Computer Science

Desh Ranjan, Chair
Janet Brunelle, Chief Departmental Advisor

The Department of Computer Science (CS) offers programs leading to the Bachelor of Science in Computer Science (BSCS), Master of Science with a major in computer science, and Doctor of Philosophy with a major in computer science. A five-year accelerated option is available that leads to a Bachelor of Science in Computer Science and a Master of Science with a major in computer science. The BSCS courses are offered via traditional live lectures and distance learning options.

At the undergraduate level the Department of Computer Science jointly offers a program with the Department of Electrical and Computer Engineering in the College of Engineering and Technology leading to a Bachelor of Science in Computer Engineering. A five-year accelerated option is available that leads to Bachelor of Science in Computer Science and Master of Business Administration degrees. The CS department also supports the computer technology concentration of the Engineering Technology bachelor’s degree and the Modeling, Simulation and Visualization Engineering bachelor’s degree.

Computer science traces its foundation to mathematics, logic and engineering. Students in this program are exposed to the broad theoretical and practical basis of computer science in lectures and laboratory experiences. Through laboratories, students are introduced to both the experimental and the design aspects of computer science. Students may choose their electives to obtain an emphasis in databases, networking, web programming, systems programming, game programming, and cyber security.

The CS Department’s curriculum applies computer science education to the real world. The Professional Workforce Development courses (CS 410 and CS 411W) expand upon the experimental and design approach of earlier courses by addressing the creativity and productivity required for business and industrial applications today. Faculty and industry representatives provide project concepts and mentor student teams in design and development of usable products.

Bachelor of Science in Computer Science

Curriculum Requirement

The Bachelor of Science in Computer Science requires the successful completion of a minimum of 120 semester credit hours of approved course work. At least 30 credit hours overall and 12 credit hours in upper-level courses in the major program must be completed at Old Dominion University. In order to gain appropriate exposure and competency in basic computer science theory and applications, students must satisfy the General Education requirements and the following departmental requirements.

Requirements

Lower-Division General Education

Skills

<table>
<thead>
<tr>
<th>Written Communication</th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td>ENGL 110C &amp; ENGL 231C</td>
<td>English Composition and Introduction to Technical Writing (preferred)</td>
</tr>
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</table>

Mathematical Skills (satisfied in the major)

<table>
<thead>
<tr>
<th>Oral Communication</th>
<th>3</th>
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<tbody>
<tr>
<td>COMM 101R Public Speaking (preferred)</td>
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</tbody>
</table>

Information Literacy and Research

| CS 121G Introduction to Information Literacy and Research for Scientists (preferred) |

Language and Culture (competence must be at the 102 level) 0-6

Ways of Knowing

| Human Creativity | 3 |

Upper Division General Education

- Option A. Approved Disciplinary Minor (a minimum of 12 hours determined by the department), or second degree or second major.
- Option B. Interdisciplinary Minor (specifically 12 hours, 3 of which may be in the major)
- Option C. International Business and Regional Courses or an approved Certification Program such as teaching licensure
- Option D. Two Upper-Division Courses from outside the College of Sciences and not required by the major (6 hours)

In addition to completing the University’s lower-division general education requirements and upper-division general education requirements, a computer science major must complete the following courses.

Required Computer Science Courses

| CS 150 Problem Solving and Programming I | 4 |
| CS 170 Introduction to Computer Architecture | 3 |
| CS 250 Problem Solving and Programming II | 4 |
| CS 252 Introduction to Unix for Programmers | 1 |
| CS 270 Introduction to Computer Architecture II | 3 |
| CS 300T Computers in Society | 3 |

Old Dominion University 1
Elective Computer Science Courses
Three additional CS courses (9 credits) at the 300/400 level (excluding CS 333, CS 334 and CS 382).

Computer science majors may select their own electives from the CS offerings or may be guided by the following emphasis areas. Up to six credits of work experience (CS 367 or CS 368) may be used.

