Master of Science in Applied Mathematics and Computer Science

Computer & Information Sciences and Mathematics ◇Indiana University South Bend

Bridging the Gap Between Academic Theories and Real Life Business Needs

The Department of Computer and Information Sciences and Department of Mathematical Sciences at IU South Bend jointly offer the Master of Science in Applied Mathematics and Computer Science (AMCS). This joint degree allows students to pursue the Master's degree with a focus in **computer science**, **applied mathematics**, **both, data science, or cybersecurity**. This advanced degree prepares students to meet the complex computer and/or mathematical challenges they will face in today's changing, high-tech business environment. This degree is designed to meet the needs of those who:

- ◊ are already working in the technical or quantitative fields.
- ◊ have a bachelor's degree in computer science, informatics, mathematical sciences, business, STEM, or other disciplines.
- ◊ are planning to pursue a Ph.D. program or career in academia.
- ◊ are interested in increasing their skills in computer science or applied mathematics.

Requirements as of Fall 2023

For official and up to date information refer to **http://go.iu.edu/1uZN**

Students earn a master's degree by completing 30 graduate credit hours.

- ◊ 24 credits of coursework + 6 credits of thesis; or 27 credits of coursework + 3 credit project; or 30 credits of coursework + exit exam
- ◊ Students choose one of five focus areas: computer science, applied mathematics, both disciplines, data science, or Cybersecurity. If a single area of focus is sought, the student must complete at least 21 graduate credit hours in the specified discipline.

Selected list of courses that students may choose to take:

Computer Science (Select Courses)

- ◊ Fundamentals of Computing Theory
- ◊ Fundamentals of Computer Networks
- ◊ Security in Computing
- ◊ Algorithms Design and Analysis
- ◊ Parallelism in Programming Language and Systems
- ◊ Networks and Distributed Computing
- ◊ Elementary Artificial Intelligence
- ◊ Neural and Genetic Approaches to Artificial Intelligence
- ◊ Advanced Computer Graphics
- ◊ Image Synthesis
- ◊ Game Programming and Design
- ◊ Natural Language Processing
- ◊ Computer Vision
- ◊ Operating Systems I
- ◊ Software Engineering I
- ◊ Databases & Advanced Databases
- ◊ Hardware System Design I

Special Topics:
Software Design Patterns, Data Mining, Web Design & Development, Mobile App Development, Deep Learning & others.

Data Science (Select Courses)

Data Mining (*3 credits*)
- ◊ Introduction to Data Science
- ◊ Applied Data Mining*
- ◊ Statistical Learning*

Database and Computing (6 credits)
- ◊ Algorithms Design and Analysis
- ◊ Advanced Database Concepts
- ◊ Database Systems
- ◊ Security

Machine Learning (*6 credits*)
- ◊ Elements of Artificial Intelligence
- ◊ Neural and Genetic Approaches to Artificial Intelligence
- ◊ Applied Data Mining*
- ◊ Deep Learning
- ◊ Statistical Learning*

Statistics (*6 credits*)
- ◊ Statistical Design of Experiments
- ◊ Analysis of Variance
- ◊ Applied Regression Analysis
- ◊ Forecasting
- ◊ Statistical Learning*

*Courses marked with an asterisk (*) can be counted only towards one of the listed categories.

Applied Mathematics (Select Courses)

- ◊ Introduction to Analysis
- ◊ Elementary Complex Variables with Applications
- ◊ Mathematical Models/Applications I & II
- ◊ The Mathematics of Finance
- ◊ Introduction to Probability Theory I
- ◊ Introduction to Mathematical Statistics
- ◊ Control Theory
- ◊ Markets and Asset Pricing
- ◊ Applied Stochastic Processes
- ◊ Statistical Design of Experiments
- ◊ Analysis of Variance
- ◊ Statistical Decision Theory
- ◊ Analysis of Numerical Methods I & II
- ◊ Applied Regression Analysis
- ◊ Simulation Modeling
- ◊ Forecasting
- ◊ Operations Research: Modeling Approach

CyberSecurity (Select Courses)

System Foundation (3 credits)
- ◊ Operating Systems
- ◊ Networks and Distributed Computing
- ◊ Hardware System Design I

Math/Theoretical Foundation (3 credits)
- ◊ Algorithm Design and Analysis
- ◊ Applied Cryptography
- ◊ Cryptography
- ◊ Mathematical Foundation for Security

Intelligent Computing (3 credits)
- ◊ Elements of Artificial Intelligence
- ◊ Applied Deep Learning
- ◊ Statistical Learning
- ◊ Natural Language Processing
- ◊ Computer Vision

Data and Software Engineering (3 credits)
- ◊ Database Systems
- ◊ Advanced Database Concepts
- ◊ Software Engineering
- ◊ Applied Data Mining

Cyber Security and Privacy (9 credits)
- ◊ Security in Computing
- ◊ Security for Networked Systems
- ◊ Privacy in Pervasive Computing
- ◊ Digital Forensics
- ◊ Intrusion Detection
- ◊ Penetration Testing and Vulnerability Analysis
- ◊ Cyber Ethics, Privacy and Legal Issues

Why AMCS @ IU South Bend?

Program Highlights

- ◊ Scholarships.
- ◊ Participate in small graduate classes to allow extensive interaction with professors and fellow graduate students.
- ◊ Attend graduate classes that often meet during weekday evening hours to accommodate the schedules of employed adult students.
- ◊ Learn from computer science faculty with diverse research interests including algorithms, software engineering, computer graphics, databases, computer networks, parallel processing, distributed computing, artificial intelligence, computer security, bioinformatics, computer vision, machine learning, quantum computing, and wireless networks.
- ◊ Learn from mathematical sciences faculty with diverse research interests including differential topology, differential equations, dynamical systems, modeling, operations research, simulations, scientific computing, statistics, and group theory.
- ◊ Access to the dedicated computer laboratories running. Access to IU's specialized research computing infrastructure including IU's Big Red II supercomputer, mass storage, as well as visualization systems.
- ◊ Computer and Information Sciences Student Club. Mathematics Students Club.
- ◊ The Department of Computer & Information Sciences offers Master's, Bachelor's, Minors and Certificates in Computer Science & Informatics.
- ◊ The Department of Mathematical Sciences offers Master's, Bachelor's, Minors in Mathematics and Actuarial Science.

What is the job outlook?

There are excellent employment opportunities for our graduates. According to bls.gov employment of computer and information technology occupations is projected to grow much faster than the average for all occupations from 2022 to 2032. About 377,500 openings are projected each year, on average. The median annual wage for computer and information technology occupations was $100.530 in May 2022, which was higher than the median annual wage for all occupations of $46,310.*

*www.bls.gov/ooh/computer-and-information-technology/home.htm

Contact Information:

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