The Department of

COMPUTER SCIENCE

BA, BS & MS Degrees in Computer Science
Concentrations in Cyber Security and Game Development
5-Year Dual Degree Programs
Minor in Computer Science
CHOOSING COMPUTER SCIENCE as a degree and a career path offers an excellent opportunity to experience and become part of an exciting, dynamic and diverse field. Rapidly developing computer technologies require employers to look for professionals with a broad background and range of skills: analytical thinking, problem solving expertise, as well as excellent communication and interpersonal skills. It is widely known that occupations in computing are among the fastest growing in the economy and offer challenging, intellectually satisfying and rewarding career opportunities. Computer Science is by its very nature an interdisciplinary endeavor: computer scientists collaborate with professionals in a wide variety of disciplines and exert influence on virtually every field of human endeavor.

The Iona College Computer Science Department is preparing the next generation of computer experts to meet the demands and challenges of the future. Many of our graduates have embarked on highly successful careers and top paying jobs in mobile and web application development, cyber security, game development, database administration, networking and many others.

SELECT APPLICATIONS IN COMPUTER SCIENCE

- Medicine: computer-assisted surgery, prosthetics and medical imaging
- Defense: surveillance and military training
- Cyber Security: application security engineer, network engineer, Web analytics developer, vulnerability engineer, and Internet security analyst
- Entertainment: computer gaming and movie production
- Art: digital art and virtual reality
- Environment: environmental monitoring and meteorology
- Communication: mobile devices and data networks
- Transportation: automated trains and mapping and location detection (GPS)
- Archaeology: digitization and 3-dimensional restoration of archaeological objects
BACHELOR OF SCIENCE

Computer Science, Mathematics and Science Courses
- Computer Science (I and II)
- Calculus (I and II)
- Probability and Statistics
- BIO/CHM/PHY (I and II) (choices)
- Discrete Mathematics
- Data Structures and Algorithm Analysis
- Computer Organization and Architecture
- Programming in a Unix Environment
- Database Organization and Design
- Programming Languages
- Operating Systems
- Automata and Formal Languages
- Software Development Project (Design and Development)
- Four Advanced CS Electives*

BACHELOR OF ARTS

Computer Science and Mathematics Courses
- Computer Science (I and II)
- Calculus I
- Discrete Mathematics
- Applied Statistics
- Data Structures and Algorithm Analysis
- Computer Organization and Architecture
- Programming in a Unix Environment
- Database Organization and Design
- Operating Systems
- Software Development Project (Design and Development)
- Two Advanced CS Electives*

*Sample Advanced CS Electives:
- Computer Architecture
- Advanced Organization and Implementation of Database Systems
- Advanced Operating Systems
- Artificial Intelligence
- Data Mining
- Parallel and Scientific Computing
- CS Internship

COMPUTER SCIENCE MINOR

Core
- Computer Science I
- Calculus I

Computer Science and Mathematics Courses
- Computer Science II
- Discrete Mathematics
- Data Structures and Algorithms Analysis
- Computer Organization and Architecture
- Database Organization and Design
COMPUTER SCIENCE

CONCENTRATION IN CYBER SECURITY

Cyber Security is one of the most sought-after skills in technology. Cyber-attacks occur on a daily basis all over the world: hackers can steal your identity through credit card theft; your private medical records can be leaked to your employer; your business can come to a halt through a cyber-attack.

The demand for Cyber Security professionals has never been greater. The Washington Post recently reported that the government sees a critical need to fill 10,000 Cyber Security jobs in the near future and that private industry has at least four times that many openings. Cyber Security is among the top 10 fastest growing careers in America, with a 27 percent growth rate. Any industry—from retail sales to hospitals to power plants—is dependent on information technology (IT), and Cyber Security is essential to ensuring that IT assets are protected. Positions in the field of Cyber Security can demand salaries ranging from $150,000-$250,000 and higher.

Courses in the Concentration in Cyber Security

The Cyber Security programs at Iona College provide students with fundamental Cyber Security skills and theoretical as well as hands-on experience. Students are exposed to new research ideas across many Cyber Security Areas.

