

Computer Science

Faculty: Pulimood *Chair;* Bloodgood, Knox, Li, Mao, Papamichail, Salgian, Yoon

The computer science curriculum is designed to prepare students for employment as computer science professionals, as well as to provide a strong background for advanced study. The BS in Computer Science program is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>. All students take courses in problem solving and programming fundamentals, data structures, computer architecture, operating systems, algorithm analysis, software engineering, and programming languages or theory of computation. Upper-level options support an in-depth exploration of a range of subdisciplines including, but not limited to, artificial intelligence, database systems, graphics, networks, security, computational biology, and human computer interaction. Special topics courses offered each semester provide the opportunity to study and work with the latest trends in technology. For their capstone requirement, students participate in research and/or industry experiences which culminate in professional presentations. Students enhance their studies with course work in mathematics and science, as well as in arts, humanities, history, and other disciplines in social sciences. A minimum of 32.5 course units is required for graduation.

The Department of Computer Science encourages its students to consider studying abroad for a semester as part of their curriculum. TCNJ students who study abroad, participate in global student teaching, pursue international internships, or go on exchange at colleges and universities in the U.S. can do so usually at a cost comparable to a semester spent at TCNJ. For more information about studying outside the United States without delaying graduation, academic advisors should be consulted. Further details are available from the College's [Center for Global Engagement](#).

The Department of Computer Science offers the B.S. degree in Computer Science and the Seven Year B.S./M.D. degree. The Department also offers a minor in Computer Science, and Computer Science Honors.

REQUIREMENTS FOR THE COMPUTER SCIENCE MAJOR:

I. Computer Science Courses

12.5 course units

Required Seminar Courses

CSC 099: Orientation to Computer Science	0 course unit
CSC 199: Computer Science Professional Development Seminar	0.25 course unit
CSC 299: Junior Seminar in Computer Science	0.25 course unit

Required Introductory Core Computer Science Courses

CSC 220/CS I: Computational Problem Solving*	1 course unit
CSC 230/CS II: Data Structures*	1 course unit
CSC 270/Discrete Structures**	1 course unit

* A student who completed CSC 250 prior to transferring to the major and wishes to use this course to meet the CSC 220 and CSC 230 requirement must successfully complete an

entrance test in C++. If the substitution is approved, the student must take an additional CS Option course to meet the Computer Science major requirements.

*** A mathematics major who has completed MAT 200 may take CSC 271 in lieu of CSC 270.*

Required Advanced Core Computer Science Courses

CSC 325/Computer Architecture	1 course unit
CSC 335/Analysis of Algorithms	1 course unit
CSC 345/Operating Systems	1 course unit
CSC 415/Software Engineering	1 course unit
CSC 435/Programming Languages	
<i>or</i>	1 course unit
CSC 445/Theory of Computation	

Capstone Requirement

CSC 399/Internship	
<i>or</i>	1 course unit
CSC 498/Mentored Research I in Computer Science	

Computer Science Options

3 (or 4) course units

Select three (or four*) courses from the following list**:

- CSC 307/Data Mining and Predictive Modeling
- CSC 315/Database Systems
- CSC 320/Information Retrieval
- CSC 350/Computer Graphics
- CSC 355/Human Computer Interaction
- CSC 360/Computer Networking
- CSC 380/Artificial Intelligence
- CSC 425/Compilers and Interpreters
- CSC 435/Programming Languages
- CSC 445/Theory of Computation
- CSC 448/Algorithms in Computational Biology
- CSC 450/Computer and Network Security
- CSC 470/Topics in Computer Science
- CSC 471/Genomics and Bioinformatics

** A student who completed CSC 250 prior to transferring to the major and wishes to use this course to meet the CSC 220 and CSC 230 requirement must successfully complete an entrance test in C++. If the substitution is approved, the student must take an additional CS Option course to meet the Computer Science major requirements.*

*** The list of Computer Science Options courses offered may change depending on availability of faculty and current trends in the computer science field.*

One additional capstone course or independent study from the following list may be chosen, with advisement and departmental approval, and applied towards the Computer Science Options.

