In 1966, when the Computer Science Department at the University of Pittsburgh was established, computers were used primarily by large corporations and universities to carry out data processing tasks or to perform mathematical calculations for scientific research. Today, computers are integrated into everyone’s lives in both personal and remote ways, ranging anywhere from empowering consumers via mobile and tablet device applications, to assisting physicians in medical diagnosis and treatment, to helping scientists predict global climate changes and earthquake scenarios. Developments and applications in computer technology are so numerous and evolve so quickly that listing them is nearly impossible. We can only imagine where technologies such as cloud computing, intelligent assistants and “big data” processing will take us in the not-so-distant future.

The undergraduate major in computer science is a challenging program that teaches the fundamental areas and core concepts of the discipline, including problem-solving techniques used for a variety of computational problems. The program additionally lets students explore their interests and strengthen their skills in advanced courses in computer science theory, artificial intelligence, computer security, operating systems, computer graphics, software engineering and other areas within the vast discipline of computer science. As the field evolves so do the opportunities and offerings within the department, and new courses are frequently added to the curriculum.

The Department of Computer Science at Pitt puts a strong emphasis on teaching. Within the faculty are two Chancellor’s Distinguished Teaching Award winners, two Bellet Dietrich School of Arts and Sciences Teaching Award winners, and one Provost’s Award for Excellence in Mentoring winner.

The Department of Computer Science is also a vibrant research department. The faculty regularly publish articles in noted journals and present at prominent conferences. Undergraduate research is encouraged here and many undergraduate students achieve significant results. Some recent faculty research projects include: artificial intelligence research in intelligent tutoring and machine learning for medical applications, security research in personal privacy management, systems research in sustainable and green computing, database research in “big data” processing and visualization, and interface research in user interfaces for mobile devices.

In addition to research, students can also expand their academic experiences by conducting an internship with a local or national company or by completing a co-op through the Cooperative Education office. Pittsburgh is a thriving center of high technology, and many local companies are eager to provide internship opportunities to our students. Internships and co-ops provide valuable experience for students and often lead to job offers upon completion. The department also offers teaching experiences for students as Peer Tutors at the Computer Science Help Desk and in some of the class recitations and laboratories.

The University of Pittsburgh offers state-of-the-art computer equipment and facilities for student use, including eight computing labs with hundreds of Mac, PC, and UNIX workstations and printers, color scanners, and graphic-generating equipment. The standard Pitt computer stations provide access to the University-wide data network and to a variety of software programs that allow students to work with databases, desktop publishing, editors, file transfer, programming languages, spreadsheets, and statistical and utility applications. Computing “access” is defined as widely as possible at the University of Pittsburgh. A high-speed wireless network connects the entire campus, and a wide variety of software packages are made available to students at no or minimal cost. In addition to the University computing labs, computer science students also have access to several departmental computing labs, containing specialized hardware and software for computer science research and instruction.
Required Core Courses

**Computer Science (16 credits)**
These courses provide an introduction to the fundamental areas of computer science including programming languages, problem-solving techniques, and data structures.

CS 0401 Intermediate Programming Using Java (4 credits)
This is an intermediate course focusing on object-oriented programming and other fundamental programming concepts utilizing the Java programming language. Students are expected to have some previous programming experience prior to taking this course.

CS 0441 Discrete Structures for Computer Science (3 credits)
Discrete structures are the backbone of computer science, and this course helps you understand and use them. In particular, you learn about logic, proofs, sets, relations, functions, counting, and probability, with an emphasis on applications in computer science.

CS 0445 Data Structures (3 credits)
This course emphasizes basic data structures of computer science (stacks, queues, trees, lists, graphs) and their implementation using Java language. You learn programming techniques that use recursion and pointer variables, as well as various searching and sorting methods. As a result, you also develop an intuitive understanding of the complexity of these algorithms. CS 0401 is a prerequisite for this course.

CS 0447 Computer Organization and Assembly Language (3 credits)
Through exercises, programming projects, and exams, this course teaches you the components of computing systems common to most computer architectures. In particular, you learn about data representation, types of processors (e.g., RISC V. CISC), memory types and hierarchy, assembly language, linking and loading, and processor implementation. CS 0401 and CS 0445 are prerequisites for this course, although CS 0445 can be taken concurrently.

