Computer Science

Faculty: Salgian *(Chair);* Bloodgood, Das, Datta, DeGood, Ferdous, Li, Papamichail, Pulimood, Russo, Turka, 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, database systems or computer networks, and programming languages or theory of computation. Security concepts are covered throughout the curriculum. Upper-level computer science (CS) options support an in-depth exploration of a range of subdisciplines including, but not limited to, artificial intelligence, computer graphics, data science, cybersecurity, computational biology, and human computer interaction. Special topics courses provide the opportunity to study and work with the latest trends in computing. For their capstone requirement, students participate in research 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 30 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. Study abroad shapes personal growth and global perspectives; students connect with a worldwide network while learning to work collaboratively with colleagues from different cultural backgrounds. TCNJ students may participate in a variety of study abroad experiences, including exchange programs and TCNJ faculty-led international programs. Computer Science academic advisors should be consulted for more information about studying outside the United States without delaying graduation. Further details are available from TCNJ's Center for Global Engagement.

The Department of Computer Science offers the B.S. degree in Computer Science, the B.S. in Computer Science with a specialization in Data Science, the B.S. in Computer Science with a specialization in Cybersecurity, and the Seven Year B.S./M.D. degree. The Department also offers a minor in Computer Science, a minor in Computer Science Education, Computer Science Honors, and an undergraduate certificate in Computer Science Education. The Department supports the Computational and Mathematical Biology minor that is housed in the Biology Department.

REQUIREMENTS FOR THE COMPUTER SCIENCE MAJOR (30 units):

I. Computer Science Courses   **13.5 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 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 315/Database Systems *or* CSC 360/Computer Networks   1 course unit
CSC 435/Programming Languages *or* CSC 445/Theory of Computation
                                                              1 course unit

Capstone Requirement
CSC 399/Internship *or* CSC 498/Mentored Research I in Computer Science
                                                              1 course unit

Computer Science Options   **3 (or 4) course units**
Select three courses from the following list*:
   CSC 307/Data Mining and Predictive Modeling
   CSC 315/Database Systems (if not used as an advanced core requirement)
   CSC 320/Information Retrieval
   CSC 350/Computer Graphics
   CSC 355/Human Computer Interaction
   CSC 358/3D Game Development
   CSC 360/Computer Networking (if not used as an advanced core requirement)
   CSC 380/Artificial Intelligence
   CSC 425/Compilers and Interpreters
   CSC 426/Machine Learning
   CSC 427/Natural Language Processing
   CSC 435/Programming Languages (if not used as an advanced core requirement)
   CSC 445/Theory of Computation (if not used as an advanced core requirement)
   CSC 448/Algorithms in Computational Biology
   CSC 450/Computer and Network Security
   CSC 470/Topics in Computer Science
   CSC 471/Genomics and Bioinfomatics
   ** 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 CS Options.
   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 CS Options courses, including mentored research, internship and independent study courses, for free elective credit.

II. Required Mathematics Courses   **3 course units**
MAT 127/Calculus A
MAT 205/Linear Algebra _or_ MAT 128/Calculus B
STA   215/Statistical Inference

III. Computer Science Natural Sciences Options   **2 course units**
Two major-level laboratory sciences, with advisement. Consult the department for details.

IV. World 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 at 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. 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: Chinese 151 and 152; Japanese 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-unit semester. Any one of these courses counts as two regular courses towards the world language requirement.

REQUIREMENTS FOR COMPUTER SCIENCE WITH A SPECIALIZATION IN DATA SCIENCE (30 units):

I. Computer Science Courses   **13.5 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 mathematics major who has completed MAT 200 may take CSC 271 in lieu of CSC 270.*

Required Advanced Core Computer Science Courses
CSC 315/Database Systems   1 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 415/Software Engineering   1 course unit

CSC 435/Programming Languages *or* CSC 445/Theory of Computation

1 course unit

Capstone Requirement (focused on data science related projects)
CSC 399/Internship *or* CSC 498/Mentored Research I in Computer Science

