# COMPUTER ENGINEERING, BS

## REQUIREMENTS

## 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 admitted to the computer engineering degree program .

Code	Title	Credits
Mathematics		19
Science		20-21
Computer Enginee	ring Core	33
Computer Enginee	ring Advanced Electives	16
Professional Electiv	/es	9
Communication Sk	ills	6
Liberal Studies		15
Free Elective		2
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	
MATH 222	Calculus and Analytic Geometry 2	4
MATH 234	CalculusFunctions of Several Variables <sup>1</sup>	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

<sup>1</sup> 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 <sup>1</sup>	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 foll	owing:	4-5
CHEM 109	Advanced General Chemistry	
CHEM 103	General Chemistry I	
CHEM 104	General Chemistry II	
Total Credits 20-21		

<sup>1</sup> Students may also fulfill this requirement by taking E M A 201 Statics and E M A 202 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 222	Electrodynamics I	4
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

Total Credits		33
E C E 551	Digital System Design and Synthesis	3
E C E/ COMP SCI 354	Machine Organization and Programming	3
E C E 353	Introduction to Microprocessor Systems	3
E C E/ COMP SCI 352	Digital System Fundamentals	3
E C E 340	Electronic Circuits I	3
E C E 315	Introductory Microprocessor Laboratory	1

# COMPUTER ENGINEERING ADVANCED ELECTIVES

Code	Title	Credits
Electronic Circuits Ele	ective	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 Ele	ctive <sup>1</sup>	3
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 <sup>1</sup>	
E C E 455	Capstone Design in Electrical and Computer Engineering	
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 COMF	° SCI 400 - COMP SCI 699 <sup>2</sup>	
Total Credits		16

<sup>1</sup> If a 4-credit course is taken, one credit may be used toward satisfying the professional elective and free elective requirement.

<sup>2</sup> 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**

Co	ode	Title	Credits
Pr	ofessional Electiv	/es	9
Co fo if i ree	ourses to be taken in llowing courses are a the courses are not a quirements.	an area of professional interest. The acceptable as professional electives used to meet any other degree	
	ECE1	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 num	bered 370 and higher	
	COMP SCI courses	numbered 400 and higher	
	MATH 319	Techniques in Ordinary Differential Equations	
	MATH 320	Linear Algebra and Differential Equations <sup>1</sup>	
	MATH 321	Applied Mathematical Analysis	
	MATH 322	Applied Mathematical Analysis	
	MATH 340	Elementary Matrix and Linear Algebra <sup>1</sup>	
	MATH 341	Linear Algebra	
	MATH courses num	nbered 400 and higher	
	STAT courses numb	pered 400 and higher	
	Any biological scient intermediate or adv	nces course that is designated as vanced level	
	Any physical science intermediate or adv	e course that is designated as vanced level	
	Any natural science advanced level, exc and statistics cours	e course that is designated as cept that math, computer sciences, ses must follow the above criteria	
	Engineering course not E C E or cross-	es numbered 300 and higher that are listed with E C E	
	Up to six credits of from School of Bus higher.	Professional Electives can be taken iness classes numbered 300 and	

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

#### Total Credits

#### LIBERAL STUDIES ELECTIVES

Code	Title	Credits
College of Eng	ineering Liberal Studies Requirement	ts
complete requir undergraduate/ engineering/red	ements/ (http://guide.wisc.edu/ ′engineering/electrical-computer- quirementstext/) <sup>1</sup>	15
<b>Total Credits</b>		15

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-computerengineering/academics/bachelor-of-science-computer-engineering/) for additional information.

#### HONORS IN UNDERGRADUATE RESEARCH PROGRAM

Qualified undergraduates may earn an Honors in Research designation in their transcript. The Honors in Research program gives an undergraduate the opportunity to participate in a research project under the direction of a faculty member. It is expected that the student will be actively involved in research that could lead to new knowledge. The project can be independent or a component of a larger team effort.

Admission Requirements include:

- 1. Complete at least one semester on the UW-Madison campus,
- 2. Have a cumulative GPA of at least 3.5,

3. Major in Computer Engineering (CMPE) or Electrical Engineering (EE),

4. Identify an ECE faculty advisor who is willing to supervise the research project.

Students admitted to the program should register for one to three credits of E C E 489 Honors in Research. A thesis worth three credits of E C E 489 Honors in Research is required. The thesis is a written document that details the objectives of the project, the methods used to carry out the research, and the results of the research activity. The thesis must be

approved by the faculty advisor and the student is encouraged to present a seminar.

The "Honors in Research" designation will be awarded to graduates who:

- 1. Complete either the CMPE or EE degree requirements.
- 2. Have a cumulative GPA of at least 3.3 at graduation.

3. Complete a total of at least six credits of E C E 489 Honors in Research.

4. Receive a final grade of at least B in E C E 489 Honors in Research.

## NAMED OPTION

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COMPUTER ENGINEERING: MACHINE LEARNING AND DATA SCIENCE. BS (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.
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Undergraduate students must maintain the minimum grade Quality of Work 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.