This document serves as an official historical record for a specific period in time. The information found is subject to change without notice. Colleges and departments make changes to their degree requirements and course descriptions frequently. More information is available at catalogs.umn.edu.

For current information, refer to:

- Program search: z.umn.edu/publicprogramsearch
- Course search: z.umn.edu/publiccoursecatalog
- University policies: policy.umn.edu
**Table of contents**

*Indicates a free-standing minor

** University policy on credit requirements for graduate degrees requires a minimum of 12 credits for a doctoral-level minor.

<table>
<thead>
<tr>
<th>College of Arts, Humanities and Social Sciences</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>American Indian Studies Minor</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>English Minor</strong></td>
<td>3</td>
</tr>
<tr>
<td>Indigenous Environmental Systems and Economics Postbaccalaureate Certificate</td>
<td>5</td>
</tr>
<tr>
<td><em>Linguistics Minor</em>*</td>
<td>6</td>
</tr>
<tr>
<td>Music M.M.</td>
<td>7</td>
</tr>
<tr>
<td>Professional Studies in Multidisciplinary Research &amp; Creativity M.P.S.</td>
<td>12</td>
</tr>
<tr>
<td>Tribal Administration and Governance M.T.A.G.</td>
<td>14</td>
</tr>
<tr>
<td>Tribal Administration and Leadership Postbaccalaureate Certificate</td>
<td>16</td>
</tr>
<tr>
<td>Tribal Natural Resources Stewardship, Economics, and Law Postbaccalaureate Certificate</td>
<td>17</td>
</tr>
<tr>
<td>Tribal Resource and Environmental Stewardship M.T.R.E.S.</td>
<td>18</td>
</tr>
<tr>
<td>Tribal Sovereignty and Federal Indian Law Postbaccalaureate Certificate</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>College of Education and Human Service Professions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Sciences and Disorders M.A.</td>
<td>21</td>
</tr>
<tr>
<td>Community College Teaching Postbaccalaureate Certificate</td>
<td>24</td>
</tr>
<tr>
<td>Education M.Ed.</td>
<td>25</td>
</tr>
<tr>
<td>Environmental Education M.E.Ed.</td>
<td>27</td>
</tr>
<tr>
<td>Environmental Education Postbaccalaureate Certificate</td>
<td>30</td>
</tr>
<tr>
<td>Psychological Science M.A.</td>
<td>32</td>
</tr>
<tr>
<td>Degree Program</td>
<td>Credits</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Social Work M.S.W.</td>
<td>36</td>
</tr>
<tr>
<td>**Social Work Minor</td>
<td>40</td>
</tr>
<tr>
<td>Teaching and Learning Ed.D.</td>
<td>42</td>
</tr>
<tr>
<td>Labovitz School of Business and Economics</td>
<td></td>
</tr>
<tr>
<td>Business Administration M.B.A.</td>
<td>44</td>
</tr>
<tr>
<td>Swenson College of Science and Engineering</td>
<td></td>
</tr>
<tr>
<td>Applied Materials Science M.S.</td>
<td>48</td>
</tr>
<tr>
<td>Chemical Engineering M.S.Ch.E.</td>
<td>50</td>
</tr>
<tr>
<td>Chemistry M.S.</td>
<td>53</td>
</tr>
<tr>
<td>**Chemistry Minor</td>
<td>55</td>
</tr>
<tr>
<td>Civil Engineering M.S.</td>
<td>57</td>
</tr>
<tr>
<td>Computer Science M.S.</td>
<td>60</td>
</tr>
<tr>
<td>**Computer Science Minor</td>
<td>63</td>
</tr>
<tr>
<td>Earth Sciences M.S.</td>
<td>65</td>
</tr>
<tr>
<td>**Earth Sciences Minor</td>
<td>68</td>
</tr>
<tr>
<td>Electrical Engineering M.S.E.E.</td>
<td>70</td>
</tr>
<tr>
<td>**Electrical Engineering Minor</td>
<td>73</td>
</tr>
<tr>
<td>Environmental Health and Safety M.Env.Hlth.Sa.</td>
<td>75</td>
</tr>
<tr>
<td>Integrated Biosciences M.S.</td>
<td>77</td>
</tr>
<tr>
<td>Integrated Biosciences Minor</td>
<td>79</td>
</tr>
<tr>
<td>Master of Engineering M.Eng.</td>
<td>81</td>
</tr>
<tr>
<td>Mathematical Sciences M.S.</td>
<td>84</td>
</tr>
<tr>
<td>**Mathematical Sciences Minor</td>
<td>87</td>
</tr>
<tr>
<td>Mechanical Engineering M.S.M.E.</td>
<td>89</td>
</tr>
<tr>
<td>Physics M.S.</td>
<td>92</td>
</tr>
<tr>
<td>Degree</td>
<td>Year</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td><strong>Physics Minor</strong></td>
<td>94</td>
</tr>
<tr>
<td>University of Minnesota Duluth</td>
<td></td>
</tr>
<tr>
<td>Integrated Biosciences Ph.D.</td>
<td>96</td>
</tr>
<tr>
<td>Water Resources Science M.S.</td>
<td>98</td>
</tr>
<tr>
<td><strong>Water Resources Science Minor</strong></td>
<td>103</td>
</tr>
<tr>
<td>Water Resources Sciences Ph.D.</td>
<td>105</td>
</tr>
</tbody>
</table>
Duluth Campus
American Indian Studies Minor
College of Arts, Humanities and Social Sciences

Link to a list of faculty for this program.

Contact Information:
Department of American Indian Studies, University of Minnesota Duluth, Cina Hall 106, 1123 University Drive, Duluth, MN 55812 (218-726-7332)
Email: umdais@d.umn.edu
Website: https://onestop2.umn.edu/pcas/viewCatalogProgram.do?programID=27260&strm=1219&campus=UMNDL

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The American Indian Studies graduate minor provides an introduction to tribal sovereignty, and the historical and contemporary experience of Native peoples and nations. Students may focus coursework in a specific area or select a broad range of courses that fit their interests.

Program Delivery
This program is available:
• completely online (all program coursework can be completed online)

Prerequisites for Admission
Special Application Requirements:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the American Indian Studies director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Coursework (9 to 12 credits)
Masters students select 9 credits, and doctoral students select 12 credits from the following in consultation with the American Indian Studies director of graduate studies. A maximum of one 3-credit, 4xxx level course can be applied to the minor.

AMIN 4230 - Introduction to Federal Indian Law [SOC SCI, CDIVERSITY] (3.0 cr)
AMIN 4250 - American Indian Diplomacy: Treaties, Compacts, and Agreements [GLOBAL PER] (3.0 cr)
AMIN 4410 - American Indian Philosophies [HUMANITIES, CDIVERSITY] (3.0 cr)
AMIN 4630 - American Indians and the Media [HUMANITIES, CDIVERSITY] (3.0 cr)
AMIN 4640 - American Indians in the Movies [HUMANITIES, CDIVERSITY] (3.0 cr)
AMIN 4810 - Business Processes in Tribal Administration (3.0 cr)
AMIN 4840 - Current Issues and Opportunities in Tribal Administration and Governance (3.0 cr)
AMIN 4893 - Directed Study (1.0 - 6.0 cr)
MTAG 5110 - Principles of Tribal Sovereignty I (3.0 cr)
MTAG 5120 - Principles of Tribal Sovereignty II (3.0 cr)
MTAG 5210 - Administration and Governance I (Strategic) (3.0 cr)
MTAG 5220 - Administration and Governance II (Operations) (3.0 cr)
MTAG 5230 - Advanced Tribal Administration and Governance I (Human Resources) (3.0 cr)
MTAG 5240 - Advanced Tribal Administration and Governance II (Project) (3.0 cr)
MTAG 5310 - Foundations of Leadership and Ethics in Indigenous Community Life and Organizations (3.0 cr)
MTAG 5320 - Applied Leadership and Ethics in an Indigenous Organizational Context (3.0 cr)
MTAG 5430 - Tribal Finance, Accounting and Budgets I (3.0 cr)
MTAG 5440 - Tribal Finance, Accounting and Budgets II (3.0 cr)
MTAG 5530 - Federal Indian Law I (3.0 cr)
MTAG 5540 - Federal Indian Law II (3.0 cr)
MTAG 5997 - Master of Tribal Administration and Governance Directed Project (2.0 cr)
TRES 5100 - Foundations of Indigenous Environmental Systems and Worldviews (Bioregionalism) (3.0 cr)
TRES 5101 - Tribal Natural Resource Program Management 1 (3.0 cr)
TRES 5102 - Tribal Natural Resource Program Management 2 (3.0 cr)
TRES 5201 - Integrated Ecosystems Stewardship 1 (3.0 cr)
TRES 5202 - Integrated Ecosystems Stewardship 2 (3.0 cr)
TRES 5301 - Tribal Natural Resource Economics (3.0 cr)
TRES 5400 - Directed Project Seminar (1.0 cr)
TRES 5994 - Master of Tribal Natural Resource Stewardship Directed Project (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Duluth Campus
English Minor
English
College of Arts, Humanities and Social Sciences

Link to a list of faculty for this program.

Contact Information:
Department of English, Linguistics, and Writing Studies, 420 Humanities, 1201 Ordean Court, University of Minnesota Duluth, Duluth, MN 55812 (218-726-8228)
Email: elws@d.umn.edu
Website: https://cahss.d.umn.edu/academics/graduate-programs/graduate-minors

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The English minor offers courses in English, Irish, and American literature; creative writing; linguistics; composition and rhetorical theory; book history; publishing; and English education.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the English director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The minimum cumulative GPA for courses applied to the minor is 2.80.

Minor Coursework (8 to 12 credits)
Masters students select 8 credits, and doctoral students select 12 credits from the following in consultation with the English director of graduate studies. Other courses may be chosen with approval by the English director of graduate studies.
ENGL 5xxx
ENGL 8xxx
WRIT 5xxx
WRIT 8xxx

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Doctoral
Duluth Campus

Indigenous Environmental Systems and Economics Postbaccalaureate Certificate
American Indian Studies
College of Arts, Humanities and Social Sciences

Link to a list of faculty for this program.

Contact Information:
1123 University Drive, 110 Cina Hall, Duluth, MN 55812  218-726-8771
Email: umdais@d.umn.edu
Website: https://cahss.d.umn.edu/departments/american-indian-studies

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2022
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Indigenous Enviro Management PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Indigenous Environmental Systems and Economics postbaccalaureate certificate is designed to meet the professional and leadership needs of individuals interested in natural resources and environmental programs considering both Indigenous and Western knowledge systems. The courses are based on the interrelationship of biological, physical, and cultural systems. Required courses address sustainability, economics, and integrated ecosystems studies. The certificate provides an opportunity for students to learn fundamental skills for tribal natural resource management, and Indigenous knowledge of aquatic and terrestrial ecosystems.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
Bachelors degree from an accredited institution.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum grade of C is required for A-F graded courses applied to the minor.

Required Courses (12 credits)
Take the following courses:
- TRES 5100 - Foundations of Indigenous Environmental Systems and Worldviews (Bioregionalism) (3.0 cr)
- TRES 5201 - Integrated Ecosystems Stewardship 1 (3.0 cr)
- TRES 5202 - Integrated Ecosystems Stewardship 2 (3.0 cr)
- TRES 5301 - Tribal Natural Resource Economics (3.0 cr)
Duluth Campus
Linguistics Minor

English Linguistics and Writing Studies
College of Arts, Humanities and Social Sciences

Link to a list of faculty for this program.

Contact Information:
Program in Linguistics, University of Minnesota Duluth, 420 Humanities Building, 1201 Ordean Court, Duluth, MN 55812 (218-726-8228; fax 218-726-6882)
Email: elws@d.umn.edu
Website: https://cahss.d.umn.edu/elws

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2022
• Length of program in credits (Masters): 6
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Graduate students may elect linguistics—which is offered interdepartmentally and through the Program in Linguistics—as a related field, or, with approval of the director of graduate studies of the major, as a designated minor.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Linguistics director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Courses offered on both the A-F and S/N grading basis must be taken A-F. The minimum grade to be earned for each course is C-.

Minor Coursework (6 credits)
Select 6 credits from the following in consultation with the Linguistics director of graduate studies. LING 8591 may be taken for a maximum of 6 credits.

ENGL 5802 - English Language for Educators (4.0 cr)
ENGL 5821 - History of the English Language (4.0 cr)
LING 5852 - Practicum in Teaching Linguistics (3.0 cr)
LING 8591 - Independent Study in Linguistics (1.0 - 3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
**Duluth Campus**

**Music M.M.**

**College of Arts, Humanities and Social Sciences**

Link to a [list of faculty](#) for this program.

**Contact Information:**
Department of Music, University of Minnesota Duluth, 1201 Ordean Court, Duluth, MN, 55812 (218-726-7890; fax: 218-726-8210)
Email: umdummm@d.umn.edu
Website: [https://academics.d.umn.edu/music-mm](https://academics.d.umn.edu/music-mm)

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30 to 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Music

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Master of Music (MM) program offers students an opportunity to acquire advanced understanding and skills in music education, theory, and practice or in musical performance. Students in music education and performance undertake essential core courses in musicianship, theory, history, research, and education/pedagogy. Additional courses in the area of specialization are tailored relative to the interests and objectives of the student.

**Accreditation**
This program is accredited by the National Association of Schools of Music.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have an undergraduate degree in music.

Other requirements to be completed before admission:
All applicants submit the following:
- a completed Department of Music Graduate Study application available from [www@d.umn.edu/music](http://www@d.umn.edu/music), which includes a sample of professional writing (a 3- to 5-page paper addressing current issues in music education or music performance), and
- a video recording of recent performances, teaching demonstration, or rehearsals.

Performance track: An entrance performance audition on the major instrument is required. Vocal performers must also demonstrate proficiency in a foreign language or enrollment in remedial coursework upon acceptance.

Applied Conducting track: Demonstration of proficiency in a foreign language or enrollment in remedial coursework upon acceptance is required.

Collaborative Piano track: Demonstration of proficiency in a foreign language or enrollment in remedial coursework upon acceptance, and 2 semesters of diction are required. Applicants without the required diction coursework must complete MU 1411 and MU 1412/13 upon acceptance.

**Special Application Requirements:**
International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
  - IELTS
    - Total Score: 6.5
    - Reading Score: 6.5
    - Writing Score: 6.5
  - MELAB
    - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan B: Plan B requires 30 to 31 major credits and up to null credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project:
- Music Education track: The Plan B comprises a directed paper that reflects comprehensive research analysis and study in the music education field.
- Applied Conducting, Collaborative Piano, and Performance tracks: The Plan B comprises a directed paper that addresses comprehensive research on the repertoire selected for the graduate recital.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Core Courses (10 credits)
Take the following courses:
- MU 5201 - Advanced Music History (2.0 cr)
- MU 8101 - Graduate Music Theory (2.0 cr)
- MU 8222 - Music Bibliography and Research (3.0 cr)
- MU 8900 - Psychology of Music (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Applied Conducting
The Applied Conducting track requires 30 total credits.

Applied Music Courses (8 credits)
Take 8 credits of the following in consultation with the advisor:
- MU 8701 - Graduate Applied Conducting (1.0 - 2.0 cr)

Ensembles (2 credits)
Select 2 credits from the following in consultation with the advisor. Other courses can be chosen with advisor approval.
- MU 4505 - Jazz Ensemble (1.0 cr)
- MU 4512 - Chamber Singers (1.0 cr)
- MU 4513 - Vocal Jazz Ensemble (1.0 cr)
- MU 4516 - Piano Ensemble (1.0 cr)
- MU 4541 - Chamber Music (1.0 cr)
- MU 5510 - Opera Studio (1.0 cr)

Literature Coursework (4 credits)
Select 4 credits of Instrumental Literature credits or 4 credits of Vocal Literature credits in consultation with the advisor.

