# MAJOR IN COMPUTER AND MATHEMATICAL SCIENCES

Computer and Mathematical Sciences majors develop analytical, quantitative skills with a solid theoretical foundation in the latest technological developments.

Computer and Mathematical Sciences majors in the Secondary Education concentration are eligible, upon graduation, to apply to receive certification to teach both computer science and mathematics for grades 7-12 in the state of Maryland.

The Computer and Mathematics Secondary Education concentration requires 127 units for completion. Students must complete 62 required units in content courses, 25 required units in Towson UTeach courses, 28 required units in Core Curriculum courses not satisfied by the major, and 12 required units in their final internship, earning a grade equivalent of 2.00 or higher in each course.

The Teacher Education Executive Board, representing all initial teacher education programs at Towson University, utilizes the following **minimum** requirements as conditions for admission into teacher education programs, maintaining candidate status and formal entry into the capstone internship. Programs may include additional requirements for admission into the program and/or the capstone internship.

The College of Education admits students either as freshmen or as undergraduate transfer students from accredited, post-secondary institutions. During the freshman and sophomore years, students are generally engaged in pre-professional courses or courses that fulfill Core Curriculum requirements, as well as all identified prerequisites (e.g., specific and sequential courses in Core Curriculum) for admission to COE screened majors and programs.

All College of Education undergraduate programs are screened majors. As an integral part of the teaching/learning experience, students work with advisers in a strategic planning process across all years at TU. Accordingly, to support student success, all COE students are required to confer prior to registration each term with their assigned advisers.

**I. PROCEDURES AND REQUIREMENTS FOR ADMISSION TO ALL TEACHER EDUCATION PROGRAMS**

a. Complete a self-disclosure criminal background form to be submitted to the major department with the application.
b. Submit an application for formal admission to the program. Students seeking admission to teacher education programs must contact their department chairperson or program coordinator by 45 credit hours for program-specific procedures and requirements for admission to professional education programs.
c. A cumulative/overall GPA of 3.00 or higher is required for admission to an initial licensure teacher education program.

    i. Applicants with a GPA between 2.50 - 2.99 may be admitted conditionally if they provide evidence of passing scores on a Basic Skills Assessment* as identified by the Maryland State Department of Education (i.e. SAT, ACT, GRE, Praxis Core) and receive approval from the department chairperson/program coordinator.

    **Candidates may apply for a test waiver directly to the department. Such waivers should only be granted if it is predicted, based on the individual candidate's transcript data, that the candidate's final cumulative/overall GPA will be above a 3.00.*

**II. REQUIREMENTS FOR MAINTAINING CANDIDATE STATUS**

A. Maintain a semester GPA of 3.00 in required education courses for all programs.
    i. At the department's discretion, candidates who do not meet the above GPA requirement may continue for one additional semester under probationary status, but must meet the 3.00 GPA requirement at the end of the probationary period. If the GPA requirement is not met at the end of the probationary period, the candidate would be dismissed from the program.
B. Obtain a grade of C or better in academic major course work applicable only in programs requiring an academic major. (Middle School; Secondary; Art, Dance, Health, Music, World Languages, Physical Education).
C. Exhibit behavior that is consistent with the University's Code of Student Conduct, the Educator Preparation Program's Professional Behavior Policy, and established professional practice in educational and clinical settings. (see COE Behavior Policy)

**III. PROCEDURES AND REQUIREMENTS FOR ENTRY INTO CAPSTONE INTERNSHIP FOR ALL PROFESSIONAL EDUCATION PROGRAMS.**

A. Complete a criminal background check as required by the school system in which the internship is located.
B. Complete all required course work.

*The Standards were revised and approved in February 1996, May 1998, February 2000, May 2007, May 2008, April 2009, December 2011, November 2012, February 2014, October 2014, February 2015, November 2015, May 2019, February 2020, and March 2021.*

All Computer and Mathematical Sciences majors are required to complete 37 units of shared major coursework, and complete the requirements for one of two available concentrations, for a total of 93-100 units.