Database
- CS 450 Database Concepts 3
- CS 456 Database Administration I 3
- CS 457 Database Administration II 3

Networking
- CS 454 Network Management 3
- CS 455 Introduction to Networks and Communications 3
- CS 458 Unix System Administration 3
- CS 472 Network and Systems Security 3
- CS 486 Introduction to Parallel Computing 3
- CS 487 Applied Parallel Computing 3

Systems Programming
- CS 476 Systems Programming 3
- CS 454 Network Management 3
- CS 488 Principles of Compiler Construction 3

Web Programming
- CS 312 Internet Concepts 3
- CS 418 Web Programming 3
- CS 431 Web Server Design 3
- CS 441 App Development for Smart Devices 3

Game Programming
- CS 480 Introduction to Artificial Intelligence 3
- CS 460 Computer Graphics 3
- CS 475 Introduction to Computer Simulation 3

Cyber Security
- CS 462 Cybersecurity Fundamentals 3
- CS 463 Cryptography for Cybersecurity 3
- CS 464 Networked Systems Security 3
- CS 465 Information Assurance 3

Miscellaneous
- CS 451 Software Engineering Survey 3
- CS 488 Principles of Compiler Construction 3

Other Required Courses
- MATH 211 Calculus I 4
- MATH 212 Calculus II 4
- MATH 316 Introductory Linear Algebra 3
- STAT 330 An Introduction to Probability and Statistics 3

Technical Electives * 6-8

Total Hours 20-22

* Computer science majors must complete two courses not counted toward another degree requirement. These may be selected from biology, chemistry, ocean, earth and atmospheric sciences, and physics (excluding BIOL 105N-BIOL 106N, BIOL 110N, BIOL 111N, BIOL 112N, BIOL 113N, BIOL 117N, BIOL 118N, and PHYS 103N-PHYS 104N). With the approval of a computer science advisor, other technically oriented courses may be used to meet this requirement.

Computer science majors must earn a grade of C or better in all (non-elective) computer science courses required for the major and in all computer science prerequisite courses. A minimum of 9 credits of upper-level (300/400) computer science elective courses must be completed in addition to the required courses.

Requirements for graduation include a minimum cumulative grade point average of 2.00 overall and in the major, 120 credit hours, which must include both a minimum of 30 credit hours overall and 12 credit hours in upper-level courses in the major program from Old Dominion University, passage of the Computer Science Exit Exam, completion of ENGL 110C, ENGL 211C or 221C or 231C, and the writing intensive (W) course in the major with a grade of C or better, and completion of a Senior Assessment. Additional hours may be required to meet the foreign language requirement.

Honors Program

Students may obtain a Bachelor of Science in Computer Science with an honors designation through the completion of three junior/senior level computer science courses with honors designation and by achieving a 3.50 in-major GPA.

Advanced Placement

The Department of Computer Science awards credit for CS 133 to students who achieve a score of 3, 4, or 5 on the AP Computer Science A or AB exams or a 5, 6, or 7 on the IB Computer Science exams.

Cooperative Education

Computer science majors interested in gaining practical experience and on-the-job training while completing undergraduate degree requirements may find opportunities through participation in the Cooperative Education Program.

Those students usually start in the junior year working with an employer in a field of computer science. Students must apply through the Career Management Center prior to registering for Cooperative Education credit. All work experiences must be approved by Career Management and the academic department concerned.

Undergraduates can earn a maximum of six semester credits through cooperative education that apply toward degree requirements. For further information, see the Career Management section of this Catalog.

Professional Development Tracks

Database Administration with Oracle Software

This track was developed in cooperation with Oracle Corporation. It prepares students for roles in modern database environments. Students may achieve Oracle DBA certification upon completion of this track. Key concepts, techniques and skills required for administering a state-of-the-art database platform are developed. The courses in this track include CS 450, CS 456, and CS 457.
Network Design and Administration
This track is intended for students who wish to establish a career in network design and administration in networker computing environments. Students will get hands-on experience in designing networks by configuring routers and switches and work with LAN and WAN routing protocols. This track includes coverage of the information required to take the CISCO, CCNA and CCNP certification. Courses under this track include CS 454 and CS 455.