Instrumental Literature
Select MU 5204 twice for a total or 4 credits, or take MU 5207 twice plus MU 5204 for a total of 4 credits, in consultation with the advisor.
MU 5204 - Instrumental Ensemble Literature (2.0 cr)
MU 5207 - Instrumental Chamber Music Literature (1.0 cr)

or Vocal Literature
Select 4 credits from the following in consultation with the advisor. MU 5203 and 5208 are recommended.
MU 5203 - Advanced Choral Literature (2.0 cr)
MU 5206 - Vocal Solo Literature (1.0 - 2.0 cr)
MU 5208 - Vocal Chamber Literature (1.0 cr)

Pedagogy Course (1 credit)
Take the following course:
MU 8401 - Graduate Music Pedagogy (1.0 cr)

Electives (4 credits)
Select 4 credits from the following in consultation with the advisor. MU 8302 may be repeated for up to 4 credits; MU 8991 may be repeated for up to 2 credits.
MU 8302 - Graduate Applied Music: Secondary Instrument (1.0 cr)
MU 8991 - Independent Study (1.0 - 2.0 cr)

Graduate Recital (1 credit)
Take the following course:
MU 8300 - Graduate Recital (1.0 cr)

Collaborative Piano
The Collaborative Piano track requires 31 total credits.

Applied Music Courses (8 credits)
Take 8 credits from the following in consultation with the advisor:
MU 8301 - Graduate Applied Music: Major Instrument (2.0 cr)

Collaborative Literature Courses (4 credits)
Take the following courses:
MU 5627 - Art of Accompanying: Vocal Music (2.0 cr)
MU 5628 - Art of Accompanying: Instrumental Music (2.0 cr)

Pedagogy Course (1 credit)
Take the following course:
MU 8401 - Graduate Music Pedagogy (1.0 cr)

Ensembles (6 credits)
Select 2 credits from the following in consultation with the advisor. Other courses can be chosen with advisor approval.
MU 4505 - Jazz Ensemble (1.0 cr)
MU 4512 - Chamber Singers (1.0 cr)
MU 4513 - Vocal Jazz Ensemble (1.0 cr)
MU 4516 - Piano Ensemble (1.0 cr)
MU 5510 - Opera Studio (1.0 cr)

Select 4 credits from the following in consultation with the advisor. Other courses can be selected with advisor approval.
MU 4541 - Chamber Music (1.0 cr)
MU 4621 - Piano Pedagogy and Practicum I (2.0 cr)
MU 4622 - Piano Pedagogy and Practicum II (2.0 cr)
MU 5205 - Instrumental Solo Literature (1.0 cr)
MU 5206 - Vocal Solo Literature (1.0 - 2.0 cr)
MU 5207 - Instrumental Chamber Music Literature (1.0 cr)
MU 8302 - Graduate Applied Music: Secondary Instrument (1.0 cr)
MU 8991 - Independent Study (1.0 - 2.0 cr)

Graduate Recital (2 credits)
Take the following course:
MU 8300 - Graduate Recital (1.0 cr)

Music Education
The Music Education track requires 31 total credits.

Required Course (1 credit)
Take the following course:
MU 8302 - Graduate Applied Music: Secondary Instrument (1.0 cr)

Education Electives (3 credits)
Select 3 credits from the following in consultation with the advisor:
EDAD 5913 - Communication and Community Relations (3.0 cr)
EDAD 5914 - Education Policy (3.0 cr)
EDAD 5918 - Continuous Improvement Processes for Schools (3.0 cr)
EDUC 7008 - Curriculum Theory and Design (3.0 cr)
EDUC 7009 - Assessment of Learning (3.0 cr)

Ensembles (2 credits)
Select 2 credits from the following in consultation with the advisor. Other ensembles can be chosen with advisor approval.

- MU 4505 - Jazz Ensemble (1.0 cr)
- MU 4512 - Chamber Singers (1.0 cr)
- MU 4513 - Vocal Jazz Ensemble (1.0 cr)
- MU 4516 - Piano Ensemble (1.0 cr)
- MU 4541 - Chamber Music (1.0 cr)
- MU 5510 - Opera Studio (1.0 cr)

**Music Education Courses (9 credits)**

Take the following courses:

- MU 8600 - Methods of Research in Music Education (3.0 cr)
- MU 8601 - Foundations of Music Education (3.0 cr)
- MU 8605 - Curricular Trends in Music Education (3.0 cr)

**Music Electives (3 credits)**

Select 3 credits from the following in consultation with the advisor:

- MU 5203 - Advanced Choral Literature (2.0 cr)
- MU 5204 - Instrumental Ensemble Literature (2.0 cr)
- MU 5205 - Instrumental Solo Literature (1.0 cr)
- MU 5206 - Vocal Solo Literature (1.0 - 2.0 cr)
- MU 5207 - Instrumental Chamber Music Literature (1.0 cr)
- MU 5208 - Vocal Chamber Literature (1.0 cr)
- MU 8302 - Graduate Applied Music: Secondary Instrument (1.0 cr)
- MU 8701 - Graduate Applied Conducting (1.0 - 2.0 cr)
- MU 8991 - Independent Study (1.0 - 2.0 cr)

**Plan B Project (3 credits)**

Take 3 credits of the following in consultation with the advisor:

- MU 8999 - Directed Project in Music Education (1.0 - 12.0 cr)

**Performance**

The Performance track requires 30 total credits.

**Applied Music Course (8 credits)**

Take 2 credits each semester, for a total of 8 credits:

- MU 8301 - Graduate Applied Music: Major Instrument (2.0 cr)

**Ensembles (2 credits)**

Select 2 credits from the following in consultation with the advisor. Other courses can be chosen with advisor approval.

- MU 4505 - Jazz Ensemble (1.0 cr)
- MU 4512 - Chamber Singers (1.0 cr)
- MU 4513 - Vocal Jazz Ensemble (1.0 cr)
- MU 4516 - Piano Ensemble (1.0 cr)
- MU 4541 - Chamber Music (1.0 cr)
- MU 5510 - Opera Studio (1.0 cr)

**Literature Coursework (4 credits)**

Select 4 credits of Instrumental and Piano Performance and Pedagogy literature courses or 4 credits of Vocal Literature courses in consultation with the advisor.

**Instrumental and Piano Performance and Pedagogy Literature**

Select 4 credits from the following in consultation with the advisor:

- MU 5204 - Instrumental Ensemble Literature (2.0 cr)
- MU 5205 - Instrumental Solo Literature (1.0 cr)
- MU 5207 - Instrumental Chamber Music Literature (1.0 cr)

**or Vocal Literature**

Select 4 credits from the following in consultation with the advisor

- MU 5206 - Vocal Solo Literature (1.0 - 2.0 cr)

**Pedagogy Course (1 credit)**

Take the following course:

- MU 8401 - Graduate Music Pedagogy (1.0 cr)

**Electives (4 credits)**

Select 4 credits of Instrumental and Vocal electives, or 4 credits Piano Performance and Pedagogy electives in consultation with the advisor.

**Instrumental and Vocal**

Select 4 credits from the following in consultation with the advisor. MU 8302 may be repeated for up to 4 credits; MU 8991 may be repeated for up to 2 credits. Other courses can be chosen with advisor approval.

- MU 5203 - Advanced Choral Literature (2.0 cr)
- MU 5208 - Vocal Chamber Literature (1.0 cr)
- MU 5210 - The Professional Singer: Entrepreneurship for Opera Singers (1.0 cr)
- MU 8302 - Graduate Applied Music: Secondary Instrument (1.0 cr)
- MU 8701 - Graduate Applied Conducting (1.0 - 2.0 cr)
MU 8991 - Independent Study (1.0 - 2.0 cr)

or Piano Performance and Pedagogy

Take 4 credits of the following in consultation with the advisor:

MU 8991 - Independent Study (1.0 - 2.0 cr)

Graduate Recital (1 credit)

Take the following course:

MU 8300 - Graduate Recital (1.0 cr)
Duluth Campus
Professional Studies in Multidisciplinary Research & Creativity M.P.S.
College of Liberal Arts - Adm
College of Arts, Humanities and Social Sciences

Link to a list of faculty for this program.

Contact Information:
Email: dseyring@d.umn.edu
Website: https://cla.d.umn.edu/majors-minors/masters-programs/mps/what-is-mps

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This interdisciplinary, self-designed Master of Professional Studies (MPS) program prioritizes applied research skills, creative and innovative problem-solving, socially conscious leadership, and the integration of theory and practice across disciplines. By engaging multiple disciplinary approaches to a selected problem, students develop their capacity to identify, delineate, and research key problems, building an empowered learning approach to their own professional studies.

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
Other requirements to be completed before admission:
Completed applications include official transcripts, an essay delineating reasons for pursuing the MPS in Multidisciplinary Research & Creativity, a description of previous education and career experiences, and three letters of recommendation from persons in a position to evaluate the applicant's potential for success.

GRE scores are not required for application. GRE scores are considered from any applicants who think the GRE strengthens their application. Not submitting GREs will not adversely affect an application.

Special Application Requirements:
The application deadline is April 15 for the following academic year.

International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

**Plan B:** Plan B requires 30 major credits and 0 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** The Plan B project is an expansion of work from a course or a topic of special interest, and can comprise multiple research papers, participatory media products, or other learning objects that represent 100 hours of independent research.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Use of 4xxx-level courses must be approved by both the advisor and director of graduate studies.

**Core Courses (12 credits)**
Take the following courses:
- MPS 8001 - Theories, Methods and Applications of Graduate Study (4.0 cr)
- MPS 8501 - Seminar: Community Engagement (4.0 cr)
- MPS 8502 - Seminar: International Perspectives (4.0 cr)

**Multidisciplinary Requirement (18 credits)**
Select social sciences and humanities courses offered within the College of Arts, Humanities and Social Sciences (CAHSS), and across campus in consultation with the advisor, to complete the 30-credit requirement. Courses may be chosen with advisor and director of graduate studies approval.
Duluth Campus
Tribal Administration and Governance M.T.A.G.
American Indian Studies
College of Arts, Humanities and Social Sciences

Link to a list of faculty for this program.

Contact Information:
Department of American Indian Studies, University of Minnesota Duluth, Cina Hall 110, 1123 University Drive, Duluth, MN 55812 (218-726-7332)
Email: umdmtag@d.umn.edu
Website: http://www.umdmtag.org

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 38
- This program does not require summer semesters for timely completion.
- Degree: Master of Tribal Admin and Governance

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Master of Tribal Administration and Governance (MTAG) is an applied degree designed to develop the knowledge and skills needed to work as an administrator in a tribal government. Students in the program may already serve as tribal administrators, council members, or tribal leaders. Students who currently work or aspire to work professionally in tribal governments or management positions will benefit from this program, which emphasizes both the acquisition of academic knowledge and the application of practical skills.

The curriculum is based on the roles that tribal administrators, leaders, and professionals play in formal and informal situations that support tribal sovereignty and self-determination. Program delivery is designed to accommodate working professionals and support existing commitments to families and home communities.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree from a regionally accredited institution in the US or a comparable degree from an officially recognized college or university outside the US may apply for admission.

Special Application Requirements:
Each cohort capacity is 20 students. The program is open until filled, with an August 15th deadline. Unofficial transcripts or academic records, two letters of recommendation, and a personal statement must be uploaded directly to the online application.

Official transcripts or academic records will be required only if the applicant is admitted to the program.

International and domestic applicants whose first language is not English must submit current score(s) from one of the English proficiency tests noted below.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 38 major credits and up to null credits outside the major. The is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

**Semester One (Fall, Year One, 9 credits)**
- Take the following courses:
  - MTAG 5110 - Principles of Tribal Sovereignty I (3.0 cr)
  - MTAG 5210 - Administration and Governance I (Strategic) (3.0 cr)
  - MTAG 5310 - Foundations of Leadership and Ethics in Indigenous Community Life and Organizations (3.0 cr)

**Semester Two (Spring, Year One, 9 credits)**
- Take the following courses:
  - MTAG 5120 - Principles of Tribal Sovereignty II (3.0 cr)
  - MTAG 5220 - Administration and Governance II (Operations) (3.0 cr)
  - MTAG 5320 - Applied Leadership and Ethics in an Indigenous Organizational Context (3.0 cr)

**Semester Three (Fall, Year Two, 11 credits)**
- Take the following courses:
  - MTAG 5230 - Advanced Tribal Administration and Governance I (Human Resources) (3.0 cr)
  - MTAG 5430 - Tribal Finance, Accounting and Budgets I (3.0 cr)
  - MTAG 5530 - Federal Indian Law I (3.0 cr)
  - MTAG 5997 - Master of Tribal Administration and Governance Directed Project (2.0 cr)

**Semester Four (Spring, Year Two, 9 credits)**
- Take the following courses:
  - MTAG 5240 - Advanced Tribal Administration and Governance II (Project) (3.0 cr)
  - MTAG 5440 - Tribal Finance, Accounting and Budgets II (3.0 cr)
  - MTAG 5540 - Federal Indian Law II (3.0 cr)
Duluth Campus
Tribal Administration and Leadership Postbaccalaureate Certificate
American Indian Studies
College of Arts, Humanities and Social Sciences

Link to a list of faculty for this program.

Contact Information:
1123 University Drive, 110 Cina Hall, Duluth, MN 55812  218-726-8771
Email: umdais@d.umn.edu
Website: https://academics.d.umn.edu/tribal-administration-and-leadership-graduate-certificate

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2022
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Tribal Admin & Leadership Postbaccalaureate Cert.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Tribal Administration and Leadership Postbaccalaureate Certificate is designed to meet the professional needs of individuals interested in tribal governance and tribal relations. The courses in this program emphasize the leadership qualities and skills necessary for tribal contexts, strategic management, operations management, and human resources management. Topics addressed include Indigenous conceptions of leadership, strengths-based orientation, leadership styles, strategic planning and implementation, organizational frameworks, personnel, workplace conflicts, effectiveness, and efficiency.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
Bachelors degree from an accredited institution.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum grade of C is required for A-F graded courses applied to the minor.

Required Courses (12 credits)
Take the following courses:
- MTAG 5210 - Administration and Governance I (Strategic) (3.0 cr)
- MTAG 5220 - Administration and Governance II (Operations) (3.0 cr)
- MTAG 5230 - Advanced Tribal Administration and Governance I (Human Resources) (3.0 cr)
- MTAG 5320 - Applied Leadership and Ethics in an Indigenous Organizational Context (3.0 cr)
**Duluth Campus**

**Tribal Natural Resource Stewardship, Economics, and Law Postbaccalaureate Certificate**  
*American Indian Studies*  
*College of Arts, Humanities and Social Sciences*

Link to a [list of faculty](#) for this program.

**Contact Information:**  
1123 University Drive, 110 Cina Hall, Duluth, MN 55812  218-726-8771  
Email: umdais@d.umn.edu  
Website: [https://cahss.d.umn.edu/departments/american-indian-studies](https://cahss.d.umn.edu/departments/american-indian-studies)

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement  
- Requirements for this program are current for Fall 2022  
- Length of program in credits: 12  
- This program does not require summer semesters for timely completion.  
- Degree: Tribal Nat Res Stewardship Postbaccalaureate Cert

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Tribal Natural Resource Stewardship, Economics, and Law Postbaccalaureate Certificate is designed to meet the professional and leadership needs of individuals interested in Tribal natural resources and environmental programs considering multiple perspectives regarding economic value and exchange of decision-making affecting the natural resources of Tribal Nations. The courses in this program provide a transdisciplinary area of study that aims to address the connections between human economies and natural ecosystems. The courses will cover topics including the roles of Tribal resource and environmental managers, modes of market and non-market resource valuation and uses for those valuations. Practical areas of study will include sustainability, pollution control, benefit-cost analysis, air and water quality, waste management and conservation, both on and off of Reservations.

**Program Delivery**  
This program is available:  
- completely online (all program coursework can be completed online)

**Prerequisites for Admission**  
Bachelors degree from an accredited institution

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**  
Use of 4xxx courses towards program requirements is not permitted.

A minimum grade of C is required for A-F graded courses applied to the minor.

