

# Software Engineering- Bachelor of Science in Software Engineering

For information, contact the Department of Computer Science and Software Engineering, 262 McVey Data Science Building, 513-529-0340, or visit <http://cse.MiamiOH.edu>.

The software engineering major provides graduates with the foundational knowledge and practical skills necessary to develop large, complex computer software systems. The program focuses on the methodologies, techniques and tools needed to develop complex software in a multidisciplinary environment. Topics of study go beyond traditional computer science and include software design, software maintenance, and formal methods for software development. Throughout the program, students are expected to learn in a team environment and thus gain skills in effective communication. In addition to interest in analytical skills, problem solving, and an aptitude for working with technology, students are expected to develop an appreciation for teamwork.

The U.S. Bureau of Labor's job outlook for software engineering graduates is excellent, and the number of positions is expected to increase by 25% between 2021 and 2031. This employment growth is due to the demand for increasing efficiency in network technology, computing speeds, software performance, and embedded systems. The median annual earnings for software developers were \$120,730 in May 2021. According to the National Association of Colleges and Employers, starting offers for graduates with a bachelor's degree in computer science average more than \$72,000.

## Program Educational Objectives

Graduates from the Software Engineering program are expected to attain or achieve the following Program Educational Objectives within a few years of graduation:

- Develop in their chosen profession and/or progress toward an advanced degree
- Provide innovative solutions using technical skills in their discipline
- Communicate effectively, demonstrate leadership, and work collaboratively in diverse teams/organizations
- Act responsibly and ethically in their profession and as informed citizens

## Student Outcomes

Upon graduation, software engineering majors should be able to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. 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. Communicate effectively with a range of audiences.

4. 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. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

## Departmental Honors

If you excel in your studies, you may qualify for the University Honors Program or the program for Honors in Computer Science and Software Engineering. As a senior in these programs, you will have the opportunity to work closely with the faculty on research projects of interest.

## Credit/No-Credit Policy

All courses in chemistry, physics, biology, mathematics, statistics and those in the College of Engineering and Computing (CPB, CSE, ECE, EGM, MME, CEC) that are used to fulfill requirements of the major, must be taken for a grade.

## Divisional Policy

**MULTIPLE MAJORS:** Students with two or more majors in the College of Engineering and Computing must take a minimum of 15 unique, additional credit hours in each major.

For more information, visit our website at <http://cse.MiamiOH.edu>.

## Program Requirements

Code	Title	Credit Hours
<b>Core Requirements</b>		
STC 135 or APC 231	Principles of Public Speaking Small Group Communication	3
Mathematics:		
MTH 151	Calculus I	4
MTH 231 or MTH 331	Elements of Discrete Mathematics Proof: Introduction to Higher Mathematics	3
Statistics		
STA 301 or STA 261 or ECE 345	Applied Statistics Statistics Introduction to Probability, Statistics, and Random Processes	3-4
Mathematics/Statistics Electives		9-10
Take three of the following:		
STA 333	Nonparametric Statistics	
STA 363	Introduction to Statistical Modeling	
STA/ISA 365	Statistical Monitoring and Design of Experiments	
STA 401	Probability	
STA 402	Statistical Programming	