1 course unit

Additional Computer Science with Data Science Requirements　　　**2 course units**
CSC 380/Artificial Intelligence
CSC 426/Machine Learning *or* CSC 427/Natural Language Processing

Computer Science with Data Science Specialization Options　　　**1 course unit**
Select one courses from the following list*:
　CSC 307/Data Mining and Predictive Modeling
　CSC 320/Information Retrieval
　CSC 426/Machine Learning (if not used as the required option)
　CSC 427/Natural Language Processing (if not used as the required option)
　CSC 470/Topics in Computer Science – Computer Vision and Multimedia Applications
*The list of Computer Science Options courses offered may change depending on
availability of faculty and current trends in the computer science and data science fields.*

One additional internship or mentored research course from the following list may be chosen,
with advisement and departmental approval, and applied towards the CS Option.
　CSC 399/Internship in Computer Science (focused on data science related projects)
　CSC 498/Mentored Research I in Computer Science (focused on data science related
　　projects)
　CSC 499/Mentored Research II in Computer Science (focused on data science related
　　projects)

Students may take additional CS Options courses, including mentored research, internship
and independent study courses, for free elective credit.

II. Required Mathematics and Statistics Courses　　　**5 course units**
MAT 127/Calculus A
MAT 205/Linear Algebra
STA 215/Statistical Inference
STA 305/Regression Analysis
STA 306/Multivariate Analysis

III. Computer Science Natural Sciences Options　　　**2 course units**
Two major-level laboratory sciences, with advisement. Consult the department for details.

IV. World 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 at 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: Chinese 151 and 152; Japanese 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-unit semester. Any one of these courses counts as two regular courses towards the world language requirement.

V. Recommended Additional Courses as Free Electives
Students are encouraged to choose additional courses from the list below, for free elective credit.
> MAT 316/Probability
> STA 404/Computational and Bayesian Statistics
> STA 370/Topics in Statistics – Statistical Software Development

REQUIREMENTS FOR COMPUTER SCIENCE WITH A SPECIALIZATION IN CYBERSECURITY (30 units):

I. Computer Science Courses   **15.5 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 mathematics major who has completed MAT 200 may take CSC 271 in lieu of CSC 270.*

Required Advanced Core Computer Science Courses

CSC 315/Database Systems	1 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 415/Software Engineering	1 course unit
CSC 435/Programming Languages	1 course unit

Capstone Requirement (focused on cybersecurity related projects)
CSC 399/Internship *or* CSC 498/Mentored Research I in Computer Science
                                                                    1 course unit

Additional Computer Science with Cybersecurity Requirements   **4 course units**
CSC 470/Topics in Computer Science – Information Systems Security
CSC 360/Computer Networking
CSC 450/Computer and Network Security
CSC 470/Topics in Computer Science – Secure Coding

Computer Science with Cybersecurity Specialization Option   **1 course unit**
Select one course from the following list*:

CSC 470/Topics in Computer Science – Cybersecurity and Cryptography
CSC 425/Compilers and Interpreters

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

One additional internship or mentored research course from the following list may be chosen, with advisement and departmental approval, and applied towards the CS Option.

CSC 399/Internship in Computer Science (focused on cybersecurity related projects)
CSC 498/Mentored Research I in Computer Science (focused on cybersecurity related projects)
CSC 499/Mentored Research II in Computer Science (focused on cybersecurity related projects)

Students may take additional CS Options courses, including mentored research, internship and independent study courses, for free elective credit.

II. Required Mathematics and Statistics Courses　　　　　　　**3 course units**
MAT 127/Calculus A
MAT 205/Linear Algebra
STA 215/Statistical Inference

III. Computer Science Natural Sciences Options　　　　　　　**2 course units**
Two major-level laboratory sciences, with advisement. Consult the department for details.

IV. World 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 at 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: Chinese 151 and 152; Japanese 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-unit semester. Any one of these courses counts as two regular courses towards the world language requirement.

V. Recommended Additional Courses as Free Electives
Students are encouraged to choose additional courses from the list below, for free elective credit.

