

# Quantum Computing - Bachelor of Science in Quantum Computing

The Bachelor of Science in Quantum Computing at Miami University is designed to prepare students for the emerging and transformative field of quantum technologies. This interdisciplinary program integrates the foundations of computer science, mathematics, physics, life sciences and more to equip students with the knowledge and skills needed to solve complex problems using quantum computing principles.

Students will explore topics such as quantum algorithms, quantum cryptography, and advanced quantum applications, while also gaining hands-on experience with quantum computing platforms. The program also incorporates relevant life science applications, developed in collaboration with Cleveland Clinic, ensuring that students are prepared for cutting-edge roles in both industry and research.

Graduates will be well-positioned for careers in quantum computing, advanced research, healthcare innovation, and other high-tech industries, or for further graduate study in quantum computing or related fields.

## Program Requirements

(91 semester hours minimum)

Code	Title	Credit Hours
<b>Core Requirements</b>		
<b>Engineering Core</b>		
CEC 111	Imagination, Ingenuity and Impact I	2
CEC 112	Imagination, Ingenuity, and Impact II	2
<b>Computer Science Core</b>		
CSE 174	Fundamentals of Problem Solving and Programming	3
CSE 271	Object-Oriented Programming	3
CSE 274	Data Abstraction and Data Structures	3
CSE 201	Introduction to Software Engineering	3
CSE 374	Algorithms I	3
<b>Quantum Computing Core</b>		
QTM 161	Quantum Computing Basics	3
QTM 261	Quantum Information Processing	3
QTM 361	Quantum Algorithms	3
QTM 461	Quantum Security Standards: FIPS 203 and FIPS 204	3
QTM 462	Advanced Quantum Computing Applications	3
<b>Cybersecurity</b>		
CYB 134	Introduction to Cybersecurity	3
CYB 236	Data Security	3
<b>AI/ML</b>		
CSE 432	Machine Learning	3
<b>Mathematics, Statistics, and Physics</b>		

MTH 151	Calculus I	4
MTH 251	Calculus II	4
MTH 246	Linear Algebra and Differential Equations for Engineers	4
MTH 231	Elements of Discrete Mathematics	3
STA 261	Statistics	3-4
or STA 301	Applied Statistics	
PHY 281	Contemporary Physics I: Foundations	3
<b>Entrepreneurship</b>		
ESP 201	Introduction to Entrepreneurship and Business Models	3
ESP 252	Entrepreneurial Mindset: Creativity and Organization	3

<b>Senior Capstone</b>		
Select one of the following capstones aligned to your track and with appropriate approval(s):		3-4
BIO 419R	Independent Research Capstone	
CSE 448 & CSE 449	Senior Design Project I and Senior Design Project II	
CYB 437	Cybersecurity Senior Design Project/ Capstone	
ESP 401	Entrepreneurship: New Ventures	
PHY 488	Research Capstone in Physics	
PSY 458	Capstone Seminar in Neuroscience	

<b>Tracks</b>		
Complete one of the following tracks:		18-21
<b>1 - Artificial Intelligence</b>		
Select at least 18 hours of the following:		
CSE 262	Technology, Ethics, and Global Society	
CSE 268	Introduction to Knowledge Representation	
CSE 433	Deep Learning	
CSE 434	Generative Artificial Intelligence	
CSE 468	Applied Knowledge Representation	
CSE 486	Introduction to Artificial Intelligence	
CSE 488	Image Processing & Computer Vision	

<b>2 - Cybersecurity</b>		
Complete all of the following:		
CYB 234	System Administration and Scripting for Cybersecurity	
CYB 235	Computer Network Design and Administration	
CYB 332	Human, Organizational, and Societal Security	
CYB 334	Network Security	
CYB 335	Defensive Security	
CYB 435	Offensive Security	

<b>3 - Neuroscience</b>		
Complete the required coursework for the minor in Neuroscience		
<b>4 - Finance</b>		
Complete the required coursework for the minor in Finance		
<b>5 - Life Science and Bioinformatics</b>		

Complete all of the following:

BIO/MBI 116 Biological Concepts: Structure,  
Function, Cellular, and Molecular  
Biology

BIO 203 Introduction to Cell Biology

CHM 141 College Chemistry

CHM 144 College Chemistry Laboratory

CPB 402 Introduction to Clinical Engineering

CSE/CHM/BIO/  
MBI 466 Bioinformatics Computing Skills

BIO 342 Genetics

## 6 - Physics

Complete all of the following:

PHY 181 General Physics I

PHY 182 General Physics II

PHY 183 General Physics Laboratory I

PHY 184 General Physics Laboratory II

PHY 282 Contemporary Physics II: Frontiers

PHY 286 Introduction to Computational Physics

PHY 293 Contemporary Physics Laboratory

**Total Credit Hours**

**91-96**