**Required Courses (12 credits)**  
Take the following courses:  
- MTAG 5530 - Federal Indian Law I (3.0 cr)  
- TRES 5101 - Tribal Natural Resource Program Management 1 (3.0 cr)  
- TRES 5102 - Tribal Natural Resource Program Management 2 (3.0 cr)  
- TRES 5301 - Tribal Natural Resource Economics (3.0 cr)
Tribal Resource and Environmental Stewardship M.T.R.E.S.

College of Arts, Humanities and Social Sciences

Link to a list of faculty for this program.

Contact Information:
Department of American Indian Studies, University of Minnesota Duluth, Cina Hall 110
1123 University Drive, Duluth, MN 55812
Email: umdais@d.umn.edu
Website: http://www.umdmtres.org

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 36
- This program does not require summer semesters for timely completion.
- Degree: Master of Tribal Res and Env Stewardship M T R E S

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Master of Tribal Resource and Environmental Stewardship is an applied degree designed to meet the professional and leadership needs of tribal natural resources and environmental programs. Students will develop fundamental knowledge and skills for natural resources careers responsive to community needs and aspirations. Those who currently work or aspire to work in natural resources programs in tribal governance and related contexts will benefit from this program's emphasis on integrated approaches to the stewardship and protection of natural resources based upon Indigenous environmental systems and worldviews. The curriculum is based upon the interrelationship of biological, physical, and cultural systems. Required courses address program operations, sustainability, and integrated ecosystems studies. The elective course and the capstone project provide opportunities for personalized areas of focus.

Program delivery is designed to accommodate working professionals and support existing commitments to families and home communities.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
The MTRES is designed to meet the needs of tribal natural resource management. Natural resource professionals have a wide variety of expertise ranging across the sciences, liberal arts, and business and economics. Students entering the program will have a Bachelor's degree but no specific disciplinary requirements are necessary.

International and domestic applicants whose first language is not English must submit current

Special Application Requirements:
Unofficial transcripts or academic records, two letters of recommendation, and a personal statement must be uploaded directly to the online application.

The application deadline is August 15. A cohort of up to 20 students is admitted for fall every other year.

score(s) from one of the English proficiency tests noted below.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
• Internet Based - Reading Score: 19
  • IELTS
    - Total Score: 6.5
    - Reading Score: 6.5
    - Writing Score: 6.5
  • MELAB
    - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 36 major credits and 0 credits outside the major. The is no final exam. A capstone project is required.

Capstone Project: The directed project is the capstone experience of the MTRES program, and is based on the plan previously approved in the seminar course. There is flexibility to do a wide range of projects: internships, service projects, research projects, or other activities related to tribal natural resource stewardship that engages the community and involves communication with others.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Course Requirements (28 credits)
Take the following courses:
- TRES 5100 - Foundations of Indigenous Environmental Systems and Worldviews (Bioregionalism) (3.0 cr)
- TRES 5101 - Tribal Natural Resource Program Management 1 (3.0 cr)
- TRES 5102 - Tribal Natural Resource Program Management 2 (3.0 cr)
- TRES 5201 - Integrated Ecosystems Stewardship 1 (3.0 cr)
- TRES 5202 - Integrated Ecosystems Stewardship 2 (3.0 cr)
- TRES 5301 - Tribal Natural Resource Economics (3.0 cr)
- TRES 5400 - Directed Project Seminar (1.0 cr)
- TRES 5994 - Master of Tribal Natural Resource Stewardship Directed Project (3.0 cr)
- MTAG 5110 - Principles of Tribal Sovereignty I (3.0 cr)
- MTAG 5120 - Principles of Tribal Sovereignty II (3.0 cr)

Electives (8 credits)
Select 8 credits from the following in consultation with the advisor and director of graduate studies. One 4xxx level course, up to 4 credits, may be applied as an elective. Other courses can be chosen with advisor and director of graduate studies approval.
- AMIN 4250 - American Indian Diplomacy: Treaties, Compacts, and Agreements [GLOBAL PER] (3.0 cr)
- AMIN 4410 - American Indian Philosophies [HUMANITIES, CDIVERSITY] (3.0 cr)
- AMIN 4630 - American Indians and the Media [HUMANITIES, CDIVERSITY] (3.0 cr)
- AMIN 4640 - American Indians in the Movies [HUMANITIES, CDIVERSITY] (3.0 cr)
- AMIN 4810 - Business Processes in Tribal Administration (3.0 cr)
- AMIN 4840 - Current Issues and Opportunities in Tribal Administration and Governance (3.0 cr)
- MTAG 5210 - Administration and Governance I (Strategic) (3.0 cr)
- MTAG 5220 - Administration and Governance II (Operations) (3.0 cr)
- MTAG 5230 - Advanced Tribal Administration and Governance I (Human Resources) (3.0 cr)
- MTAG 5310 - Foundations of Leadership and Ethics in Indigenous Community Life and Organizations (3.0 cr)
- MTAG 5320 - Applied Leadership and Ethics in an Indigenous Organizational Context (3.0 cr)
- MTAG 5430 - Tribal Finance, Accounting and Budgets I (3.0 cr)
- MTAG 5440 - Tribal Finance, Accounting and Budgets II (3.0 cr)
- MTAG 5530 - Federal Indian Law I (3.0 cr)
- MTAG 5540 - Federal Indian Law II (3.0 cr)
Tribal Sovereignty and Federal Indian Law Postbaccalaureate Certificate

American Indian Studies
College of Arts, Humanities and Social Sciences

Contact Information:
1123 University Drive, 110 Cina Hall, Duluth, MN 55812 218-726-8771
Email: umdais@d.umn.edu
Website: https://academics.d.umn.edu/tribal-sovereignty-and-federal-indian-law-graduate-certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Tribal Sovereignty and Federal Indian Law Postbaccalaureate Certificate is designed to meet the professional needs of individuals interested in tribal governance and tribal relations. The courses in this program emphasize the inherent authority of tribal nations, federal Indian policy, and the legal status of tribes as contemplated within federal courts. Topics addressed include Indigenous understandings of sovereignty, treaty relations, trust obligations, jurisdiction, the past and present of relevant congressional policy, and landmark court decisions.

Program Delivery
This program is available:
• completely online (all program coursework can be completed online)

Prerequisites for Admission
Bachelors degree from an accredited institution

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum grade of C is required for A-F graded courses applied to the minor.

Required Courses (12 credits)
Take the following courses:
MTAG 5110 - Principles of Tribal Sovereignty I (3.0 cr)
MTAG 5120 - Principles of Tribal Sovereignty II (3.0 cr)
MTAG 5530 - Federal Indian Law I (3.0 cr)
MTAG 5540 - Federal Indian Law II (3.0 cr)
Duluth Campus
Communication Sciences and Disorders M.A.
Communication Sciences & Disorders
College of Education and Human Service Professions

Contact Information:
Department of Communication Sciences and Disorders, 174 Chester Park, 31 West College Street, Duluth, MN, 55812 (218-726-7974; fax: 218-726-8693)
Email: cd@d.umn.edu
Website: https://cehsp.d.umn.edu/departments-centers/departments/csd

• Program Type: Master's
• Requirements for this program are current for Fall 2022
• Length of program in credits: 60 to 61
• This program requires summer semesters for timely completion.
• Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Communication Sciences and Disorders (CSD) masters program effectively combines academic and clinical endeavors to prepare students to become speech-language pathologists. The program places a major emphasis on the development of clinical skills, although students can engage in a wide variety of academic and research activities as well. The curriculum, which is based on five semesters of study, is accredited by the Council on Academic Accreditation in Audiology and Speech-Language Pathology (CAA) of the American Speech-Language-Hearing Association (ASHA). The program focuses on helping students meet standards for certification as speech-language pathologists that have been established by the American Speech-Language-Hearing Association.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have the equivalent of a 4-year undergraduate degree in communication sciences and disorders completed at an accredited institution and must have a cumulative GPA of 3.0 or higher.

Special Application Requirements:
Applicants with a four-year undergraduate degree in another field from an accredited institution and who have completed a post-baccalaureate program in CSD from an accredited institution may apply. Applicants must have earned a cumulative GPA of 3.00 or higher in the post-baccalaureate program.

Required prerequisites in the post-baccalaureate program:
- Language Development
- Anatomy/Physiology of the Speech System and Auditory System
- Phonetics
- Speech Science (including the physics of sound and acoustic characteristics of speech)
- Audiology (including hearing measurement and hearing disorders)
- Aural Rehabilitation
- Articulation/Phonological Disorders
- Child Language Disorders

All applicants must provide:
- at least three letters of recommendation, two of which should be from academic faculty familiar with the applicant; and
- a personal statement.

International and domestic applicants whose first language is not English must submit current score(s) from one of the English proficiency tests noted below.

International applicants must submit score(s) from one of the following tests:
• TOEFL
- Internet Based - Total Score: 79
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19

IELTS
- Total Score: 6.5
- Reading Score: 6.5
- Writing Score: 6.5

MELAB
- Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan B: Plan B requires 60 to 61 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: To complete the Plan B Project, students must register for 3 credits of CSD 8099 Projects in Communication Disorders in consultation with the advisor on the A-F grade basis. All Plan B projects must be pre-approved by the student’s examining committee, which also grants final approval.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The MA degree requires 43 course credits plus 17 to 18 credits of clinical internship, externship, and practicum credits for a total of 60 to 61 credits.

To meet accreditation standards for the Council on Academic Accreditation in Audiology and Speech-Language Pathology (CAA) and to ensure students qualify for certification by the American Speech-Language-Hearing Association Council for Clinical Certification in Audiology and Speech-Language Pathology (ASHA CFCC), students must register for clinical internship, externship, and practicum credits beyond those required for the MA degree.

All courses are selected in consultation with the advisor and are subject to director of graduate studies approval.

Required Courses (43 credits)
Complete CSD 5100 for a total of 3 credits and CSD 8099 for a total of 3 credits.

CSD 5100 - Research Methods in Communication Disorders (1.0 - 3.0 cr)
CSD 5145 - Advanced Articulation and Phonological Disorders (3.0 cr)
CSD 5200 - Dysphagia (3.0 cr)
CSD 5210 - Interprofessional Practice in CSD (1.0 cr)
CSD 5230 - Advanced Applications in Communication Modalities (4.0 cr)
CSD 5250 - Seminar in Augmentative and Alternative Communication (1.0 cr)
CSD 5260 - Seminars in Orofacial Disorders (2.0 cr)
CSD 5301 - Language Disorders in Infants, Toddlers, and Preschoolers (3.0 cr)
CSD 5302 - Language Disorders in School-Age Children (2.0 cr)
CSD 5500 - Voice Disorders (3.0 cr)
CSD 8099 - Projects in Communication Disorders (1.0 cr)
CSD 8205 - Advanced Fluency Disorders (2.0 cr)
CSD 8211 - Professional Issues in Communication Disorders I (1.0 cr)
CSD 8212 - Professional Issues in Communication Disorders II (1.0 cr)
CSD 8230 - Neurogenic Language Disorders (4.0 cr)
CSD 8231 - Neurogenic Speech Disorders (3.0 cr)
CSD 8232 - Mgmt of Communication Disorders in Persons with Tracheostomy, Ventilator Dependency, & Laryngectomy (1.0 cr)
CSD 8235 - Counseling Applications in Communication Disorders (2.0 cr)

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Information current as of January 17, 2023
CSD 8350 - Applied Clinical Methods in CSD (1.0 cr)

**CSD Internship/Externship (17 - 18 credits)**
All courses are chosen in consultation with the student's advisor and the clinical director; subject to approval by the director of graduate studies.
- CSD 8397 - On-Campus Graduate Internship in Communication Disorders I (1.0 - 4.0 cr)
- CSD 8497 - On-Campus Graduate Internship in CSD II (1.0 - 5.0 cr)
- CSD 8597 - Part-Time CSD Graduate Internship in Education Settings (5.0 cr)
- CSD 8697 - Part-Time CSD Graduate Internship in Medical Setting (5.0 cr)
- CSD 8797 - Full-Time CSD Graduate Externship in Education Settings (6.0 cr)
- CSD 8897 - Full-Time CSD Graduate Externship in Medical Settings (6.0 cr)
- CSD 8997 - Graduate Practicum in Communication Disorders (1.0 cr)
Duluth Campus
Community College Teaching Postbaccalaureate Certificate
Education
College of Education and Human Service Professions

Link to a list of faculty for this program.

Contact Information:
UMD Education
150 EduE
412 Library Dr
Duluth, MN 55812
218-726-7233
Email: educ@d.umn.edu
Website: https://cehsp.d.umn.edu/departments-centers/departments/education/programs/minors-certificates/cctgc

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2022
- Length of program in credits: 14
- This program does not require summer semesters for timely completion.
- Degree: Community College Teaching PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Community College Teaching postbaccalaureate certificate provides an opportunity for students from science-related disciplines to learn how to be effective teachers in a college setting.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Required Courses (11 credits)
Take the following courses:
- EDSE 5000 - Introduction to Post-Secondary Teaching (2.0 cr)
- EDSE 5204 - Designing Learning Environments (3.0 cr)
- EDSE 5501 - Adolescent/Adult Development and Learning Theory (3.0 cr)
- EDSE 5525 - Assessment for Secondary Education (3.0 cr)

Electives (3 credits)
Select credits from the following in consultation with the advisor to complete the minimum credit requirement. Other courses can be chosen with advisor approval.
- BIOL 5001 - Teaching and Learning in the Life Sciences (1.0 cr)
- EDSE 5255 - Teaching Science Grades 5 - 12 (3.0 cr)
- EDUC 5411 - Teaching Online (3.0 cr)
Duluth Campus
Education M.Ed.
College of Education and Human Service Professions

Link to a list of faculty for this program.

Contact Information:
Department of Education, 412 Library Drive EduE 150, Duluth, MN 55812
Email: educ@d.umn.edu
Website: http://cehsp.d.umn.edu/departments-centers/department-education/programs/master

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Master of Education (MEd) is a professional development degree for teachers and those who work in the human and social service profession, community education, or post-secondary education. Professional development is achieved through critical reflection, investigation, and application of theory and research to practice in communities. The curriculum is based on the work done as teachers, leaders, and change agents in formal, non-formal, and community-based settings.

Program Delivery
This program is available:
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

A bachelor's degree from an accredited US college or university or equivalent degree from a recognized college or university in another country.

Other requirements to be completed before admission:
Preferred candidates will have a GPA of 2.80 or higher and two years professional experience or demonstrated experience working with learners.

Special Application Requirements:
Please see the MEd application information found at: https://cehsp.d.umn.edu/departments-centers/department-education/programs/master-education-med/application

International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan C: Plan C requires 30 major credits and 0 credits outside the major. There is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Courses offered on both the A-F and S/N grading basis must be taken A-F.

Core Coursework (9 credits)
Take the following courses:
- EDUC 7001 - Foundations of Education and Research (3.0 cr)
- EDUC 7002 - Diversity and Social Justice (3.0 cr)
- EDUC 7019 - Educational Policy and Issues (3.0 cr)

Electives (21 credits)
Select electives from the following in consultation with the advisor and director of graduate studies. Other courses can be chosen with advisor and director of graduate studies approval.
Take 21 or more credit(s) from the following:
- EDSE 5000 - Introduction to Post-Secondary Teaching (2.0 cr)
- EDSE 5214 - Teaching Content-Area Reading (3.0 cr)
- EDUC 5081 - American Indian Education Policy Development in the 20th Century (3.0 cr)
- EDUC 5230 - Indigenous Peoples and the Environment (3.0 cr)
- EDUC 5411 - Teaching Online (3.0 cr)
- EDUC 5911 - Educational Organization and Leadership (3.0 cr)
- EDUC 7008 - Curriculum Theory and Design (3.0 cr)
- EDUC 7009 - Assessment of Learning (3.0 cr)
- SPED 5433 - Foundations in Special Education (3.0 cr)
**Duluth Campus**

**Environmental Education M.E.Ed.**

*D Applied Human Sciences. Education*

**College of Education and Human Service Professions**

Link to a list of faculty for this program.