Capstone Courses and Independent Study

- CSC 399/Internship in Computer Science
- CSC 498/Mentored Research I in Computer Science
- CSC 499/Mentored Research II in Computer Science
- CSC 391/Independent Study in Computer Science

Students may take additional Computer Science Options courses, including capstone courses and independent study, for free elective credit.

II. Required Mathematics Courses **3 course units**

- MAT 127/Calculus A
- MAT 128/Calculus B or MAT 205/Linear Algebra
- STA 215/Statistical Inference

III. Computer Science Natural Sciences and Mathematics Options **4 course units**

Three major-level laboratory sciences and one additional math or science course, with advisement. Consult the department for details.

IV. Foreign Language Requirements **2 or 3 course units**

Two courses in sequence in any of the modern languages are required if students opt for a language not previously studied in high school or another institution.

Alternatively, students continuing a foreign language previously taken in high school or at another institution must take three courses of that language in sequence. However, this requirement may be reduced by taking a placement test in that language. Based on the student's performance on that test, 0, 1, 2, or 3 courses may be required.

Note: Arabic 151 and 152; Chinese 151 and 152; Japanese 151 and 152; and Russian 151 and 152 are one-semester intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.

REQUIREMENTS FOR THE SEVEN YEAR B.S./M.D. IN COMPUTER SCIENCE DEGREE:

This accelerated program with Rutgers New Jersey Medical School in Newark is available to entering first-year students only. Students are accepted to both TCNJ and the medical school. Upon successful completion of the first year of medical school, the student is granted the B.S. in Computer Science degree from TCNJ. The M.D. degree is earned at the end of four years at NJMS.

Computer Science Courses **12.5 course units****Required Seminar Courses**

- CSC 099: Orientation to Computer Science 0 course unit
- CSC 199: Computer Science Professional Development Seminar 0.25 course unit
- CSC 299: Junior Seminar in Computer Science 0.25 course unit

Required Introductory Core Computer Science Courses

- CSC 220/CS I: Computational Problem Solving* 1 course unit

CSC 230/CS II: Data Structures*	1 course unit
CSC 270/Discrete Structures**	1 course unit

* A student who completed CSC 250 prior to transferring to the major and wishes to use this course to meet the CSC 220 and CSC 230 requirement must successfully complete an entrance test in C++. If the substitution is approved, the student must take an additional CS Option course to meet the Computer Science major requirements.

** A mathematics major who has completed MAT 200 may take CSC 271 in lieu of CSC 270.

Required Advanced Core Computer Science Courses

CSC 325/Computer Architecture	1 course unit
CSC 335/Analysis of Algorithms	1 course unit
CSC 345/Operating Systems	1 course unit
CSC 415/Software Engineering	1 course unit
CSC 435/Programming Languages	1 course unit
<i>or</i>	
CSC 445/Theory of Computation	

Required Capstone Requirement

CSC 399/Internship	1 course unit
<i>or</i>	
CSC 498/Mentored Research I in Computer Science	

Computer Science Options

3 (or 4) course units

Select three (or four*) courses from the following list**:

- CSC 307/Data Mining and Predictive Modeling
- CSC 315/Database Systems
- CSC 320/Information Retrieval
- CSC 350/Computer Graphics
- CSC 355/Human Computer Interaction
- CSC 360/Computer Networking
- CSC 380/Artificial Intelligence
- CSC 425/Compilers and Interpreters
- CSC 435/Programming Languages
- CSC 445/Theory of Computation
- CSC 448/Algorithms in Computational Biology
- CSC 450/Computer and Network Security
- CSC 470/Topics in Computer Science
- CSC 471/Genomics and Bioinformatics

* A student who completed CSC 250 prior to transferring to the major and wishes to use this course to meet the CSC 220 and CSC 230 requirement must successfully complete an entrance test in C++. If the substitution is approved, the student must take an additional CS Option course to meet the Computer Science major requirements.

** The list of Computer Science Options courses offered may change depending on availability of faculty and current trends in the computer science field.

One additional capstone course or independent study from the following list may be chosen, with advisement and departmental approval, and applied towards the Computer Science Options.

