

## **INTRODUCTION**

The computational mathematics curriculum is a program of study offered by the Department of Mathematics, Statistics and Computer Science that blends the subjects of computer science and applied mathematics. The program is designed to provide a balance between mathematics and computer science that would otherwise require a double major to achieve. It includes those courses in the mathematics curriculum that emphasize applied mathematics as well as those from the computer science curriculum that develop the computing skills required by many of today's applications.

## **CAREER OPPORTUNITIES**

The curriculum in computational mathematics produces graduates who are uniquely positioned for careers in today's technical environment. Such careers vary greatly in one's day-to-day projects but tend to involve the development of mathematical models by which scientists and engineers can test theories and predict future actions in the real world. For example, a graduate working with a medical research team may develop models based on theories of diseases and immunizations and use these models to predict the long term effects of a particular immunization program. Other graduates might find themselves involved in the development of automated control systems for use in automobiles, airplanes or industrial machinery. Still others find careers developing scientifically oriented computer software. Indeed, the list seems endless, with opportunities in both large and small corporations, which can, in fact, lead to the creation of a graduate's own consulting business.

Perhaps of most importance in the long run is that the curriculum in computational mathematics, being encased in the liberal arts tradition of Marquette University, not only teaches the skills required to launch a successful career, but also enhances the creative skills that allow a graduate to grow and learn in a changing world.

## **ADVISING and PRE-REGISTRATION**

A student planning to complete a major in computational mathematics should enroll in COSC 1010 and MATH 1450 in the first semester of his or her freshman year and in COSC 1020 and MATH 1451 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.

## REQUIREMENTS FOR THE COMPUTATIONAL MATHEMATICS MAJOR

### REQUIRED COURSES

All students must take the following **six** mathematics courses:

MATH 1450	Calculus 1	4 sem. hrs.
MATH 1451	Calculus 2	4 sem. hrs.
MATH 2350	Foundations of Mathematics	3 sem. hrs.
MATH 2450	Calculus 3	4 sem. hrs.
MATH 3100	Linear Algebra & Matrix Theory	3 sem. hrs.
MATH 4540	Numerical Analysis	3 sem. hrs.
MATH 4630	Mathematical Modeling and Analysis	3 sem. hrs.

and the following **four** COSC 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.

In addition, all students must take **one** of the following MATH courses:

MATH 4710	Mathematical Statistics	3 sem. hrs.
MATH 4720	Statistical Methods	3 sem. hrs.

**two** of the following MATH courses:

MATH 4200	Intermediate Analysis 1	3 sem. hrs.
MATH 4500	Theory of Differential Equations	3 sem. hrs.
MATH 4510	Elementary Partial Differential Equations	3 sem. hrs.
MATH 4650	Theory of Optimization	3 sem. hrs.
MATH 4670	Applied Combinatorial Mathematics	3 sem. hrs.
MATH 4700	Theory of Probability	3 sem. hrs.
MATH 4740	Biostatistical Methods and Models	3 sem. hrs.
MATH 4760	Time Series Analysis	3 sem. hrs.

and **one** of the following COSC courses:

COSC 3250	Operating Systems	3 sem. hrs.
COSC 3410	Programming Languages	3 sem. hrs.

# SAMPLE CURRICULUM

## *Computational Mathematics 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 1450	4	MATH 1451	4
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	17-18		17-18
<i>Sophomore</i>			
<u>First Term</u>	<u>Sem. Hrs.</u>	<u>Second Term</u>	<u>Sem. Hrs.</u>
COSC 2200	3	COSC 2100	3
MATH 2350	3	MATH 3100	3
MATH 2450	4	PHIL 1001	3
Social-Behavioral Science	3	Electives	6
Elective	3		
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	16		15
<i>Junior</i>			
<u>First Term</u>	<u>Sem. Hrs.</u>	<u>Second Term</u>	<u>Sem. Hrs.</u>
Literature	3	Literature	3
COSC 3250 or 3410 (or elective)	3	Mathematics elective	3
Mathematics elective	3	Natural Science	4
Natural Science	4	PHIL 2310	3
THEO 1001	3	Elective (or COSC 3250 or 3410 if not taken 1 <sup>st</sup> term)	3
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	16		16
<i>Senior</i>			
<u>First Term</u>	<u>Sem. Hrs.</u>	<u>Second Term</u>	<u>Sem. Hrs.</u>
MATH 4540	3	MATH 4710 or 4720	3
MATH 4630	3	Mathematics elective	3
Philosophy (upper division)	3	Theology (third level)	3
Theology (second level)	3	Diverse Cultures elective	3
Electives	3-6	Electives	3-6
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	15-18		15-18

1. Taking the minimum number of hours each semester will not accumulate sufficient hours for graduation in four years.
2. MATH 2450 and 2350 can be taken in either order or concurrently.
3. Potential computational mathematics 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 1450 and/or 1451 or placement in MATH 1451 or 2450 before registering for a calculus course.

## 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.msccs.mu.edu/>.