**Program Specifics:**
As well as the graduate degree program, students may count up to 9 graduate hours toward the completion of their undergraduate program as an accelerated time frame. With Fast Track, students may count up to 9 graduate courses which make up their individual plan of study; such an emphasis provides both focus and depth in the graduate experience.

Whatever their objectives in their graduate programs, students should form a close working relationship with a faculty member having similar mathematical interests as soon as possible. This will ensure good advice in planning a coherent plan of study. In addition, an advisor may be able to suggest special topics courses, independent study, or the thesis option which could all be used to pursue one’s interests in greater depth. Finally, students who plan to pursue a doctoral degree in mathematics should include a sequence in analysis and a sequence in algebra in their plans of study.

**Program Contact Information**
Dr. Andrew Swift, DSc, Graduate Program Chair (GPC)
237 Durham Science Center (DSC)
402.554.3637
aswift@unomaha.edu

**Program Website (http://www.unomaha.edu/math/)**

**Other Program Related Information**

**Fast Track Program**
The Department of Mathematics and Statistical Sciences has developed a Fast Track program for highly qualified and motivated students providing the opportunity to complete a bachelor’s degree and a master’s degree in an accelerated time frame. With Fast Track, students may count up to 9 graduate hours toward the completion of their undergraduate program as well as the graduate degree program.

Program Specifics:
- This program is available for undergraduate students pursuing a BA/BS in Mathematics desiring to pursue a MA/MS/MAT in Mathematics.
- Students must have completed no less than 60 undergraduate hours
- Students must have a minimum undergraduate GPA of 3.0.
- Students must complete the Fast Track Approval form and obtain all signatures and submit to the Office of Graduate Studies prior to first enrollment in a graduate course.
- Students will work with their undergraduate advisor to register for the graduate courses.
- A minimum cumulative GPA of 3.0 is required for graduate coursework to remain in good academic standing.
- Students remain undergraduates until they meet all the requirements for the undergraduate degree and are eligible for all rights and privileges granted undergraduate status including financial aid.
- Near the end of the undergraduate program, formal application to the graduate program is required. The application fee will be waived, the applicant will need to contact the Office of Graduate Studies for a fee waiver code.

- Admission to Fast Track does NOT guarantee admission to the graduate program.
- The admit term must be after the completion term of the undergraduate degree.

**Graduate Assistantships**
The Department of Mathematics and Statistical Sciences annually awards graduate assistantships for work within the department. All of these positions pay an annual stipend plus a waiver of tuition. For the details of the nature of the work, please visit the assistantships page of the Department of Mathematics website.

**Admissions**

General Application Requirements and Admission Criteria (http://catalog.unomaha.edu/graduate/admission/)

**Program-Specific Requirements**

**Application Deadlines (Spring 2023, Summer 2023, and Fall 2023)**
- Fall: July 31
- Spring: November 30
- Summer: April 15

**Other Requirements**
For unconditional admission, an applicant should:
- Have completed a bachelor’s degree with a grade point average of at least 3.0 in mathematics courses taken.
- Have completed 15 credit hours of mathematics courses beyond calculus, including MATH 3230/MATH 8235 or equivalent.
- Applicants lacking the 15 credit hours beyond calculus may be eligible for admission in a provisional or unclassified status with a deficiency to be made up in addition to the degree requirements listed.
- Applicants who satisfy the admission requirements above except for the GPA requirement may be granted provisional admission to the graduate program. They will be granted unconditional admission upon completion of 12 graduate hours with a grade of "B" or better in each course.
- **English Language Proficiency:** Applicants are required to have a command of oral and written English. Those who do not hold a baccalaureate or other advanced degree from the United States, OR a baccalaureate or other advanced degree from a predetermined country on the waiver list, must meet the minimum language proficiency score requirement in order to be considered for admission.

**Degree Requirements**

**Required Courses**
There are no required courses. Choose mathematics courses with a MATH or STAT prefix numbered 8000 or above and ending in the digit zero or six, excluding MATH 8880. At least 18 of these hours must be in courses with a number ending in a zero digit. These 18 may include hours of independent study, MATH 8970. Courses numbered 8x5 will not count towards the MS degree in Mathematics.

If the project option is chosen, the six required hours of MATH 8960 or STAT 8960 will count towards the overall credit hour total, and the required 18 hours of courses ending in a zero digit.
If a student chooses to add a concentration to their degree program (see below) then there will be specific courses that will be needed to be completed to fulfill the concentration requirements.