Capstone Courses and Independent Study

CSC 399/Internship in Computer Science

CSC 498/Mentored Research I in Computer Science

CSC 499/Mentored Research II in Computer Science

CSC 391/Independent Study in Computer Science

Students may take additional Computer Science Options courses, including capstone courses and independent study, for free elective credit.

II. Required Mathematics Courses

3 course units

MAT 127/Calculus A

MAT 128/Calculus B or MAT 205/Linear Algebra

STA 215/Statistical Inference

III. Required Natural Science Courses

8 course units

BIO 201/Foundations of Biological Inquiry

CHE 201/General Chemistry I

CHE 202/General Chemistry II

PHY 201/General Physics I

PHY 202/ General Physics II

BIO 211 /Biology of the Eukaryotic Cell

CHE 331/ Organic Chemistry I

CHE 332/ Organic Chemistry II

IV. Foreign Language Requirements

2 or 3 course units

Two courses in sequence in any of the modern languages are required if students opt for a language not previously studied in high school or another institution.

Alternatively, students continuing a foreign language previously taken in high school or at another institution must take three courses of that language in sequence. However, this requirement may be reduced by taking a placement test in that language. Based on the student's performance on that test, 0, 1, 2, or 3 courses may be required.

Note: Arabic 151 and 152; Chinese 151 and 152; Japanese 151 and 152; and Russian 151 and 152 are one-semester intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.

COMPUTER SCIENCE COURSEWORK AND ACADEMIC REGULATIONS

A student, after entry into the Computer Science program or Seven Year Medical program in Computer Science, must complete all computer science courses at TCNJ, unless approval is granted by the department chair.

If a student fails or withdraws from a course taken at TCNJ, to meet a requirement for the Computer Science program or Seven Year Medical program in Computer Science, the course must be repeated at TCNJ to satisfy the requirement and override the previous grade in the calculation of the grade point average.

A student may repeat any course once without authorization. To repeat a course for a second time, permission must be obtained, using the Repeat of Course Authorization form, from the chair of the department in which the student is majoring and the chair of the department offering the course (except for courses described in the catalog as “may be repeated”) prior to registration. Permission will not be granted to repeat any course three or more times. A grade of “W” is a repeat instance. This applies to courses taken at the College as well as courses officially transferred to the College.

A minimum of 6 course units in the major must be earned in the department. A minimum of 4 course units of the final 6 units in the major must be earned in the department.

CSC 101, CSC 102, CSC 105, and CSC 215 do not count toward the required or options courses in the Computer Science major or minor, or the Seven Year Medical program in Computer Science. These may be taken by computer science majors only if they fulfill requirements / required options for other majors.

CSC 365 and CSC 465 do not count toward the required or options courses in the Computer Science major or minor, or the Seven Year Medical program in Computer Science, but may be taken as free electives.

Students who are approved to take CSC 250 (Accelerated CS I, II), in lieu of the CSC 220-230 sequence, must complete an additional CS Option course.

PROGRAM ENTRANCE, RETENTION, AND EXIT STANDARDS

Every major program at the College has set standards for allowing students to remain in that program, to transfer within the College from one program to another, and to graduate from a program. The following are the standards for the Computer Science program and Seven Year Medical program in Computer Science. Minimum grades are noted in parentheses.

- Students must successfully complete the Introductory Core and Calculus A before taking courses in the Advanced Core or CS Options. Successful completion is indicated by a grade of C or higher in each of these courses:
 - (i) CSC 220*/Computer Science I: Computational Problem Solving
 - (ii) CSC 230*/Computer Science II: Data Structures
 - (iii) CSC 270/Discrete Structures
 - (iv) MAT 127/Calculus A.

Students are responsible for ensuring they meet the prerequisites, including grade requirements, for courses in which they are enrolled. If, after semester grades have been issued, a student discovers that he/she will not meet this requirement, he/she must de-register for the subsequent course(s) and retake the prerequisite course(s). Prior to the start of each

semester, the Computer Science Department will review rosters for all Computer Science courses and de-register students who have not met course prerequisites.

