CECS) Office of Advising and Academic Success (https://umdearborn.edu/cecs/undergraduate-programs/undergraduate-advising/) is the primary contact for undergraduate students for academic advising and for information about all undergraduate CECS programs. The office provides the following services to CECS undergraduate students:

- academic advising of new and continuing students
- admission of cross-campus transfer applicants
- handling of petitions and individual requests
- degree audits of students' credits toward graduation
- placement and release of academic holds
- handling of academic (probationary) actions and petitions
- final certification of degree completion.

The CECS Office of Advising and Academic Success is located in 1084 Engineering Lab Building (ELB), (phone: 313-593-5510).

Majors

- Bioengineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/bioengineering/#majortext) (also offered as Dual Degree)
- CIS Mathematics (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/cis-mathematics/#majortext) (concurrent degree only)

- Computer and Information Science (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/computer-information-science/#majortext) (also offered as Dual Degree)
- Computer Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/computer-engineering/#majortext) (also offered as Dual Degree)
- Cybersecurity and Information Assurance (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/cyber-security-information-assurance/) (also offered as Dual Degree)
- Data Science (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/data-science/) (also offered as Dual Degree)
- Data Science/Economics (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/data-science-economics-concurrent/) (concurrent degree only)
- Electrical Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/electrical-engineering/#majortext) (also offered as Dual Degree)
- Engineering Mathematics (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/engineering-mathematics/#majortext) (concurrent degree only)
- Industrial and Systems Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/industrial-systems-engineering/#majortext) (also offered as Dual Degree)
- Health Sciences Studies as a Secondary Major (https://catalog.umd.umich.edu/undergraduate/college-arts-sciences-letters/health-science-studies-secondary-major/) (only offered as a secondary major; must have a CECS major as primary)
- Human Centered Engineering Design (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/human-centered-engineering-design/)
- Manufacturing Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/manufacturing-engineering/#majortext) (also offered as Dual Degree)
- Mechanical Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/mechanical-engineering/#majortext) (also offered as Dual Degree)
- Robotics Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/robotics-engineering/#majortext)
- Software Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/software-engineering/#majortext)

Minors

- Artificial Intelligence (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/artificial-intelligence/)
- Computer and Information Science (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/computer-information-science/#minortext)
- Game Design (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/game-design/)

Certificates

- Energy and Sustainability (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/energy-sustainability/)
- Engineering Design (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/engineering-design/)
- Engineering Mechanics (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/engineering-mechanics/)
- Materials and Manufacturing (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/materials-manufacturing/)
- Mechatronics and Robotics (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/mechatronics-robotics/)
- Vehicles and Mobility (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/vehicles-mobility/)
- Practical Aspects of Computer Security (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/practical-aspects-computer-security/)

Dual Degree Programs

- BSE, Bioengineering/Mechanical Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/dual-degree/bio-eng-mechanical-eng/)
- BS, Computer and Info Systems/Cybersecurity (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/dual-degree/comp-info-and-cybersecurity/)
- BS, Computer and Info Systems/Data Science (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/dual-degree/comp-info-data-science/)
- BSE, Electrical/Computer Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/dual-degree/electrical-computer-engineering/)
- BSE, Industrial and Systems Engineering/Manufacturing Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/dual-degree/industrial-systems-manufacturing-eng/)
- BSE, Manufacturing/Mechanical Engineering (https://catalog.umd.umich.edu/undergraduate/college-engineering-computer-science/dual-degree/manufacturing-mechanical-eng/)

Administration

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Brahim Medjahed, PhD, Associate Dean for Undergraduate Education

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Susan Guinn, MPA, Director, CECS Online

Lauren Paton, Director, Business Operations

Lisa Remsing Hall, PhD, Director, Advising and Academic Success

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Wencong Su, Chair, Department of Electrical and Computer Engineering

Shan Bao, Chair, Department of Industrial and Manufacturing Systems Engineering

Di Ma, Chair, Department of Computer and Information Science

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Zhang, Yi, PhD, University of Illinois at Chicago, Professor of Mechanical Engineering

Zikanov, Oleg, PhD, Moscow State University, Professor of Mechanical Engineering

Cooperative Education & Experiential Learning in Engineering & Computer Science

The College of Engineering and Computer Science (CECS) at UM-Dearborn recognizes experiential learning as an essential component of an engineering and computer science education. CECS strongly encourages students to engage in structured, professional work experiences that complement their academic studies and support their career development.

We provide an optional academic pathway designed for students completing co-ops and internships to earn academic credit while gaining valuable skills. These experiences allow students to apply classroom theories, technical methods, and problem-solving skills in professional settings while gaining exposure to workplace expectations, industry standards, and emerging technologies.

Students can seek approval to enroll in the Experiential Learning in Engineering & Computer Science courses (ENGR 299, 399, 499), which provide academic structure, faculty oversight, and guided reflection to ensure meaningful integration of academic learning and professional practice.

The CECS Career Success Hub (https://umdearborn.edu/cecs/undergraduate-programs/career-success-hub/) offers support for students to secure internships and co-ops through career coaching, resume development, interview preparation, and connections with employer partners to help you find opportunities that match your goals and interests.

Experiential Learning in Engineering & Computer Science Courses (ENGR 299, 399, 499)

These courses let you bridge classroom learning and professional practice, earning academic credit for practical experiences that directly relate to your major and career interests.

Learning Objectives:

- Integrate classroom theories, methods, and technical skills in the workplace.
- Gain hands-on experience with tools and technologies relevant to your field.
- Grow your communication, teamwork, and professional problem-solving abilities.
- Demonstrate ethical standards and workplace responsibility.
- Explore workplace dynamics and build your professional network.
- Reflect on your personal strengths, growth areas, and career goals.