All courses that count toward the major must be completed with a grade equivalent of 2.00 or higher.

## Computer and Mathematical Sciences Major Requirements

| Code | Title | Units |
|---|---|---|
| **Required Courses** | | |
| CIS 377 | INTRODUCTION TO CYBERSECURITY | 3 |
| COSC 236 | INTRODUCTION TO COMPUTER SCIENCE I [1] | 4 |
| COSC 237 | INTRODUCTION TO COMPUTER SCIENCE II | 4 |
| COSC 336 | DATA STRUCTURES AND ALGORITHM ANALYSIS | 4 |
| COSC 412 | SOFTWARE ENGINEERING | 3 |
| COSC 418 | ETHICAL AND SOCIETAL CONCERNS OF COMPUTER SCIENTISTS (Core 14) | 3 |
| MATH 265 | ELEMENTARY LINEAR ALGEBRA | 4 |
| MATH 273 | CALCULUS I | 4 |
| MATH 274 | CALCULUS II | 4 |

| | | |
|---|---|---|
| MATH 275 | CALCULUS III | 4 |
| **Total Units** | | **37** |

## Applied Mathematics and Computer Science Concentration

| Code | Title | Units |
|---|---|---|
| **Required Courses** | | |
| COSC 290 | PRINCIPLES OF COMPUTER ORGANIZATION | 4 |
| COSC 350 | DATA COMMUNICATIONS AND NETWORKING | 3 |
| COSC 439 | OPERATING SYSTEMS | 3 |
| COSC 455 | PROGRAMMING LANGUAGES: DESIGN & IMPLEMENTATION | 3 |
| COSC 457 | DATABASE MANAGEMENT SYSTEMS | 3 |
| MATH 267 | INTRODUCTION TO ABSTRACT MATHEMATICS | 4 |
| MATH 330 | INTRODUCTION TO STATISTICAL METHODS | 4 |
| or MATH 331 | PROBABILITY | |
| MATH 369 | INTRODUCTION TO ABSTRACT ALGEBRA | 4 |
| MATH 372 | REAL ANALYSIS I | 4 |
| **Required Core Courses** | | |
| COMM 131 | PUBLIC SPEAKING (Core 5) | 3 |
| ENGL 317 | WRITING FOR BUSINESS AND INDUSTRY (Core 9) | 3 |
| **Computer Science Elective Courses** | | |
| Select two of the following: | | 6 |
| COSC 397 | INTERNSHIP IN COSC | |
| or COSC 495 | INDEPENDENT STUDY | |
| COSC 417 | INTRODUCTION TO THE THEORY OF COMPUTING | |
| COSC 459 | COMPUTER SIMULATION & MODELING | |
| COSC 461 | ARTIFICIAL INTELLIGENCE | |
| COSC 465 | ROBOTICS | |
| COSC 471 | COMPUTER GRAPHICS | |
| COSC 483 | DESIGN & ANALYSIS ALGORITHMS | |
| **Math Elective Courses – Group 1** | | |
| Select two of the following: | | 6-7 |
| MATH 314 | INTRODUCTION TO CRYPTOGRAPHY | |
| MATH 331 | PROBABILITY [2] | |
| MATH 332 | MATHEMATICAL STATISTICS | |
| MATH 374 | DIFFERENTIAL EQUATIONS | |
| MATH 377 | MATHEMATICAL MODELS | |
| MATH 379 | FOURIER ANALYSIS WITH APPLICATIONS | |
| MATH 435 | NUMERICAL ANALYSIS I | |
| MATH 437 | OPERATIONS RESEARCH | |
| MATH 439 | COMPUTATIONAL PROBABILITY MODELS | |
| **Math Elective Courses – Group 2** | | |
| Select two of the following: | | 6-7 |
| MATH 315 | APPLIED COMBINATORICS | |
| MATH 451 | GRAPH THEORY | |
| MATH 457 | DIFFERENTIAL GEOMETRY | |
| MATH 463 | LINEAR ALGEBRA | |
| MATH 465 | NUMBER THEORY | |
| MATH 467 | ALGEBRAIC STRUCTURES | |
| MATH 472 | REAL ANALYSIS II | |
| MATH 475 | COMPLEX ANALYSIS | |
| MATH 477 | TOPOLOGY | |
| **Total Units** | | **56-58** |

[1] COSC 175 is a prerequisite for COSC 236.