- Retention in the Computer Science program and Seven Year Medical program in Computer Science is based on making adequate progress towards meeting the requirements of the respective major. A student who is not making adequate progress will be placed on probation after one semester, and dismissed from the major after the second consecutive semester, of lack of progress.

Adequate progress in the Computer Science program is demonstrated by the following minimum performance standards, and by enrolling in at least one course required for the major each semester:

- (i) overall GPA of 2.0 or higher
- (ii) CSC 220*/Computer Science I: Computational Problem Solving (grade of C or higher)
- (iii) CSC 230*/Computer Science II: Data Structures (grade of C or higher)
- (iv) CSC 270/Discrete Structures (grade of C or higher)
- (v) CSC 335/ Analysis of Algorithms (grade of C or higher)
- (vi) MAT 127/ Calculus A (grade of C or higher).

Adequate progress in the Seven Year Medical program in Computer Science is demonstrated by the following minimum performance standards, and by enrolling in at least one course required for the major each semester:

- (i) Minimum overall GPA of 3.5;
- (ii) Minimum GPA of 3.5 each semester;
- (iii) B or better in each of the required science courses
- (iv) C or better in all other courses;
- (v) Take the Medical College Admissions Test (MCAT) no later than the spring semester of the third (and final) year at TCNJ; no minimum MCAT score is required.

- To apply to transfer into the Computer Science program from another program within the College, students must be in good academic standing, and are required to meet the following minimum performance standards:
 - (i) CSC 220/Computer Science I: Computational Problem Solving (grade of C or higher) and
 - (ii) MAT 127/Calculus A (grade of C or higher).
- Graduation with the B.S. in Computer Science degree requires the following minimum performance standards:
 - (i) overall GPA of 2.0 or higher
 - (ii) in-major GPA of 2.0 or higher
 - (iii) CSC 220*/Computer Science I: Computational Problem Solving (grade of C or higher)
 - (iv) CSC 230*/Computer Science II: Data Structures (grade of C or higher)
 - (v) CSC 270/Discrete Structures (grade of C or higher)
 - (vi) CSC 335/ Analysis of Algorithms (grade of C or higher)

(vii) MAT 127/ Calculus A (grade of C or higher).

**When CSC 250/Accelerated CS I and II (one course unit) is used to fulfill the CSC 220 and 230 requirement, the same standard of minimum grade of C is required.*

- Graduation with the Seven Year B.S./M.D. in Computer Science degree requires the following minimum performance standards:
 - (i) Completion of CS program requirements
 - (ii) Minimum overall GPA of 3.5;
 - (iii) Minimum GPA of 3.5 each semester;
 - (iv) Minimum in-major GPA of 3.5;
 - (v) B or better in each of the required science courses
 - (vi) C or better in all other courses;
 - (vii) Take the Medical College Admissions Test (MCAT) no later than the spring semester of the third (and final) year at TCNJ; no minimum MCAT score is required.

REQUIREMENTS FOR THE COMPUTER SCIENCE MINOR 5 course units

I. Required Courses (four course units)

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|--|---------------|
| 1. CSC 220*/CS I: Computational Problem Solving | 1 course unit |
| 2. CSC 230*/CS II: Data Structures | 1 course unit |
| 3. CSC 270**/Discrete Structures of Computer Science | 1 course unit |
| 4. CSC 415/Software Engineering | 1 course unit |

II. Options for Computer Science Minor (one or two* course units) 1 or 2 course units

One advanced computer science course (300 or 400 level), with the approval of the department.

** A student who has taken CSC 250 prior to adding the Computer Science minor and wishes to use this course to meet the CSC 220 and CSC 230 requirement must successfully complete an entrance test in C++. If the substitution is approved, the student must take an additional CS Option course to meet the Computer Science minor requirements.*

*** A mathematics major who has completed MAT 200 may take CSC 271 in lieu of CSC 270.*

To apply for the minor, students must be in good academic standing, and are required to meet the following minimum performance standards:

- (i) CSC 220/Computer Science I: Computational Problem Solving (grade of C or higher) and
- (ii) MAT 127/Calculus A (grade of C or higher).

