COLLEGE OF ARTS & SCIENCES

COMPUTER SCIENCE

LUC.EDU/CAS

Loyola University Chicago's College of Arts and Sciences (CAS) offers undergraduates a comprehensive liberal arts education that introduces them to various disciplines and viewpoints in the natural sciences, social sciences, and humanities. CAS students develop valuable career and life skills, including critical thinking, strong verbal and writing abilities, comprehensive general knowledge, social awareness, and research competencies. As the largest of Loyola's 10 schools, CAS has extensive resources, providing students with modern labs and electronic classrooms, opportunities to participate actively in research, and a distinguished faculty of teacher-scholars.

Recent growth and renovation at both Loyola's Lake Shore and Water Tower Campuses have enhanced living and learning for students. Recent additions to the Lake Shore Campus include the Norville Center for Intercollegiate Athletics, a state-of-the-art facility that includes a new strength and conditioning center, a sports medicine facility, student athlete activity spaces, and offices for athletics administrators. Future enhancements include a new student union and academic building, among others.

For more information about what's new at Loyola, visit **» LUC.edu/undergrad/whatsnew**.

Picturesque Lake Shore Campus, situated on the shore of Lake Michigan and located on Chicago's North Side, is home to more than 3,400 undergraduate resident students.

THE PROGRAM

The mission of Loyola's Department of Computer Science is to provide high-quality computer science education focusing on scholarship, advanced research, career opportunities, and service to others. The department offers a comprehensive set of undergraduate programs and a growing number of offerings for part-time professionals interested in continuing education and lifelong learning.

Bachelor of Science (BS) degree programs include:

- Computer Science
- Communication Networks and Security
- Information Technology
- Software Development

In addition to fulfilling major requirements to earn an undergraduate degree, students are required to complete Loyola's Core Curriculum, which teaches them important skills and values (see page 6). Students also develop their own interests by taking general electives.

Students may minor in computer science or computer crime and forensics. Other computer-related interdisciplinary programs include:

- **BS in Bioinformatics:** Combines computer science, mathematics, and statistics to solve biological problems using DNA and related material.

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LOYOLA UNIVERSITY CHICAGO

Preparing people to lead extraordinary lives

COMPUTER SCIENCE

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THE PROGRAM [CONTINUED]

- **BS/MS in Computer Science:** Enables students to begin graduate studies as early as their junior year, and to complete both the BS and MS degree requirements in five years. Advanced students may also be eligible for teaching or research assistantships.

Loyola also offers:

- **BS in Computer Science and Mathematics**
- **BS in Computer Science and Physics**

For more information about related computer science programs, please visit **LUC.edu/cs**. Depending on their career interests, students may also combine computer science with other Loyola majors like biology, business, chemistry, and education. For information on other Loyola programs, visit **LUC.edu/brochures**.

Program Options

Students majoring in computer science, communication networks and security, information technology, and software development complete a total of 51 credit hours of coursework, including 30 credit hours of shared foundation and practicum courses. All these majors also share the same elective rules. Each major also requires 21 credit hours of 300-level coursework specific to the individual program.

FOUNDATION COURSES

24 credit hours:

Computer Science (COMP)

COMP 150 Introduction to Computing
COMP 163 Discrete Structures
COMP 170 Introduction to Object-Oriented Programming
OR
COMP 215 Object-Oriented Programming with Mathematics
COMP 250 Introduction to Scientific and Technical Communication
COMP 264 Introduction to Computer Systems
COMP 271 Data Structures: Algorithms and Applications
COMP 317 Social, Legal, and Ethical Issues in Computing

Mathematics (MATH)

MATH 131 Elements of Calculus I

PRACTICUM

Six credit hours selected from the following:

COMP 390 Computer Science Project (one to six credit hours)
COMP 391 Internship in Computer Science (one to six credit hours)
COMP 398 Independent Study (one to six credit hours)

ELECTIVE RULES

Each major allows at least two electives, which are additional 300-level computer science courses. Three additional units of 390 and 398 beyond the practicum may be counted as an elective, provided that no more than six units of 390 and 398 are taken all together.

