Bachelor of Science in Computer Science

Computer Science (BSCS) Requirements

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 departmental requirements.

**Lower-Division General Education**

- Written Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#written) 6
- Oral Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#oral) 3
- Mathematics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#math) 3
- Language and Culture (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#language) 0-6
- Information Literacy and Research (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#information) 3
- Human Behavior (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#behavior) 3
- Human Creativity (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#creativity) 3
- Interpreting the Past (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#interpret) 3
- Literature (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#literature) 3
- Philosophy and Ethics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#philosophy) 3
- The Nature of Science (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#nature) 8
- Impact of Technology (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#impact) 3

Written Communication: Grade of C or better required in both courses.

Mathematics (satisfied in the major)

Oral Communication: COMM 101R

Information Literacy and Research: CS 121G or CS 202G

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

Impact of Technology (satisfied through the major by CS 330, CS 350, CS 410, and CS 411W)

The Nature of Science: Computer Science majors must complete two Nature of Science courses in sequence for a total of eight credits from the following:

| BIOL 121N | General Biology I | 4 |
| BIOL 122N | and General Biology I Lab |
| BIOL 123N | General Biology II | 4 |
| BIOL 124N | and General Biology II Lab |
| BIOL 136N | Honors General Biology I | 4 |
| BIOL 137N | and Honors General Biology I Lab |
| BIOL 138N | Honors General Biology II | 4 |
| BIOL 139N | and Honors General Biology II Lab |
| CHEM 105N | Introductory Chemistry | 4 |
| CHEM 106N | and Introductory Chemistry Laboratory |
| CHEM 107N | Introductory Organic and Biochemistry | 4 |
| CHEM 108N | and Introductory Organic and Biochemistry Laboratory |
| CHEM 121N | Foundations of Chemistry I Lecture | 4 |
| CHEM 122N | and Foundations of Chemistry I Laboratory |
| CHEM 123N | Foundations of Chemistry II Lecture | 4 |
| CHEM 124N | and Foundations of Chemistry II Laboratory |
| OEAS 106N | Introductory Oceanography | 8 |
| OEAS 108N | and Understanding Global Climate Change |
| OEAS 106N | and Understanding Global Climate Change |
| OEAS 126N | Honors: Introductory Oceanography | 8 |
| OEAS 108N | and Natural Hazards and Disasters |
| OEAS 126N | and Natural Hazards and Disasters |
| PHYS 111N | Introductory General Physics | 8 |
| PHYS 112N | and Introductory General Physics |
| PHYS 226N | Honors: University Physics I | 8 |
| PHYS 227N | and Honors: University Physics II |
| PHYS 231N | University Physics I | 8 |
| PHYS 232N | and University Physics II |

**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. 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)

**Requirements for Graduation**

Requirements for graduation include the following:

- Minimum of 120 credit hours.
- Minimum of 30 credit hours overall and 12 credit hours of upper-level courses in the major program from Old Dominion University.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward the major.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward a minor.
- Completion of ENGL 110C, ENGL 211C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better.
- The W course must be taken at Old Dominion University.
- Completion of Senior Assessment.

**Computer Science Major**

**General Education**

Complete lower-division requirements 35-41
Complete upper-division requirements (minimum of 6 credit hours) 6-12

**Computer Science Required Computer Science Courses**

Select one of the following: 4

- CS 151 Introduction to Programming with Java or
- CS 153 Introduction to Programming with Python or
- CS 150 Introduction to Programming with C++
- CS 170 Introduction to Computer Architecture I 3

Select one of the following: 5-6

- CS 251 Programming with Java and C++ for Programmers
- and CS 260

Select three additional CS courses at the 300/400 level from the Elective Computer Science Courses:

- CS 315 Computer Science Undergraduate Colloquium
- or CS 310 Introduction to Computer Science with Python
- CS 330 Object-Oriented Design and Programming
- CS 350 Introduction to Software Engineering
- CS 361 Data Structures and Algorithms
- CS 381 Introduction to Discrete Structures
- CS 390 Introduction to Theoretical Computer Science
- CS 401 Professional Workforce Development I
- CS 411W Professional Workforce Development II
- CS 417 Computational Methods and Software
- CS 450 Database Concepts (or)
- or CS 418 Web Programming
- CS 471 Operating Systems

E elective Computer Science Courses

Select three additional CS courses at the 300/400 level from the following:

- CS 312 Internet Concepts
- CS 402 Formal Software Foundations
- CS 418 Web Programming
- CS 422 Introduction to Machine Learning
- CS 431 Web Server Design
- CS 432 Web Science
- CS 441 App Development for Smart Devices
- CS 450 Database Concepts
- CS 455 Introduction to Networks and Communications
- CS 460 Computer Graphics
- CS 462 Cybersecurity Fundamentals
- CS 463 Cryptography for Cybersecurity
- CS 464 Networked Systems Security
- CS 465 Information Assurance for Cybersecurity
- CS 466 Principles and Practice of Cyber Defense
- CS 467 Introduction to Reverse Software Engineering
- CS 469 Data Analytics for Cybersecurity
- CS 472 Network and Systems Security
- CS 473 Introduction to Computer Simulation
- CS 476 Systems Programming
- CS 478 Computational Geometry, Methods and Applications
- CS 480 Introduction to Artificial Intelligence
- CS 486 Introduction to Parallel Computing
- CS 487 Applied Parallel Computing
- CS 488 Principles of Compiler Construction
- CS 491 Honors Research I in Computer Science
- CS 492 Honors Research II in Computer Science
- CS 499W Honors Thesis in Computer Science

Other Required Courses

MATH 211 Calculus I
MATH 212 Calculus II
MATH 316 Introductory Linear Algebra
STAT 330 An Introduction to Probability and Statistics
Technical Elective ***

Total Credit Hours 117-131

* CS 115 is not open to students with prior credit for CS 150, CS 151, or CS 153. Students who have taken CS 115 may also take CS 315.

** Excluding CS 300T and CS 315. Computer science majors may select their own electives from the CS offerings. Up to six credits of work experience (CS 367 or CS 368) may be used.

*** Computer Science majors must complete one course not counted toward another degree requirement. These may be selected from the following: biology, chemistry, ocean and earth science, and physics courses: BIOL 121N, BIOL 123N, BIOL 136N, BIOL 138N, CHEM 105N, CHEM 107N, CHEM 121N, CHEM 123N, OAES 106N, OAES 108N, OAES 110N, OAES 111N, OAES 112N, OAES 126N, OAES 250N, PHYS 111N, PHYS 112N, PHYS 226N, PHYS 227N, PHYS 231N, PHYS 232N.

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 and in the writing intensive (W) course in the major. A minimum of 9 credits of upper-level (300/400) computer science elective courses must be completed in addition to the required courses.

Computer Science Major Double Degree/Major Options

Computer science majors may also complete the requirements for a second degree or second major in computer engineering, cybersecurity, or cyber operations. Students interested in a second degree or second major in cybersecurity or cyber operations should contact their computer science advisor. A five-year degree program guide for students pursuing degrees in computer science and computer engineering can be found below. Students seeking two degrees should be aware that a minimum of 150 credit hours is required.

Computer Science (BSCS) & Computer Engineering Major (BSCOME) 5-Year Plan (catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/electricalcomputerengineering/computerengn-dualdegree-cces-bs-fiveyearplan/)

Additional Requirements and Information

Advanced Placement

Advanced placement credit is awarded to students who earn qualifying scores on AP and IB subject examinations. See the equivalency charts on the Office of Undergraduate Admissions website at https://www1.odu.edu/academics/academic-records/score-analysis/ap-ib (https://www1.odu.edu/academics/academic-records/score-analysis/ap-ib/).

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 Career Development Services prior to registering for Cooperative Education credit. All work
experiences must be approved by Career Development Services 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 Development Services section of this Catalog.

Honors Program in Computer Science

Undergraduate computer science majors maintaining an overall GPA of at least 3.25 and of 3.50 in the major have the opportunity to participate in the Honors Program in Computer Science (program coordinator: Dr. Jing He). Students who complete the program and also meet the University's standards for graduation with honors (see description in this Catalog) may earn the designation of departmental honors on their diplomas. Students must complete one of three options.

A. Departmental Honors in Computer Science

Students maintaining an overall GPA of at least 3.25 and of 3.50 in computer science can receive a "Bachelor's Degree with Honors in Computer Science" subject to satisfaction of the minimum University standards for the departmental honors and completion of one of the following:

1. Successful completion of two semesters of honors research taken as either CS 491 and CS 492 or CS 491 and CS 499W.

2. Successful completion of four upper-division courses in Computer Science as "Contract Honors Courses" and achievement of the "Honors" designation in each.

3. Successful completion of one semester of honors research taken as CS 491 and two "Contract Honors Courses" in Computer Science and achievement of the Contract Honors designation in each.

Note: Completion of at least 60 credit hours at Old Dominion University, 54 of which must be in grade-point graded courses, is also required. Candidates who have used grade forgiveness or adjusted resident credit should be aware that the enhanced grade point average determined by use of these procedures does not determine eligibility for departmental honors. To determine eligibility for departmental honors, the student’s complete record, including grades and hours for courses that have been forgiven or adjusted, will be evaluated to calculate the final grade point average.

B. Honors Research Scholars

Undergraduates with junior or senior standing and a minimum of 3.0 GPA (or with approval by Honors Program Coordinator) are eligible to participate in Honors Research. After consultation with the Honors Program Coordinator, students select a faculty member who agrees to oversee the research project. The research project, time commitment, and the basis for grading are mutually determined by the student and the mentor. An outline of honors work to Honors Program Coordinator and obtain an approval before the start of the semester in which the course is taken.