[2] MATH 331 may apply as an elective if not already selected to fulfill the requirement of MATH 330 or MATH 331 in the Required Mathematics Courses area.

## Secondary Education Concentration

| Code | Title | Units |
|---|---|---|
| **Required Computer Science & Mathematics Courses** | | |
| COSC 109 | COMPUTERS AND CREATIVITY | 3 |
| COSC 482 | TEACHING COMPUTER SCIENCE IN THE SECONDARY SCHOOLS | 3 |
| COSC 492 | INTERNSHIP IN SECONDARY EDUCATION - COMPUTER SCIENCE | 6 |
| ITEC 250 | FUNDAMENTALS OF COMPUTER NETWORKS | 3 |
| MATH 267 | INTRODUCTION TO ABSTRACT MATHEMATICS | 4 |
| or MATH 263 | DISCRETE MATHEMATICS | |
| MATH 310 | FUNCTIONS AND MODELING FOR SECONDARY SCHOOL TEACHERS | 3 |
| MATH 330 | INTRODUCTION TO STATISTICAL METHODS | 4 |
| MATH 353 | EUCLIDEAN AND NON-EUCLIDEAN GEOMETRIES | 3 |
| MATH 423 | TEACHING MATHEMATICS IN THE SECONDARY SCHOOLS | 3 |
| MATH 426 | INTERNSHIP IN SECONDARY EDUCATION - MATHEMATICS | 6 |
| **Required Education Courses** | | |
| SCED 460 | USING LITERACY IN THE SECONDARY SCHOOLS | 4 |
| SCED 461 | TEACHING LITERACY IN THE SECONDARY CONTENT AREAS | 3 |
| SEMS 110 | INTRODUCTION TO STEM TEACHING I: INQUIRY APPROACHES TO TEACHING | 1 |
| SEMS 120 | INTRODUCTION TO STEM TEACHING II: INQUIRY-BASED LESSON DESIGN | 1 |
| SEMS 230 | KNOWING AND LEARNING | 3 |
| SEMS 240 | CLASSROOMS INTERACTIONS | 3 |
| SEMS 250 | PERSPECTIVES IN SCIENCE AND MATHEMATICS | 3 |
| SEMS 370 | PROJECT-BASED INSTRUCTION | 3 |
| SEMS 430 | SEMINAR IN APPRENTICE TEACHING | 1 |
| SEMS 498 | INTERNSHIP IN MATHEMATICS AND SCIENCE SECONDARY EDUCATION | 3 |
| **Total Units** | | **63** |

## Applied Mathematics and Computer Science Concentration Suggested Four-Year Plan

Based on course availability and student needs and preferences, the selected sequences will probably vary from those presented below. Students should consult with their adviser to make the most appropriate elective choices.

**Freshman**

| Term 1 | Units Term 2 | Units |
|---|---|---|
| COSC 236 | 4 COSC 237 | 4 |
| MATH 273 (Core 3) | 4 MATH 265 | 4 |
| Core 1 (or Core 2) | 3 MATH 274 | 4 |
| Core | 3 Core 2 (or Core 1) | 3 |
| | **14** | **15** |

**Sophomore**

| Term 1 | Units Term 2 | Units |
|---|---|---|
| CIS 377 | 3 COSC 336 | 4 |
| COSC 290 | 4 COSC 350 | 3 |
| MATH 267 | 4 MATH 369 | 4 |
| MATH 275 | 4 Core 7 | 4 |
| Core | 3 | |
| | **18** | **15** |