BS IN COMPUTER SCIENCE

The field of computer science has expanded in recent years to not only encompass traditional programming, but also to include areas like networking, security, data mining, software engineering, systems analysis, and more. Loyola's computer science major offers a wide range of courses and combines theoretical foundations and applied computer science so that students have the flexibility to select subject areas that best suit their individual interests and desired career paths.

All computer science majors learn fundamental computer science skills in object-oriented languages, operating systems, and other programming languages. Students may choose from courses in networking, client/server programming, artificial intelligence, security, databases, software engineering, systems analysis, graphics, distributed computing, cryptography, numerical algorithms, bioinformatics, project management, and more.

Major Requirements

Computer science majors must complete the foundation and practicum courses listed at left on this page. In addition, students must complete the following specialized course and electives:

SPECIALIZED COURSES

Three credit hours:

COMP 363 Design and Analysis of Computer Algorithms

ELECTIVES

Students must complete 18 credit hours of electives (see elective rules above).

BS IN INFORMATION TECHNOLOGY

Enterprises make substantial investments to acquire and use data to help them build and run their operations. They need to effectively integrate, use, and manage an ever-increasing amount of information, which may be from multiple sources and in different formats. Much of this data may be Web-related, which requires increasingly sophisticated approaches for access and use.

Loyola's new information technology major was designed in collaboration with the School of Business Administration. The program teaches students how to combine business management with technical knowledge to manage enterprise information systems. Students will learn industry practices as they develop the following skills: planning, designing, implementing, and administering databases that can be effectively used and manipulated; assessing the information and data requirements of an organization to implement these requirements as an information system; and functioning as an effective member of an information services division in an organization.

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In addition, the information technology major introduces students to various computer science components including object-oriented languages, data structures, operating systems, and other programming languages.

Electives in the major allow students to deepen their understanding of data management or to broaden their computer science background. Courses cover cutting-edge areas such as graphics and multimedia, Web services, open source computing, and wireless networks and security.

Major Requirements

Information technology majors must complete the foundation and practicum courses listed on page 2. In addition, students must complete the following specialized courses and electives:

SPECIALIZED COURSES

12 credit hours:

COMP 300 Data Warehousing and Data Mining
COMP 320 Software Systems Analysis
COMP 353 Database Programming

Information Systems and Operations Management (ISOM)

ISOM 349 Project Management

ELECTIVES

Students must complete nine credit hours of electives (see elective rules on page 2).

BS IN SOFTWARE DEVELOPMENT

Loyola's software development major teaches students the techniques and technology used to develop the next generation of software applications, including office productivity suites, e-commerce portals, or mobile chat clients.

Students gain necessary talents to be successful in today's organizations, as they learn industry practices in designing and developing software according to industry best practices; understanding and applying software development processes and methodologies in their work; leveraging software development tools used in the various phases of the development life cycle; and functioning as an effective member of a software development team or organization.

To solidify their skills, students take high-level electives in which they complete major projects in advanced areas such as client/server programming for the Web, distributed programming for large clusters of processors, database programming, and markup language transformation. As students work on modern applications with current software engineering practices like extreme programming, they also learn to analyze and apply this knowledge to real-world business and scientific problems.

Major Requirements

Software development majors must complete the foundation and practicum courses listed on page 2. In addition, students must complete the following specialized courses and electives:

SPECIALIZED COURSES

15 credit hours:

COMP 313 Intermediate Object-Oriented Development
COMP 330 Software Engineering
COMP 363 Design and Analysis of Computer Algorithms

Two courses selected from:

COMP 320 Software Systems Analysis
COMP 336 Markup Languages
COMP 337 Introduction to Concurrency
COMP 338 Server-Based Software Development
COMP 339 Distributed Systems
COMP 353 Database Programming
COMP 370 Software Quality, Metrics, and Testing
COMP 373 Objects, Frameworks, and Patterns
ISOM 349 Project Management

ELECTIVES

Students must complete six credit hours of electives (see elective rules on page 2).