Computer Science Add-on Endorsement for Professional Education Licensure
A person licensed by the Commonwealth of Virginia to teach in secondary schools may add an endorsement for computer science by completing this program. The required courses are:

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<td>CS 170</td>
<td>Introduction to Computer Architecture I</td>
<td>3</td>
</tr>
<tr>
<td>CS 250</td>
<td>Problem Solving and Programming II</td>
<td>4</td>
</tr>
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<td>CS 252</td>
<td>Introduction to Unix for Programmers</td>
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<td>CS 312</td>
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<td>CS 330</td>
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<tr>
<td>or CS 355</td>
<td>Principles of Programming Languages</td>
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<tr>
<td>CS 361</td>
<td>Advanced Data Structures and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS 381</td>
<td>Introduction to Discrete Structures</td>
<td>3</td>
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</table>

Total Hours 24

For more information, refer to the Darden College of Education section of this Catalog.

Bachelor of Science in Computer Engineering
The computer engineering undergraduate degree program is designed to provide both a broad engineering background and comprehensive foundation in the technical principles underlying the computer area. Students develop a background through course work in mathematics, the basic sciences, and general engineering. The technical core consists of courses from electrical and computer engineering to address hardware aspects of computer engineering and course work from computer science to address software aspects. A grade of C or better must be earned in computer science required courses. In addition, course work in General Education perspectives and communication skills is required to assure a well rounded program of study. Specific degree requirements can be found listed under the Department of Electrical and Computer Engineering.

Due to limited laboratory facilities, admission to the computer engineering program is on a competitive basis. Students should apply to the Department of Electrical and Computer Engineering.

Bachelor of Science in Engineering Technology with a Concentration in Computer Engineering Technology
The goal of the computer engineering technology program is to prepare students for employment in areas defined by the rapidly expanding opportunities of computer applications. With new hardware and software products being introduced monthly, students who wish to succeed in this field should develop a background in both software and hardware. This program provides such a background by combining a grounding in basic theory with hands-on, application courses selected from the disciplines of Computer Science and Electrical Engineering Technology. The curriculum emphasizes practical design and the utilization of systems and hardware. Areas of concentration include network design and management, modern communication systems, microcomputer systems, and application programs. A grade of C or better must be earned in computer science required courses. Specific degree requirements can be found listed under the Department of Engineering Technology.

Minor in Computer Science
Students may minor in computer science by taking the following courses:

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Select two CS Electives at the 400-level or from the following: 6

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</tr>
<tr>
<td>CS 361</td>
<td>Advanced Data Structures and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS 350</td>
<td>Introduction to Software Engineering</td>
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</tr>
<tr>
<td>CS 381</td>
<td>Introduction to Discrete Structures</td>
<td></td>
</tr>
<tr>
<td>CS 390</td>
<td>Introduction to Theoretical Computer Science</td>
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</tr>
</tbody>
</table>

Total Hours 18

A grade of C or better is required in each course. Students must also meet the University’s requirements for a minor as described under Requirements for Undergraduate Degrees.

The curriculum for the Bachelor of Science in Engineering Technology with an emphasis in computer engineering technology and the Bachelor of Science in Computer Engineering contain a built-in minor in computer science.

Minor in Web Programming
Students may minor in Web Programming by taking the following:

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<td>CS 330</td>
<td>Object-Oriented Programming and Design</td>
<td>3</td>
</tr>
<tr>
<td>CS 418</td>
<td>Web Programming</td>
<td>3</td>
</tr>
</tbody>
</table>

One three-credit upper-level CS elective 3

Total Hours 12

* CS 252 and CS 333 are prerequisites and are not included in the calculation of the grade point average for the minor.

A grade of C or better is required in any of these courses if they are used as a prerequisite to any other CS course. Students must also meet the University’s requirements for a minor as described under Requirements for Undergraduate Degrees.

Five-year Bachelor of Science in Computer Science and Master of Business Administration
This program allows students to earn a Bachelor of Science in Computer Science and a Master of Business Administration. After students have satisfactorily completed their undergraduate requirements, they must complete the remaining requirements in the MBA program.

Additional information can be found in the section on B.S./M.B.A. Five-year Program listed at the beginning of the College of Sciences section of this Catalog. Students interested in this program should contact the MBA Program as early as possible. The MBA Program manager will act as an advisor to the student in addition to the Computer Science advisor.