Graduation with the Computer Science minor is based on the following minimum performance standards:

- (i) CSC 220*/Computer Science I: Computational Problem Solving (grade of C or higher);
- (ii) CSC 230*/Computer Science II: Data Structures (grade of C or higher);
- (iii) CSC 270**/Discrete Structures of Computer Science (grade of C or higher);
- (iv) CSC 415/Software Engineering (grade of C or higher);
- (v) MAT 127/ Calculus A (grade of C or higher);

- (vi) Minimum GPA of 2.0 in computer science courses.

REQUIREMENTS FOR COMPUTER SCIENCE HONORS

A student in the Computer Science program or Seven Year Medical program can accomplish departmental honors by fulfilling the following requirements:

- Overall GPA of 3.5 or higher
- In-major GPA of 3.5 or higher.
- Completing 3 CS honors courses.
 - At least 1 of the 3 CS courses must be Honors Mentored Research course.
 - At least 1 of the remaining 2 CS honors courses from must be a CS mid- or upper-level (300 or 400) honors course.

The student must have an in-major GPA of 3.5 or higher at the time of applying for each honors course.

The Computer Science program currently has no stand-alone honors courses. Instead, students may complete the 'honors by contract' for a regular course.

The procedure is as follows:

- (a) The student consults with the course instructor to define the scope and requirements of the honors project.
- (b) The student completes the departmental 'honors by contract' form and submits it to the sponsoring faculty for approval.
- (c) The course instructor submits a report at the end of the semester to the Chair of the Computer Science Department to confirm that the project has been completed satisfactorily.

In exceptional cases where a class or research project results in outstanding work, possibly in a publication or patent, the Computer Science Department may choose to award honors credit to the student by following procedural steps (a) through (c) as described above after completion of the course.

The Computer Science Department's Honor's Program is aligned with the School of Science and College-level Honor's programs. Thus, it is possible to have CS Honors and qualify for SoS and TCNJ Honors as well. CS Honors courses, as described above, may be used for the College Honors program.

SUGGESTED COURSE SEQUENCE FOR BS IN COMPUTER SCIENCE**First-Year****Fall**

CSC 099/Orientation to Computer Science	0 course unit
CSC 220/CS I: Computational Problem Solving	1 course unit
MAT 127/Calculus A	1 course unit
FSP First Seminar	1 course unit
Liberal Learning (Foreign Language suggested)*	1 course unit

*Note: *Arabic 151 and 152, Chinese 151 and 152, Japanese 151 and 152, and Russian 151 and 152 (offered annually); are intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.*

Spring

CSC 230/CS II: Data Structures	1 course unit
CSC 270/Discrete Structures	1 course unit
MAT 128/Calculus B	
<i>or</i>	
MAT 205/Linear Algebra	1 course unit

<i>or</i>	
WRI 102/Academic Writing (if not exempted)	
Liberal Learning (Foreign Language suggested)*	1 course unit

*Note: *Arabic 151 and 152, Chinese 151 and 152, Japanese 151 and 152, and Russian 151 and 152 are intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.*

Total **8 course units**

Second-Year

CSC 199/ CS Professional Development Seminar	0.25 course unit
CSC 325/Computer Architecture	1 course unit
CSC 335/Analysis of Algorithms	1 course unit
CSC 345/Operating Systems	1 course unit
CSC Option Course	1 course unit
MAT 128/Calculus B <i>or</i> MAT 205/Linear Algebra (if WRI 102 was not exempted)	
<i>or</i>	
Free Elective (CSC 105 suggested for free elective credit)	1 course unit
STA 215/Statistical Inference	1 course unit
Natural Sciences (major-level; with lab)	1 course unit
Liberal Learning (Foreign Language suggested)	1 course unit

Total **8.25 course units**

Third-Year (for majors intending to apply for jobs in the industry)

CSC 299/Junior Seminar in Computer Science	0.25 course unit
CSC Option Course	1 course unit

CSC 415/Software Engineering	1 course unit
CSC Option Course	1 course unit
Natural Sciences (major-level; with lab)	2 course units
Liberal Learning	2 course units
Free Elective	1 course unit
Total	8.25 course units