BS IN COMMUNICATIONS NETWORKS AND SECURITY

This major examines the architecture, properties, management, and performance of both wired and wireless networks, including how to keep them reliable and secure. Students learn industry practices necessary for success in today's organizations as they acquire important skills in planning, designing, and administering voice and data communication networks; assessing and implementing the communication and security requirements of an organization to develop a secure communication infrastructure; and functioning as an effective team member of a network and security services division.

In addition, the communications networks and security major introduces students to various computer science components, including object-oriented languages, operating systems, programming languages, software engineering, and algorithms.

Computer science electives in the major allow students to either deepen their understanding of networks or to broaden their computer science background. Courses cover cutting-edge areas such as graphics and multimedia, Web services, project management, data mining, wireless networks, and security.

Major Requirements

Communications networks and security majors must complete the foundation and practicum courses listed on page 2. In addition, students must complete the following specialized courses and electives:

SPECIALIZED COURSES

12 credit hours:

COMP 343 Introduction to Computer Networks

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Three courses selected from:

COMP 331 Cryptography
COMP 346 Introduction to Telecommunications
COMP 347 Intrusion Detection
COMP 348 Network Security
COMP 349 Wireless Network Security
COMP 351 Network Management

ELECTIVES

Students must complete nine credit hours of electives (see elective rules on page 2).

Computer Science Courses

Loyola offers many other computer-science-related courses beyond those specifically required for the majors.

COMP 101 Exploring the Internet (one credit hour)
COMP 102 Web Design and Multimedia
COMP 104 Computer Animation
COMP 111 History of Computing
COMP 125 Visual Information Processing
COMP 150 Introduction to Computing
COMP 163 Discrete Structures
COMP 170 Introduction to Object-Oriented Programming
COMP 171 Scripting Languages (one credit hour)
COMP 215 Object-Oriented Programming with Mathematics
COMP 219 Introduction to Unix (one credit hour)
COMP 250 Introduction to Scientific and Technical Communication
COMP 264 Introduction to Computer Systems
COMP 266 Digital Electronics Laboratory
COMP 271 Data Structures: Algorithms and Applications
COMP 300 Data Warehousing and Data Mining
COMP 309 Numerical Methods
COMP 312 Open Source Computing
COMP 313 Intermediate Object-Oriented Development
COMP 314 Problem Solving Strategies I (one credit hour)
COMP 315 Problem Solving Strategies II (two credit hours)
COMP 317 Social, Legal, and Ethical Issues in Computing
COMP 320 Software Systems Analysis
COMP 330 Software Engineering
COMP 331 Cryptography
COMP 333 Formal Methods in Software Engineering
COMP 336 Markup Languages
COMP 337 Concurrent Programming
COMP 338 Server-Based Software Development
COMP 339 Distributed Systems
COMP 340 Computer Forensics
COMP 343 Computer Networks
COMP 346 Introduction to Telecommunications
COMP 347 Intrusion Detection
COMP 348 Network Security
COMP 349 Wireless Network Security
COMP 351 Network Management
COMP 353 Database Programming
COMP 360 Computer Organization
COMP 363 Design and Analysis of Computer Algorithms
COMP 366 Microcomputer Design and Interfacing
COMP 370 Software Quality, Metrics, and Testing
COMP 372 Programming Languages
COMP 373 Objects, Frameworks, and Patterns
COMP 374 Introduction to Operating Systems
COMP 376 Formal Languages and Automata
COMP 378 Artificial Intelligence
COMP 380 Introduction to Computer Graphics
COMP 381 Bioinformatics
COMP 383 Computational Biology
COMP 390 Computer Science Project (one to six credit hours)
COMP 391 Internship in Computer Science (one to six credit hours)
COMP 398 Independent Study (one to six credit hours)
COMP 399 Honors Tutorial (one to six credit hours)

Minors

The computer science minor, with its considerable flexibility, is available to students wanting to combine some computer science courses with another major. The computer crime and forensics minor is a focused program offered in conjunction with the Department of Criminal Justice. Eighteen credit hours are required for each minor.