For each approved work experience, you will earn **one academic credit** per course. Each course is **letter-graded (A-E)**. Students in all CECS majors may apply **up to 3 credits** from these courses (ENGR 299, 399, and 499) toward their technical electives. This approach allows you to build valuable work experience while also fulfilling your degree requirements.

Registration & Eligibility

To enroll in Experiential Learning in Engineering & Computer Science courses students must meet the following eligibility:

- **Standing:** Must be a sophomore (25+ credits), junior, or senior.
- **CECS Tenure:** Completed at least 2 semesters in CECS.
- **GPA:** Minimum of 2.0 and in good academic standing.
- **Prerequisites:**
  - ENGR 299: Completed CIS 150 or ENGR 100.
  - ENGR 399 builds on ENGR 299; ENGR 499 builds on ENGR 399.

Students must obtain approval to enroll in Experiential Learning in Engineering & Computer Science courses (ENGR 299, 399, 499). Start this process by reaching out to the CECS Career Success Hub (https://umdearborn.edu/cecs/undergraduate-programs/career-success-hub/).

Position Requirements

For a position to be approved, it should provide an opportunity to integrate knowledge and theory learned in the classroom with practical application and skills development in a professional workplace setting. Additionally, your position must meet these specific requirements:

- Be secured by you, the student, prior to registration.
- Relate to your major and career goals.
- Be in-person, remote, or hybrid.
- Offer supervision and regular feedback.
- Integrate classroom learning with the workplace.
- Last at least 7 weeks and a total minimum of 140 hours.

Support is available: The CECS Career Success Hub (https://umdearborn.edu/cecs/undergraduate-programs/career-success-hub/) provides resources and support to help guide your application and recruitment process.

Course Credit & Grading

For each approved work experience, you will earn **one academic credit** per course. Each course is **letter-graded (A-E)**. Students in all CECS majors may apply **up to 3 credits** from these courses (ENGR 299, 399, and 499) toward their technical electives.

At the beginning of the term, the student and employer will establish a set of learning objectives aligned with the course outcomes. These objectives must be submitted for review and approved by the faculty advisor no later than the second week of the semester.

Throughout the semester, students will complete **1–3 structured reports** using a provided template. Students will receive a grade based on their performance, as included in the reports.

By completing these courses, you gain practical experience and receive valuable feedback, all while earning academic credit that counts toward your technical elective requirements and strengthens your degree and career preparation.

Important Policies:

- Credit for Experiential Learning in Engineering & Computer Science courses (ENGR 299, 399, 499) can only be earned for current, approved experiences. Previous work experiences are not eligible for credit.
- Although there is no specific limit on how many other courses you can take while enrolled in an Experiential Learning course, students are strongly recommended to discuss their overall workload (academic and employment) with an academic advisor in the CECS Office of Advising and Academic Success (https://umdearborn.edu/cecs/undergraduate-programs/undergraduate-advising/).

Engineering Learning Center

The mission of the Engineering Learning Center (ELC) (https://umdearborn.edu/cecs/undergraduate-programs/engineering-learning-center/) is to support the academic success of the College of Engineering and Computer Science (CECS) students in an open, inclusive, and student-focused environment that fosters students' ownership of their learning journey, in close partnership with faculty, staff, students, alumni as well as university and industry partners.

Our Approach

The ELC supports its mission through a holistic approach to learning and success that includes a variety of services and programs such as free tutoring, boot-camps, exam preparation, success coaching, and guided study sessions. ELC services are tailored to engineering and computer science students, programs, and courses and cover major courses across the four CECS departments. The ELC services and programs are provided in collaboration with faculty, staff, students, alumni, and industry partners. The center complements and coordinates with existing UM-Dearborn academic success resources such as the Office of Academic Success, Experience+, Talent Gateway, peer learning centers (math, science, and writing), and the Mardigian Library.

The ELC is located in Room 1170 of the Heinz Prechter Engineering Complex (HPEC).

Study Abroad Opportunities

Student Exchange Programs with the Jönköping School of Engineering in Jönköping, Sweden and the Ulm University of Applied Sciences in Ulm, Germany

The College of Engineering and Computer Science offers two study abroad opportunities. Our exchange programs with Ulm University of Applied Sciences in Germany and Jönköping University in Sweden are a great way to gain intercultural experience while fulfilling degree requirements. Students register for a full-time course load and pay their normal UM-Dearborn tuition. All courses are taught in English and designed with exchange students in mind. To maintain full-time status and financial aid, students typically enroll in three technical courses and one language/culture course. Courses taken abroad count toward students' UM-Dearborn GPA. Students register for courses at UM-Dearborn and pay their normal tuition. There is no extra fee to participate, but students should budget for living expenses, such as housing, food, airfare, and travel. All CECS majors in good academic standing are eligible to apply.

Please contact the Office of Advising and Academic Success (https://umdearborn.edu/cecs/undergraduate-programs/undergraduate-advising/) to discuss these opportunities with your advisor, or visit the Office of International Affairs for information about additional study abroad programs.

Career Opportunities

A wide variety of employment opportunities is available to engineering and computer science graduates, as mentioned above. The University's Office of Career Services (https://umdearborn.edu/career-services/) offers numerous services to students and graduates in preparing for careers and in searching for professional employment in a chosen field.

Student Clubs and Organizations

CECS students are involved in a wide variety of student organizations (https://umdearborn.edu/cecs/life-cecs/student-clubs-organizations/) at UM-Dearborn. CECS has more than 20 clubs, teams, and professional organizations that challenge students to problem solve, make connections, and prepare for a fulfilling career in engineering or computer science.