Third-Year (for majors intending to apply for graduate school)

CSC 299/Junior Seminar in Computer Science	0.25 course unit
CSC Capstone Course	1 course unit
CSC 415/Software Engineering	1 course unit
CSC 445/Theory of Computation	1 course unit
Natural Sciences (major-level; with lab)	2 course units
Liberal Learning	2 course units
Free Elective (CSC 498 or 499 recommended)	1 course unit
Total	8.25 course units

Fourth-Year (for majors intending to apply for jobs in the industry)

CSC 435/Programming Languages	
<i>or</i>	1 course unit
CSC 445/Theory of Computation	
CSC Capstone Course	1 course unit
Math or Science Option (major-level)	1 course unit
Liberal Learning	3 course units
Free Electives	2 course units
Total	8 course units

Fourth-Year (for majors intending to apply for graduate school)

CSC Option Course	1 course unit
CSC Option Course (CSC 435 recommended)	1 course unit
Free Elective (CSC 498 or 499 recommended)	1 course unit
Math or Science Option	1 course unit
Liberal Learning	3 course units
Free Elective	1 course unit
Total	8 course units

SUGGESTED COURSE SEQUENCE FOR SEVEN-YEAR BS/MD PROGRAM IN COMPUTER SCIENCE

First-Year (Fall, Spring, Summer)

CSC 099/Orientation to Computer Science	0 course unit
CSC 220/CS I: Computational Problem Solving	1 course unit
CSC 230/CS II: Data Structures	1 course unit
CSC 270/Discrete Structures	1 course unit
MAT 127/Calculus A *	1 course unit
MAT 128/Calculus B *	
<i>or</i>	
MAT 205/Linear Algebra *	1 course unit
<i>or</i>	
WRI 102/Academic Writing (if not exempted)	
CHE 201/General Chemistry I *	1 course unit
PHY 201/General Physics I *	1 course unit
FSP First Seminar	1 course unit
World Language 1 *	1 course unit
World Language 2 *	1 course unit
Liberal Learning 1 *	1 course unit

Note: Arabic 151 and 152, Chinese 151 and 152, Japanese 151 and 152, and Russian 151 and 152 are intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.

** At least three of these courses must be satisfied via AP credits or completed prior to the first year.*

Total **11 course units**

Second-Year (Fall, Spring, Summer)

CSC 199/ CS Professional Development Seminar	0.25 course unit
CSC 325/Computer Architecture	1 course unit
CSC 335/Analysis of Algorithms	1 course unit
CSC 345/Operating Systems <i>or</i> CSC Option Course	1 course unit
CSC Option Course	1 course unit
CSC 415/Software Engineering	1 course unit
STA 215/Statistical Inference	1 course unit
PHY 202/General Physics II **	1 course unit
BIO 201/Foundations of Biological Inquiry **	1 course unit
CHE 202/General Chemistry II **	1 course unit
World Language 3 **	1 course unit
Liberal Learning 2 **	1 course unit

Total **11.25 course units**

Note: Arabic 151 and 152, Chinese 151 and 152, Japanese 151 and 152, and Russian 151 and 152 are intensive courses and carry two course units of credit each. Students should take this into account when planning a normal four-course semester.

*** At least three of these courses must be completed over the summer prior to the second year.*

Third-Year

CSC 299/Junior Seminar in Computer Science	0.25 course unit
CSC Option Course	1 course unit
CSC Option <i>or</i> CSC 345/Operating Systems (if not taken in Year 2)	1 course unit
CSC 435: Programming Languages	
<i>or</i>	1 course unit
CSC 445: Theory of Computation	
CSC Capstone (Mentored Research suggested)	1 course unit
BIO 211/Biology of the Eukaryotic Cell ***	1 course unit
CHE 331/Organic Chemistry I	1 course unit
CHE 332/Organic Chemistry II	1 course unit
Liberal Learning ***	2 course units

Total **9.25 course units**

*** *At least one of these courses must be completed over the summer prior to the third year.*

Fourth-Year (Completed while at NJMS)

Liberal Learning (Psychiatry)