In addition to the required courses for the BS and the BA, students take 18 credits in Cyber Security courses:

Required Courses (12 credits)
- Software Security
- Cryptography
- Computer Networks and Network Programming
- Network Security

Electives (6 credits)
- Web Application Development and Web Application Security OR
- Mobile Application Development and Mobile Application Security

Photo: Screen-shot from student game development project

CONCENTRATION IN GAME DEVELOPMENT

Game Development is a hot new direction in Computer Science, aimed at developing realistic computer graphics entertainment as well as serious simulation software. Some areas benefiting from the recent advances in game development include:

- Video games
- Movie Industry
- Defense and law enforcement
- Pilot training
- Medical training and simulation
- Emergency response simulations
- Natural disaster (earthquake, hurricane, etc.) simulations and assessment
- Scientific visualization
- Drug discovery
- Architectural design and planning
- Interior design
- Education

Game Development is one of the fastest growing sectors of the world economy, accounting for $91.5 billion in revenue (2015 statistics). This creates a rapidly increasing need for professionals with the right set of skills and knowledge to be employed in the game development industry. Salaries in the field of Game Development can exceed $125,000.

In addition to the required courses for the BS and the BA, students take 15 credits in Game Development courses.

Required Courses (6 credits)
- Game Development
- Computer Graphics

Electives (6 credits)
- Advanced Game Development
- Advanced Computer Graphics
- Mobile Application Development
- Artificial Intelligence

The CS Department also offers Introduction to Game Development for non-CS majors – a gentle introduction to game development with no prerequisites or background requirements.
MASTER OF SCIENCE

Computer Science Courses (33 credits)
- Data Structures and Algorithm Analysis
- Computer Organization and Architecture
- Database Organization and Design
- Operating Systems
- Software Development Project (Design and Development) or MS Thesis
- Five CS Electives

The Master’s program is also offered with the Cyber Security and Game Development Concentrations.

FIVE-YEAR PROGRAMS IN COMPUTER SCIENCE

The Computer Science Department offers a variety of five year programs where students can earn a bachelor’s degree and a master’s degree in five years. Qualified students take 15 to 18 graduate credits during the first four years that fulfill current undergraduate requirements and, in the fifth year, take the remaining courses to satisfy the 33 credit graduate program. After four years, students complete the bachelor’s program. Upon completion of the five-year program, students have a bachelor’s and a master’s degree that will allow them to pursue an exciting career in computer science and/or a doctoral degree.

These five year programs are available for the BS and BA programs alone and also with the Cyber Security and Game Development concentrations.

FIVE-YEAR PROGRAMS WITH OTHER DISCIPLINES AND COMPUTER SCIENCE

The Computer Science Department offers collaborative five-year programs with Chemistry, Economics and Mathematics.
- BS in Chemistry / MS in Computer Science
- BS in Economics / MS in Computer Science
- BS in Mathematics / MS in Computer Science

As with the Computer Science five year programs, students take graduate computer science classes in the first four years and earn a bachelor’s degree in their field of study. In the fifth year, students take the remaining graduate computer science courses to complete the master’s degree. These dual degree programs provide students with a broad background of knowledge and skills that can be applied in a wide variety of challenging careers.
COMPUTER SCIENCE COURSES IN EMERGING TECHNOLOGIES

Here is a brief description of the new and innovative courses being offered:

CS 142 Website Design
This course will introduce the student to the fundamental concepts of networking, the Internet and website design and development.

CS 144 Introduction to Game Development
This course is a hands-on introduction to Computer Science and the art of game design and development.

CS 146 Introduction to Robotics
This course is a hands-on introduction to Computer Science through Robotics covering the fundamentals of autonomous mobile robotics.

CS 315 Software Security
This course provides students with a broad familiarity with security concepts pertaining to secure software development.

CS 409 Cryptography
This course introduces the theory and application of cryptography – a fundamental area of Computer Science and Mathematics at the core of modern software and hardware security.

CS 434 Game Development
The course is a hands-on introduction to game design and development, providing a comprehensive look at the overall game development process.