**Contact Information:**
Center for Environmental Education, 122 Sports and Health Center, 1216 Ordean Court, Duluth, Minnesota 55812-3032 (218-726-7554)
Email: lmmcgraw@d.umn.edu
Website: https://cehsp.d.umn.edu/graduate-studies/meed

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Environmental Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The purpose of the Master of Environmental Education (MEEd) program is to develop advanced practitioners in environmental education (EE) who will take on leadership roles through positions such as EE specialists and directors at nature centers, outdoor and EE centers, natural resource agencies, conservation groups, park and recreation programs, and in P-16 school settings.

A minimum of 31 credits is required for the degree. Two plans are available (each are 31 credits). Students in both plans take coursework in core foundations (underlying theory, program planning and evaluation, Indigenous perspectives, and place-based education), a research methods course, and coursework pertaining to applications and/or teaching strategies. Plan B students take additional research coursework and complete a research project.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree from an accredited US college or university or an equivalent degree from a recognized college or university in another country.

Other requirements to be completed before admission:
Applications are due February 1, with admission for the following fall semester. (Under extenuating circumstances, applications may be considered past the deadline for admission.) All application materials should be submitted directly into the Graduate School's online application system. Your application will not be reviewed until all of the required materials are submitted successfully. Incomplete applications cannot be considered for admission. Required materials include the following: - Transcripts - Writing sample that demonstrates suitability for graduate-level study and/or formal academic writing ability - Resume - Two work samples that communicate suitability for graduate-level study in EE, such as a lesson plan, grant proposal, article, capstone project, etc. - Three letters of recommendation that speak to the applicant's potential as a graduate student and EE professional.

**Special Application Requirements:**
International and domestic applicants whose first language is not English must submit current score(s) from one of the English proficiency tests noted below.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
- Total Score: 6.5
- Reading Score: 6.5
- Writing Score: 6.5

**MELAB**
- Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan B**: Plan B requires 31 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.  
**Capstone Project**: Final project options include a research-based paper or journal article or a project involving systematic investigation or scholarly inquiry (such as an action research project or program evaluation).

**Plan C**: Plan C requires 31 major credits and 0 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

4xxx-level electives must be approved for graduate credit.

Credits taken before the award of a baccalaureate degree cannot be applied toward MEEd requirements.

**Core Foundations and Underpinnings (10 credits)**

- EDUC 5230 - Indigenous Peoples and the Environment (3.0 cr)
- ENED 5165 - Theories and Models in Outdoor Education (2.0 cr)
- ENED 5600 - Place-based Education (2.0 cr)
- ENED 5625 - Program Development and Evaluation (3.0 cr)

**Plan B or Plan C**

**Strategies and Applications (8 credits)**

At least 4 credits must have the ENED subject

Take 8 or more credit(s) from the following:

- ENED 5163 - Outdoor Education Methods (3.0 cr)
- ENED 5315 - Operations and Management (4.0 cr)
- ENED 5325 - Sustainability Issues Investigation (2.0 cr)
- ENED 5500 - Early Childhood Nature Experiences and Pedagogies (3.0 cr)
- ENED 5850 - Classroom Applications (2.0 cr)
- ENED 5855 - Programming for School Systems (3.0 cr)
- ENED 5991 - Independent Study (1.0 - 6.0 cr)
- MPS 8501 - Seminar: Community Engagement (4.0 cr)
- Other 5xxx level or above courses may be accepted upon approval of DGS

**Research (13 credits)**

- ENED 5100 - Research Design and Methods in the Social Sciences (3.0 cr)
- ENED 5560 - Current Research and Issues (3.0 cr)
- ENED 5998 - Outdoor Education Seminar (1.0 cr)

Research Project must be taken for a total of 6 credits.

- EDUC 5990 - Research Project (1.0 - 6.0 cr)
- or ENED 5990 - Research Project (1.0 - 6.0 cr)

**or Plan C**

**Strategies and Applications**

At least 13 credits must have the ENED subject

Take 17 or more credit(s) from the following:

- Other 5xxx level or above courses may be accepted upon approval of DGS
- ENED 5163 - Outdoor Education Methods (3.0 cr)
- ENED 5315 - Operations and Management (4.0 cr)
- ENED 5325 - Sustainability Issues Investigation (2.0 cr)
- ENED 5500 - Early Childhood Nature Experiences and Pedagogies (3.0 cr)

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Information current as of January 17, 2023
• **ENED 5850** - Classroom Applications (2.0 cr)
• **ENED 5855** - Programming for School Systems (3.0 cr)
• **ENED 5991** - Independent Study (1.0 - 6.0 cr)
• **ENED 5992** - Readings in Environmental Education (1.0 - 6.0 cr)
• **MPS 8501** - Seminar: Community Engagement (4.0 cr)

**Research (4 credits)**

ENED 5100 - Research Design and Methods in the Social Sciences (3.0 cr)
ENED 5998 - Outdoor Education Seminar (1.0 cr)
**Duluth Campus**

**Environmental Education Postbaccalaureate Certificate**

*D Applied Human Sciences, Education*

**College of Education and Human Service Professions**

Link to a [list of faculty](#) for this program.

**Contact Information:**

Email: lmmcgraw@d.umn.edu

Website: [https://cehsp.d.umn.edu/departments-centers/centers/center-environmental-education/ee-certificate](https://cehsp.d.umn.edu/departments-centers/centers/center-environmental-education/ee-certificate)

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2022
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Certificate in Environmental Education

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Environmental Education post-baccalaureate certificate is for those who have a bachelor's degree and are interested in pursuing a career as an environmental educator.

The certificate emphasizes skills for the provision of outdoor and environmental education in a variety of settings and contexts and with varied audiences.

**Program Delivery**

This program is available:

- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:

The GRE is not required.

International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- **MELAB**
  - Final score: 80

Key to [test abbreviations](#) (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Coursework (12 credits)
Take 12 credits of the following in consultation with the advisor.
- EDUC 5230 - Indigenous Peoples and the Environment (3.0 cr)
- ENED 5163 - Outdoor Education Methods (3.0 cr)
- ENED 5165 - Theories and Models in Outdoor Education (2.0 cr)
- ENED 5315 - Operations and Management (4.0 cr)
- ENED 5325 - Sustainability Issues Investigation (2.0 cr)
- ENED 5343 - Advanced Field Interpretive Techniques (3.0 cr)
- ENED 5500 - Early Childhood Nature Experiences and Pedagogies (3.0 cr)
- ENED 5600 - Place-based Education (2.0 cr)
- ENED 5625 - Program Development and Evaluation (3.0 cr)
- ENED 5850 - Classroom Applications (2.0 cr)
- ENED 5855 - Programming for School Systems (3.0 cr)
- ENED 5991 - Independent Study (1.0 - 6.0 cr)
- ENED 5998 - Outdoor Education Seminar (1.0 cr)
Psychological Science M.A.

Psychology
College of Education and Human Service Professions

Contact Information:
UMD Psychology
320 BohH D147A
1207 Ordean Court
Duluth, MN 55812
218/726-7808
Email: mapsumd@d.umn.edu
Website: http://cehsp.d.umn.edu/departments-centers/department-psychology/programs/graduate

Program Type: Master's
Requirements for this program are current for Fall 2022
Length of program in credits: 36 to 50
This program requires summer semesters for timely completion.
Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Psychological Science MA program prepares graduate students with research-based knowledge and skills essential to successful careers in organizational, educational, clinical, and counseling settings. The program has three integrated tracks: 1) clinical/counseling psychology; 2) experimental psychology; and 3) industrial-organizational psychology. The degree and research-based preparation of each track should facilitate graduates' admission into doctoral Psychology programs.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A psychology baccalaureate degree from an accredited US institution/foreign equivalent; other majors will be considered if comparable coursework in statistics and research methods has been completed.

Other requirements to be completed before admission:
Applicants must supply:
1. Unofficial transcripts or academic records for each institution attended, including partial or incomplete transcripts. Transcripts should be uploaded directly into the online application system. International students should also upload an English translation if the transcript is not in English.
2. A brief personal statement indicating why an advanced degree in Psychology is of interest and their choice of track
3. Three letters of recommendation
4. Graduate Record Examination verbal and quantitative test scores
5. Documentation of English language proficiency (ELP) is required for any non-native speaker of English, domestic or international.
6. Work sample
7. CV

The departmental deadline for admission is February 15 of the year of admission. Pending available space, applications submitted after the deadline may be considered. Admission to the program is for fall semester only.

Special Application Requirements:
Clinical/Counseling (CC) track applicants:
- Must demonstrate successful completion of an undergraduate abnormal psychology course.
- Should be aware that, if admitted, will undergo a criminal background check before enrolling in internships per University policy.
Experimental Psychology track applicants:
· Are recommended to have previous research experience in a laboratory or through an individual project.

Industrial-Organizational Psychology applicants:
· Are recommended to have passed an introductory industrial/organizational psychology or similar course.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 70
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
• IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan B: Plan B requires 36 to 50 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project comprises an empirical research paper, meta-analysis, or applied project completed in consultation with the advisor.

Plan C: Plan C requires 50 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Courses offered on both the A-F and S/N grading basis must be taken A-F, with a minimum grade of B- earned for each course.

Program Sub-plans

Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Clinical/Counseling
The clinical/counseling track follows the scientist-practitioner model of training through its emphasis on current, empirically based diagnostic and intervention methods and opportunities for students to conduct independent projects. Students will be prepared to work as successful mental health service providers with diverse populations in a variety of settings, or continue on to doctoral-level graduate studies. The curriculum is designed to provide the required coursework and skills training for graduates to be eligible for licensure as Licensed Professional Clinical-Counselors through the Minnesota Board of Behavioral Health and Therapy.

At least 41 graduate-level coursework credits must be earned while enrolled as a degree-seeking student in this master's program.

Clinical/Counseling
Clinical/Counseling is a 50-credit track that can be completed under the Plan B or Plan C option.

Required Coursework (44 credits)
Take the following courses. Take PSY 8197 twice for a total of 6 credits.
PSY 5021 - Advanced Developmental Psychology (3.0 cr)
PSY 5052 - Advanced Statistics I (3.0 cr)
PSY 5120 - Career and Lifestyle Development (2.0 cr)
PSY 5121 - Psychopathology Over the Lifespan (3.0 cr)
PSY 8021 - Research Methods and Evaluation (3.0 cr)
PSY 8097 - Clinical-Counseling Practicum (3.0 cr)
PSY 8103 - Introduction to Graduate Studies (0.0 cr)
PSY 8221 - Individual Adult and Group Therapy/Counseling (3.0 cr)
PSY 8223 - Child, Adolescent, and Family Therapy (3.0 cr)
PSY 8224 - Clinical Treatment Planning (3.0 cr)
PSY 8231 - Assessment I: Foundations and Cognitive Assessment (3.0 cr)
PSY 8232 - Assessment II (3.0 cr)
PSY 8301 - Multicultural Foundations in Clinical/Counseling Psychology (3.0 cr)
PSY 8302 - Ethical and Legal Issues in Therapy and Counseling (3.0 cr)
PSY 8197 - Clinical Counseling Internship (3.0 cr)

Plan Options

Plan B
Research Project (6 credits)
Take 6 credits of the following in consultation with the advisor:
PSY 8099 - Research Project in Psychology (1.0 - 3.0 cr)

-OR-

Plan C
Electives (6 credits)
Select 6 credits in consultation with the advisor.
PSY 5401 - Advanced Social Psychology (3.0 cr)
PSY 5621 - Cognition and Emotion (3.0 cr)
PSY 5631 - Biological Bases of Behavior (3.0 cr)
PSY 5701 - Advanced Personnel Psychology (3.0 cr)
PSY 5702 - Advanced Organizational Psychology (3.0 cr)
PSY 5111 - Advanced Personality Science and Research (3.0 cr)
PSY 5131 - Mind-Body Connection (3.0 cr)
PSY 5130 - Evolutionary Psychology (3.0 cr)
PSY 5155 - Forensic Psychology (3.0 cr)
PSY 5500 - Behavioral Approaches to Worker Wellbeing (3.0 cr)
PSY 8052 - Advanced Statistics II (3.0 cr)
PSY 8991 - Graduate Applied Projects in Psychology (1.0 - 2.0 cr)
SW 5215 - Trauma Informed Social Work Practice with Children and Adolescents (3.0 cr)
SW 5144 - Grief, Loss and Coping in Social Work Practice (3.0 cr)
SW 5280 - Substance Use Trends and Interventions in Social Work (3.0 cr)

Experimental
This sub-plan is limited to students completing the program under Plan B.

Experimental psychology encompasses a variety of experimental research areas within psychology. Our faculty have background and current research interest in:
Behavioral Neuroscience
Cognition
Social psychology
Evolutionary psychology
Perception and action

Graduate students are prepared for doctoral-level programs in various areas of psychology, as well as careers in research and academic instruction.

At least 27 graduate-level coursework credits must be earned while enrolled as a degree-seeking student in this master's program.

Experimental
Experimental is a 36-credit track that is completed under the Plan B option.

Required Coursework (21 credits)
Take the following courses:
PSY 5021 - Advanced Developmental Psychology (3.0 cr)
PSY 5052 - Advanced Statistics I (3.0 cr)
PSY 5401 - Advanced Social Psychology (3.0 cr)
PSY 5621 - Cognition and Emotion (3.0 cr)
Students in the industrial-organizational track will be trained to be evidence-based practitioners and prepared to pursue doctoral-level training. Through coursework spanning the areas of personnel selection, employee motivation, training and development, performance management and evaluation, and organizational change and development, students will be immersed in scientific research in order to acquire the knowledge and skills to solve a variety of workplace issues. Students will apply these skills through applied projects with real organizational clients to prepare for employment in organizational settings.

At least 27 graduate-level coursework credits must be earned while enrolled as a degree-seeking student in this master's program.

Industrial-Organizational
Industrial-Organizational is a 36-credit track that is completed under the Plan B option.

**Required Coursework (24 credits)**
Take the following courses:
- PSY 5052 - Advanced Statistics I (3.0 cr)
- PSY 5701 - Advanced Personnel Psychology (3.0 cr)
- PSY 5702 - Advanced Organizational Psychology (3.0 cr)
- PSY 8021 - Research Methods and Evaluation (3.0 cr)
- PSY 8052 - Advanced Statistics II (3.0 cr)
- PSY 8103 - Introduction to Graduate Studies (0.0 cr)
- PSY 8701 - Performance Evaluation and Management (3.0 cr)
- PSY 8705 - Organizational Systems & Development (3.0 cr)
- PSY 8706 - Personnel Training & Development (3.0 cr)

**Research Project (6 credits)**
Take 6 credits of the following in consultation with the advisor:
- PSY 8099 - Research Project in Psychology (1.0 - 3.0 cr)

**Electives (6 credits)**
Select credits in consultation with the advisor.
- PSY 5021 - Advanced Developmental Psychology (3.0 cr)
- PSY 5120 - Career and Lifestyle Development (2.0 cr)
- PSY 5121 - Psychopathology Over the Lifespan (3.0 cr)
- PSY 5111 - Advanced Personality Science and Research (3.0 cr)
- PSY 5131 - Mind-Body Connection (3.0 cr)
- PSY 5130 - Evolutionary Psychology (3.0 cr)
- PSY 5155 - Forensic Psychology (3.0 cr)
- PSY 5500 - Behavioral Approaches to Worker Wellbeing (3.0 cr)
- PSY 5621 - Cognition and Emotion (3.0 cr)
- PSY 5631 - Biological Bases of Behavior (3.0 cr)
- PSY 8991 - Graduate Applied Projects in Psychology (1.0 - 2.0 cr)
Duluth Campus

Social Work M.S.W.
Social Work
College of Education and Human Service Professions

Link to a list of faculty for this program.