COMPUTER SCIENCE MINOR

Students with a minor in computer science must complete the following courses:

COMP 150 Introduction to Computing
COMP 170 Introduction to Object-Oriented Programming
COMP 271 Data Structures: Algorithms and Applications

Nine units of electives in Computer Science, excluding COMP 391, three at the 200-level or above, and the rest at the 300-level.

COMPUTER CRIME AND FORENSICS MINOR

Computer crime and forensics, an interdisciplinary minor, helps familiarize students with the criminal justice system, courts, laws and procedures, computer software, hardware, networks, and investigative and evidence-gathering protocols. The minor, offered by the Computer Science and Criminal Justice Departments, requires six courses and does not require any programming background. Students will learn to use computers to solve criminal or civil cases where the evidence is traceable via a computer network or storage. The minor complements majors in computer science, criminal justice, and forensic sciences, but it is open to all Loyola students.

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Students with a minor in computer crime and forensics must complete the following courses:

Criminal Justice (CRMJ)

CRMJ 131 Introduction to Criminal Justice
COMP 150 Introduction to Computing
COMP 340 Computer Forensic Investigation
COMP 347 Intrusion Detection

One course from the following:

CRMJ 322 Criminal Courts and Law
CRMJ 323 Criminal Procedure

One course from the following:

COMP 264 Introduction to Computer Systems
COMP 317 Social, Legal, and Ethical Issues in Computing
COMP 343 Computer Networks

Additional Academic Opportunities

Special topic computer science courses incorporate recent trends in computing into the Loyola curriculum. Recent topics include client side Web design, rapid-application development methodology (.NET), and human-computer interface design. Students also have ample opportunity to pursue their own interests through independent study under the guidance of faculty members.

The Computer Science Department has an Industry Advisory Group made up of professionals and researchers from leading companies in the U.S. The charter of the group is to provide input for improving the quality and recognition of Loyola's programs. The group also advises the department on matters of strategic direction and philosophy.

The Faculty

Chairperson: Chandra Sekharan, PhD, Clemson University
Peter Dordal, PhD, Harvard University
Stephen Doty, PhD, University of Notre Dame*
Ronald Greenberg, PhD, Massachusetts Institute of Technology
Andrew Harrington, PhD, Stanford University
William Honig, PhD, Northwestern University
Konstantin Läufer, PhD, New York University
Gerard McDonald, PhD, State University of New York, Stony Brook*
Catherine Putonti, PhD, University of Houston**
George K. Thiruvathukal, PhD, Illinois Institute of Technology

Students are assigned a faculty advisor who helps them plan their curriculum and offers them valuable assistance in finding a job or gaining admission to graduate school.

** These faculty members are also affiliated with the Mathematics and Statistics Department.*

*** This faculty member is also affiliated with the Biology Department.*

Opportunities For Graduates

Loyola graduates are prepared for a technology-driven world where their strong backgrounds in computing can make a difference, whether they choose to be Web developers, software engineers, programmers, system analysts, computer engineers, IT managers, graphic designers, database managers, network designers, actuarial scientists, financial analysts in options and commodities trading, operations-research scientists, consultants, or academics.

Computer science is a field with many opportunities. According to the Bureau of Labor Statistics, three of the top 10 jobs expected to experience large growth in the next decade are network systems and data communications analysts (55% growth); computer software engineers, applications (48% growth), and computer software engineers, systems software (43% growth). Recent Loyola computer science graduates received annual starting salaries ranging from $45,000 – 70,000.

Sample employers of recent graduates:

In academia and government: Argonne National Laboratories, Cook County Treasury, DePaul University, Loyola University Chicago, Northwestern University, University of Chicago, and others.

