

INTRODUCTION

The Department seeks to provide each of its majors with a broad understanding of computer science. This broad understanding serves as a coherent framework in which the student can place his or her developing knowledge and technical skill. Moreover, the Department seeks to provide each student with a solid foundation in the central ideas and methods of modern computer science. It seeks to produce computer scientists who know, understand, and can apply these central ideas and methods to real problems.

Computer science is dynamic. It grows constantly. It evolves continuously. It regularly experiences revolutionary transformation. The Department seeks, therefore, to produce computer scientists who can adapt and grow along with their chosen profession.

The Department does not seek to train its majors in any particular hardware device, software product or conceptual methodology. Rather, the goal is to provide its majors with the power to succeed in today's computer environment as well as tomorrow's. Students will, however, acquire ample specific knowledge during their education.

ADVISING and PRE-REGISTRATION

A student planning to complete a major in computer science should enroll in COSC 1010 and MATH 1400 in the first semester of his or her freshman year and in COSC 1020 and MATH 2100 in the second semester. As soon as he or she has decided to major in the Department, the student should report to the Department office (room #340 of Cudahy Hall) to declare a major and to be assigned a departmental advisor. From this time on the student meets with the advisor to discuss course selections for the next semester and general academic progress.

COSC LEARNING OUTCOMES

Upon completion of all required coursework, students will be able to:

1. Construct software systems that satisfy users' computing needs.
2. Communicate technical ideas clearly to colleagues.
3. Learn independently to use existing code libraries.
4. Discuss matters of professional ethics.
5. Analyze the efficiency of an algorithm.

COURSE SELECTION

A computer science major must satisfy the requirements for the major as well as the graduation requirements of the College of Arts and Sciences as described in the University Undergraduate Bulletin. Both the requirements for the major and the general requirements of the College are flexible enough to allow each student to select a variety of courses. The following comments are intended to aid students in making these selections.

Most elective COSC courses are offered either every other semester, or every fourth semester (once every two years) in a standard rotation. Consult your advisor for a predicted schedule of offerings. In addition, the Department occasionally offers special courses not yet part of the regular curriculum. These will be listed in the Timetable of Classes as COSC 4931 (Topics in Computer Science).

A student interested in the mathematical aspects of Computer Science, including both mathematical modeling and numerical analysis, should seriously consider a major or minor in Mathematics to go with his or her major in Computer Science, or perhaps a major in Computational Mathematics. The requirements for combined programs are described later in this document. Mathematically-inclined majors should take MATH 1450 in their first semester, (in place of the recommended MATH 1400,) and continue with the standard calculus sequence in later semesters. If interested in applications, a student should select mathematics electives such as: MATH 2451 or MATH 4500 (Differential Equations), MATH 4540 (Numerical Analysis), MATH 4650 (Theory of Optimization), MATH 4670 (Applied Combinatorial Mathematics), or the sequence MATH 4700 (Theory of Probability), MATH 4710 (Mathematical Statistics), MATH 4720 (Statistical Methods). If interested in theory, electives may include MATH 4120 (Abstract Algebra), MATH 4320 (Number Theory), MATH 4450 (Topology).

A student interested in applications of computing in business may consider completing the requirements for the Minor in Business Administration described in the University Undergraduate Bulletin and outlined in the sample curriculum which appears later in this document.

Both the College of Engineering and the College of Business Administration offer a number of computer related courses. Computer science majors may find some of these useful as electives. Courses from other Colleges can sometimes be used to satisfy the elective requirements for a major in computer science, but students must apply for a waiver from the MSCS Undergraduate Committee. Consult your advisor before attempting any such cross-college substitutions.

For electives outside the Department, courses that enhance communication and reasoning skills are the most beneficial to the computer science professional. There are a number of such courses to be found in the offerings of the Departments of English and Philosophy.