Contact Information:
Department of Social Work, 220 Bohannon Hall, 1207 Ordean Court, Duluth, MN 55812 (218-726-7245; fax: 218-726-7185)
Email: umdsw@d.umn.edu
Website: https://cehsp.d.umn.edu/departments-centers/departments/sw

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 34 to 51
- This program does not require summer semesters for timely completion.
- Degree: Master of Social Work

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Master of Social Work (MSW) program offers an advanced generalist practice curriculum that prepares students to practice in a variety of human service settings. Graduates undertake a variety of professional social work roles ranging from counselor and case manager to community organizer and administrator. The curriculum has a special focus on services with American Indians and their communities. In addition to the 51-credit generalist program, a 34-credit advanced generalist program is available to applicants with a bachelor of social work degree from a program accredited by the Council of Social Work Education. Students can complete additional coursework towards optional emphases in child welfare practice and clinical social work. Completion of the MSW can satisfy most or all of the clinical content hours for licensure.

Accreditation
This program is accredited by the Council of Social Work Education (CSWE).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Bachelor's degree with a solid background in the liberal arts, including courses in cultural studies, and behavioral and social sciences. Social work or degree in related discipline preferred.

Other requirements to be completed before admission:
Applicants must have completed at least:
- 6 semester credits from at least 2 social science disciplines (e.g., sociology, psychology, economics, anthropology, or political science);
- A college-level biology course with content on human anatomical and physiological development -or- a college-level developmental psychology course, with at least a grade of C.
- A college-level statistics course with at least a grade of C.

Applicants can be provisionally admitted before completing the enrollment prerequisites but must show successful completion before beginning MSW courses. Prerequisites cannot be applied to MSW requirements.

Course credits are not awarded for non-academic or professional "life experience."

The following must be submitted through the online application:
a personal statement,
a writing sample,
3 letters of recommendation, and

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Information current as of January 17, 2023
36
Special Application Requirements:
Professional experience in human service settings, particularly when this experience involves working with underrepresented and protected classes, is preferred.

Applicants should be knowledgeable about diverse cultures, social problems and conditions, and the social, psychological, and biological determinants of human behavior. Applicants should show potential to contribute to the social work profession.

Applicants with a Bachelor of Social Work degree from a program accredited by the Council of Social Work Education are eligible for the 34-credit Advanced Generalist program. Advanced Generalist Program students have the option of starting either in the summer or fall semester.

Generalist Program students are admitted in the fall semester only.

International and domestic applicants whose first language is not English must submit scores from one of the following tests.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 34 to 51 major credits and 0 to 6 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semester must be completed before filing a Degree Program Form.

4xxx- or 5xxx-level coursework taken prior to the award of the bachelors degree cannot be applied to MSW degree requirements.

Advanced Generalist

The 34-credit Advanced Generalist program is for students who have earned a Council of Social Work Education-accredited BSW.

Advanced Generalist Concentration Courses (23 credits)

Take the following courses. SW 8802 must be taken for a total of 8 credits.

- SW 8100 - Social Work with Diverse Populations (3.0 cr)
- SW 8102 - Advanced Research (3.0 cr)
- SW 8235 - American Indians and Social Policy (3.0 cr)
- SW 8331 - Organization and Community Practice II (3.0 cr)
- SW 8441 - Individual, Family and Group Practice II (3.0 cr)
- SW 8802 - Field Placement II (3.0 - 8.0 cr)
Advanced Practice Course (3 credits)
Select 1 of the following courses in consultation with the advisor. Students who elect to complete the Child Welfare emphasis must take SW 8031. Students who elect to complete the Mental Health/Clinical emphasis must take SW 8443.
SW 8031 - Advanced Practice in Child Welfare (3.0 cr)
SW 8332 - Advanced Practice in Administration and Community Development (3.0 cr)
SW 8443 - Advanced Practice in Mental Health (3.0 cr)

Advanced American Indian Content Course (2 credits)
Select 1 of the following courses in consultation with the advisor:
SW 8771 - Health in American Indian Communities (2.0 cr)
SW 8881 - Dynamics of American Indian Families (2.0 cr)

Electives (0 to 6 credits)
Advanced Generalist students who do not elect to complete an emphasis select 6 credits in consultation with their advisor to complete the 34-credit minimum.

Generalist
The 51-credit Generalist program is for students without a Council of Social Work Education-accredited BSW.

Generalist Courses (20 credits)
Take the following courses. SW 8801 must be taken for 6 credits.
SW 5101 - Human Behavior in the Social Environment (3.0 cr)
SW 5201 - Social Welfare Policy (3.0 cr)
SW 8101 - Introduction to Research (2.0 cr)
SW 8111 - Individual, Family and Group Practice I (3.0 cr)
SW 8112 - Organization and Community Practice I (3.0 cr)
SW 8801 - Field Placement I (3.0 - 6.0 cr)

Advanced Generalist Concentration Courses (23 credits)
Take the following courses. SW 8802 must be taken for 8 credits.
SW 8100 - Social Work with Diverse Populations (3.0 cr)
SW 8102 - Advanced Research (3.0 cr)
SW 8235 - American Indians and Social Policy (3.0 cr)
SW 8331 - Organization and Community Practice II (3.0 cr)
SW 8441 - Individual, Family and Group Practice II (3.0 cr)
SW 8802 - Field Placement II (3.0 - 8.0 cr)

Advanced Practice Course (3 credits)
Select 1 of the following courses in consultation with the advisor:
SW 8031 - Advanced Practice in Child Welfare (3.0 cr)
SW 8443 - Advanced Practice in Mental Health (3.0 cr)

Advanced American Indian Content Course (2 credits)
Select 1 of the following courses in consultation with the advisor:
SW 8771 - Health in American Indian Communities (2.0 cr)
SW 8881 - Dynamics of American Indian Families (2.0 cr)

Emphases

Child Welfare (7 credits)
Required Courses (5 credits)
Take the following courses:
SW 5032 - Child Welfare and the Law (2.0 cr)
SW 5215 - Trauma Informed Social Work Practice with Children and Adolescents (3.0 cr)

Additional Course (2 credits)
Select 1 of the following in consultation with the advisor:
SW 8771 - Health in American Indian Communities (2.0 cr)
or SW 8881 - Dynamics of American Indian Families (2.0 cr)

Mental Health/Clinical (8 credits)
Required Course (3 credits)
Take the following course:
SW 8070 - Evidence-Based Practice in Clinical Social Work (3.0 cr)

Additional Courses (5 credits)
Select 1 of the following in consultation with the advisor:
SW 5144 - Grief, Loss and Coping in Social Work Practice (3.0 cr)
or SW 5280 - Substance Use Trends and Interventions in Social Work (3.0 cr)
or SW 5500 - Healthcare, Social Work, and Interdisciplinary Care (3.0 cr)
Select 1 of the following in consultation with the advisor:
SW 8771 - Health in American Indian Communities (2.0 cr)
or SW 8881 - Dynamics of American Indian Families (2.0 cr)
Duluth Campus
Social Work Minor
College of Education and Human Service Professions

Link to a list of faculty for this program.

Contact Information:
Department of Social Work, 220 Bohannon Hall, 1207 Ordean Court, Duluth, MN 55812 (218-726-7245)
Email: sw@d.umn.edu
Website: https://cehsp.d.umn.edu/departments-centers/departments/sw

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Master of Social Work (MSW) program offers a concentration in advanced generalist practice that prepares students to practice in a variety of human service settings. Graduates undertake a variety of professional social work roles ranging from counselor and case manager to community organizer and administrator. The curriculum has a special focus on services to American Indians and their communities. Coursework is also available in the area of child welfare, mental health/clinical, and community practice.

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
Special Application Requirements:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Social Work director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

The minimum cumulative GPA for coursework applied to the minor is 3.00.

Minor Coursework (6 to 12 credits)
Master's students select 6 credits and doctoral students select 12 credits from the following in consultation with the advisor and Social Work director of graduate studies. Other courses can be chosen with approval by the Social Work director of graduate studies.

- SW 5032 - Child Welfare and the Law (2.0 cr)
- SW 5095 - Special Topics: (Various Titles to be Assigned) (3.0 cr)
- SW 5051 - School Social Work (3.0 cr)
- SW 5101 - Human Behavior in the Social Environment (3.0 cr)
- SW 5111 - Grant Writing in the Human Services (3.0 cr)
- SW 5120 - Cross-Cultural Exploration Through Learning Circles (1.0 cr)
- SW 5144 - Grief, Loss and Coping in Social Work Practice (3.0 cr)
- SW 5201 - Social Welfare Policy (3.0 cr)
- SW 5215 - Trauma Informed Social Work Practice with Children and Adolescents (3.0 cr)
- SW 5222 - Intervention in Family Violence (3.0 cr)
- SW 5271 - Women and Social Policy (3.0 cr)
- SW 5280 - Substance Use Trends and Interventions in Social Work (3.0 cr)
- SW 5500 - Healthcare, Social Work, and Interdisciplinary Care (3.0 cr)
- SW 8991 - Practice in the American Indian Community (2.0 - 4.0 cr)
Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Duluth Campus
Teaching and Learning Ed.D.
Education
College of Education and Human Service Professions

Link to a list of faculty for this program.

Contact Information:
Department of Education, 412 Library Drive, 150 EduE, Duluth, MN 55812 (218-726-6525; fax: 218-726-7008)
Website: http://cehsp.d.umn.edu/departments-centers/department-education/programs/edd

- Program Type: Doctorate
- Requirements for this program are current for Fall 2022
- Length of program in credits: 76
- This program requires summer semesters for timely completion.
- Degree: Doctor of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students are currently not being accepted into this program. Catalog information is for reference by current students only.

The doctor of education degree (EdD) with a major in teaching and learning is an applied degree for the professional development of P-12, community college, and university faculty and administrators; professionals in other human service professions such as coaching, athletic training, criminal justice, social work, extension, community agency administration, university student personnel; as well as business professionals involved in education and training activities. The mission of the program is to produce scholarly practitioners. The goals of doctoral study in this program are to help students 1) acquire greater content knowledge in teaching and learning; 2) develop abilities for research in the field of teaching and learning; 3) evolve a broadened professional background in areas related to teaching and learning, such as systems and system interactions, and methods for program improvement; and 4) increase levels of cultural competence. Students will be immersed in research on best practices in teaching and learning, and will acquire the skills needed to apply best practices in their own schools and organizations.

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A master's or comparable foreign degree in education or a related field (special education, curriculum and instruction, human development, psychology, social work, management science, criminology).

Other requirements to be completed before admission:
The application must also include three letters of recommendation, a minimum of three work samples (e.g., written reports, articles, presentations, curricula, or other professional artifacts), a personal statement of career objectives, and a personal interview with the EdD teaching and learning admissions committee. The statement of career objectives will be used to 1) evaluate how well this program will meet the needs of the applicant, 2) determine if appropriate concentration courses are available, and 3) conduct an initial evaluation of writing skills. GRE scores will be considered as part of a holistic evaluation of the application. Results of the survey will also be used as part of a holistic evaluation of the application.

Special Application Requirements:
International and domestic applicants whose first language is not English must submit current score(s) from one of the English proficiency tests noted below.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19

**IELTS**
- Total Score: 6.5
- Reading Score: 6.5
- Writing Score: 6.5

**MELAB**
- Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

37 credits are required in the major.
15 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

**Required Coursework (37 credits)**
Select courses in consultation with the advisor to complete the 37-credit requirement.

**Outside Coursework (15 credits)**
Select courses in consultation with the advisor to complete the 15-credit requirement.

**Thesis Credits (24 credits)**
Take 24 doctoral thesis credits.
EDUC 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
**Duluth Campus**

**Business Administration M.B.A.**

*Labovitz School of Business & Economics - Adm*

*Labovitz School of Business and Economics*

Link to a [list of faculty](#) for this program.

**Contact Information:**
Labovitz School of Business and Economics, 219 LSBE, 1318 Kirby Drive, Duluth, MN 55812 (218-726-7440; fax: 218-726-6936)
Email: [LaboMBA@d.umn.edu](mailto:LaboMBA@d.umn.edu)
Website: [http://lsbe.d.umn.edu/mba](http://lsbe.d.umn.edu/mba)

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 32
- This program requires summer semesters for timely completion.
- Degree: Master of Business Administration

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Labovitz Master of Business Administration (MBA) program in Duluth is designed to meet the needs of those who would like to pursue a graduate management education either full-time or part-time. Part-time students can complete all program requirements in two to three years by taking evening courses (6:00 - 8:40 p.m.). Full-time students can finish the program in 12 months by taking a mix of day and evening courses.

The MBA program in Rochester is designed primarily to meet the needs of those who are currently employed full-time in professional managerial careers and who would like to pursue a graduate management education while continuing to work. Courses are offered in Rochester from 3:00-9:00 p.m. on Fridays, and 8:00 a.m.-12:30 p.m. on Saturdays every other week over a period of 7 weeks. It is possible to enroll in the program on a full-time basis by registering for 6 or more credits per semester.

The Labovitz MBA is one of six in the entire state and the only program in Northern Minnesota accredited by the International AACSB. This accreditation means a rigorous review process and ongoing evaluations of faculty qualifications, curriculum, continuous improvement processes, assessment practices, and staff and faculty resources. Only five percent of business schools worldwide are able to achieve this accreditation, which guarantees the MBA meets the highest criteria established by the management education community.

**Accreditation**
This program is accredited by International AACSB

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

All applicants must have an earned bachelor's degree from a regionally or nationally accredited college or university unless applying to the BBA/MBA or BAcc/MBA integrated degree program.

Other requirements to be completed before admission:
- A GMAT or GRE score is required for all applicants except:
  those who submit a copy of Certified Public Accountant (CPA) score reports, issued license or issued certificate with their MBA application;
- are PharmD/MBA Dual Degree Program applicants with PCAT scores at or above the 50th percentile in both Critical Reading and Quantitative Reasoning;
- are graduates of the BBA or BAcc programs from the Labovitz School with a minimum 3.30 GPA;
- are applicants to the BBA/MBA or BAcc/MBA integrated degree program; or
- have earned a prior graduate degree from an accredited institution (see college for specific details).
Demonstrated competence, through completion of online UMD business courses, other undergraduate business coursework, or competency tests in mathematics (at the finite mathematics/precalculus level), statistics, accounting, economics, financial management, human resource management, organizational management, operations management, and marketing.

**Special Application Requirements:**
Applicants submit a current resume, personal statement, and a diversity statement. Letters of recommendation are not required but may be requested by the program.