**Junior**

| Term 1 | Units Term 2 | Units |
|---|---|---|
| COMM 131 (Core 5) | 3 COSC 412 | 3 |
| COSC 439 | 3 COSC 455 | 3 |
| MATH 372 | 4 MATH 330 or 331 | 4 |
| Math Elective #1 | 3 MATH Elective #2 | 3 |
| Core | 3 Core | 3 |
| | **16** | **16** |

**Senior**

| Term 1 | Units Term 2 | Units |
|---|---|---|
| COSC 457 | 3 COSC 418 (Core 14) | 3 |
| COSC Elective #1 | 3 COSC Elective #2 | 3 |
| ENGL 317 (Core 9) | 3 MATH Elective #4 | 3 |
| MATH Elective #3 | 3 Core | 3 |
| Core | 3 Core | 3 |
| | **15** | **15** |

**Total Units 124**

## Secondary Education Concentration Suggested Four-Year Plan

Based on course availability and student needs and preferences, the selected sequences will probably vary from those presented below. Students should consult with their adviser to make the most appropriate elective choices.

**Freshman**

| Term 1 | Units Term 2 | Units |
|---|---|---|
| COSC 109 (Core 4) | 3 COSC 236 | 4 |
| MATH 273 | 4 MATH 274 (Core 3) | 4 |
| SEMS 110 | 1 SEMS 120 | 1 |
| Core 1 (or Core 2) | 3 Core 2 (or Core 1) | 3 |
| Core 6 | 3 Core 7 | 4 |
| | **14** | **16** |

**Sophomore**

| Term 1 | Units Term 2 | Units |
|---|---|---|
| COSC 237 | 4 COSC 336 | 4 |
| MATH 265 | 4 MATH 263 or 267 | 3-4 |
| SEMS 230 | 3 SEMS 240 | 3 |
| Core 8 | 3-4 Core 11 | 3 |
| Core 10 | 3 Core 12 | 3 |
| | **17-18** | **16-17** |

**Junior**

| Term 1 | Units Term 2 | Units |
|---|---|---|
| CIS 377 | 3 SEMS 370 | 3 |
| ITEC 250 | 3 SCED 460 | 4 |
| MATH 275 | 4 MATH 310 (Core 9) | 3 |
| MATH 353 | 3 COSC 412 | 3 |
| SEMS 250 (Core 5) | 3 Core 13 | 3 |
| | **16** | **16** |

**Senior**

| Term 1 | Units Term 2 | Units |
|---|---|---|
| COSC 418 (Core 14) | 3 COSC 492 | 6 |
| COSC 482 | 3 MATH 426 | 6 |
| MATH 330 | 4 SEMS 430 | 1 |
| MATH 423 | 3 | |
| SCED 461 | 3 | |
| SEMS 498 | 3 | |
| | **19** | **13** |

**Total Units 127-129**

# Computer Science Learning Objectives

Student Learning Outcomes by Course Level:

a. An ability to analyze a problem, and to identify and define the computing requirements appropriate for its solution.
b. An ability to design, implement, and evaluate a computer-based solution to meet a given set of computing requirements in the context of the discipline.
c. An ability to communicate effectively with a range of audiences about technical information.
d. An ability to make informed judgments in computing practice based on legal and ethical principles.
e. An ability to function effectively on teams to establish goals, plan tasks, meet deadlines, manage risk, and produce deliverables.
f. An ability to apply theory in the design and implementation of computer-based solutions.
g. An ability to reason about and explain computer-based solutions at multiple levels of abstraction.

# Mathematics Learning Objectives

Student Learning Outcomes by Course Level:

a. Demonstrate knowledge of the properties of numbers and sets.
b. Demonstrate skills and knowledge of appropriate technology used in solving mathematical problems.

c. Demonstrate skills and knowledge of the basic concepts of calculus.
d. Demonstrate skills and knowledge of linear and abstract algebra.
e. Demonstrate skills and knowledge of basic probability and/or statistics.