

# Computer Science- Bachelor of Science in Computer Science

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 [bulletin.miamioh.edu/engineering-computing/computer-science-bs/](http://bulletin.miamioh.edu/engineering-computing/computer-science-bs/)

For information, contact the Department of Computer Science and Software Engineering 205 Benton Hall, 513-529-0340, or visit <http://cse.MiamiOH.edu>.

This program is accredited by the Computing Accreditation Commission of ABET <http://www.abet.org>.

If you want to change the world and you like to think analytically and solve problems, enjoy mathematics, and are interested in working with computers and technology, consider a major in computer science. Innovations such as the Internet, smart phone apps, websites like Facebook, and online shopping all owe their foundations to developments in computer science. The computer science major at Miami provides you with a thorough understanding of the key principles and practices of computing as well as the mathematical and scientific principles that underpin them. You will study programming languages, algorithms, computer architecture, operating systems, and applications of computer science such as computer networks, computer security, computer games, and the ethical and social implications of computer technology. The U.S. Bureau of Labor job outlook for computer science graduates is excellent. Jobs are expected to grow 24% from 2008 to 2018, much faster than average for all occupations. 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 computer specialists ranges from \$74,000 to \$105,000. According to the National Association of Colleges and Employers, starting offers for graduates with a bachelor's degree in computer science averaged \$61,407.

Upon entering this program, you should have an interest in analytical thinking and problem solving, an aptitude for mathematics, and an interest in working with computers and technology. A high school background in computers is not necessary to major in computer science because the program includes introductory courses needed for the major.

Graduates typically work as software engineers, consultants, programmers, network systems analysts, computer scientists, systems programmers, network administrators, or database administrators. Other graduates continue their education in graduate school or start their own businesses.

## Program Educational Objectives

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The Miami Plan forms the foundation of liberal education at Miami University. This plan is guided by four principles:

- **critical thinking**
- **understanding of contexts**
- **engaging with other learners, and**
- **reflection and action.**

Our program emphasizes **critical thinking** by promoting the **scientific principles, analysis techniques, and design methodologies** that form the basis for critical thinking in computer science. We promote **understanding of the social context and broader impacts of technology**, which is necessary for leadership and for integration of computing into business. By requiring students to **engage with other learners**, we develop their abilities to **communicate clearly, and work in teams responsibly**. This pattern of deep **reflection**, broad understanding, and engagement with others is transformed into **action** through coursework that emphasizes a mixture of theoretical foundations and hands-on application.

**Depth.** Computer Science graduates will have a sufficient understanding of the field of computer science including scientific principles, analysis techniques, and design methodologies to:

Be successfully employed, pursue a graduate degree, or continue their professional education

**Breadth.** Computer Science graduates will have a broad liberal education enabling them to:

- Demonstrate adaptability or leadership by, for example, being promoted, moving up to a better job, or by taking a leadership role in a team.
- Demonstrate an understanding of the context and broader impacts of technology in their organization by, for example, engaging stakeholders outside their immediate team, or by identifying ethical, economic, cultural, legal or environmental issues related to work projects.

**Professionalism.** Computer Science graduates will be prepared for modern work environments, where they will:

- Apply their skills in clear communication, responsible teamwork, and time management by, for example, managing a team or project, working on multidisciplinary project teams, or communicating with external stakeholders.
- Demonstrate professional attitudes and ethics by, for example, assisting colleagues in professional development (e.g. mentoring), engaging in continuing education or training, participating in professional societies, engaging in service to the community, or contributing to an employer's efforts to comply with software licensing, protect privacy, or assure quality and safety.

To help to achieve the educational objectives, all computing and engineering programs offered by the College of Engineering and Computing (CEC) have outcomes, are designed to prepare graduates to attain the program educational objectives and to connect with the student outcomes defined by the Computing Accreditation Committee of ABET, <http://www.abet.org>.

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

## Student Outcomes

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CS.1: Explain and apply the key facts, concepts, principles, and theories of computer science;

CS.2: Analyze problems, and select and apply appropriate techniques from computer science and mathematics to solve them;

CS.3: Effectively use current techniques, skills, and tools necessary for computing practice;

CS.4: Design, implement, and test software systems of varying complexity that meet desired needs;

CS.5: Think critically in evaluating information and solving problems;

CS.6: Work effectively as a member or leader in a team;

CS.7: Recognize the need for and an ability to engage in continuing professional development;

CS.8: Communicate technical information effectively, both orally and in writing;

CS.9: Recognize the social, professional, cultural, and ethical issues involved in the use of computer technology and give them due consideration in decision making;

CS.10: Learn independently through the use of research papers, technical documents and tutorials.

## Departmental Honors

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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

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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.

## Graduate Study

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The department offers a combined bachelor's/master's degree program that allows students to complete bachelor's and master's degrees in computer science in an accelerated manner. Students are eligible to apply for this program in their junior year. Please contact the CSE department office for more information.

Additional information is available from the CSE department office and website  
<http://cse.MiamiOH.edu>.

