COMPUTER ENGINEERING, B.S.

As a computer engineering major, you can learn how to design and manufacture computer hardware using the latest semiconductor chip technologies, which form the foundation of everything from automobiles to household appliances to defense systems. In addition, you can learn how to develop, analyze and research systems that process, store and convey digital information. Computer engineering majors explore cutting-edge systems, including wearable technology, mobile devices, personal computers, servers used in the cloud, and embedded systems. You can even focus on the mathematics, tools and practices associated with machine learning and data science in engineering with our new Machine Learning and Data Science named degree option. Become a Badger, and let your curiosity set your path for learning.

ELECTRICAL ENGINEERING AND COMPUTER ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES

Our graduates should be engaged in activities such as:

1. Employment in industry, government, academia, or non-profit using their degree knowledge or skills for professional functions such as teaching, research and development, quality control, technical marketing, intellectual property management, or sales. Graduates may eventually reach a leadership position supervising others.
2. Continuing education through self-study or short courses and workshops through their employer, local or online educational institutions, or attendance at professional events such as conferences.
3. Taking a principal role in starting a new business or product line.
4. Pursuing a postgraduate degree.

HOW TO GET IN

ADMISSION TO THE COLLEGE AS A FRESHMAN

Students applying to UW–Madison (https://www.admissions.wisc.edu/apply/) need to indicate an engineering major (https://engineering.wisc.edu/degrees-programs/undergraduate/) as their first choice in order to be considered for direct admission to the College of Engineering. Direct admission to a major means students will start in the program of their choice in the College of Engineering and will need to meet progression requirements (https://engineering.wisc.edu/student-services/undergraduate-student-advising/progression/) at the end of the first year to guarantee advancement in that program.

CROSS-CAMPUS TRANSFER TO ENGINEERING

UW–Madison students in other schools and colleges on campus must meet minimum admission requirements (https://engineering.wisc.edu/admissions/undergraduate/cross-campus-students/) for admission consideration to engineering degree granting classifications. Cross-campus admission is competitive and selective, and the grade point average expectations may increase as demand trends change. The student's overall academic record at UW–Madison is also considered. Students apply to their intended engineering program by submitting the online application by stated deadlines for spring and fall. The College of Engineering offers an online information tutorial and drop-in advising (https://engineering.wisc.edu/admissions/undergraduate/cross-campus-students/) for students to learn about the cross-campus transfer process.

OFF-CAMPUS TRANSFER TO ENGINEERING

With careful planning, students at other accredited institutions can transfer coursework that will apply toward engineering degree requirements at UW–Madison. Off-campus transfer applicants are considered for direct admission to the College of Engineering by applying to the Office of Admissions with an engineering major listed as their first choice. Those who are admitted to their intended engineering program must meet progression requirements (https://engineering.wisc.edu/admissions/undergraduate/transfer-from-off-campus/) at the point of transfer or within their first two semesters at UW–Madison to guarantee advancement in that program. A minimum of 30 credits in residence in the College of Engineering is required after transferring, and all students must meet all requirements for their major in the college. Transfer admission to the College of Engineering is competitive and selective, and students who have exceeded the 80 credit limit at the time of application are not eligible to apply.

The College of Engineering has dual degree programs with select four-year UW System campuses. Eligible dual degree applicants are not subject to the 80 credit limit.

Off-campus transfer students are encouraged to discuss their interests, academic background, and admission options with the Transfer Coordinator in the College of Engineering: ugtransfer@engr.wisc.edu or 608-262-2473.

SECOND BACHELOR'S DEGREE

The College of Engineering does not accept second undergraduate degree applications. Second degree student (https://engineering.wisc.edu/admissions/undergraduate/adult-students-second-degree-students/)s (https://engineering.wisc.edu/student-services/undergraduate-student-advising/) might explore the Biological Systems Engineering program at UW–Madison, an undergraduate engineering degree elsewhere, or a graduate program in the College of Engineering.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduatestudytext) section of the *Guide*.

General Education

- Breadth—Humanities/Literature/Arts: 6 credits
- Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits
- Breadth—Social Studies: 3 credits
- Communication Part A & Part B *
- Ethnic Studies *
- Quantitative Reasoning Part A & Part B *

* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

SUMMARY OF REQUIREMENTS

The following curriculum applies to students who were admitted to the computer engineering degree program (classification changed to CMPE) in fall 2017 or later.