**Electives**

Since there are no required courses, all courses are electives which must satisfy the requirements given above for the 36 credit hours. Up to 12 hours of graduate work electives may be taken in areas related to mathematics, physics, computer science, and economics, if permission is obtained from the Graduate Program Committee.

**Exit Requirements**

Select One:

- **Comprehensive Examination**
  - The comprehensive examination is based on three related courses (one of which must have a number ending in a zero digit) consisting of two parts. The first part is a one-week take-home examination. The second part is a three hour examination which may be open book, at the discretion of the instructor(s). The examination is normally taken in the student’s final semester and should be scheduled well in advance of the graduate college deadlines.

- **Project**
  - A mathematical or statistical project undertaken under the supervision of both a faculty advisor and an external (industry) advisory. The purpose of the project is for the student to work on a 'real-world' problem. The student will produce a written report and give an oral presentation of their work. Students are required to register for six hours of MATH 8960 or STAT 8960.

**Concentrations**

Students may choose (although there is no requirement to do so) to add a concentration to their Mathematics MS degree. There are currently four available concentrations:

- Mathematics, MS with Computational Mathematics Concentration
- Mathematics, MS with Data Science Concentration
- Mathematics, MS with Operations Research Concentration
- Mathematics, MS with Statistics Concentration

**Total Credit Hours: 36**

**Concentrations**

Courses numbered 8-5 will not count towards the MS degree in Mathematics.

**Computational Mathematics Concentration**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 8250</td>
<td>PARTIAL DIFFERENTIAL EQUATIONS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8336</td>
<td>INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8406</td>
<td>THE FINITE ELEMENT METHOD</td>
<td>3</td>
</tr>
<tr>
<td>MATH/CSCI 8500</td>
<td>NUMERICAL LINEAR ALGEBRA</td>
<td>3</td>
</tr>
<tr>
<td>MATH/CSCI 8510</td>
<td>NUMERICAL DIFFERENTIAL EQUATIONS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8970</td>
<td>INDEPENDENT GRADUATE STUDIES</td>
<td>3</td>
</tr>
</tbody>
</table>

**Electives**

Select at least 21 credit hours of courses related to computational mathematics (see below).

**Total Credits**

36

1 Students who were undergraduates at UNO and took MATH 4330 or MATH 4400 may not take MATH 8336 or MATH 8406 at the graduate level. Students can replace these requirements with additional elective courses.

**Electives**

At least 21 credit hours of courses related to computational mathematics. Students must have at least 18 hours of courses ending on 0, including the core courses.

Some suggested courses are provided below. Other elective courses may be possible with the prior permission of the graduate program chair.

If any of the core course requirements were waived, then additional electives should be taken in their place.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 8056</td>
<td>LINEAR ALGEBRA</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8236</td>
<td>MATHEMATICAL ANALYSIS I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8246</td>
<td>MATHEMATICAL ANALYSIS II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8276</td>
<td>COMPLEX ANALYSIS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8356</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8400</td>
<td>DYNAMICAL SYSTEMS AND CHAOS</td>
<td>3</td>
</tr>
<tr>
<td>MATH/CSCI 8766</td>
<td>TOPICS IN APPLIED MATHEMATICS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8970</td>
<td>INDEPENDENT GRADUATE STUDIES</td>
<td>3-6</td>
</tr>
</tbody>
</table>

1 Students who were undergraduates at UNO and took MATH 4350, MATH 4050, MATH 4230, MATH 4240, or MATH 4270 may not take MATH 8356, MATH 8056, MATH 8236, MATH 8246, or MATH 8276 at the graduate level.

**Exit Requirements**

**Comprehensive Examination**

The comprehensive examination is based on three related courses (one of which must have a number ending in a zero digit) consisting of two parts. The first part is a one-week take-home examination. The second part is a three hour examination which may be open book, at the discretion of the instructor(s). The examination is normally taken in the student’s final semester and should be scheduled well in advance of the graduate college deadlines.

(Note: The project exit requirement is not available for those students wishing to complete the Computational Mathematics concentration, only the comprehensive exam exit requirement is allowed).

**Data Science Concentration**

**Prerequisites**

Some statistics and computer programming are highly recommended.