COMBINED MAJORS AND MINORS IN MATHEMATICS AND COMPUTER SCIENCE

MAJOR IN COMPUTER SCIENCE AND MINOR IN MATHEMATICS

A student who majors in Computer Science and wishes to minor in Mathematics should take MATH 1450 (in place of MATH 1400), MATH 1451, MATH 2450, MATH 2451 (or an upper division MATH elective), MATH 2350 (in place of MATH 2100), and one more upper division MATH elective (in addition to the MATH elective required for the COSC major). If a COSC major decides to embark on a MATH minor after completing MATH 1400 or MATH 2100, substitutions for the MATH 1450 and MATH 2350 requirements may be allowed, but students must apply for a waiver from the MSCS Undergraduate Committee.

DOUBLE MAJOR IN COMPUTER SCIENCE AND MATHEMATICS

A student majoring in both Computer Science and Mathematics must complete 77 hours of COSC and MATH courses: COSC 1010, 1020, 2100, 2200, 3100, 3250, 3410, 4997, 4998, and twelve additional hours of upper division COSC courses; MATH 1450, 1451, 2350, 2450, 3100, and 21 additional hours of upper division MATH courses as outlined in the Mathematics major handbook. MATH 4550 (Numerical Analysis) may be double-counted as satisfying both a COSC elective and a MATH elective.

MAJOR IN MATHEMATICS AND MINOR IN COMPUTER SCIENCE:

A student with a major in mathematics needs to complete the computer science requirements for the Computer Science minor, which are: COSC 1010, 1020, 2100, 2200, and six additional hours of upper division COSC courses.

REQUIREMENTS FOR THE COMPUTER SCIENCE MAJOR

REQUIRED COURSES

All students must take the following nine courses:

| | | |
|-----------|--------------------------------------|-------------|
| COSC 1010 | Introduction to Computer Programming | 4 sem. hrs. |
| COSC 1020 | Object-Oriented Software Design | 4 sem. hrs. |
| COSC 2100 | Data Structures & Algorithms 1 | 3 sem. hrs. |
| COSC 2200 | Hardware Systems | 3 sem. hrs. |
| COSC 3100 | Data Structures and Algorithms 2 | 3 sem. hrs. |
| COSC 3250 | Operating Systems | 3 sem. hrs. |
| COSC 3410 | Programming Languages | 3 sem. hrs. |
| COSC 4997 | Principles of Design | 3 sem. hrs. |
| COSC 4998 | Senior Design Project | 3 sem. hrs. |

In addition, all students must take the following three Mathematics courses: (MATH 1450 can be used as a substitute for MATH 1400, and should be taken by students interested in a MATH major or minor).

| | | |
|------------------------------|------------------------|-------------|
| MATH 1400 | Elements of Calculus 1 | 3 sem. hrs. |
| MATH 2100 | Discrete Mathematics | 3 sem. hrs. |
| Upper division MATH elective | | 3 sem. hrs. |

ELECTIVES

To complete the major, 12 semester hours of upper-division COSC courses are required. A partial list of available choices is given below:

| | | |
|-----------|---|-------------|
| COSC 3300 | Networks and Internets | 3 sem. hrs. |
| COSC 3550 | Programming Computer Games | 3 sem. hrs. |
| COSC 4110 | Formal Languages and Computability | 3 sem. hrs. |
| COSC 4400 | Compiler Construction | 3 sem. hrs. |
| COSC 4600 | Fundamentals of Artificial Intelligence | 3 sem. hrs. |
| COSC 4610 | Data Mining | 3 sem. hrs. |
| COSC 4800 | Principles of Database Systems | 3 sem. hrs. |
| COSC 4860 | Component-Based Software Construction | 3 sem. hrs. |