Code	Title	Credits
Mathematics		19
Science		20-21
Computer Engineering Core		34
Computer Engineering Advanced Electives		16
Professional Electives		9
Communication Skills		6
Liberal Studies		15
Free Elective		1
Total Credits		**120-121**

MATHEMATICS

Code	Title	Credits
MATH 221	Calculus and Analytic Geometry 1	5
or MATH 217	Calculus with Algebra and Trigonometry II	
or MATH 275	Topics in Calculus I	
MATH 222	Calculus and Analytic Geometry 2	4
or MATH 276	Topics in Calculus II	
MATH 234	Calculus--Functions of Several Variables [1]	4
MATH/ COMP SCI 240	Introduction to Discrete Mathematics	3
or MATH/ COMP SCI/ STAT 475	Introduction to Combinatorics	
Probability/Statistics Elective (select one)		*3*
STAT 311	Introduction to Theory and Methods of Mathematical Statistics I	
MATH/STAT 431	Introduction to the Theory of Probability	
E C E 331	Introduction to Random Signal Analysis and Statistics	
Total Credits		**19**

1 MATH 375 and MATH 376 taken in sequence will fulfill the requirement for MATH 234.

SCIENCE

Code	Title	Credits
COMP SCI 300	Programming II	3
COMP SCI 400	Programming III	3
PHYSICS 201	General Physics [1]	5
or PHYSICS 207	General Physics	
or PHYSICS 247	A Modern Introduction to Physics	
PHYSICS 202	General Physics	5
or PHYSICS 208	General Physics	
or PHYSICS 248	A Modern Introduction to Physics	
Select one of the following:		4-5
CHEM 109	Advanced General Chemistry	
CHEM 103	General Chemistry I	
CHEM 104	General Chemistry II	
Total Credits		**20-21**

1 Students may also fulfill this requirement by taking E M A 201 Statics and E M A 202 Dynamics or E M A 201 Statics and M E 240 Dynamics.

COMPUTER ENGINEERING CORE

Code	Title	Credits
E C E 203	Signals, Information, and Computation	3
E C E 210	Introductory Experience in Electrical Engineering	2
E C E 219	Analytical Methods for Electromagnetics Engineering	2
E C E 220	Electrodynamics I	3
E C E 230	Circuit Analysis	4
E C E/ COMP SCI 252	Introduction to Computer Engineering	3
E C E 270	Circuits Laboratory I	1
E C E 315	Introductory Microprocessor Laboratory	1
E C E 340	Electronic Circuits I	3
E C E/ COMP SCI 352	Digital System Fundamentals	3
E C E 353	Introduction to Microprocessor Systems	3
E C E/ COMP SCI 354	Machine Organization and Programming	3
E C E 551	Digital System Design and Synthesis	3
Total Credits		**34**

COMPUTER ENGINEERING ADVANCED ELECTIVES

Code	Title	Credits
Electronic Circuits Elective		*3*
E C E 342	Electronic Circuits II	
E C E 447	Applied Communications Systems	

E C E 541	Analog MOS Integrated Circuit Design	
E C E 542	Introduction to Microelectromechanical Systems	
E C E 548	Integrated Circuit Design	
E C E 555	Digital Circuits and Components	
Systems Software Elective		*3-4*
E C E/ COMP SCI 506	Software Engineering	
COMP SCI 536	Introduction to Programming Languages and Compilers	
COMP SCI 537	Introduction to Operating Systems	
COMP SCI 564	Database Management Systems: Design and Implementation	
Capstone Design		*4*
E C E 453	Embedded Microprocessor System Design	
E C E 454	Mobile Computing Laboratory [1]	
E C E 554	Digital Engineering Laboratory	
CMPE Elective I		*3*
E C E 537	Communication Networks	
E C E/ COMP SCI 552	Introduction to Computer Architecture	
E C E 553	Testing and Testable Design of Digital Systems	
E C E 556	Design Automation of Digital Systems	
CMPE Elective II		*3*
Select from E C E 399 - E C E 699		
Select from COMP SCI 400 - COMP SCI 699 [1]		
Total Credits		**16-17**

1 E C E 454 Mobile Computing Laboratory and COMP SCI 407 Foundations of Mobile Systems and Applications cannot both be taken for degree credit.