CS 436 Advanced Game Development
The course explores advanced topics in game development, including advanced computer graphics, artificial intelligence, and software engineering principles for game design and implementation.

CS 444 Web Applications Development
This course provides an in-depth introduction to the design, implementation, testing, and deployment of web applications.

CS 446 Computer Graphics
This course introduces fundamental concepts in 2D and 3D computer graphics, including graphics primitives, geometric transformations, 2D and 3D viewing and rendering.

CS 447 Advanced Computer Graphics
This course focuses on the mathematical foundations and algorithms for advanced computer graphics, including 3D modeling, hidden surface removal, texture mapping, and computer animation.

CS 461 Artificial Intelligence
This course covers the principal ideas and developments in artificial intelligence, including knowledge representation, problem solving and search strategies, game playing, and machine learning.

CS 464 Parallel and Scientific Computing
The course is an introduction to Parallel and Scientific Computing, including advantages, limitations, theory, and applications of parallel and distributed computing.

CS 465 Data Mining
This course introduces principles of data mining methods for extracting knowledge from data, including introduction to the knowledge discovery process, data preprocessing, visualization, and machine learning.

CS 472 Web Application Security
The course introduces vulnerabilities of Web applications where students learn how to discover, exploit and prevent security flaws.

CS 473 Mobile Applications Development
This course provides an in-depth introduction to the design, implementation, testing and deployment of mobile applications on a variety of modern mobile platforms.

CS 474 Mobile Application Security
This course shows students the security problems that developers and IT managers need to look for when developing and deploying mobile applications.

CS 475 Computer Networks and Network Programming
This course presents computer networking in both theory and practice where students learn about computer networks with a focus on networking protocols and network programming.

CS 477 Network Security
This course introduces various attacks and threats that can take place in a computer network.

For more details about all our programs and courses, please visit the Computer Science Department webpage at http://www.iona.edu/cs.
STUDENT INTERNSHIPS

Almost all of our computer science students are doing some form of paid internship, most starting as sophomores or juniors. Students can get credit for internships of sufficient complexity that provide educational enhancements as well as skills in new technologies. Some students choose to intern at major companies and experience work in large teams; others prefer smaller companies such as start-ups where they can see the development of a project from inception to completion. Internships provide valuable work experience to our students, bridge the gap between the classroom and the work-place, and very often directly result in full time job offers.

In summer 2015, undergraduate students with a concentration in cyber security were awarded paid internships through the Research Experiences for Undergraduates (REU, funded by the National Science Foundation) at the University of North Texas. Through this program, motivated students engaged in research in secure software testing for web and mobile applications research, Iona students and alumni have completed internships at many notable companies and academic institutions, including:

- Argus
- Gartner
- GLC Software
- IBM Global Financing
- Legg Mason
- Majestyk
- PepsiCo Business + Information Solutions
- Steiner Sports
- Tapis
- University of North Texas

University of North Texas  
WALTER SQUIRES  
BS in Computer Science, ‘16

I took part in undergraduate research at the University of North Texas (UNT) through the Secure Software Testing for Web and Mobile Applications REU program. The program served as a platform for computer science undergraduates, like myself, to experience research and gain a better idea of what graduate school is like. My team was working with Brain Computer Interfaces and we were attempting to determine if the devices could be used for malicious purposes and if additional security for the devices was required. My experience at the REU allowed me to work on an exciting new technology while applying skills which I had learned at Iona. Something from every class I have taken thus far proved useful in my research experience, from the Python skills I learned in CS 201 to the development of Android applications taught in the mobile application development class, I was able to take the things the faculty at Iona have taught me and develop useful research tools with them. My experience at the UNT REU was fantastic, as it gave me a better idea of what graduate school is like.

eScholar  
KERRI SEXTON  
BS in Computer Science, ‘17

Recently I started working at eScholar in White Plains, NY as a Quality Assurance intern. I believe my education at Iona College has prepared me well for this. Thanks to the Database course, I understand how the backend of our application functions and how to manipulate the tables if I need to. I also have an understanding of how the backend is connected to the frontend. This coupled with the communication skills that are emphasized in many classes makes it easy for me to convey issues to the other members of my team. I am grateful for what I’ve learned here and am glad that I have had the opportunity to apply these skills in a workplace environment.
IBM Global Financing
ORLANDO BARRIERO
BS Computer Science, ‘16