## Program Requirements: Computer Science

Core Requirements		
<u>ECO 201</u>	Principles of Microeconomics	3
or <u>ECO 202</u>	Principles of Macroeconomics	
<u>ENG 313</u>	Technical Writing	3
<u>STC 135</u>	Principles of Public Speaking	3
or <u>STC 231</u>	Small Group Communication	
<u>MTH 151</u>	Calculus I	5
<u>MTH 231</u>	Elements of Discrete Mathematics	3
or <u>MTH 331</u>	Proof: Introduction to Higher Mathematics	
<u>STA 301</u>	Applied Statistics	3-4
or <u>STA 261</u>	Statistics	
or <u>ECE 345</u>	Applied Probability and Statistics for Engineers	
		9-10
<u>STA 333</u>	Nonparametric Statistics	
<u>STA 363</u>	Introduction to Statistical Modeling	
<u>STA 365</u>	Statistical Monitoring and Design of Experiments	
<u>STA 401/STA 501</u>	Probability	
<u>STA 402/STA 502</u>	Statistical Programming	
<u>STA 404/STA 504</u>	Advanced Data Visualization	
<u>STA 427/STA 527</u>	Introduction to Bayesian Statistics	
<u>STA 432</u>	Survey Sampling in Business	
<u>STA 463/STA 563</u>	Regression Analysis	
<u>STA 466/STA 566</u>	Experimental Design Methods	
<u>STA 467/STA 567</u>	Statistical Learning	
<u>MTH 222</u>	Introduction to Linear Algebra	
<u>MTH 251</u>	Calculus II	

or <u>MTH 249</u>	Calculus II	
<u>MTH 252</u>	Calculus III	
<u>MTH 347</u>	Differential Equations	
<u>MTH 411/MTH 511</u>	Foundations of Geometry	
<u>MTH 421/MTH 521</u>	Introduction to Abstract Algebra	
<u>MTH 432/MTH 532</u>	Optimization	
<u>MTH 436</u>	Combinatorial Designs and Coding Theory	
<u>MTH 437/MTH 537</u>	Game Theory and Related Topics	
<u>MTH 438/MTH 538</u>	Theory and Applications of Graphs	
<u>MTH 439/MTH 539</u>	Combinatorics	
<u>MTH 441/MTH 541</u>	Real Analysis	
<u>MTH 447/MTH 547</u>	Topics in Mathematical Finance	
		8-10
<u>BIO/MBI 115</u>	Biological Concepts: Ecology, Evolution, Genetics, and Diversity	
<u>BIO/MBI 116</u>	Biological Concepts: Structure, Function, Cellular, and Molecular Biology	
<u>CHM 141</u> & <u>CHM 144</u>	College Chemistry and College Chemistry Laboratory	
<u>CHM 142</u> & <u>CHM 145</u>	College Chemistry and College Chemistry Laboratory	
<u>PHY 191</u>	General Physics with Laboratory I	
<u>PHY 192</u>	General Physics with Laboratory II	
1		3-5
Computer Science Core		
<u>CEC 101</u>	Computing, Engineering & Society	1
<u>CSE 102</u>	Introduction to Computing and Engineering	3
<u>CSE 174</u>	Fundamentals of Programming and Problem Solving	3
<u>CSE 201</u>	Introduction to Software Engineering	3
<u>CSE/CIT 262</u>	Technology, Ethics, and Global Society	3
<u>CSE 271</u>	Object-Oriented Programming	3
<u>CSE 274</u>	Data Abstraction and Data Structures	3

<u>CSE 278</u>	Systems I: Introduction to Systems Programming	3
<u>CSE 381</u>	Systems 2: OS, Currency, Virtualization, and Security	3
<u>CSE 383</u>	Client Server Programming	3
<u>CSE 448</u>	Senior Design Project <sup>2</sup>	2
<u>CSE 449</u>	Senior Design Project <sup>2</sup>	2
<u>CSE 464/CSE 564</u>	Algorithms	3
<u>CSE 465/CSE 565</u>	Comparative Programming Languages	3
CSE Electives (a total of 21 hours are required)		21
<u>CSE 287</u>	Foundations of Computer Graphics and Games	
<u>CSE 387</u>	Advanced Graphics and Game Engine Design	
<u>CSE 443/CSE 543</u>	High Performance Computing & Parallel Programming	
<u>CSE 451/CSE 551</u>	Web Services and Service Oriented Architectures	
<u>CSE/BIO 466</u>	Bioinformatics Computing Skills	
<u>CSE 467/CSE 567</u>	Computer and Network Security	
<u>CSE 470/CSE 570</u>	Special Topics In CSE	
<u>CSE 471/CSE 571</u>	Simulation	
<u>CSE 473/CSE 573</u>	Automata, Formal Languages, and Computability	
<u>CSE 474/CSE 574</u>	Compiler Design	
<u>CSE 485/CSE 585</u>	Advanced Database Systems	
<u>CSE 486/CSE 586</u>	Introduction to Artificial Intelligence	
<u>CSE 487/CSE 587</u>	Game Design and Implementation	
<u>CSE 211</u>	Software Construction	
<u>CSE 212</u>	Software Engineering for User Interface and User Experience Design	
<u>CSE 241</u>	Computational Modeling and Simulation	
<u>CSE 270</u>	Special Topics	
<u>CSE 273</u>	Optimization Modeling	
<u>CSE 311</u>	Software Architecture and Design	
<u>CSE 321</u>	Software Quality Assurance and Testing	
<u>CSE 322</u>	Software Requirements	
<u>CSE 372</u>	Stochastic Modeling	

<u>ECE 287</u>	Digital Systems Design	
<u>ECE 387</u>	Embedded Systems Design	
<u>ECE 461/ECE 561</u>	Network Performance Analysis	
<u>CSE 340U</u>	Undergraduate Summer Scholars Program (requires petition)	
<u>CSE 480/CSE 580</u>	Special Problems (honors Program)	
<u>CSE 491</u>	Undergraduate Research	
Total Credit Hours		99-105

**Note:** Additional free elective hours may need to be taken.