PROFESSIONAL ELECTIVES

Code	Title	Credits
Professional Electives		**9**
Courses to be taken in an area of professional interest. The following courses are acceptable as professional electives if the courses are not used to meet any other degree requirements.		
E C E 1	Cooperative Education Program (One co-op credit can count towards professional electives.)	
E C E 204	Data Science & Engineering	
E C E/ PHYSICS 235	Introduction to Solid State Electronics	
E C E 320	Electrodynamics II	
E C E 330	Signals and Systems	
E C E 331	Introduction to Random Signal Analysis and Statistics	
E C E 332	Feedback Control Systems	
E C E 334	State Space Systems Analysis	
E C E 335	Microelectronic Devices	
E C E 342	Electronic Circuits II (may be used if not already used as an Electronic Circuits Advanced Elective)	
E C E 355	Electromechanical Energy Conversion	
E C E 356	Electric Power Processing for Alternative Energy Systems	
E C E courses numbered 399 and higher		
COMP SCI courses numbered 400 and higher		
MATH 319	Techniques in Ordinary Differential Equations	
MATH 320	Linear Algebra and Differential Equations [1]	
MATH 321	Applied Mathematical Analysis	
MATH 322	Applied Mathematical Analysis	
MATH 340	Elementary Matrix and Linear Algebra [1]	
MATH 341	Linear Algebra	
MATH courses numbered 400 and higher		
STAT courses numbered 400 and higher		
Any biological sciences course that is designated as intermediate or advanced level		
Any physical science course that is designated as intermediate or advanced level		
Any natural science course that is designated as advanced level, except that math, computer sciences, and statistics courses must follow the above criteria		
Engineering courses numbered 300 and higher that are not E C E or cross-listed with E C E		
Up to six credits of Professional Electives can be taken from School of Business classes numbered 300 and higher.		
DS 501	Special Topics (Wearable Technologies)	
DANCE 560	Current Topics in Dance: Workshop (Making Digital Lighting Controls)	

1 Students may only earn degree credit for MATH 320 Linear Algebra and Differential Equations or MATH 340 Elementary Matrix and Linear Algebra, not both.

COMMUNICATION SKILLS

Code	Title	Credits
ENGL 100	Introduction to College Composition	3
or LSC 100	Science and Storytelling	
or COM ARTS 100	Introduction to Speech Composition	
or COM ARTS 181	Elements of Speech-Honors Course	
or ESL 118	Academic Writing II	
INTEREGR 397	Engineering Communication	3
Total Credits		**6**

LIBERAL STUDIES ELECTIVES

Code	Title	Credits
College of Engineering Liberal Studies Requirements		
Complete requirements (http://guide.wisc.edu/undergraduate/engineering/#requirementstext) [1]		15
Total Credits		**15**

1

All liberal studies credits must be identified with the letter H, S, L, or Z. Language courses are acceptable without the letter and are considered humanities. **Note**: See an E C E advisor and/or the EE Curriculum Guide (https://www.engr.wisc.edu/department/electrical-computer-engineering/academics/bachelor-of-science-computer-engineering/) for additional information.

HONORS IN UNDERGRADUATE RESEARCH PROGRAM

Qualified undergraduates may earn an Honors in Research designation on their transcript and diploma by completing 8 credits of undergraduate honors research, including a senior thesis. Further information is available in the department office.

NAMED OPTION

View as listView as grid

- COMPUTER ENGINEERING: MACHINE LEARNING AND DATA SCIENCE, B.S. **(**HTTP://GUIDE.WISC.EDU/UNDERGRADUATE/ENGINEERING/ELECTRICAL-COMPUTER-ENGINEERING/COMPUTER-ENGINEERING-BS/COMPUTER-ENGINEERING-MACHINE-LEARNING-DATA-SCIENCE-BS/**)**

TOTAL DEGREE CREDITS: 120

UNIVERSITY DEGREE REQUIREMENTS

Total Degree	To receive a bachelor's degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.
Residency	Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. “In residence” credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.
Quality of Work	Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