I am an Information Technology intern with IBM Global Financing (IBF). My main role has been to develop and maintain applications built within Lotus Notes. Lotus Notes is an IBM proprietary software used for email, scheduling and application development. Lotus Notes supports the development of a variety of business applications using object-oriented databases. My internship with IGF has exposed me to a completely new dynamic not attainable in the classroom. Among many things, I have gained experience in the business world, been introduced to the software development process, and even had the opportunity to work with colleagues from around the globe. I have also been able to directly apply the skills I have learned in my computer science courses at Iona. Overall, my internship with IGF has been extremely rewarding and has given me valuable insight into my career path.

Steiner Sports
COSTANTINOS VRAHIMIS
BS in Computer Science
MS in Computer Science, ‘17

I recently completed an internship with Steiner Sports as a .Net developer working on their order processing system. The computer science degree and academic knowledge that I received from Iona College has given me a strong foundation to compete for internships and top job opportunities during and after my years as an undergraduate student. The strong demand for computer science professionals, Iona’s solid reputation in the business world and proximity to New York City provided the ideal combination for my successful employment and career path. The close relationships I had with my computer science professors were instrumental during my undergraduate years and have continued while I am pursuing my Master’s degree.

IBM Corp.
MELISSA GALLAGHHER
BA in Computer Science, ‘17

My name is Melissa Gallagher and I am a senior at Iona College majoring in Computer Science. During my time here I have learned countless things in the realms of programming languages, data structures, databases, artificial intelligence and computer architecture just to name a few. The knowledge that I’ve acquired during these three, going on four, years has helped me to excel in my internship at IBM as an automated tester. The programming skills that I have learned have helped me to seamlessly turn over work that is requested of me. My knowledge of programming languages has been global enough that I can apply general concepts to any new language I am faced with. The faculty in the computer science department are both encouraging and motivating and have helped me to succeed in a field that I am passionate and excited about. Iona College has been a valuable addition to my education and I can’t wait to see what else will become possible!

PepsiCo
KARL ENGEMANN
BS in Computer Science, ‘17

I joined PepsiCo as a Business + Information Solutions intern on the BIS Global eCommerce team. I focused on eCommerce product content, leveraging external APIs to audit retailer content, as well as creating a user guide and technical spec document for the internal Product Space API which can now be leveraged for 3rd party consumption. The internship exposed me to new software tools which strengthened my technical savvy. I also learned the importance of effective communication and how to interact in a real-world business environment. Iona prepared me for my internship by not only giving me the technical know-how needed to succeed in an IT role, but also a resourcefulness mindset that allowed me to solve any challenge I faced.
**STUDENT SUCCESS STORIES**

**2015 Upsilon Pi Epsilon Scholarship Award**

**CHELSEA MARIE RAMSINGH,** November, 2015  
*BS in Computer Science, ’16*

Chelsea Marie Ramsingh ’16, a computer science student, recently won a 2015 Upsilon Pi Epsilon Scholarship Award. She was selected on the basis of her academic record and extra-curricular activities from a large number of scholarship applications from students at both the undergraduate and graduate levels. Upsilon Pi Epsilon (UPE) is the international honor society for students, faculty and computing professionals who exhibit superior scholastic and professional achievement in the computing and information disciplines. UPE is a member of the Association of College Honor Societies (ACHS) and has chapters at more than 270 colleges and universities in the U.S. and overseas. Chelsea was nominated for this scholarship by Dr. Smiljana Petrovic, moderator of Upsilon Pi Epsilon.

**Iona Scholars Day**

**MONICA SULEIMAN,** April 2016  
*MS in Computer Science, ’16*

Iona Scholars Day is a yearly celebratory event that allows students to present their research, collaborative or independent, in a friendly and supportive atmosphere. Monica presented her MS thesis work entitled Role-Attribute-Based Encryption (RABE) Access Control for Healthcare Cloud Systems. Her work was published in the International Journal of Computers and Technology (IJCT) in June 2016.