Accelerated Bachelor of Science in Computer Science and Master of Science in Computer Science
This program allows exceptionally successful students to earn both a bachelor’s and master’s degree in computer science within five years by
allowing them to count up to 12 credits of graduate coursework toward both their undergraduate and master’s degrees in computer science.

**Admission**

To be admitted to the accelerated program, students must have completed at least 60 undergraduate credit hours with at least 24 credit hours from ODU. Students must have completed CS 361, CS 381, MATH 212 and all prerequisites for those courses. At the time of admission, they must have an overall GPA of 3.00 or better, and an overall GPA of 3.00 or better in CS and MATH courses.

Interested students who meet the admission requirements should apply to the graduate program director, after consulting with the undergraduate chief departmental advisor, as soon as possible upon completing the required courses and 60 credit hours. In consultation with the graduate program director, a student will:

1. Officially declare an undergraduate Computer Science major with the undergraduate chief departmental advisor.
2. Draft a schedule of graduate courses to be taken as an undergraduate to be presented to the undergraduate chief departmental advisor.
3. Apply, during their senior year, to the Office of Graduate Admissions for admission to the master’s in computer science program.

Students who have completed at least six hours of graduate courses upon attaining senior standing (completion of 90 credit hours) and who have earned a GPA of 3.00 or better in those courses will not be required to take the Graduate Record Exam (GRE) for admission to the master’s program. Otherwise, in keeping with normal admission requirements for the M.S. in computer science, students will take the GRE as an undergraduate and will subsequently be reevaluated for continuation into the master’s program.

Once students have been awarded their bachelor’s degree and fulfilled all regular admission requirements for the M.S. in computer science, they will be officially admitted into the M.S. program.

**Program Requirements**

Students in the program will fulfill all normal admission and curricular requirements for both a Bachelor of Science in Computer Science and an M.S. in computer science with the following exceptions:

1. Students in the program may count up to 12 hours of graduate courses, at the 500 or 600 level, excluding independent study, taken as an undergraduate toward both the bachelor’s and master’s degrees in computer science.
   a. Students in the program may substitute computer science graduate courses for undergraduate courses according to the following schema. All students must complete an undergraduate writing intensive course in the major. Students may substitute 500- and 600-level courses for the upper-level CS electives in the undergraduate program so long as they have the prerequisites for those courses. 700- or 800-level courses may not be used.
   b. Students will not receive credit for both the 400 and 500 level version of the same course.
   c. Students in the program may make a written petition for other substitutions to the graduate program director, who will consider them in consultation with the chief departmental advisor and the instructor(s) of the courses involved.

**NOTES:**

1. In accordance with University policy, up to 21 hours of graduate courses taken as an undergraduate may be counted toward the bachelor’s degree in computer science. However, only 12 hours of graduate courses taken as an undergraduate may also be counted toward the M.S. degree in computer science. This will limit students’ scheduling flexibility subsequently.
2. Like students in the regular M.S. in computer science program, students in the accelerated B.S.C.S./M.S. computer science degree may count no more than 12 hours at the 500-level toward their M.S. degree.

**Computing Facilities**

The Computer Science Department at Old Dominion University offers a wide array of facilities, resources, and services to faculty, staff, students and guests. Assets are distributed between Dragas Hall and the Engineering and Computational Sciences Building (E&CS). This system architecture enables services to be configured in a redundant/highly-available manner. This stability and resiliency is essential to maintaining a high level of service to over 2,300 users.

The E&CS building is home to the primary data-center and main administrative office. It also houses several of research labs, a multimedia conference room, and the network operations center. Dragas Hall contains several instructional and research labs, the satellite administrative office, secondary conference room, redundant data-center, extended network operations center, and support staff offices.

The department offers a heterogeneous computing environment that primarily consists of Windows and *nix based workstations and servers. On the Windows domain, users are offered network logons, Exchange email, terminal services via the Virtual Computing Lab (VCLab) where users can have access to software remotely, roaming profiles, MSSQL database access for research, and Hyper-V virtualization for research/faculty projects. For Unix and Linux users, Solaris, Ubuntu and Red Hat Enterprise Linux (RHEL) distributions are supported. The *nix services include DNS, NIS, Unix mail, access to personal MySQL databases, class and research project Oracle databases, and both Linux and Unix servers for secure shell sessions.