STA 404	Advanced Data Visualization	
STA 427	Introduction to Bayesian Statistics	
STA 432	Survey Sampling in Business	
STA 466	Experimental Design Methods	
STA 467	Statistical Learning	
MTH 222	Introduction to Linear Algebra	
MTH 245	Differential Equations for Engineers	
MTH 251 or MTH 249	Calculus II	
MTH 252	Calculus III	
MTH 347	Differential Equations	
MTH 411	Foundations of Geometry	
MTH 421	Introduction to Abstract Algebra	
MTH 432	Optimization	
MTH 437	Game Theory and Related Topics	
MTH 438	Theory and Applications of Graphs	
MTH 439	Combinatorics	
MTH 441	Real Analysis	
MTH 447	Topics in Mathematical Finance	
Natural Science Electives		8-10
Select two of the following six options:		
BIO/MBI 115	Biological Concepts: Ecology, Evolution, Genetics, and Diversity	
BIO/MBI 116	Biological Concepts: Structure, Function, Cellular, and Molecular Biology	
CHM 141 & CHM 144	College Chemistry and College Chemistry Laboratory	
CHM 142 & CHM 145	College Chemistry and College Chemistry Laboratory	
PHY 181 & PHY 183	General Physics I and General Physics Laboratory I	
PHY 182 & PHY 184	General Physics II and General Physics Laboratory II	
Mathematics/Statistics/Science Elective		3-5
Select one additional course from one of the following:		
Any of the above Mathematics/Statistics Electives		
Any of the above Natural Science Electives		
Any Miami Plan Natural Science		
<b>Software Engineering Core</b>		
CEC 111	Imagination, Ingenuity and Impact I	2
CEC 112	Imagination, Ingenuity, and Impact II	2
CSE 174	Fundamentals of Problem Solving and Programming	3
CYB 134	Introduction to Cybersecurity	3
CSE 201	Introduction to Software Engineering	3
CSE 202	Software Requirements	3
CSE 212	Software Engineering for User Interface and User Experience Design	3
CSE 271	Object-Oriented Programming	3
CSE 274	Data Abstraction and Data Structures	3
CSE 278	Systems I: Introduction to Systems Programming	3
CSE 301	Software Architecture and Design	3
CSE 302	Software Construction	3
CSE 374	Algorithms I	3
CSE 383	Web Application Programming	3
CSE 401	Software Quality Assurance and Testing	3
CSE 448	Senior Design Project	2
CSE 449	Senior Design Project	2
<b>CSE Electives (a total of 12 hours are required)</b>		<b>12</b>
6 to 12 hours of software engineering electives:		
CSE 268	Introduction to Knowledge Representation	
CSE 382	Mobile App Development	
CSE 385	Database Systems	
CSE 389	Game Design and Implementation	
CSE 411	Introduction to Model-Driven Software Engineering	
CSE 432	Machine Learning	
CSE 451	Web Services and Service Oriented Architectures	
CSE 467	Computer and Network Security	
CSE 470	Special Topics in CSE	
CSE 474	Compiler Design	
CSE 485	Advanced Database Systems	
CSE 489	Advanced Graphics and Game Engine Design	
CYB 235	Computer Network Design and Administration	
IMS 211	Introduction to Game Studies	
IMS 212	Introduction to Game Design	
IMS 319	Foundations in Digital 3-D Modeling and Animation	
ISA 401	Business Intelligence and Data Visualization	
ISA 406	IT Project Management	
0 to 6 hours of affiliate electives:		
CSE 262	Technology, Ethics, and Global Society	
CSE 270	Special Topics	
CSE 276	Mathematics and Computer Science	
CSE 381	Systems 2: OS, Concurrency, Virtualization, and Security	
CSE 386	Foundations of Computer Graphics and Games	
CSE 443	High Performance Computing & Parallel Programming	
CSE 465	Comparative Programming Languages	
CSE 473	Automata, Formal Languages, and Computability	
CSE 486	Introduction to Artificial Intelligence	
CSE 488	Image Processing & Computer Vision	
CYB 234	System Administration and Scripting for Cybersecurity	
CYB 236	Data Security	
ECE 287	Digital Systems Design	
ECE 461	Network Performance Analysis	

IMS 333	Digital Innovation and Entrepreneurship
IMS 414	Web and Social Media Analytics
ISA 235	Information Technology and the Intelligent Enterprise
0 to 3 hours of research electives:	
CSE 340U	Undergraduate Summer Scholars Program (requires petition)
CSE 480	Special Problems (honors Program)
CSE 491	Undergraduate Research
<b>Total Credit Hours</b>	<b>92-98</b>