CSC 470/Topics in Computer Science – Computer Science III
CRI 210 – Principles of Forensic Science
CRI 303 – White-Collar Crime
CRI 370 – Cybersecurity, Ethics, and Privacy
ELC 411 – Embedded Systems
MAT 303 – Cryptography and Coding Theory

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 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 *or* CSC 445/Theory of Computation

<div align="right">1 course unit</div>

Required Capstone Requirement

CSC 399/Internship *or* CSC 498/Mentored Research I in Computer Science

<div align="right">1 course unit</div>

Computer Science Options	3 course units

Select three 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 426/Machine Learning
- CSC 427/Natural Language Processing

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 Bioinfomatics

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 CS 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 205/Linear Algebra or MAT 128/Calculus B
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 /Cell Biology and Biochemistry
CHE 331/ Organic Chemistry I
CHE 332/ Organic Chemistry II

IV. World 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 at 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: Chinese 151, 152 and Japanese 151, 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-unit semester. Any one of these courses counts as two regular courses towards the world language requirement.

COMPUTER SCIENCE COURSEWORK AND ACADEMIC REGULATIONS

A student, after entry into TCNJ, must complete all computer science courses that meet requirements for the Computer Science program, the Computer Science with Data Science Specialization, the Computer Science with Cybersecurity Specialization, the Seven Year Medical program in Computer Science, the minor in Computer Science, or the minor in Computer Science Education, at TCNJ, unless approval is granted by the department chair.

100-level computer science courses (CSC 101, CSC 102, CSC 105, CSC 120), CSC 215, CSC 216, and CSC 217 do not count toward the required or options courses in the Computer Science major or minor, Computer Science with Data Science Specialization, Computer Science with Cybersecurity Specialization, or 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, and then only as free electives.

CSC 275, CSC 305, CSC 365 and CSC 465 do not count toward the required or options courses in the Computer Science major or minor, Computer Science with Data Science Specialization, Computer Science with Cybersecurity Specialization, or Seven Year Medical program in Computer Science, but may be taken as free electives.

CSC 101, CSC 105, CSC 215, CSC 275, CSC 365 and CSC 465 do not count toward the required or options courses in the Computer Science Education minor.

Repeating Courses
If a student fails or withdraws from a course taken at TCNJ to meet a requirement for the Computer Science program, Computer Science with Data Science Specialization, Computer Science with Cybersecurity Specialization, Seven Year Medical program in Computer Science, the minor in Computer Science, or the minor in Computer Science Education, 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.

Residency Requirement
The residency requirement is based on TCNJ's policy. A minimum of six (6) course units in the major must be earned in the department.

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, Computer Science with Data Science Specialization, Computer Science with Cybersecurity Specialization, 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 a prerequisite 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, Computer Science with Data Science Specialization, Computer Science with Cybersecurity Specialization, 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, Computer Science with Data Science Specialization, and Computer Science with Cybersecurity Specialization 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).
  When CSC 271 is approved to fulfill the CSC 270 requirement, the same standard of minimum grade of C is required.

  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) Taking 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).

- To add the Data Science Specialization or the Cybersecurity Specialization, the student must be enrolled in the Computer Science program, must be in good academic standing, and must meet the following minimum performance standards:
  - (iii) CSC 220/Computer Science I: Computational Problem Solving (grade of C or higher) and
  - (iv) 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) cumulative 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 271 is approved to fulfill the CSC 270 requirement, the same standard of minimum grade of C is required.

- Graduation with the B.S. in Computer Science degree with Data Science Specialization 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 271 is approved to fulfill the CSC 270 requirement, the same standard of minimum grade of C is required.

- Graduation with the B.S. in Computer Science degree with Cybersecurity Specialization 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 271 is approved to fulfill the CSC 270 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) Taking 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 MINOR IN COMPUTER SCIENCE   5 course units

I. Required Courses (four course units)
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 course unit)   1 course unit
One advanced computer science course (300 or 400 level), with the approval of the department.

* 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.

When CSC 271 is approved to fulfill the CSC 270 requirement, the same standard of minimum grade of C is required.

REQUIREMENTS FOR THE MINOR IN COMPUTER SCIENCE EDUCATION

5 course units

The Minor in Computer Science Education is open to all Education majors.