LEARNING OUTCOMES

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

FOUR-YEAR PLAN

SAMPLE FOUR-YEAR PLAN

First Year

Fall	Credits	Spring	Credits
MATH 221	5	MATH 222	4
E C E/COMP SCI 252	3	PHYSICS 201	5
or Communications A		E C E 210	2
CHEM 103, 104, or 109	4-5	Communications A or	3
Liberal Studies Elective	3	E C E/COMP SCI 252	
	15-16		**14**

Second Year

Fall	Credits	Spring	Credits
E C E 203	3	MATH/COMP SCI 240	3
E C E/COMP SCI 352	3	E C E 219	2
MATH 234	4	E C E 230	4
PHYSICS 202	5	E C E 270	1
		COMP SCI 300	3
		Liberal Studies Elective	3
	15		**16**

Third Year

Fall	Credits	Spring	Credits
E C E 353	3	E C E 315	1
E C E 220	3	E C E 551	3
E C E 340	3	Circuits Elective	3
E C E/COMP SCI 354	3	Probability and Statistics Elective	3
COMP SCI 400	3	INTEREGR 397	3
		Liberal Studies Elective	3
	15		**16**

Fourth Year

Fall	Credits	Spring	Credits
E C E 453, 454, or 554	4	COMP SCI 536, 537, or 564	3-4
Computer Engineering Elective	3	Computer Engineering Elective	3
Professional Elective	3	Professional Elective	3
Liberal Studies Elective	3	Liberal Studies Elective	3
Professional Elective	3	Free Elective	1
	16		**13-14**

Total Credits 120-122

ADVISING AND CAREERS

ADVISING

Each College of Engineering program has academic advisors dedicated to serving its students. Program advisors can help current College of Engineering students with questions about accessing courses, navigating degree requirements, resolving academic issues and more. Students can find their assigned advisor on the homepage of their student center.

ENGINEERING CAREER SERVICES

Engineering Career Services (ECS) assists students in identifying pre-professional work-based learning experiences such as co-ops and summer internships, considering and applying to graduate or professional school, and finding full-time professional employment during their graduation year.

ECS offers two major career fairs per year, assists with resume writing and interviewing skills, hosts workshops on the job search, and meets one-on-one with students to discuss offer negotiations.

Students are encouraged to utilize the ECS office early in their academic careers. For comprehensive information on ECS programs and workshops, see the ECS website or call 608-262-3471.

PEOPLE

PROFESSORS

Susan Hagness (Chair)
Nader Behdad
Daniel Botez
Azadeh Davoodi
John A. Gubner (Associate Chair for Operations)
Yu Hen Hu
Hongrui Jiang (Associate Chair for Graduate Studies)
Irena Knezevic
Bernard Lesieutre (Associate Chair for Undergraduate Studies)
Mikko Lipasti
Zhenqiang Ma
Luke J. Mawst
Robert Nowak
Parameswaran Ramanathan
Bulent Sarlioglu
William A. Sethares
Daniel van der Weide
Giri Venkataramanan
Amy E. Wendt
Zongfu Yu

ASSOCIATE PROFESSORS

Mikhail Kats
Daniel Ludois
Paul H. Milenkovic
Umit Ogras
Dimitris Papailiopoulos
Andreas Velten

ASSISTANT PROFESSORS

Joseph Andrews
Jennifer Choy
Jeremy Coulson
Kassem Fawaz
Dominic Gross
Chirag Gupta
Robert Jacobberger
Younghyun Kim
Bhuvana Krishnaswamy
Kangwook Lee
Chu Ma
Pedro Morgado
Shubhra Pasayat
Line Roald
Jinia Roy
Joshua San Miguel
Eric Severson
Eric Tervo
Ramya Korlakai Vinayak
Ying Wang

TEACHING FACULTY

Mark C. Allie
Setareh Behroozi
Eric Hoffman
Joe Krachey
Srdjan Milicic

TEACHING PROFESSOR

Eduardo Arvelo
Steven Fredette
Nathan Strachen

See also Electrical and Computer Engineering Faculty Directory (https://directory.engr.wisc.edu/ece/faculty/).

ACCREDITATION

Accreditation.

Accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org (http://www.abet.org/).

Note: Undergraduate Program Educational Objectives and Student Outcomes are made publicly available at the Departmental website. (In this Guide, the program's Student Outcomes are designated by our campus as "Learning Outcomes.")