Degree Program Guide

The Degree Program Guide is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 110C</td>
<td>English Composition (Grade of C or better required)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 211</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>CS 151 or CS 153</td>
<td>Introduction to Programming with Java or Introduction to Programming with Python</td>
<td></td>
</tr>
<tr>
<td>Human Behavior</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Language &amp; Culture I (May be waived; See requirement details)</td>
<td></td>
<td>0-3</td>
</tr>
<tr>
<td>CS 491</td>
<td>Honors Research I in Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CS 492</td>
<td>Honors Research II in Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CS 499W</td>
<td>Honors Thesis in Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CS 315</td>
<td>Computer Science Undergraduate Colloquium **</td>
<td>1</td>
</tr>
</tbody>
</table>
** Students who have completed CS 115 are not required to take CS 315.

**Linked 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 BS/MBA Linked Program at the beginning of the College of Sciences section of this Catalog and the Strome College of Business section in the Graduate Catalog (http://catalog.odu.edu/graduate/stromecollegeofbusiness/).

**Linked Bachelor of Science in Computer Science and Master of Science in Computer Science**

This program allows for exceptionally successful students to earn both a BSCS and an MS in Computer Science by allowing up to 12 credits of graduate coursework to count toward both their bachelor’s and master’s degree in Computer Science. All options available under the MS degree are available under this program. Students must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree).

**Admission**

To be admitted to the linked 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 MS 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 MS in computer science, they will be officially admitted into the MS 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 MS 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.
   d. To maximize the accelerated benefit one or more of the following required courses should be selected: CS 517, CS 518, CS 550, or CS 571.

**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 MS degree.
in computer science. This will limit students' scheduling flexibility subsequently.

2. Like students in the regular MS in computer science program, students in the linked BSCS/MS computer science degree may count no more than 12 hours at the 500-level toward their MS degree. Students are advised against taking all 12 of those 500-level credits as an undergraduate, since doing so will limit their scheduling flexibility subsequently.

**Linked Bachelor of Science in Computer Science and Master of Science in Data Science and Analytics**

This program allows for exceptionally successful students to earn both a BSCS and an MS in Data Science and Analytics by allowing up to 12 credits of graduate coursework to count toward both their bachelor's degree in Computer Science and master's degree in Data Science and Analytics. All options available under the MS degree are available under this program. Students must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree).

**Admission**

To be admitted to the linked 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 Data Science and Analytics 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 MS in Data Science and Analytics, 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 MS in data science and analytics, they will be officially admitted into the MS 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 MS in Data Science and Analytics 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.
   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 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.

The graduate courses taken must be from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 550</td>
<td>Database Concepts</td>
<td>3</td>
</tr>
<tr>
<td>CS 522</td>
<td>Introduction to Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CS 352</td>
<td>Web Science</td>
<td>3</td>
</tr>
<tr>
<td>CS 569</td>
<td>Data Analytics for Cybersecurity</td>
<td>3</td>
</tr>
<tr>
<td>CS 580</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credit Hours** 12

* Substitutions of other computer science courses may be made with approval of the graduate program director.

**NOTE:**

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 MS degree in Data Science and Analytics. This will limit students' scheduling flexibility subsequently.

**BA or BS to MBA (Master of Business Administration) Linked Program**

The linked BA/MBA or BS/MBA program is an early entry to the MBA program of study. The early-entry program is designed for well qualified non-business undergraduate ODU students to start their MBA program prior to completing their undergraduate degree. Well qualified non-business undergraduate students may take MBA-level courses as early as three semesters prior to graduation and count up to 12 graduate credits toward their undergraduate degree. Students participating in the early-entry program must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree). Early-entry program students should carefully consider their undergraduate degree program requirements when planning their course of study. Students in the early-entry program work in close consultation with the MBA Program Office and should refer to information in the Strome College of Business section in the graduate catalog (http://catalog.odu.edu/graduate/stromecollegeofbusiness/) to develop an individualized plan of study based on the required coursework.

**BA or BS to MPA (Master of Public Administration) Linked Program**

The linked BA/MPA or BS/MPA program provides qualified Old Dominion University undergraduate students with the opportunity to earn a master's degree in public administration while taking credits in the MPA program as an undergraduate student. The program is designed for highly motivated students with the desire to immediately continue their education after the bachelor's degree. The program is especially relevant to individuals seeking to work (or currently working) in the public or non-profit sectors, but is suitable for students from any undergraduate major. Graduate courses may be taken during the fall and spring semester of the student's senior undergraduate year. Up to 12 graduate credits can count toward both the undergraduate and graduate degree and can meet upper-level General Education requirements. After receiving the undergraduate degree, a student will continue with the MPA program, taking MPA courses until completing the required 39 credit hours. Students in the linked program
must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree).

Requirements for admission to the graduate program can be found in the School of Public Service section of the Graduate Catalog (http://catalog.odu.edu/graduate/business/public-service/). For additional information, please contact the School of Public Service in the Strome College of Business.