**Required Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 8746</td>
<td>INTRODUCTION TO PROBABILITY AND STATISTICS I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8756</td>
<td>INTRODUCTION TO PROBABILITY AND STATISTICS II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Core Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 8416</td>
<td>INTRODUCTION TO DATA SCIENCE</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8426</td>
<td>EXPLORATORY DATA VISUALIZATION AND QUANTIFICATION</td>
<td>3</td>
</tr>
<tr>
<td>MATH/CSCI 8306</td>
<td>DETERMINISTIC OPERATIONS RESEARCH MODELS</td>
<td>3</td>
</tr>
</tbody>
</table>

**Approved Electives**

Select at least 15 credit hours from the following: 3

15
Operations Research Concentration

Mathematics, MS

Electives
Select at least 5 of the following:

- DETERMINISTIC OPERATIONS RESEARCH MODELS
- PROBABILISTIC OPERATIONS RESEARCH MODELS
- COMPUTATIONAL OPERATIONS RESEARCH
- LINEAR PROGRAMMING
- NETWORK PROGRAMMING

Total Credits
36

1 Students who were undergraduates at UNO and took MATH 4740 or MATH 4750 may not take MATH 8746 or MATH 8756. For those students who can demonstrate previous statistical exposure can appeal to the graduate program chair to waive the MATH 8746/MATH 8756 requirements. Students can replace these requirements with additional elective courses.

2 Students who were undergraduates at UNO and took STAT 4410, STAT 4420, or MATH 4300 may not take STAT 8416, STAT 8426, or MATH 8306 at the graduate level. Students can replace these requirements with additional elective courses.

3 If any of the introductory or core course requirements were waived, then additional electives should be taken in their place. Other elective courses may be possible with the prior permission of the graduate program chair.

4 Students who were undergraduates at UNO and took MATH 4310, STAT 4440, or MATH 4320 may not take MATH 8316, STAT 8436, or STAT 8446 at the graduate level.

 Exit Requirement
Each student is required to complete a project involving working with real-world data. The student will be advised by both a faculty and external advisor, and a completed written and oral report is required.

Students are required to sign up for 6 hours of MATH 8960 or STAT 8960.

(Not: The comprehensive exam exit requirement is not available for those students wishing to complete the Data Science concentration, only the project exit requirement is allowed)

Operations Research Concentration

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH/SCSI 8316</td>
<td>PROBABILISTIC OPERATIONS RESEARCH MODELS 1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8400</td>
<td>LINEAR PROGRAMMING</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8460</td>
<td>INTEGER PROGRAMMING</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8650</td>
<td>INTRODUCTION TO PROBABILITY MODELS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8670</td>
<td>TOPICS IN PROBABILITY AND STATISTICS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8970</td>
<td>INDEPENDENT GRADUATE STUDIES</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8436</td>
<td>LINEAR MODELS</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8446</td>
<td>TIME SERIES ANALYSIS</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8456</td>
<td>INTRODUCTION TO MACHINE LEARNING AND DATA MINING 4</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8700</td>
<td>BAYESIAN STATISTICS</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8710</td>
<td>DESIGN AND ANALYSIS OF EXPERIMENTS</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8720</td>
<td>RELIABILITY THEORY</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8730</td>
<td>ADVANCED STATISTICAL MACHINE LEARNING</td>
<td>3</td>
</tr>
<tr>
<td>STAT/MATH 8960</td>
<td>MASTER’S PROJECT</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits
36

1 Students who were undergraduates at UNO and took MATH 4300, MATH 4310, or MATH 4320 may not take MATH 8306, MATH 8316, or MATH 8326 at the graduate level. Students can replace these requirements with additional elective courses.

Electives
For students choosing the comprehensive exam option, at least 21 credit hours of courses related to operations research.

Students must have at least 18 hours of courses ending on 0, including the core courses and, for those choosing the project option, the 6 hours of project, MATH 8960.

Some suggested courses are provided below. Other elective courses may be possible with the prior permission of the graduate program chair.

If any of the core course requirements were waived, then additional electives should be taken in their place.