SAMPLE CURRICULUM

Computer Science Major

| <i>Freshman</i> | | | |
|--------------------------|------------------|-----------------------------------|------------------|
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 1010 | 4 | COSC 1020 | 4 |
| ENGL 1001 | 3 | ENGL 1002 | 3 |
| Foreign Language | 3-4 | Foreign Language | 3-4 |
| HIST 1001 or 1002 | 3 | History/Social-Behavioral Science | 3 |
| MATH 1400 ^{2,3} | 3 | MATH 2100 | 3 |
| | ----- | | ----- |
| | 16-17 | | 16-17 |

| <i>Sophomore</i> | | | |
|---------------------------|------------------|--------------------|------------------|
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 2100 | 3 | COSC 3100 | 3 |
| COSC 2200 | 3 | COSC 3250 | 3 |
| Social-Behavioral Science | 3 | PHIL 1001 | 3 |
| THEO 1001 | 3 | Elective | 3 |
| Elective | 3 | Literature | 3 |
| | ----- | | ----- |
| | 15 | | 15 |

| <i>Junior</i> | | | |
|---------------------------|------------------|----------------------------|------------------|
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 3410 | 3 | Computer Science electives | 6 |
| Computer Science elective | 3 | PHIL 2310 | 3 |
| Literature | 3 | Natural Science | 4 |
| Natural Science | 4 | Elective | 3 |
| Mathematics elective | 3 | | |
| | ----- | | ----- |
| | 16 | | 16 |

| <i>Senior</i> | | | |
|-----------------------------|------------------|---------------------------|------------------|
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 4997 | 3 | COSC 4998 | 3 |
| Computer Science elective | 3 | Theology (third level) | 3 |
| Philosophy (upper division) | 3 | Diverse Cultures elective | 3 |
| Theology (second level) | 3 | Electives | 6-9 |
| Electives | 3-6 | | |
| | ----- | | ----- |
| | 15-18 | | 15-18 |

1. Taking the minimum number of hours each term will not accumulate sufficient hours for graduation in four years.
2. Potential computer science majors who have taken a university level calculus course in high school should discuss with the department the possibility of credit by examination for MATH 1400.
3. MATH 1450, which is a required course in the MATH major and MATH minor, fulfills the MATH 1400 requirement.

SAMPLE CURRICULUM

Computer Science and Mathematics Double Major¹

| <i>Freshman</i> | | | |
|-------------------|------------------|-----------------------------------|------------------|
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 1010 | 4 | COSC 1020 | 4 |
| MATH 1450 | 4 | MATH 1451 | 4 |
| ENGL 1001 | 3 | ENGL 1002 | 3 |
| Foreign Language | 3-4 | Foreign Language | 3-4 |
| HIST 1001 or 1002 | 3 | History/Social-Behavioral Science | 3 |
| | ----- | | ----- |
| | 17-18 | | 17-18 |

| <i>Sophomore</i> | | | |
|---------------------------|------------------|--------------------|------------------|
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 2100 | 3 | COSC 3100 | 3 |
| COSC 2200 | 3 | COSC 3250 | 3 |
| MATH 2350 | 3 | MATH 3100 | 3 |
| MATH 2450 | 4 | THEO 1001 | 3 |
| Social-Behavioral Science | 3 | PHIL 1001 | 3 |
| | | Literature | 3 |
| | ----- | | ----- |
| | 16 | | 18 |

| <i>Junior</i> | | | |
|--|------------------|--|------------------|
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 3410 | 3 | Computer Science elective ² | 3 |
| Computer Science elective ² | 3 | Mathematics elective ² | 3 |
| Mathematics elective sequence #1 | 3 | Mathematics elective sequence #2 | 3 |
| Literature | 3 | PHIL 2310 | 3 |
| Natural Science | 4 | Natural Science | 4 |
| | ----- | | ----- |
| | 16 | | 16 |

| <i>Senior</i> | | | |
|--|------------------|--|------------------|
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 4997 | 3 | COSC 4998 | 3 |
| Computer Science elective ² | 3 | Computer Science elective ² | 3 |
| Mathematics electives ² | 6 | Mathematics electives ² | 6 |
| Philosophy (upper division) | 3 | Diverse Cultures elective | 3 |
| Theology (second level) | 3 | Theology (third level) | 3 |
| | ----- | | ----- |
| | 18 | | 18 |

1. For a single major program that combines aspects of both Computer Science and Mathematics with fewer course requirements, please see the Computational Mathematics major handbook.
2. MATH 4550 (Numerical Analysis) may be double-counted as satisfying both a Computer Science elective and a Mathematics elective.