In industry: Atypon, Chicago Mercantile Exchange, Epic, Hewitt, Hostway, Lucent, Maximus, Microsoft, Motorola, NavTeq, Oracle, Orbitz, Sapient, SBC, ThoughtWorks, Townsend Analytics, Yahoo, and others.

Computer science students have also gone on to attend some of the most prestigious graduate schools in the country including Columbia University, Indiana University, Iowa State University, Northwestern University, University of Illinois at Urbana-Champaign and at Chicago, University of Chicago, and more. Many students also seek professional degrees in business, law, and medicine.

Internships

The Internship in Computer Science course (COMP 391) gives juniors and seniors academic credit for applying their classroom knowledge in a real-world environment to build on-the-job experience using a range of computing skills. The Career Development Center and the Computer Science Department's annual job/internship fair inform students about work opportunities with dozens of Chicago-based software, consulting, and computer firms. Students also find part-time work on campus.

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Student Activities

Loyola students develop leadership, administrative, and networking skills beyond the classroom through participation in any of Loyola's more than 175 student organizations. Majors in all computer science areas may participate in department colloquia, in Loyola's chapter of the Association for Computing Machinery (ACM), and in the department's Computer Science Student Advisory Council.

Computing Facilities

Computer science students receive a Linux account, including online disk space for programming assignments and other work, such as Web hosting and server-side development. The department provides a Linux-based laboratory with 32 new computing systems running the latest open source software. Students have access to experimental systems, including computational clusters and embedded systems through its Emerging Technologies Laboratory. For more information on the Computer Science Department's facilities, visit **LUC.edu/cs**.

Loyola is on Internet-2 and all of its campuses are interconnected by a high-speed fiber optics network. Each campus has computing centers equipped with extensive software options and standard programming environments. Most residence halls have high-speed, always-on network access in each room. Loyola's new WiFi wireless network allows students to access the University's network and the Internet from several indoor and outdoor locations on both campuses.

DEPARTMENTAL HONORS

A student whose GPA in all major courses is at least 3.4 may qualify for departmental honors by completing two additional 300-level or graduate-level computer science electives.

Transfer Credit and Advanced Placement

Transfer students must complete the majority of their major requirements at Loyola. Majors or minors in computer science will not be given permission to take any 300-level courses at other institutions in order to complete degree requirements at Loyola.

The Computer Science Department will award:

COMP 170 credit for:

- A four or five on the AP Computer Science–A course
- A three on the AP Computer Science–AB course

COMP 170 and 271 credit for:

- A four or five on the Computer Science–AB course

COMP 150 credit for:

- A five, six, or seven on the International Baccalaureate Diploma Higher-Level (IBHL)

For more information, please visit **LUC.edu/cs**.

Core Curriculum

Loyola's Core Curriculum focuses on desired outcomes in addition to academic disciplines. This varied curriculum instills important skills which prepare students for success regardless of desired career paths. These skills include communications, critical thinking, ethical awareness, information literacy, quantitative and qualitative analysis, research methods, and technological literacy. Students develop these skills by completing Loyola's 10 required areas of knowledge through coursework, which includes college writing seminar(s), artistic knowledge and experience, historical knowledge, literary knowledge, quantitative analysis, scientific literacy, societal and cultural knowledge, philosophical knowledge, theological and religious studies, and ethics. Loyola's Core integrates values across the curriculum through 12 credit hours completed in the Core, major or electives. These values focus on understanding and promoting justice, understanding diversity in the U.S. and the world, understanding spirituality or faith in action in the world, and promoting civic engagement or leadership. This 45-credit hour curriculum makes up about one-third of a student's coursework, is complemented by a major and electives, and may be completed at any time during the Loyola academic experience.

For more information, please visit **LUC.edu/core**.

Information in this brochure is correct as of July 2011.
*For the most up-to-date information, visit **LUC.edu/undergrad/academics***

Loyola is an equal opportunity educator/employer.

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