**ALUMNI SUCCESS STORIES**

**Majestyk App Co-founder**

**SEAN O’ SHEA**  
*BS-MS in Computer Science, ’13*

Sean O’Shea, co-founded Majestyk Apps, which has been selected as a Winner in the IBM Watson Challenge. The company will be creating an adaptive learning platform around IBM’s Watson.

**Google**

**SEAN CAMPBELL**  
*BS in Computer Science, ’16*

I am starting out in the Software Engineering Residency program at Google, which is a one-year program to train recent college graduates to be able to hit the ground running in an industry setting. Currently, I am still in the 2-month training period, which is followed by two 4-and-a-half month rotations on teams in the Manhattan office. The professors at Iona provided me with a strong education, as well as opportunities to build computer science skills through challenging projects, research, and internships, all of which provided a solid base for the residency program. I am enjoying applying what I learned in school, and I look forward both to learning more and to putting more of what I learned into practice during the rotational part of the program.

**Con Edison**

**VANESSA SANTANA**  
*MS in Computer Science, ’16*

At Con Edison, I am a management associate in the Information Technology track as part of the Growth Opportunities for Leadership Development program. The GOLD program includes three rotations that are six months in duration each, which place you in either an individual contributor (developer or analyst) or supervisory role in Electric, Gas or Steam throughout the Con Edison service territory which includes Bronx, Westchester, Brooklyn, Queens, Staten Island, Westchester and Orange and Rockland (O&R). I am currently in my first rotation as a developer in IT Electric Operations Support working in Manhattan. The IT Electric Operations Support group develops and maintains a suite of applications related to the operation of the company’s electric distribution system. Getting my graduate degree in computer science at Iona College helped shape the way I think through problems and get to their solutions in my role as a developer. The team projects I worked on while at Iona were very helpful and were great when I needed to provide team work examples during job interviews. Also, my professors were always very helpful and interested in my learning and progress.
CONSTANTINOS MAKRIDES
BS Physics, ’07
BA Computer Science, ’07
Ph.D. Atomic and Molecular Physics, University of Toledo, ’14

After graduating from Iona College, I proceeded to obtain my Ph.D. in atomic and molecular physics. I am presently a postdoctoral researcher at the Joint Quantum Institute at the University of Maryland. In addition to analytical work, much of the research I am involved in has computational aspects ranging from numerical solutions of differential equations to statistical analysis of physical quantities. In both cases, it is critical to have the ability to develop new software and/or augment existing codes to the project’s needs. It is not uncommon to encounter a computationally demanding calculation where special attention needs to be taken. As such, I make use of computational clusters where thousands of processors and/or large physical memory nodes are available to me.

Having never written a line of code prior to starting my undergraduate studies at Iona College, I would claim that a large part of my present success can be attributed to gaining the necessary skills required in today’s academic research environment. From the first course in basic programming to the more advanced courses such as parallel computing, it is clear that there are long lasting impressions on my career. The computer science faculty at Iona College properly recognized the computational aspects of my career path and made sure that I was engaged in projects that reinforced concepts related to my interests. It was evident a short time later in my postgraduate studies that I was well prepared to use my computational background to my research in atomic scattering. I am very grateful to the faculty for their guidance and instruction in my early programming days and for the opportunities that have opened as a result.

JOSHUA ESPINOZA
BA in Computer Science, ’15
MS in Computer Science, ’16

I am currently the Player Mechanics Designer at Avalanche Studios (responsible for Just Cause 3, Mad Max, and some mechanics in the upcoming Final Fantasy XV). My position calls for me to use my knowledge of various programming languages (C++, Python, XML, and more) alongside my skills as a designer to develop prototypes for mechanics on their next game. Basically, when you pick up your controller, it’s my job to make sure you say “this game feels great!” Of course, Iona’s C.S. Department gave me the diverse programming knowledge I needed for this job. But I was taught more than that. I was not just taught how to code, I was taught how the code WORKS which is extremely important. Anyone can learn to code but it’s different to know what it means. In addition to this, my professors gave me enough freedom to work on what I was most passionate about. Even if it was wild or silly, if I could pull it off, they let me do it. And that sort of academic freedom produces the most exceptional of students.