CS 0449 Introduction to Systems Software (3 credits)
This course will introduce the students to the important systems language, C, and to several topics related to the hardware and software environment. These are issues related to device interfaces and hardware synchronization at the lowest level of the operating system, the linkage of operating system services to application software, and the fundamental mechanisms for computer communications. CS 0441, CS 0445, and CS 0447 are prerequisites for this course, although CS 0447 may be taken concurrently.

**Mathematics (11–12 credits)**
These courses are required to teach students the level of mathematical expertise essential for the study of computer science. It is highly recommended that you complete these courses early, starting with MATH 0220 in your freshman or sophomore year.

Note: If 12 credits are completed in mathematics/statistics, this can be used as your related area.

MATH 0220 Analytical Geometry and Calculus 1 (4 credits)
MATH 0230 Analytical Geometry and Calculus 2 (4 credits)

Choose one of the following courses:
- STAT 1000 Applied Statistical Methods (4 credits)
- STAT 1100 Stat. and Probability for Bus. Mgt. (4 credits)
- STAT 1151 Introduction to Probability (3 credits)

**Typical Freshman Course Sequence**

**First Term**
- CS 0401 Intermediate Programming Using Java
- CS 0441 Discrete Structures for Computer Science
- MATH 0220 Analytical Geometry and Calculus 1
- General Writing course

**Second Term**
- CS 0445 Data Structures
- CS 0447 Computer Organizations and Assembly Language
- MATH 0230 Analytical Geometry and Calculus 2
- STAT 1000 Applied Statistical Methods
- English Writing course

**Upper-Level Courses**
These courses allow you to explore the major areas of computer science (theory, programming languages, systems programming, artificial intelligence, and software engineering) in more depth than core courses. Please see the Department of Computer Science Web page for complete course descriptions and prerequisites.

**Required Courses (9 credits)**
It is advisable to take these three courses before any other upper-level computer science courses:
CS 1501 Algorithm Implementation (3 credits)
All problem-solving methods of computer science involve the manipulation of data. Data structures, including lists and trees, are some of the tools used to store and manipulate data. In this course, you learn about data structures and problem-solving methods such as divide-and-conquer techniques, greedy methods, and dynamic programming. You also study various sorting and searching methods and receive an introduction to methods of analyzing the efficiency of an algorithm.

CS 1502 Formal Methods in Computer Science (3 credits)
This course aims to develop your skills in modeling problems using discrete mathematics, and to introduce you to new discrete structures. In addition, you further develop your mathematical and algorithmic reasoning skills and learn about the theoretical study of information and computation as a physical phenomenon.

CS 1550 Introduction to Operating Systems (3 credits)
The purpose of this course is to instruct you to use and understand the basic concepts of operating systems, the mechanisms that allow the machines to interface with the programmers. In particular, you learn about concepts such as the processing unit, process management, concurrency, communication, memory management and protection, and file systems.

Elective Courses (15 credits)
At least five upper-level course electives must be taken from the list below:

- CS 1510 Algorithm Design
- CS 1511 Introduction to the Theory of Computation
- CS 1515 Scientific Computation
- CS 1520 Programming Languages for Web Applications
- CS 1530 Software Engineering
- CS 1538 Introduction to Simulation
- CS 1541 Introduction to Computer Architecture
- CS 1555 Database Management Systems
- CS 1566 Introduction to Computer Graphics
- CS 1571 Introduction to Artificial Intelligence
- CS 1573 Artificial Intelligence Application Development
- CS 1621 Structure of Programming Languages
- CS 1622 Introduction to Compiler Design
- CS 1630 Software-System Design and Management
- CS 1631 Software Design Methodology
- CS 1635 Interface Design Methodology
- CS 1640 Bioinformatics Software Design
- CS 1645 Introduction to High Performance Computing Systems
- CS 1652 Data Communications and Computer Networks
- CS 1653 Applied Cryptography and Network Security
- CS 1655 Secure Data Management and Web Applications
- CS 1666 Principles of Computer Game Design and Implementation
- CS 1671 Human Language Technologies

Capstone Experience: Completion of either a Computer Science directed study, internship, two co-op rotations or a Computer Science capstone designed course.

Job Opportunities
Because of the widespread use of computers and networks, employment opportunities for computer science majors exist in virtually every area of society (e.g., technology, banking, government, medicine, and education). Generally speaking, BS-level computer science majors are employed as either applications programmers or systems programmers. Individuals in the former classification are concerned with the design and implementation of programs to handle specific applications such as payroll, inventory, numerical analysis, or patient monitoring. Systems programmers, on the other hand, are concerned primarily with the computing system itself (independent of a particular application), and they design, implement, and maintain programs whose purpose is to support the execution of applications programs.