International and domestic applicants whose first language is not English must provide proof of English language proficiency. Please visit the English Proficiency page for more information: [https://graduate-school.d.umn.edu/prospective-students/applications/english-proficiency-requirements](https://graduate-school.d.umn.edu/prospective-students/applications/english-proficiency-requirements)

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the [General Information](https://graduate-school.d.umn.edu) section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 32 major credits and up to null credits outside the major. There is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

**Core Coursework (20 credits)**

Take the following courses:

- MBA 8111 - Business Ethics (2.0 cr)
- MBA 8211 - Data Analysis and Statistics for Managers (2.0 cr)
- MBA 8311 - Decision Making in Operations (3.0 cr)
- MBA 8412 - Accounting for Decision Making and Control (3.0 cr)
- MBA 8511 - Managerial Economics (2.0 cr)
- MBA 8611 - Financial Management and Decision Making (3.0 cr)
- MBA 8711 - Strategic Marketing Management (3.0 cr)
- MBA 8811 - Human Resource Challenges (2.0 cr)
Capstone Requirement (3 credits)
Take the following course after completing MBA 8311, 8412, 8611, 8711, and 8811:

MBA 8911 - Strategic Management (3.0 cr)

Electives (9 credits)
Select 9 elective credits from the following in consultation with the advisor:
ACCT 5402 - Advanced Business Taxation (3.0 cr)
ACCT 5501 - Advanced Accounting (3.0 cr)
ACCT 5505 - International Accounting (3.0 cr)
ACCT 5600 - Employee Benefit and Retirement Planning (3.0 cr)
BA 5410 - Data Visualization (3.0 cr)
BA 5420 - Data Analytics for Managerial Decision Making (3.0 cr)
BLAW 5301 - Estate Planning Concepts and Strategies (3.0 cr)
CIA 5761 - Fundamental Consumer Analytic Techniques (3.0 cr)
CIA 5762 - Advanced Consumer Analytics (3.0 cr)
ECON 5040 - Econometrics II (3.0 cr)
ECON 5213 - Mathematical Economics (3.0 cr)
ECON 5410 - International Economics (3.0 cr)
ECON 5590 - Economic and Business Forecasting (3.0 cr)
ECON 5613 - Oligopoly and Monopoly (3.0 cr)
FIN 5615 - Derivative Securities (3.0 cr)
FIN 5616 - Security Analysis (3.0 cr)
FIN 5617 - Management of Financial Institutions (3.0 cr)
FIN 5620 - Portfolio Theory and Analysis (3.0 cr)
FIN 5624 - Applied Portfolio Management (3.0 cr)
FIN 5644 - Portfolio Management (3.0 cr)
FIN 5645 - Financial Modeling and Valuation (3.0 cr)
FIN 5646 - Financial Plan Development (3.0 cr)
HCM 5530 - Legal Aspects of and Ethics in Health Care (3.0 cr)
HCM 5550 - Health Care Finance (3.0 cr)
HCM 5570 - Health Care Quality Management (3.0 cr)
HCM 5580 - Health Services Data and Analysis (3.0 cr)
MBA 8910 - Improvisational Theater for Business (1.0 cr)
MBA 8991 - Independent Study (1.0 - 3.0 cr)
MBA 8994 - (Inactive) (1.0 - 6.0 cr)
MBA 8995 - Special Topics: (Various Titles to be Assigned) (1.0 - 3.0 cr)
MGTS 5431 - Leadership Studies (3.0 cr)
MGTS 5463 - Foundations of Sustainable Management (3.0 cr)
MGTS 5472 - Entrepreneurship (3.0 cr)
MGTS 5473 - Management of Innovation and Technology (3.0 cr)
MGTS 5478 - Supply Chain Management (3.0 cr)
MGTS 5821 - Staffing Work Organizations (3.0 cr)
MGTS 5825 - Human Resource Analytics (3.0 cr)
MGTS 5831 - Compensation Systems (3.0 cr)
MGTS 5841 - Training and Development (3.0 cr)
MGTS 5851 - Labor Relations (3.0 cr)
MGTS 5861 - International Human Resource Management (3.0 cr)
MGTS 5871 - Strategic Human Resource Management (3.0 cr)
MGTS 5921 - Entrepreneurial Finance (3.0 cr)
MGTS 5941 - Social Entrepreneurship (3.0 cr)
MIS 5220 - Healthcare Informatics (3.0 cr)
MIS 5225 - Advanced Applications Development (3.0 cr)
MIS 5241 - Data Analytics for Managerial Decision Making (3.0 cr)
MKTG 5710 - Marketing for Non-Profits (3.0 cr)
MKTG 5721 - Advertising and Marketing Communications (3.0 cr)
MKTG 5731 - Consumer Behavior (3.0 cr)
MKTG 5741 - Developing and Marketing New Products (3.0 cr)
MKTG 5774 - International Marketing (3.0 cr)

Joint- or Dual-degree Coursework: PharmD/MBAStudent may take a total of 9 credits in common among the academic programs.

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

**UMD Rochester**

The Labovitz School offers a Part-Time Executive-format MBA option which takes place entirely in Rochester, MN (with some alternative elective course offerings). As noted above, students in this subplan complete their coursework on an alternating weekend schedule over the span of 2-5 years. The majority of students in this program work full time, with average years of work experience being 10. The key benefits of this program format include: high-level face-to-face discussions with a wide variety of industry professionals; a non-cohort format to provide scheduling flexibility; and extensive opportunity to expand a professional network for immediate and future career development.

**Integrated B.B.A/M.B.A.**

The Labovitz School offers an integrated Bachelor of Business Administration (BBA) and Master of Business Administration (MBA) degree on the Duluth campus. The integrated BBA/MBA program offers students the opportunity to earn a bachelor's degree and a master's degree in five years. The integrated program offers several benefits: streamlined admissions from the undergraduate to the graduate program (GMAT not required); and flexibility in fulfilling required courses for both degrees during the senior year (up to 9 credits can be applied to the MBA).

Application is open to UMD BBA undergraduates who:
- are in their junior year; and
- hold a cumulative GPA of 3.30 or higher.

The MBA degree must be started within 5 months of the award of the BBA and must be completed within 1 year. Both the BBA and MBA degrees must be completed in their entirety. The graduate degree cannot be earned before the undergraduate requirements are satisfied.

**Integrated B.Acc./M.B.A.**

The Labovitz School offers an integrated Bachelor of Accounting (BAcc) and Master of Business Administration (MBA) degree on the Duluth campus. The integrated BAcc/MBA program offers students the opportunity to earn a bachelor's degree and a master's degree in five years. The integrated program offers several benefits: streamlined admissions from the undergraduate to the graduate program (GMAT not required); and flexibility in fulfilling required courses for both degrees during the senior year (up to 9 can be applied to the MBA).

Eligibility requirements for the integrated BAcc/MBA program are the same as those noted above for the BBA/MBA.
Duluth Campus

Applied Materials Science M.S.
UMD-Civil Engineering, Dept of
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
109 Swenson Civil Engineering, 1405 University Drive, Duluth, MN 55812  218-726-7810
Email: muchrist@d.umn.edu
Website: https://scse.d.umn.edu/graduate-programs/ms-materials-science

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Materials science and engineering (MSE) is a field that studies the structure, property, processing, and performance of materials. The MS program in Applied Materials Science (AMS) aims to train students to handle, lead, and excel at research and development projects in the field of materials science and technology. Through unique interdisciplinary and practice-oriented teaching, students will be trained for careers in a wide variety of fields such as aerospace, biomedical, and energy. Collaboration with regional industry partners combined with the expertise of instructors will ensure a program that will help our graduates to succeed in their respective careers.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

BA or BS degree in engineering, chemistry, physics, or similar fields; other undergraduate degrees may be accepted with additional coursework required prior to beginning the program.

Other requirements to be completed before admission:
The GRE is optional.

Special Application Requirements:
International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project comprises 3 credits of AMS 5555 completed in consultation with the advisor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Use of independent study or special topics courses toward program requirements is permitted under certain conditions with advisor approval.

Core Requirements (13 credits)

Take the following courses:
- AMS 5101 - Materials Analysis & Design I (4.0 cr)
- AMS 5102 - Materials Analysis and Design Lab I (2.0 cr)
- AMS 5201 - Materials Analysis and Design II (4.0 cr)
- AMS 8099 - Graduate Seminar (1.0 cr)

Electives (7 to 14 credits)

Plan A students select 7 credits, and Plan B students select 14 credits from the following in consultation with the advisor. No more than 6 credits of 4xxx-level coursework can be applied as electives.

- CE 5027 - Advanced Concrete Materials and Repair (3.0 cr)
- CHE 4141 - Material and Minerals Processing (3.0 cr)
- CHE 4142 - Extractive Metallurgy: An Introduction to metals' extraction (3.0 cr)
- CHE 4231 - Solar Energy and Photovoltaics (3.0 cr)
- CHE 5021 - Transport Phenomena (3.0 cr)
- CHE 5121 - Advanced Thermodynamics (3.0 cr)
- CHE 5131 - Polymer Engineering (3.0 cr)
- CHE 5621 - Particle Technology (3.0 cr)
- CHE 5711 - Biomedical Engineering (3.0 cr)
- CHEM 4373 - Physical Biochemistry: Statistical Bio-Thermodynamics (3.0 cr)
- CHEM 4374 - Physical Biochemistry Laboratory (2.0 cr)
- CHEM 5510 - Polymer Chemistry (3.0 cr)
- CHEM 5650 - Computational Chemistry (3.0 cr)
- CHEM 5714 - Applications of Spectroscopy (4.0 cr)
- EE 4611 - Introduction to Solid-State Semiconductors (3.0 cr)
- EE 5621 - Microelectronics Technology (3.0 cr)
- EES 5321 - Theory, Practice of Scanning Electron Microscopy and X-Ray Microanalysis in Lectures (3.0 cr)
- IE 5325 - Advanced Engineering Economics (3.0 cr)
- ME 5220 - Advanced Mechanics of Materials (3.0 cr)
- ME 5315 - Nondestructive Evaluation of Engineering Materials (3.0 cr)
- ME 5345 - Smart Materials and Structures (3.0 cr)
- PHYS 5041 - Optics (3.0 cr)
- PHYS 5531 - Introduction to Solid State Physics (3.0 cr)

Plan Options

Plan A

Thesis Credits
Take 10 master's thesis credits.
- AMS 8777 - Thesis Credits: Master's (1.0 - 10.0 cr)

-OR-

Plan B

Capstone Project (3 credits)
Take 3 project credits.
- AMS 5555 - Applied Materials Science Project Credits (3.0 - 6.0 cr)
Duluth Campus
Chemical Engineering M.S.Ch.E
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
176 Engineering, 1303 Ordean Court, Duluth, MN  55812
218-726-7126
Email: umdche@d.umn.edu
Website: http://www.d.umn.edu/che/

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science in Chemical Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MSChE degree combines scholarship and research in a program oriented towards students and engineering practitioners in the private and public sectors who are interested in advanced coursework and applied research.

Program Delivery
This program is available:
* via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Preferred minimum GPA is 3.00 for engineering courses and 3.25 for science courses. Previous research experience will be considered in the case of applicants with GPAs below the preferred minimum.

Other requirements to be completed before admission:
A BS in chemical engineering or other engineering major from an ABET-accredited institution is required unless applying to the BSChE/MSChE integrated degree program.

Applicants with other undergraduate degrees (e.g., degrees in biology, biochemistry, chemistry, geology, or physics) may be considered but are expected to have knowledge of material and energy balances, heat and mass transfer, fluid mechanics, thermodynamics, chemical reaction engineering, and separations. If necessary, proficiency in these areas will be determined by satisfactory completion of at least 3 undergraduate courses as determined by the advisor and program of study committee, which must be completed prior to the start of the MSChE. Additional courses may include ChE 2111, ChE 2121, ChE 3111, ChE 3112, ChE 4111, ChE 4301.

Special Application Requirements:
The GRE is not required.

International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
Program Requirements

Plan A: Plan A requires 14 to 20 major credits, 0 to 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 to 30 major credits and 0 to 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project requires a minimum of 3 credits of CHE 5555 completed in consultation with the advisor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

Only 6 elective credits may be taken at the 4xxx level. All other courses must be taken at the 5xxx level or higher. Students in the integrated BSChE/MSChE sub-plan may not apply any 4xxx credits to the MSChE degree.

Core Courses (8 credits)
Take the following courses. Take CHE 8150 for a total of 2 credits.
CHE 5021 - Transport Phenomena (3.0 cr)
CHE 5031 - Chemical Engineering Analysis (3.0 cr)
CHE 8150 - Seminar (1.0 cr)

Electives (12 to 19 credits)
Plan A students select 12 credits and Plan B students select 19 credits from the following in consultation with the advisor. Other courses can be selected with advisor and director of graduate studies approval.
CHE 5011 - Process Optimization: Lean Six Sigma (3.0 cr)
CHE 5121 - Advanced Thermodynamics (3.0 cr)
CHE 5131 - Polymer Engineering (3.0 cr)
CHE 5301 - Advanced Chemical Reactor Design (3.0 cr)
CHE 5601 - Biochemical Engineering I (3.0 cr)
CHE 5612 - Hazardous Waste Process Engineering (3.0 cr)
CHE 5621 - Particle Technology (3.0 cr)
CHE 5701 - Biochemical Engineering II (3.0 cr)
CHE 5711 - Biomedical Engineering (3.0 cr)
CHE 5991 - Graduate Independent Study in Chemical Engineering (1.0 - 3.0 cr)
CHE 5995 - Special Topics in Chemical Engineering: (Various Titles to be Assigned) (1.0 - 4.0 cr)

Plan Options

Plan A
Thesis Credits
Take 10 master's thesis credits.
CHE 8777 - Thesis Credits: Master's (1.0 - 10.0 cr)

-OR-

Plan B
Plan B Project (3 credits)
Take a minimum of 3 credits of the following in consultation with the advisor:
CHE 5555 - Project Credits: MEng - Chemical Engineering (3.0 - 6.0 cr)
Program Sub-plans
A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

Integrated B.S.Ch.E./M.S.Ch.E
The Swenson College of Science and Engineering offers an integrated Bachelor of Science in Chemical Engineering (BSChE) and Master of Science in Chemical Engineering (MSChE) degree. The integrated BSChE/MSChE program offers students the opportunity to earn a bachelor’s degree and a master’s degree in five years. The integrated program offers several benefits: streamlined admissions from the undergraduate to the graduate program and flexibility in fulfilling required courses for both degrees during the senior year (up to 9 credits of approved 5000-level courses can be applied to the MSChE).

Eligibility requirements for the integrated program:

Application is open to UMD BSChE students who
- are within 32 credits of completing the requirements for the bachelors degree;
- have a MSChE faculty advisor selected prior to admission; and
- hold a cumulative GPA of 3.30 or higher.

Both the BSChE and MSChE degrees must be completed in their entirety. The graduate degree cannot be earned before the undergraduate requirements are satisfied.
**Duluth Campus**

**Chemistry M.S.**

*Chemistry and Biochemistry*

**Swenson College of Science and Engineering**

Link to a list of faculty for this program.

**Contact Information:**
Department of Chemistry and Biochemistry, 246 Chemistry Building, 1039 University Drive, Duluth MN 55812 (218-726-7212; fax: 218-726-7394)
Email: umdchem@d.umn.edu
Website: [http://www.d.umn.edu/chem/graduates/](http://www.d.umn.edu/chem/graduates/)

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Chemistry MS offers a broad-based education in chemistry that is well suited for students going on to doctoral programs, careers in industry, or professional schools.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have completed an undergraduate chemistry or biochemistry major. Coursework should include inorganic chemistry, physical chemistry, calculus, and physics.

The General GRE is not required, but is encouraged for international applicants and optional for domestic (US) applicants. There is no minimum score required for international applicants.

**Special Application Requirements:**
Applications are accepted on a rolling basis, with a priority deadline of January 7. Students are primarily admitted only for fall semester, but spring admission is an option in special circumstances.

International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B requires completing two (4 credits of CHEM 8094) or three (6 credits of CHEM 8094) small projects in the major and/or related fields, and presenting the projects in an oral defense. Projects can be research papers, proposals, outreach, education, or laboratory projects and should be approved by the advisor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

Courses offered on both the A-F and S/N grading basis must be taken A-F.

Approval by the director of graduate studies is required for 4xxx-level coursework.

Chemistry Seminars (2 credits)
The following courses are required for both Plan A and Plan B students:
CHEM 8099 - Introductory Graduate Seminar (1.0 cr)
CHEM 8184 - Seminar (1.0 cr)

Coursework (18 to 28 credits)
Plan A students select 18 credits and Plan B students select 28 credits from the following in consultation with the advisor. Up to 6 credits outside the major field, or other courses inside the major field, may be chosen with approval of the advisor and director of graduate studies.
CHEM 5242 - Instrumental Analysis (3.0 cr)
CHEM 5212 - Advanced Environmental Chemistry (3.0 cr)
CHEM 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
CHEM 5373 - Physical Biochemistry: Statistical Bio-Thermodynamics (3.0 cr)
CHEM 5424 - Advanced Inorganic Chemistry I (3.0 cr)
CHEM 5510 - Polymer Chemistry (3.0 cr)
CHEM 5524 - Advanced Organic Chemistry I (3.0 cr)
CHEM 5624 - Advanced Physical Chemistry I (3.0 cr)
CHEM 5650 - Computational Chemistry (3.0 cr)
CHEM 5659 - Fluorescence Methods in Life Science (3.0 cr)
CHEM 5714 - Applications of Spectroscopy (4.0 cr)
CHEM 5725 - Advanced Analytical Chemistry I (3.0 cr)
CHEM 5795 - Special Topics in Chemistry: (Various Titles to be Assigned) (1.0 - 4.0 cr)
CHEM 8224 - Advanced Analytical Chemistry II (4.0 cr)
CHEM 8424 - Advanced Inorganic Chemistry II (4.0 cr)
CHEM 8524 - Advanced Organic Chemistry II (4.0 cr)
CHEM 8720 - Modern Mass Spectrometry (3.0 cr)
IBS 8101 - Cellular Biochemistry (3.0 cr)
IBS 8102 - Cell, Molecular and Developmental Biology (3.0 cr)
IBS 8202 - Chemical Biology (3.0 cr)
IBS 8203 - Methods in Molecular Biosciences (2.0 cr)
LIM 5102 - Chemical Limnology (3.0 cr)
CE 5241 - Water Chemistry (3.0 cr)
PHAR 6722 - Principles of Medicinal Chemistry (2.1 cr)

Plan Options

Plan A
Take 10 master's thesis credits.
CHEM 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Take 4 or 6 project credits.
CHEM 8094 - Plan B Project Credits (1.0 - 6.0 cr)
Duluth Campus

Chemistry Minor

Chemistry and Biochemistry
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Chemistry and Biochemistry, 126 HCAMS, 1038 University Drive, Duluth, MN 55812 (218-726-7212; fax: 218-726-7394)
Email: umdchem@d.umn.edu
Website: http://www.d.umn.edu/chem/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Chemistry graduate minor offers education in chemistry that is well suited for students seeking additional Chemistry education to complement their graduate studies in a different field.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Chemistry director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Courses applied to the minor must be approved by the Chemistry director of graduate studies.

