

# Applied and Computational Mathematics



## Career Profile

Applied mathematics refers to a wide variety of mathematical and computational fields and their application to practical problems. Advances in technology and the increasing complexity of our society have created a need for mathematicians who can use their expertise in real-life situations. Our degree program in applied and computational mathematics has a curriculum designed for the current needs of industry and academia.

Applied mathematicians solve problems that arise from scientific and engineering applications, use statistics to evaluate risks for insurance companies, work in industry to ensure quality control, interpret numerical data, and simulate physical problems with mathematical modeling. Graduates of a computational and applied mathematics program have demonstrated the ability to deal with abstract and complex material. A degree in mathematics can also serve as a stepping stone to a career in business, law, library science, and other professions.

## Accreditation

The South Dakota School of Mines and Technology is accredited by the Higher Learning Commission of the North Central Association of Colleges and Secondary Schools, the recognized accrediting agency for the north central states. In 2006, the HLC voted to continue accreditation of the School of Mines. The School of Mines has been accredited since 1925.

## Faculty

Chair: Dr. Kyle Riley  
Professors: Dr. Edward Corwin, Dr. Roger Johnson, Dr. Toni Logar, and Dr. Donald Teets  
Associate Professors: Dr. Janet Burgoyne and Dr. Jeffrey McGough

Assistant Professors: Dr. Karen Braman, Ms. Julie Dahl, Ms. Laura Geary, and Dr. Travis Kowalski  
Instructors: Mr. Jon Lofberg and Ms. Jill Trimble

## Features and Strengths

Faculty members consider teaching to be their most important activity and pride themselves on personal contact with students. The department is big enough to offer quality programs, yet small enough to have the best people teaching students at all levels. The department regularly participates in the Putnam exam and in the Mathematical Contest in Modeling.

## Program Overview

The School of Mines mathematics program gives students a strong foundation in core mathematics and experience in application areas such as statistics, numerical analysis, and computer science. The curriculum is designed to enhance the best of what modern mathematics has to offer. Our students take the introductory computer science courses and then augment this background with class work involving numerical methods and numerical analysis. The goal is to produce graduates with the technical skills and the theoretical knowledge in high demand in today's job market.

Our graduates develop a strong foundation of knowledge and skill in the core areas of analysis, differential equations, and algebra. They also attain a basic understanding of statistics, computer science, and numerical analysis. Since applied mathematicians are problem solvers, our graduates must develop the ability to formulate and solve problems arising from scientific and engineering applications. The importance of applying mathematics in other fields is underscored with the use of an emphasis area as part of our degree program. This feature offers courses that can be useful to a career in industry, or provide a strong foundation for the pursuit of a graduate degree.

## Outcomes

- School of Mines mathematics graduates received salary offers that average more than \$55,000.
- 100 percent of 2006-07 School of Mines graduates were placed in their field or entered a graduate program within three months of graduation.
- 80 percent of graduates gain real-life experience through internships and co-ops.
- Companies hiring mathematics graduates include Assurant, EROS Data Center, Microsoft, Raytheon, Rockwell Collins, IBM, and HP.

## Student Organizations

Students at the School of Mines also have a variety of opportunities for extra-curricular activities that range from music, intramurals, and drama to ski and snowboarding clubs, and more than 75 other clubs and professional student organizations. These are important activities for our students and we encourage

them to take full advantage of out-of-classroom events.

The Center for Advanced Manufacturing and Production (CAMP) is designed to teach students engineering, science and design skills, as well as the ability to work in teams. Team members design, build, market and raise the money for their projects. All students are welcome to work on camp projects.

## Research

Students have the opportunity to be involved in research with professors conducting work on projects in genetic algorithms, image processing, math modeling, optimal gambling strategies, and orbital mechanics.

## Curriculum Listing

<http://catalog.sdsmt.edu>

### Applied and Computational Mathematics Curriculum/Checklist

#### Freshman Year

##### First Semester

ENGL 101	Composition I	3
IS 110	Explorations	2
MATH 123	Calculus I <sup>2</sup>	4
CSC 150	Computer Science I	3
	Science Elective	3
	Elective/Lab <sup>1</sup>	3
<b>TOTAL</b>		<b>18</b>

##### Second Semester

MATH 125	Calculus II	4
PHYS 211	University Physics I <sup>2</sup>	3
CSC 250	Computer Science II	4
PE	Physical Education <sup>4</sup>	1
	Elective/Lab <sup>1</sup>	5
<b>TOTAL</b>		<b>17</b>

#### Sophomore Year

##### First Semester

ENGL 279	Technical Communications I	3
MATH 225	Calculus III <sup>2</sup>	4
MATH 321	Differential Equations	4
PHYS 213	University Physics II	3
	Elective/Lab <sup>1</sup>	3
<b>TOTAL</b>		<b>17</b>

##### Second Semester

MATH 315	Linear Algebra	4
CSC 251	Finite Structures	4
ENGL 289	Technical Communications II	3
MATH 373	Intro to Numerical Analysis	3
	Elective/Lab <sup>1</sup>	3
<b>TOTAL</b>		<b>17</b>

#### Junior Year

##### First Semester

MATH 413	Abstract Algebra	3
MATH 381	Probability and Statistics	3
MATH 431	Dynamical Systems	3
PE	Physical Education <sup>4</sup>	1
	Elective <sup>1</sup> /Emphasis <sup>3</sup>	6
<b>TOTAL</b>		<b>16</b>

### For More Information contact:

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#### Second Semester

MATH 382	Probability and Statistics II	3
MATH 471	Numerical Analysis	3
MATH 421	Complex Analysis	3
	Elective <sup>1</sup> /Emphasis <sup>3</sup>	6
<b>TOTAL</b>		<b>15</b>

#### Senior Year

##### First Semester

MATH 423	Advanced Calculus I	4
MATH 432	Partial Differential Equations	3
MATH 498	Undergraduate Research I	1
	Elective <sup>1</sup> /Emphasis <sup>3</sup>	7
<b>TOTAL</b>		<b>15</b>

##### Second Semester

MATH 424	Advanced Calculus II	4
MATH 451	Math Modeling	3
MATH 402	Communicating Mathematics	1
	Elective <sup>1</sup> /Emphasis <sup>3</sup>	7
<b>TOTAL</b>		<b>15</b>

**128 credits required for graduation**

#### Curriculum Notes

<sup>1</sup>The science requirement for this major consists of PHYS 211, PHYS 213, one course from among BIOL 151, CHEM 112, GEOL 201, plus a lab associated with one of the science courses taken – either BIOL 151L, CHEM 112L, GEOL 201L, or PHYS 213L.

<sup>2</sup>Students should consult the “General Education Requirements” section of this catalog for a complete listing of all general education requirements. It is important to note that all general education requirements must be completed within the first 64 credits taken. We additionally require math majors to take a total of at least sixteen (16) semester hours of electives in humanities and social sciences.

<sup>3</sup>Math majors must complete three (3) courses in a science or engineering “emphasis” area. Any double major automatically satisfies this emphasis area requirement with their other major. Further information about possible emphasis areas is available from the department.

<sup>4</sup>MUEN 101, 121, 122, can be used to substitute for one or two of the required two Physical Education credits.