For more information on the computer science major, please contact:
University of Pittsburgh
Department of Computer Science
John C. Ramirez
Director of Undergraduate Studies
6141 Sennott Square,
Pittsburgh, PA 15260
412-624-8492
www.cs.pitt.edu

For information on other majors, please contact:
University of Pittsburgh
Office of Admissions and Financial Aid
Alumni Hall, 4227 Fifth Avenue
Pittsburgh, PA 15260-6601
412-624-PITT
E-mail: oafa@pitt.edu
www.oafa.pitt.edu
Special Programs/Extracurricular Activities

Internships
Pittsburgh and Western Pennsylvania have experienced rapid development of small high-technology firms in recent years. As a student, you have many opportunities to gain valuable work experience at these and other firms while completing your undergraduate degree. The Department of Computer Science is actively involved in placing students in internships locally and in other cities. Students have conducted internships at places such as the Pittsburgh Supercomputing Center, University of Pittsburgh School of Medicine, USX, Alcoa, Microsoft, Mellon National Bank, Eli Lilly, Blue Cross Blue Shield, and Aristech.

Computer Science Co-op Program
Through the assistance of the Swanson School of Engineering’s Office of Cooperative Education, computer science majors can enter the co-op program after the completion of their sophomore year, and rotate between academic terms and paid work assignments. Co-op students complete at least three work periods lasting four months with a local, national, or international employer and take on increasingly challenging work assignments that complement their academic progression. Credit for work assignment does not count toward the 40 credits needed for completion of the computer science major, but can be used as elective credit for the general degree requirements in the Dietrich School of Arts and Sciences.

Double Majors
Students majoring in computer science may consider completing a second major in another field. One option is the Dietrich School of Arts and Sciences/Business Dual Major, a challenging four-year program that enables you to complete the requirements for any Dietrich School of Arts and Sciences major (in this case, computer science) while completing a major in business. After successfully completing the program, you are awarded a BS degree in computer science and business. Pitt’s undergraduate business program is accredited by the American Assembly of Collegiate Schools of Business, a distinction held by only 25 percent of business schools in the country.

BS/MS Dual Degree Program (Bachelor of Science in Computer Science/Master’s degree in Computer Science)
Exceptional computer science students may consider the BS/MS Dual Degree Program. This challenging program allows students to complete both a BS and an MS degree in computer science in a period of five years, rather than the normal six years that the two degrees in sequence would require.

Undergraduate Teaching and Tutoring
The Department of Computer Science hires qualified undergraduate students on a selective basis to help teach undergraduate courses. At the CS Help Room, computer science majors also provide tutoring services to undergraduates who are taking computer science courses at Pitt.

Undergraduate Research
Faculty in the Department of Computer Science occasionally hire undergraduates, particularly students who have performed well in upper-level computer science classes, to assist them on research projects. Areas of faculty research include natural language processing, artificial intelligence and intelligent computer programming, image processing and pictorial information systems, computer architecture, parallel compilers, and optical memory in systems that require large memories, such as map databases for air navigation and medical databases for emergency treatment.

University of Pittsburgh Special Interest Group for Networks (UPSIGN)
is a campus organization devoted to encouraging communication between network administrators, users, and campus support organizations to increase efficiency, technical knowledge, and quality of service regarding the University’s network system. UPSIGN provides a forum for discussing network-related issues on campus through meetings and an electronic discussion board.

Association for Computing Machinery at Pitt
This national organization promotes the research, discussion, and exchange of information on current topics in computer science and machinery. Members hold meetings, organize social activities, and sponsor lectures and seminars.

Study Abroad
Study abroad programs let you earn credits toward your degree while strengthening your credentials as a graduate and enhancing your appreciation and understanding of other cultures. Credits earned are Pitt credits, scholarships are available, and financial aid is applicable. Study abroad programs that offer a strong curriculum in computer science include:

An exchange program with the University of Sussex in Brighton, England allows students to take courses at the School of Cognitive and Computing Sciences for one academic year and pay Pitt tuition and housing fees. Brighton, located on the southeastern coast of England, is known as “London-by-the-sea” because of its cultural offerings, shops, and student population.

The Program for North American Mobility in Higher Education, a student exchange program between Pitt and a number of well-regarded universities in Canada and Mexico, offers courses for computer science majors. Students attend for one semester or the entire academic year for the approximate cost of attending Pitt.