The CS Education Minor requires five courses in Computer Science consisting of four core courses and one CS Option course, as follows.

I. Required Courses   **4 course units**
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 305***/Methods in Teaching Computer Science   1 course unit

II. Options for Minor in Computer Science Education   **1 course unit**

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

* *Students who received a score of 4 or higher in AP CS A may be waived from the CSC 220 requirement. In this case, the student must take an additional CS Option course to meet the five-course requirement for the minor.*

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

*** *The pedagogy course of the student's primary major must be successfully completed prior to taking CSC 305.*

To apply for the minor, students must be in good academic standing, and must have a grade of C or better in MAT 127/Calculus A.

To graduate with the Minor in Computer Science Education students must be in good academic standing, and must have a grade of C or better in the Required Courses.

REQUIREMENTS FOR THE UNDERGRADUATE CERTIFICATE PROGRAM IN COMPUTER SCIENCE EDUCATION   **4 course units**

Required Courses (four course units)
1. CSC 120/Foundations of Computational Thinking   1 course unit
2. CSC 220/CS I: Computational Problem Solving   1 course unit
3. CSC 230/CS II: Data Structures   1 course unit
4. TED 360/Teaching Methods for Computational Thinking in STEM Education   1 course unit   1 course unit

To apply for the certificate program, students must be in good academic standing, and must have a grade of C or better in CSC 120/Foundations of Computational Thinking.

To graduate with the Undergraduate Certificate in Computer Science Education students must be in good academic standing, and must have a grade of C or better in the Required 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.
   o At least 1 of the 3 CS courses must be an Honors Mentored Research course.
   o At least 1 of the remaining 2 CS honors courses 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 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 Honors Program is aligned with the School of Science and College-level Honors 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 (30 units)

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
FYS First Year Seminar	1 course unit
College Core (World Language suggested)*	1 course unit

Spring

CSC 230/CS II: Data Structures	1 course unit
CSC 270/Discrete Structures	1 course unit
MAT 128/Calculus B (if taken instead of MAT 205)	
or	
FYS First Year Seminar (if not previously taken)	
or	
Natural Sciences (major-level; with lab)	1 course unit
College Core (World Language suggested)*	1 course unit

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 315/Database Systems	
or	
CSC 360/Computer Networks	1 course unit
CSC 345/Operating Systems	
or	
CSC Option Course	1 course unit
MAT 205/Linear Algebra (suggested)	
or	
MAT 128/Calculus B (if not previously taken)	1 course unit
Free Elective	1 course unit
STA 215/Statistical Inference	1 course unit
College Core (World Language suggested)*	1 course unit

Total	**8.25 course units**

*Note: *Chinese 151 and 152, Japanese 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-unit semester. Any one of these courses counts as two regular courses towards the world language requirement.*

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	345/Operating Systems (if not previously taken)	
	or	
CSC	Option Course	1 course unit
CSC	415/Software Engineering	1 course unit
CSC	435/Programming Languages	
	or	
CSC	Option Course	1 course unit
Natural Sciences (major-level; with lab)		1 course unit
College Core		2 course units

Total   **7.25 course units**

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

CSC	299/Junior Seminar in Computer Science	0.25 course unit
CSC	345/Operating Systems (if not previously taken)	
	or	
CSC	Option Course	1 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)		1 course unit
College Core		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	Option Course	1 course unit
CSC	Capstone Course (Internship suggested)	1 course unit
College Core		3 course units
Free Electives		2 course units

Total   **7 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
College Core		3 course units
Free Elective		1 course unit

Total   **7 course units**

SUGGESTED COURSE SEQUENCE FOR BS IN COMPUTER SCIENCE WITH DATA SCIENCE SPECIALIZATION (30 units)

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
FYS	First Year Seminar	1 course unit
College Core (World Language suggested)*		1 course unit

Spring

CSC	230/CS II: Data Structures	1 course unit
CSC	270/Discrete Structures	1 course unit
STA	215/Statistical Inference	
	or	
FYS	First Year Seminar (if not already taken)	
	or	
Natural Sciences (major-level; with lab)		1 course unit
College Core (World Language suggested)*		1 course unit