Courses offered on both the A-F and S/N grading basis must be taken A-F, with a minimum grade of B earned for each.

The minimum cumulative GPA for courses applied to the minor is 3.0.

Minor Coursework (6 to 12 credits)
Master's students select 6 credits, and doctoral students select 12 credits in consultation with the Chemistry director of graduate studies. Other courses can be chosen with approval of the Chemistry director of graduate studies

CHEM 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
CHEM 5212 - Advanced Environmental Chemistry (3.0 cr)
CHEM 5242 - Instrumental Analysis (3.0 cr)
CHEM 5373 - Physical Biochemistry: Statistical Bio-Thermodynamics (3.0 cr)
CHEM 5424 - Advanced Inorganic Chemistry I (3.0 cr)
CHEM 5510 - Polymer Chemistry (3.0 cr)
CHEM 5524 - Advanced Organic Chemistry I (3.0 cr)
CHEM 5650 - Computational Chemistry (3.0 cr)
CHEM 5659 - Fluorescence Methods in Life Science (3.0 cr)
CHEM 5714 - Applications of Spectroscopy (4.0 cr)
CHEM 5725 - Advanced Analytical Chemistry I (3.0 cr)
CHEM 5795 - Special Topics in Chemistry: (Various Titles to be Assigned) (1.0 - 4.0 cr)
CHEM 8224 - Advanced Analytical Chemistry II (4.0 cr)
CHEM 8424 - Advanced Inorganic Chemistry II (4.0 cr)
CHEM 8524 - Advanced Organic Chemistry II (4.0 cr)
CHEM 8720 - Modern Mass Spectrometry (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Duluth Campus
Civil Engineering M.S.
UMD-Civil Engineering, Dept of
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
221 Swenson Civil Engineering, 1405 University Drive, Duluth, Minnesota, MN 55812 (218-726-6444; fax: 218-726-6445)
Email: civileng@d.umn.edu.
Website: http://www.d.umn.edu/civileng/grad/index.html

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of science (MS) in Civil Engineering is typically a two-year program that provides students with in-depth knowledge in a sub-discipline within Civil Engineering. Sub-disciplines are Structural Engineering, Transportation Engineering, Geotechnical Engineering, Materials Engineering, Environmental and Water Resources Engineering. The Plan A track is intended for students working closely with a faculty member pursuing a research emphasis on a specific thesis topic. The Plan B track is more heavily focused on coursework with a final capstone-style project.

Integrated Degree Program (IDP): UMD undergraduate students who are admitted into the IDP program can apply up to 9 credits of approved coursework to both their undergraduate (BSCE) and graduate (MS) degrees. Students must be admitted to the IDP program prior to taking courses that count toward the graduate degree. Students must apply to the IDP program at least two semesters before completing their BSCE degree. It is expected that students in the IDP program will complete a thesis-based (Plan A) MS degree Application deadlines for IDP: October 15th for Spring admission or April 15th for Fall admission.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have earned a BS degree in engineering (e.g., civil, mechanical, chemical, environmental) or the sciences (e.g., chemistry, physics, mathematics).

Other requirements to be completed before admission:
The MS program is designed for students with undergraduate degrees in Civil Engineering or another engineering discipline. These students should be able to enroll immediately in Civil Engineering 5xxx courses. Students with undergraduate degrees in science disciplines (e.g., physics, chemistry, math) may require additional prerequisite coursework, some of which can be taken concurrently with graduate courses.

Students should consult with the CE director of graduate studies or a faculty member in their subdiscipline for a review and assessment of their specific academic background and prerequisite coursework needs. Students with undergraduate degrees in fields other than engineering should expect to complete several UMD courses (or their equivalents) prior to enrollment.

Special Application Requirements:
Applicants should submit the following materials with their application: Personal Statement (Education and Career Goals, limit one page);
Diversity Statement (Statement of Purpose, limit one page);
CV or resume (list technical publications and conference presentations); Unofficial transcripts;
Two letters of recommendation (waived for current UMD CE undergraduate students, unless applying to the integrated degree program).
To be considered for financial support, graduate school applications are due January 5 for the following fall semester and May 31 for the following spring semester. Domestic applicants applying for part-time study who do not require financial support are able to apply as late as April 15 for the following fall semester and October 15 for the following spring semester but are still encouraged to apply by the above earlier deadlines.

Submission of GRE scores is optional.

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A**: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B**: Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project**: Courses and a project are arranged by the student and department adviser.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

The MS Plan A is intended for students pursuing a research emphasis and seeking in-depth knowledge in an area within civil engineering. Degree requirements include the completion of an original body of work resulting from research conducted by the student under the supervision of an advisory committee of graduate faculty members. The MS Plan A requires 20 credits of coursework and 10 thesis credits (approximately 600 hours of work including writing of the thesis), usually completed within two years.

The MS Plan B is intended to provide additional training to prepare students for a higher level of engineering design work. The degree is more coursework focused with a capstone project arranged by the student and department adviser. The MS Plan B requires 26 credits of coursework and 4 project credits (approximately 240 hours of work, including writing of the project report), usually completed within one to two years.

CE 4126 and CE 4255 (or their equivalent) cannot be counted toward a MS degree.

Students may use up to 6 approved 4xxx credits towards program requirements. Students in the integrated BSCE/MS sub-plan may not apply any 4xxx credits to the MS degree.

**Required Coursework**

Select from the following courses in consultation with the advisor and director of graduate studies to meet the minimum degree requirements. Other courses may be chosen with advisor and director of graduate studies approval.

- **CE 4131** - Design of Wood and Masonry Structures (3.0 cr)
- **CE 5027** - Advanced Concrete Materials and Repair (3.0 cr)
- **CE 5115** - Structural Dynamics (3.0 cr)
- **CE 5116** - Seismic Design and Analysis (3.0 cr)
- **CE 5127** - Bridge Analysis and Design (3.0 cr)
- **CE 5128** - Prestressed Concrete Structures (3.0 cr)
Plan Options

Plan A
Students must take CE 8777 for a minimum of 10 credits.
CE 8777 - Thesis Credits: Master's (1.0 - 12.0 cr)

-OR-

Plan B
Students must take CE 8094 for a minimum of 4 credits.
CE 8094 - Civil Engineering Master's Project (1.0 - 6.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Integrated Civil Engineering BSCE/Civil Engineering MS
The Swenson College of Science and Engineering offers an integrated Bachelor of Science in Civil Engineering (Civil Engineering BSCE) and Master of Science in Civil Engineering (Civil Engineering MS) degree. The integrated BSCE/MS program offers students the opportunity to earn a bachelor's degree and a master's degree in five years. The integrated program offers several benefits: streamlined admissions from the undergraduate to the graduate program and flexibility in fulfilling required courses for both degrees during the senior year (up to 9 credits can be applied to the MS).

Eligibility requirements for the integrated degree program:

Application is open to UMD Civil Engineering BSCE students who
· apply at least two semesters before completing the BSCE degree;
· hold a minimum cumulative GPA of 3.35; and
· provide letters of recommendation from two Civil Engineering faculty members.

It is expected that students in the integrated degree program will complete a thesis-based (Plan A) MS degree.

Both the Civil Engineering BSCE and Civil Engineering MS degrees must be completed in their entirety. The graduate degree cannot be earned before the undergraduate requirements are satisfied.
Duluth Campus

Computer Science M.S.

Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Computer Science, University of Minnesota Duluth, 1114 Kirby Drive, 320 Heller Hall, Duluth, MN 55812 (218-726-7607; fax: 218-726-8240)
Email: cs@d.umn.edu
Website: https://scse.d.umn.edu/about/departments-and-programs/computer-science-department/graduate-programs

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30 to 32
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Computer science is a discipline that involves understanding the design of computers and computational processes. Study in the field ranges from the theoretical study of algorithms to the design and implementation of software at the systems and applications levels.

The Master of Science is a 2-year program that provides the necessary foundational studies for graduates planning to pursue either a doctorate in computer science or a career as a computer scientist in business or industry.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

The program is designed for students with undergraduate degrees in computer science or a related field.

Other requirements to be completed before admission:
Students with undergraduate degrees in fields other than computer science or related areas may be considered for admittance if they have completed the following courses or their equivalents: CS 1511-1521 - Computer Science I-II; CS 2511 - Software Analysis and Design; CS 2521 - Computer Organization and Architecture; MATH 3355 - Discrete Mathematics or CS 2531 - Discrete Structures for Computer Science; CS 3531 Automata & Formal Languages; and at least three of CS 4312 - Operating Systems, CS 4332 - Computer Security, CS 4422 - Computer Networks, CS 4122 - Advanced Data Structures and Algorithms, CS 4212 - Computer Graphics, CS 4322 - Database Management Systems. The appropriate math prerequisites, namely MATH 1296 - Calculus I and STAT 3611 - Introduction to Probability and Statistics, are also required.

Special Application Requirements:
Admission is for fall semester only.

International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80
Key to test abbreviations (GRE, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 32 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project, completed in consultation with the advisor, comprises significant programming research. The project is often based on an extended 5XXX-level course assignment.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Computer Science Coursework (12 credits)

Select 12 credits from the following in consultation with the advisor:

- CS 5112 - Advanced Theory of Computation (4.0 cr)
- CS 5122 - Advanced Algorithms and Data Structures (4.0 cr)
- CS 5212 - Computer Graphics (4.0 cr)
- CS 5222 - Artificial Intelligence (4.0 cr)
- CS 5232 - Introduction to Machine Learning and Data Mining (4.0 cr)
- CS 5242 - Natural Language Processing (4.0 cr)
- CS 5312 - Operating Systems (4.0 cr)
- CS 5322 - Database Management Systems (4.0 cr)
- CS 5332 - Computer Security (4.0 cr)
- CS 5342 - Compiler Design (4.0 cr)
- CS 5412 - Computer Architecture (4.0 cr)
- CS 5422 - Computer Networks (4.0 cr)
- CS 5432 - Sensors and Internet of Things (4.0 cr)
- CS 5642 - Advanced Natural Language Processing (4.0 cr)
- CS 5732 - Advanced Computer Security (4.0 cr)

Graduate Seminar (2 credits)

Take 1 credit the first fall semester, and 1 credit the second fall semester of the following:

- CS 8993 - Seminar (1.0 cr)

Electives (6 credits)

Select 6 credits from the following in consultation with the advisor. Other 5xxx-level or higher coursework can be chosen with approval of the advisor and director of graduate studies.

- CHE 5011 - Process Optimization: Lean Six Sigma (3.0 cr)
- CS 5732 - Advanced Computer Security (4.0 cr)
- CS 5995 - Special Topics: (Various Titles to be Assigned) (1.0 - 4.0 cr)
- EDSE 5000 - Introduction to Post-Secondary Teaching (2.0 cr)
- EDUC 5413 - Teaching With Technology (4.0 cr)
- EDUC 7002 - Diversity and Social Justice (3.0 cr)
- EE 5151 - Digital Control System Design (3.0 cr)
- EE 5161 - Linear State-Space Control Systems (3.0 cr)
- EE 5311 - Design of VLSI Circuits (4.0 cr)
- EE 5315 - Multiprocessor-Based System Design (3.0 cr)
- EE 5351 - Introduction to Robotics and Mobile Robot Control Architectures (3.0 cr)
- EE 5477 - Antennas and Transmission Lines (3.0 cr)
- EE 5479 - Antennas and Transmission Lines Laboratory (1.0 cr)
- EE 5501 - Energy Conversion System (3.0 cr)
- EE 5522 - Power Electronics I (3.0 cr)
- EE 5533 - Grid- Resiliency, Efficiency and Technology (3.0 cr)
- EE 5621 - Microelectronics Technology (3.0 cr)
- EE 5741 - Digital Signal Processing (3.0 cr)
- EE 5745 - Medical Imaging (3.0 cr)
Plan Options

Plan A
Thesis Credits
Take 10 master's thesis credits.
CS 8777 - Thesis Credits: Master's (1.0 - 24.0 cr)

-OR-

Plan B
Plan B Project (4 credits)
Take 4 credits of the following in consultation with the advisor:
CS 8794 - Project Credits: Master's (1.0 - 4.0 cr)

Additional Coursework (8 credits)
Select 8 credits from the lists above in consultation with the advisor to complete the 32-credit requirement. Other courses can be chosen with advisor approval.
Duluth Campus

Computer Science Minor

Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Computer Science, 1114 Kirby Drive, 320 Heller Hall, Duluth, MN 55812 (218-726-7607; fax: 218-726-8240)
Email: cs@d.umn.edu
Website: http://www.d.umn.edu/cs/degrees/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Computer science is a discipline that involves understanding the design of computers and computational processes. Study in the field ranges from the theoretical study of algorithms to the design and implementation of software at the systems and applications levels.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Computer Science director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The minimum cumulative GPA for minor field coursework is 3.00.

Minor Coursework (8 to 12 credits)
Masters students select 8 credits, and doctoral students select 12 credits from the following in consultation with the Computer Science director of graduate studies:

- CS 5112 - Advanced Theory of Computation (4.0 cr)
- CS 5122 - Advanced Algorithms and Data Structures (4.0 cr)
- CS 5212 - Computer Graphics (4.0 cr)
- CS 5222 - Artificial Intelligence (4.0 cr)
- CS 5232 - Introduction to Machine Learning and Data Mining (4.0 cr)
- CS 5242 - Natural Language Processing (4.0 cr)
- CS 5312 - Operating Systems (4.0 cr)
- CS 5322 - Database Management Systems (4.0 cr)
- CS 5332 - Computer Security (4.0 cr)
- CS 5342 - Compiler Design (4.0 cr)
- CS 5412 - Computer Architecture (4.0 cr)
- CS 5422 - Computer Networks (4.0 cr)
- CS 5432 - Sensors and Internet of Things (4.0 cr)
CS 5642 - Advanced Natural Language Processing (4.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Duluth Campus
Earth Sciences M.S.
D Earth & Environmental Sci
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Earth and Environmental Sciences, University of Minnesota Duluth, 230A Heller Hall, 1114 Kirby Drive, Duluth, MN 55812 (218-726-8385; fax: 218-726-8275)
Email: dees@d.umn.edu
Website: https://scse.d.umn.edu/about/departments-and-programs/earth-environmental-sciences

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Earth Sciences MS program includes areas of environmental geoscience, economic geology, geophysics, glacial geology and geomorphology, hydrology, hydrogeology, igneous and metamorphic petrology, isotope and aqueous geochemistry, limnogeology, paleoclimatology, planetary geology, sedimentology and stratigraphy, surface processes, and structure-tectonics. Several of these areas are strengthened by collaboration with the Large Lakes Observatory and the Natural Resources Research Institute.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A four-year BS or BA degree in geology, Earth science, or a related field in engineering, basic science, or mathematics is required.