Media Company
CHRISTOPHER FOREHAND
MS Computer Science, ’14

Iona College provided me with a great foundation to pursue my new career path. Prior to graduating in May 2014, I was hired as a Software Developer for a media company in December 2012. Without my experiences at Iona College, I doubt this transition would have been possible. I am currently employed with the same organization and in my free time, I continue to develop my skillset. Computer Science is unique, in that your growth and development is enhanced through a real-world work experience, but your success is ultimately in your control.

Bank of America
LUJAN BACAJ
BS-MS in Computer Science, ’13

I am an Assistant Vice President, Senior Software Engineer, at Bank of America, architecting and building middleware services. I am building middleware services that are critical to helping the bank scale out its Global Operations. Having recently graduated from the program at Iona, I must say that I will absolutely miss the friends I was able to make due to small class sizes, the hands on work and interaction that its world class professors provided. I also wholeheartedly recommend the program to anyone looking to gain real world skills that are very much in demand in today’s economy.
CS FACULTY RESEARCH

PAOLINA CENTONZE, PHD
Dr. Centonze’s areas of research include language-based security and mobile computing. At Iona College, she has been responsible for extending the Computer Science curriculum into the field of Cyber Security. In April 2015, President Joseph E. Nyre, Ph.D., awarded Dr. Centonze the Academic Innovation Grant to work on achieving a National Centers of Academic Excellence (CAE) for Cyber Operations designation, an NSA accreditation, for the Computer Science programs with concentration in Cyber Security. Before joining Iona College, Dr. Centonze was a researcher at IBM’s Thomas J. Watson Research Center in Yorktown Heights, N.Y. Dr. Centonze mentors numerous undergraduate and graduate students in their research and publications.
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WALTER O. KRAWEC, PHD
Dr. Krawec’s primary research interests are in quantum computation and especially quantum key distribution. In particular, his current work involves the design and security analysis of new quantum protocols that require fewer quantum resources from the participating users.
Besides his work in quantum key distribution, Dr. Krawec is also very interested in quantum random walks and the application of evolutionary algorithms to problems in quantum computation and quantum cryptography. He has also published, and maintains an active interest in: combinatorial game theory, graph theory, and developmental robotics.
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SMILJANA PETROVIC, PHD
Dr. Petrovic’s research interests are in the development of machine learning techniques for authorship attribution and for solving constraint satisfaction problems and other Cyber Security related problems, as well as database security. Her authorship attribution methodology was actively used for authorship of 18th Century political writing, with special attention to the work of Thomas Paine. Dr. Petrovic has mentored a number of students working on master’s theses and independent research projects about applications and implementations of data mining methods. She has collaborated with numerous experts from different areas. Dr. Petrovic is the recipient of 2014 Br. William B. Cornelia Distinguished Faculty Award.
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LUBOMIR IVANOV, PHD
Dr. Ivanov's diverse research interests include the theory and application of parallel and scientific computing, natural language processing, and data mining. Dr. Ivanov has been involved in numerous research projects in areas as diverse as authorship attribution, chemical process modeling, and parallel image/video processing. He is an active participant in several interdisciplinary collaborations with scientists in chemistry and psychology. Dr. Ivanov is also engaged in the development of professional and research-oriented mobile applications and serious-games software and simulations. Dr. Ivanov has given numerous invited talks, and his work has been published and presented at many top national and international conferences and journals in computer science.
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CHIA-LING TSAI. PHD
Dr. Tsai joined Iona College in 2008. She received the BSc and BSc Hons degrees from the University of the Witwatersrand, South Africa, in 1994 and 1995, respectively, and the PhD degree in computer science from Rensselaer Polytechnic Institute, Troy, New York, in 2003. She has been teaching at the college level since 2005. Her research interests include biomedical image analysis, computer vision, image processing, and interdisciplinary undergraduate research.
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