Code | Title                                      | Credits |
-----|--------------------------------------------|---------|
MATH/SCSI 8156 | GRAPH THEORY & APPLICATIONS 1 | 3       |
MATH/SCSI 8520 | ADVANCED TOPICS IN OPERATIONS RESEARCH | 3       |
MATH 8650    | INTRODUCTION TO PROBABILITY MODELS        | 3       |
MATH 8746    | INTRODUCTION TO PROBABILITY AND STATISTICS I 1 | 3       |
MATH 8756    | INTRODUCTION TO PROBABILITY AND STATISTICS II 1 | 3       |
MATH 8970    | INDEPENDENT GRADUATE STUDIES              | 1-3     |
STAT 8416    | INTRODUCTION TO DATA SCIENCE              | 3       |
STAT 8426    | EXPLORATORY DATA VISUALIZATION AND QUANTIFICATION 1 | 3       |
STAT 8436    | LINEAR MODELS                              | 3       |
STAT 8446    | TIME SERIES ANALYSIS                       | 3       |

1 Students who were undergraduates at UNO and took MATH 4740, MATH 4750, MATH 4150, STAT 4410, STAT 4420, STAT 4430, or STAT 4440 may not take MATH 8746, MATH 8756, MATH 8156, MATH 8416, STAT 8426, STAT 8436, or STAT 8446 at the graduate level.

Exit Requirements

Code | Title                                      | Credits |
-----|--------------------------------------------|---------|
MATH/STAT 8960 | MASTER’S PROJECT                          | 6       |

The comprehensive examination is based on three related courses (one of which must have a number ending in a zero digit) consisting of two parts. The first part is a one-week take-home examination. The second
part is a 3-hour examination which may be open book, at the discretion of the instructor(s). The examination is normally taken in the student’s final semester and should be scheduled well in advance of the graduate college deadlines.

A project undertaken under the supervision of both a faculty advisor and an external (industry) advisory. The purpose of the project is for the student to work on a ‘real-world’ problem using the skills learned during their coursework. The student will produce a written report and give an oral presentation of their work. Students are required to register for 6 hours of MATH 8960.

### Statistics Concentration

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 8746</td>
<td>INTRODUCTION TO PROBABILITY AND STATISTICS I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8756</td>
<td>INTRODUCTION TO PROBABILITY AND STATISTICS II</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8436</td>
<td>LINEAR MODELS</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8710</td>
<td>DESIGN AND ANALYSIS OF EXPERIMENTS</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Electives

Select one of the following (see below):

- For students choosing the comprehensive exam option, at least 24 credit hours of courses with a statistical nature, with at least 15 hours of courses ending in 0.
- For students choosing the project option, at least 18 credit hours of courses with a statistical nature, with at least 9 hours of courses ending in 0. Six hours of MATH 8960 are required.

#### Total Credits

36

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1 Students who were undergraduates at UNO and took MATH 4740, MATH 4750, or STAT 4430 may not take MATH 8746, MATH 8756, or STAT 8436 at the graduate level. Students can replace these requirements with additional elective courses.

### Exit Requirements

<table>
<thead>
<tr>
<th>Code/MATH 8960</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MASTER’S PROJECT</td>
<td>6</td>
</tr>
</tbody>
</table>

The comprehensive examination is based on three related courses (one of which must have a number ending in a zero digit) consisting of two parts. The first part is a one-week take-home examination. The second part is a 3-hour examination which may be open book, at the discretion of the instructor(s). The examination is normally taken in the student’s final semester and should be scheduled well in advance of the graduate college deadlines.

A statistical project undertaken under the supervision of both a faculty advisor and an external (industry) advisory. The purpose of the project is for the student to work on a ‘real-world’ problem. The student will produce a written report and give an oral presentation of their work.

Students are required to register for 6 hours of STAT 8960.

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### Code/Title

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH/CSCI 8316</td>
<td>PROBABILISTIC OPERATIONS RESEARCH MODELS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8650</td>
<td>INTRODUCTION TO PROBABILITY MODELS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8670</td>
<td>TOPICS IN PROBABILITY AND STATISTICS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 8970</td>
<td>INDEPENDENT GRADUATE STUDIES</td>
<td>1-3</td>
</tr>
<tr>
<td>STAT 8416</td>
<td>INTRODUCTION TO DATA SCIENCE</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8426</td>
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</tr>
<tr>
<td>STAT 8446</td>
<td>TIME SERIES ANALYSIS</td>
<td>3</td>
</tr>
<tr>
<td>STAT 8700</td>
<td>BAYESIAN STATISTICS</td>
<td>3</td>
</tr>
</tbody>
</table>

1 Students who were undergraduates at UNO and took MATH 4310, STAT 4410, STAT 4420, or STAT 4440 may not take MATH 8316, STAT 8416, STAT 8426, or STAT 8446 at the graduate level.