Computer Science

Faculty: Pulimood *Chair;* Bloodgood, Das, DeGood, Ferdous, Knox, Li, Papamichail, Salgian, 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, security, 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 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. Students can usually study abroad at a cost comparable to a semester spent at TCNJ. Academic advisors should be consulted for more information about studying outside the United States without delaying graduation. 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, the B.S. in Computer Science with a specialization in Data Science, and the Seven Year B.S./M.D. degree. The Department also offers a minor in Computer Science, a minor in Computer Science Education, and Computer Science Honors. The Department supports the Computational and Mathematical Biology minor that is housed in the Biology Department.

REQUIREMENTS FOR THE COMPUTER SCIENCE MAJOR (32.5 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 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++ with a grade of C or better. If the substitution is approved, the student must take an additional CS Option course to meet the CS 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 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 (or four*) 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 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 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

* *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++ with a grade of C or better. If the substitution is approved, the student must take an additional CS Option course to meet the CS 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 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 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-course semester.

REQUIREMENTS FOR COMPUTER SCIENCE WITH A SPECIALIZATION IN DATA SCIENCE (32.5 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 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++ with a grade of C or better. If the substitution is approved, the student must take an additional CS Option course to meet the CS 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 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 470/Topics in Computer Science – Natural Language
  Processing

Computer Science with Data Science Specialization Options   1 (or 2) course units
Select one (or two*) courses from the following list**:
  CSC 307/Data Mining and Predictive Modeling
  CSC 320/Information Retrieval
  CSC 426/Machine Learning (if Natural Language Processing is used as the required
    option)
  CSC 470/Topics in Computer Science – Natural Language Processing (if Machine
    Learning is used as the required option)
  CSC 470/Topics in Computer Science – Semantic Multimedia Analysis

  ** 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++ with a grade of C or better. If the substitution is approved, the student
  must take an additional CS Option course to meet the CS major requirements.*
  *** 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 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-course semester.

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 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++ with a grade of C or better. If the substitution is approved, the student must take an additional CS Option course to meet the CS 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 *or* CSC 445/Theory of Computation

                                                  1 course unit

Required 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 (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 426/Machine Learning
        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
  * *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++ with a grade of C or better. If the substitution is approved, the student must take an additional CS Option course to meet the CS 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 CS Options.

    <u>Capstone Courses and Independent Study</u>
        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 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-course semester.

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 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) and CSC 215 do not count toward the required or options courses in the Computer Science major or minor, Computer Science with Data Science 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, 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.

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.

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, 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

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.

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, 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, 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, and Computer Science with Data Science 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 250 is approved to fulfill the CSC 220 and 230 requirement, the same standard of minimum grade of C is required.
  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, 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 250 is approved to fulfill the CSC 220 and 230 requirement, the same standard of minimum grade of C is required.
  **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 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.
  **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 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++ with a grade of C or better. 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.

When CSC 250 is approved to fulfill the CSC 220 and 230 requirement, the same standard of minimum grade of C is required.
**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. Students can choose one of the following three pathways to meet the minor program requirements:

(A)	(B)	(C)
1. CSC 102	1. CSC 215	1. CSC 220
2. CSC 250	2. CSC 250	2. CSC 230
3. CSC 270	3. CSC 270	3. CSC 270
4. CSC 305 Methods	4. CSC 305 Methods	4. CSC 305 Methods
5. CSC Option	5. CSC Option	5. CSC Option

I. Required Courses   1 course unit

Pathway A
1. CSC 102*/Introduction to Computational Thinking — 1 course unit
2. CSC 250/ Accelerated CS I, II — 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

Pathway B
1. CSC 215/CS I for Science and Engineering — 1 course unit
2. CSC 250/ Accelerated CS I, II — 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

Pathway C
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 Principles may be waived from the CSC 102 requirement. In this case, the student must take an additional CS Option course to meet the five-course requirement for the minor.

**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 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.
  - At least 1 of the 3 CS courses must be Honors Mentored Research course.
  - 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 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 (32.5 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 *or* FYW/First Year Writing (if not exempted)	1 course unit
Liberal Learning (World Language suggested)*	1 course unit

Spring

CSC 230/CS II: Data Structures	1 course unit
CSC 270/Discrete Structures	1 course unit
MAT 205/Linear Algebra	
or	
MAT 128/Calculus B	
or	
FYS First Year Seminar (if FYW/First Year Writing was taken in the Fall)	
or	
Natural Sciences (major-level; with lab)	1 course unit
Liberal Learning (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
Liberal Learning (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-course semester.*

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
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	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
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	Option Course	1 course unit
CSC	Capstone Course (Internship suggested)	1 course unit
Liberal Learning		3 course units
Free Electives		3 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
Liberal Learning		3 course units
Free Elective		2 course unit
Total		**8 course units**

SUGGESTED COURSE SEQUENCE FOR BS IN COMPUTER SCIENCE WITH DATA SCIENCE SPECIALIZATION   (32.5 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 *or* FYW/First Year Writing (if not exempted)	1 course unit
Liberal Learning (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 FYW/First Year Writing was taken in the Fall)	
or		
Natural Sciences (major-level; with lab)		1 course unit
Liberal Learning (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
Liberal Learning (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-course semester.*

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
Liberal Learning		2 course units

Total   **8.25 course units**

Fourth-Year

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

Total   **8 course units**

SUGGESTED COURSE SEQUENCE FOR SEVEN-YEAR BS/MD PROGRAM IN COMPUTER SCIENCE (32.5 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
	or	
FYW	102/First Year Writing (if not exempted)	
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
Liberal Learning 1 *		1 course unit

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-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 *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
Liberal Learning 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-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 *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
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)