SAMPLE CURRICULUM

Computer Science Major with a Business Administration Minor

| <i>Freshman</i> | | | |
|-----------------------------|------------------|-----------------------------------|------------------|
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 1010 | 4 | COSC 1020 | 3 |
| ENGL 1001 | 3 | ENGL 1002 | 3 |
| Foreign Language | 3-4 | Foreign Language | 3-4 |
| HIST 1001 or 1002 | 3 | History/Social-Behavioral Science | 3 |
| MATH 1400 ^{2,3} | 3 | MATH 2100 | 3 |
| | ----- | | ----- |
| | 16-17 | | 15-16 |
| <i>Sophomore</i> | | | |
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 2100 | 3 | COSC 3100 | 3 |
| COSC 2200 | 3 | COSC 3250 | 3 |
| Social-Behavioral Science | 3 | Literature | 3 |
| THEO 1001 | 3 | PHIL 2310 | 3 |
| ACCO 2030 | 3 | ACCO 2031 | 3 |
| PHIL 1001 | 3 | Elective | 3 |
| | ----- | | ----- |
| | 18 | | 18 |
| <i>Junior</i> | | | |
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 3410 | 3 | Computer Science electives | 6 |
| Computer Science elective | 3 | MATH 4720 | 3 |
| Literature | 3 | Natural Science | 3-4 |
| Natural Science | 3-4 | ECON 2004 | 3 |
| ECON 2003 | 3 | | |
| | ----- | | ----- |
| | 15-16 | | 15-16 |
| <i>Senior</i> | | | |
| <u>First Term</u> | <u>Sem. Hrs.</u> | <u>Second Term</u> | <u>Sem. Hrs.</u> |
| COSC 4997 | 3 | COSC 4998 | 3 |
| Computer Science elective | 3 | Theology (third level) | 3 |
| Philosophy (upper division) | 3 | MANA 3001 | 3 |
| Theology (second level) | 3 | Diverse Cultures elective | 3 |
| MARK 3001 | 3 | Elective | 3 |
| FINA 3001 | 3 | | |
| | ----- | | ----- |
| | 18 | | 15 |

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3. MATH 1450, which is a required course in the MATH major and MATH minor, fulfills the MATH 1400 requirement.

STUDENT COMPUTING FACILITIES

Katherine Reed Cudahy Hall houses the University's Information Technology Service (ITS) central computing facilities on the second floor, and MSCS department computing facilities on the first, third and fourth floors.

Marquette students, faculty and staff are granted accounts on the Emarq and CheckMarq systems maintained by ITS. Authentication credentials can be obtained from the ITS Help Desk (room CU 293) and are maintained throughout a student's enrollment at Marquette. Additional information regarding University computing facilities can be obtained by calling the ITS Help Desk at 288-7799.

The MSCS Department maintains its own independent computing facilities for both teaching and research purposes. Students enrolled in MSCS courses or as department majors are granted access to general purpose laboratories in CU 101, CU 310, and CU 412. In addition, students enrolled in particular courses or involved in research projects may be granted access to special-purpose laboratories in CU 145, CU 301, CU 310, CU 368, CU 392, or CU 410.

The MSCS network features Gigabit internal connectivity between seven subnets with a wide variety of computing hardware and operating systems. Solaris and Linux servers provide centralized file, mail, web and print services to Windows, Linux, Solaris and Mac clients. Computer configurations range from an in-desk PC classroom to laboratories of dual-head workstations for collaborative project work.

Although students may have their own computer equipment, the MSCS department provides sufficient facilities for all MSCS coursework. Students are encouraged to make use of department facilities; experience with heterogeneous computing environments provides a rich educational opportunity, and MSCS maintains a large body of software tailored to the needs and interests of department majors.

Additional information about MSCS department computing facilities can be obtained from the MSCS system administrator at 288-1580, or online at <http://www.mscs.mu.edu/>.