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	315/Database Systems	1 course unit
CSC	345/Operating Systems	
	or	
CSC	380/Artificial Intelligence	1 course unit
MAT	205/Linear Algebra	1 course unit
STA	305/Regression Analysis	1 course unit
STA	306/Multivariate Statistics	1 course unit
College Core (World Language suggested)*		1 course unit

Total	**8.25 course units**

*Note: *Chinese 151 and 152, Japanese 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-unit semester. Any one of these courses counts as two regular courses towards the world language requirement.*

Third-Year

CSC	299/Junior Seminar in Computer Science	0.25 course unit
CSC	345/Operating Systems (if not previously taken)	
or		
CSC	380/Artificial Intelligence (if not previously taken)	1 course unit
CSC	415/Software Engineering	1 course unit
CSC	470/Machine Learning	
or		
CSC	470/Natural Language Processing	1 course unit
CS Data Science Option Course (from approved list)		1 course unit
Natural Sciences (major-level; with lab)		2 course units
College Core		2 course units

Total   **8.25 course units**

Fourth-Year

CSC	435/Programming Languages	1 course unit
CSC	Capstone Course	1 course unit
College Core		3 course units
Free Electives (recommended to take courses from lists of CS Options or additional courses approved for Data Science)		1 course units

Total   **6 course units**

SUGGESTED COURSE SEQUENCE FOR BS IN COMPUTER SCIENCE WITH CYBERSECURITY SPECIALIZATION (30 units)

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
FYS	First Year Seminar	1 course unit
College Core (World Language suggested)*		1 course unit

Spring

CSC	230/CS II: Data Structures	1 course unit
CSC	270/Discrete Structures	1 course unit
STA	215/Statistical Inference	
or		
FYS	First Year Seminar	
or		
Natural Sciences (major-level; with lab)		1 course unit
College Core (World Language suggested)*		1 course unit

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 315/Database Systems	1 course unit
CSC 470/Information Systems Security	1 course unit
CSC 360/Computer Networks	1 course unit
MAT 205/Linear Algebra	1 course unit
College Core (World Language if needed)*	2 course units

Total   **8.25 course units**

*Note: *Chinese 151 and 152, Japanese 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-unit semester. Any one of these courses counts as two regular courses towards the world language requirement.*

Third-Year

CSC 299/Junior Seminar in Computer Science	0.25 course unit
CSC 345/Operating Systems	1 course unit
CSC 470/Secure Coding	1 course unit
CSC 415/Software Engineering	1 course unit
CSC 450/Computer and Network Security	1 course unit
Natural Sciences (major-level; with lab)	2 course units
College Core	2 course units

Total   **8.25 course units**

Fourth-Year

CSC 435/Programming Languages	1 course unit
CSC Capstone Course	1 course unit
CS Option (from approved list of CS Options for Cybersecurity)	1 course unit
College Core	2 course units
Free Electives (recommended to take courses from lists of CS Options or additional courses approved for Cybersecurity)	1 course units

Total   **8 course units**

SUGGESTED COURSE SEQUENCE FOR SEVEN-YEAR BS/MD PROGRAM IN COMPUTER SCIENCE (32 units)

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 *	
	or	
MAT	205/Linear Algebra *	1 course unit
CHE	201/General Chemistry I *	1 course unit
PHY	201/General Physics I *	1 course unit
FYS	First Year Seminar	1 course unit
World Language 1 *		1 course unit
World Language 2 *		1 course unit
College Core 1 *		1 course unit

Total   11 course units

Note: Chinese 151 and 152, Japanese 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-unit semester. Any one of these courses counts as two regular courses towards the world language requirement.

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

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 *or* 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
College Core 2 **		1 course unit

Total   11.25 course units

Note: Chinese 151 and 152, Japanese 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-unit semester. Any one of these courses counts as two regular courses towards the world language requirement.

** 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 *or* CSC 345/Operating Systems (if not taken in Year 2)		1 course unit
CSC	435: Programming Languages	
	or	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
College Core ***		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)
College Core (Psychiatry)