Other requirements to be completed before admission:
Most candidates will have completed a bachelor's degree in Earth science, environmental science, geology, geophysics, or a related field. However, students with degrees in fields such as chemistry, physics, or biology are encouraged to apply. At least one year of study in calculus, chemistry, and physics is required. Field camp and/or undergraduate research experience is recommended.

Special Application Requirements:
International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

**Plan A:** Plan A requires 15 to 21 major credits, 0 to 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 25 to 31 major credits and 0 to 6 credits outside the major. The final exam is written. A capstone project is required.

**Capstone Project:** The capstone project is completed in consultation with the advisor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Coursework offered on both the A-F and S/N grading basis must be taken A-F.

**Required Course (1 credit)**
Take the following course:

- **EES 8200** - Professional Issues in Earth and Environmental Science (1.0 cr)

**Major Electives (14 to 24 credits)**
Plan A students select at least 14 credits, and Plan B students select at least 24 credits from the following in consultation with the advisor:

- **EES 4102** - Environmental Assessment (3.0 cr)
- **EES 4180** - Teaching Assistant Experience (1.0 - 2.0 cr)
- **EES 4201** - Watershed Hydrology (3.0 cr)
- **EES 4250** - Environmental Applications in Hydrology & Hydrogeology (4.0 cr)
- **EES 4270** - Field Methods in Snow Hydrology (1.0 cr)
- **EES 4280** - Principles of Soil Science (3.0 cr)
- **EES 4311** - Igneous Petrogenesis (3.0 cr)
- **EES 4355** - Economic Geology (4.0 cr)
- **EES 4356** - Ore Deposits and Economic Geology (3.0 cr)
- **EES 4360** - Geologic, Geophysical, and Geochemical Methods of Exploration (4.0 cr)
- **EES 4400** - Astrogeology (3.0 cr)
- **EES 4450** - Structural Geology (4.0 cr)
- **EES 4500** - Field Geology (6.0 cr)
- **EES 4550** - TectonicGeomorphology (3.0 cr)
- **EES 4710** - Geochemistry (4.0 cr)
- **EES 4800** - Principles of Geophysics (4.0 cr)
- **EES 4839** - Coral Reef Geology [GLOBAL PER] (3.0 cr)
- **EES 4863** - Ecosystems Ecology and Biogeochemistry (3.0 cr)
- **EES 5095** - Earth & Environmental Special Topics (Various Titles to be Assigned) (1.0 - 3.0 cr)
- **EES 5100** - Seminar (1.0 - 2.0 cr)
- **EES 5103** - Geological Paleolimnology (3.0 cr)
- **EES 5150** - Organic and Stable Isotope Biogeochemistry (3.0 cr)
- **EES 5201** - Watershed Hydrology (3.0 cr)
- **EES 5210** - Glacial and Quaternary Geology (4.0 cr)
- **EES 5250** - Hydrogeology (4.0 cr)
- **EES 5260** - Well Hydraulics (3.0 cr)
- **EES 5270** - Fluvial Geomorphology (3.0 cr)
- **EES 5270** - Field Methods in Snow Hydrology (1.0 cr)
- **EES 5310** - Advanced Petrology (3.0 cr)
- **EES 5311** - Igneous Petrogenesis (3.0 cr)
- **EES 5321** - Theory, Practice of Scanning Electron Microscopy and X-Ray Microanalysis in Lectures (3.0 cr)
- **EES 5355** - Economic Geology (4.0 cr)
- **EES 5356** - Ore Deposits and Economic Geology (3.0 cr)
- **EES 5360** - Geologic, Geophysical, and Geochemical Methods of Exploration (4.0 cr)
- **EES 5400** - Astrogeology (3.0 cr)
- **EES 5450** - Structural Geology (5.0 cr)
- **EES 5460** - Tectonics (3.0 cr)
- **EES 5601** - Introduction to Stream Restoration (3.0 cr)
EES 5603 - Stream Crossing Design (2.0 cr)
EES 5711 - Geochemistry (4.0 cr)
EES 5730 - Geochronology (3.0 cr)
EES 5815 - Exploration Geophysics (4.0 cr)
EES 5820 - Global Geophysics (3.0 cr)
EES 5863 - Ecosystems Ecology and Biogeochemistry (3.0 cr)
EES 8094 - Research in Earth & Environmental Science (1.0 - 6.0 cr)
EES 8200 - Professional Issues in Earth and Environmental Science (1.0 cr)
EES 8602 - Stream Restoration Practice (2.0 cr)

Additional Coursework (0 to 6 credits)
Select additional credits as needed to meet minimum course credit requirements, in consultation with the advisor.

Plan Options

Plan A
Thesis Credits
Take 10 masters thesis credits.

EES 8777 - Thesis Credit: Master's (1.0 - 10.0 cr)
Duluth Campus
Earth Sciences Minor
D Earth & Environmental Sci
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Earth and Environmental Sciences, University of Minnesota Duluth, 230 Heller Hall, 1114 Kirby Drive, Duluth, MN 55812
(218-726-8385; fax: 218-726-8275)
Email: dees@d.umn.edu
Website: https://scse.d.umn.edu/about/departments-and-programs/earth-environmental-sciences

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Earth Sciences minor includes areas of economic geology, geophysics, glacial geology and geomorphology, hydrogeology, igneous and metamorphic petrology, isotope and aqueous geochemistry, limnogeology, paleoclimatology, planetary geology, sedimentology and stratigraphy, surface processes, forest/vadose zone hydrology, and structure-tectonics. Several of these areas are strengthened by collaboration with the Large Lakes Observatory and the Natural Resources Research Institute.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Earth Sciences director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Minor coursework offered on both the A-F and S/N grading basis must be taken A-F.

Coursework (6-12 credits)
Masters students select 6 credits, and doctoral students select 12 credits in consultation with the Earth Sciences director of graduate studies
- EES 5091 - Independent Study in Earth & Environmental Science (1.0 - 2.0 cr)
- EES 5095 - Earth & Environmental Special Topics (Various Titles to be Assigned) (1.0 - 3.0 cr)
- EES 5100 - Seminar (1.0 - 2.0 cr)
- EES 5103 - Geological Paleolimnology (3.0 cr)
- EES 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
- EES 5201 - Watershed Hydrology (3.0 cr)
- EES 5210 - Glacial and Quaternary Geology (4.0 cr)
- EES 5250 - Hydrogeology (4.0 cr)
- EES 5251 - Well Hydraulics (3.0 cr)
- EES 5260 - Fluvial Geomorphology (3.0 cr)
- EES 5270 - Field Methods in Snow Hydrology (1.0 cr)
- EES 5310 - Advanced Petrology (3.0 cr)
EES 5311 - Igneous Petrogenesis (3.0 cr)
EES 5321 - Theory, Practice of Scanning Electron Microscopy and X-Ray Microanalysis in Lectures (3.0 cr)
EES 5355 - Economic Geology (4.0 cr)
EES 5356 - Ore Deposits and Economic Geology (3.0 cr)
EES 5360 - Geologic, Geophysical, and Geochemical Methods of Exploration (4.0 cr)
EES 5400 - Astrogeology (3.0 cr)
EES 5450 - Structural Geology (5.0 cr)
EES 5460 - Tectonics (3.0 cr)
EES 5601 - Introduction to Stream Restoration (3.0 cr)
EES 5603 - Stream Crossing Design (2.0 cr)
EES 5711 - Geochemistry (4.0 cr)
EES 5730 - Geochronology (3.0 cr)
EES 5815 - Exploration Geophysics (4.0 cr)
EES 5820 - Global Geophysics (3.0 cr)
EES 5863 - Ecosystems Ecology and Biogeochemistry (3.0 cr)
EES 8094 - Research in Earth and Environmental Science (1.0 - 6.0 cr)
EES 8200 - Professional Issues in Earth and Environmental Science (1.0 cr)
EES 8602 - Stream Restoration Practice (2.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

Doctoral
Duluth Campus
Electrical Engineering M.S.E.E.
Swenson College of Science and Engineering

Link to a [list of faculty](#) for this program.

**Contact Information:**
EE Graduate Program, 271 MWAH, 1023 University Drive, Duluth, MN 55812 (218-726-6830; fax: 218-726-7267)
Email: umdee@d.umn.edu
Website: http://www.d.umn.edu/ee/

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Science in Electrical Engineering

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Master of Science in Electrical Engineering (MSEE) combines scholarship and research in a program oriented toward students and engineering practitioners in the private and public sectors who are interested in advanced coursework and applied research. The program focuses on the departmental faculty's research areas of control systems, communications, signal processing, VLSI, nanoscale optoelectronics and photovoltaics, biomedical engineering, and intelligent transportation systems.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

An undergraduate degree in electrical engineering, computer engineering, or computer science. Applicants from related majors can apply but may be required to take additional undergraduate courses.

**Special Application Requirements:**

The GRE is not required.

International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- **MELAB**
  - Final score: 80

Key to [test abbreviations](#) (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.
Program Requirements

**Plan A:** Plan A requires 21 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 31 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** The Plan B project comprises 1 to 3 credits of EE 8222, completed in consultation with the advisor. Students are encouraged to collaborate with an industrial counterpart.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Courses offered on both the A-F and S/N grading basis must be taken A-F.

The MSEE requires at least 3 8xxx-level course credits (excluding EE 8001 and EE 8222).

A maximum of 6 4xxx-level course credits can be applied to degree requirements. Students in the integrated BSEE/MSEE sub-plan may not apply any 4xxx credits to the MSEEE degree.

Coursework

**Required Course (1 credit)**
Take the following course:
EE 8001 - Graduate Professional Communication Seminar (1.0 cr)

**Additional Courses (20 to 29 credits)**
Plan A students select 20 credits and Plan B students select 27 to 29 credits from the following in consultation with the advisor. Other courses can be selected with approval by the advisor and director of graduate studies.
EE 4305 - Computer Architecture (4.0 cr)
EE 4321 - Computer Networks (3.0 cr)
EE 4341 - Digital Systems (4.0 cr)
EE 4501 - Power Systems (4.0 cr)
EE 4611 - Introduction to Solid-State Semiconductors (3.0 cr)
EE 4896 - Co-op in Electrical Engineering (1.0 cr)
EE 5151 - Digital Control System Design (3.0 cr)
EE 5161 - Linear State-Space Control Systems (3.0 cr)
EE 5311 - Design of VLSI Circuits (4.0 cr)
EE 5315 - Multiprocessor-Based System Design (3.0 cr)
EE 5477 - Antennas and Transmission Lines (3.0 cr)
EE 5479 - Antennas and Transmission Lines Laboratory (1.0 cr)
EE 5501 - Energy Conversion System (3.0 cr)
EE 5522 - Power Electronics I (3.0 cr)
EE 5533 - Grid- Resiliency, Efficiency and Technology (3.0 cr)
EE 5621 - Microelectronics Technology (3.0 cr)
EE 5741 - Digital Signal Processing (3.0 cr)
EE 5745 - Medical Imaging (3.0 cr)
EE 5765 - Modern Communication (4.0 cr)
EE 5801 - Introduction to Artificial Neural Networks (3.0 cr)
EE 5995 - Special Topics: (Various Titles to be Assigned) (1.0 - 3.0 cr)
EE 8151 - Optimal Control Systems (3.0 cr)
EE 8741 - Digital Image Processing (4.0 cr)
EE 8765 - Digital Communications (3.0 cr)

**Plan Options**

**Thesis Credits**
Take 10 master's thesis credits.
EE 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-
Plan B
Project Credits (1 to 3 credits)
Take 1 to 3 credits of the following in consultation with the advisor:
EE 8222 - Master's Plan B Research and Design Project (1.0 - 3.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Integrated B.S.E.E./M.S.E.E
The Swenson College of Science and Engineering offers an integrated Bachelor of Science in Electrical Engineering (BSEE) and Master of Science in Electrical Engineering (MSEE) degree. The integrated BSEE/MSEE program offers students the opportunity to earn a bachelor's degree and a master's degree in five years.

The integrated program offers several benefits: streamlined admissions from the undergraduate to the graduate program and flexibility in fulfilling required courses for both degrees during the senior year (up to 9 approved 5xxx credits can be applied to the MSEE).

Eligibility requirements for the integrated program:
Application is open to UMD BSEE students who
· apply at least two semesters before completing the BSEE degree;
· hold a minimum cumulative GPA of 3.30; and
· provide letters of recommendation from two Electrical Engineering faculty members.

Both the BSEE and MSEE degrees must be completed in their entirety. The graduate degree cannot be earned before the undergraduate requirements are satisfied.
Duluth Campus

Electrical Engineering Minor

Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
EE Graduate Program, 271 MWAH, 1023 University Drive, Duluth, MN 55812 (218-726-6830; fax: 218-726-7267)
Email: umdee@d.umn.edu
Website: https://scse.d.umn.edu/graduate-programs-5

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Electrical Engineering minor provides students with exposure to advanced science and technologies in electrical engineering.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Electrical Engineering director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Courses offered on both the A-F and S/N grading basis must be taken A-F, with a minimum grade of C earned for each.

The minimum cumulative GPA for courses applied to the minor is 3.00.

Minor coursework must be approved by the Electrical Engineering director of graduate studies.

Minor Coursework (6 to 12 credits)
Masters students select 6 credits, and doctoral students select 12 credits from the following in consultation with the Electrical Engineering director of graduate studies. Other courses can be chosen with approval of the Electrical Engineering director of graduate studies.

- EE 5151 - Digital Control System Design (3.0 cr)
- EE 5161 - Linear State-Space Control Systems (3.0 cr)
- EE 5311 - Design of VLSI Circuits (4.0 cr)
- EE 5315 - Multiprocessor-Based System Design (3.0 cr)
- EE 5351 - Introduction to Robotics and Mobile Robot Control Architectures (3.0 cr)
- EE 5477 - Antennas and Transmission Lines (3.0 cr)
- EE 5501 - Energy Conversion System (3.0 cr)
EE 5522 - Power Electronics I (3.0 cr)
EE 5533 - Grid- Resiliency, Efficiency and Technology (3.0 cr)
EE 5741 - Digital Signal Processing (3.0 cr)
EE 5745 - Medical Imaging (3.0 cr)
EE 5765 - Modern Communication (4.0 cr)
EE 5801 - Introduction to Artificial Neural Networks (3.0 cr)
EE 8151 - Optimal Control Systems (3.0 cr)
EE 8741 - Digital Image Processing (4.0 cr)
EE 8765 - Digital Communications (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Doctoral
**Duluth Campus**

**Environmental Health and Safety M.Env.Hlth.Sa.**
**UMD Mechanical/Industrial Engineering**
**Swenson College of Science and Engineering**

Link to a [list of faculty](#) for this program.

**Contact Information:**
Dr. Katherine Schofield, MEHS Director of Graduate Studies, 105 Voss-Kovach Hall, 1305 Ordean Court, Duluth, MN 55812 (218-726-7981)
Email: [kscho@d.umn.edu](mailto:kscho@d.umn.edu)
Website: [http://www.d.umn.edu/mehs](http://www.d.umn.edu/mehs)

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 33
- This program requires summer semesters for timely completion.
- Degree: Master of Environmental Health and Safety

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Master of Environmental Health and Safety (MEHS) program prepares its graduates for professional careers in environmental health and safety—encompassing occupational safety, industrial hygiene, ergonomics, risk management, and environmental health. The program strives not only to provide academic-based knowledge, but also the technical and practical skills necessary to be a successful EHS professional and the coursework covers a broad range of EHS topics.

Ultimately, the mission of the MEHS program is to produce highly regarded and sought-after graduates who have the requisite skills and knowledge to practice environmental health and safety effectively in a diverse range of occupations and will do so in a competent, professional, and ethical manner.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

A baccalaureate degree in a science, engineering, or other EHS-related field is preferred. All degrees must have been earned at an accredited college or university.

Other requirements to be completed before admission:
Applicants must have earned a grade of C or better at the collegiate level in the following introductory coursework: chemistry with a lab component, and statistics.

Applicants must provide three letters of recommendation, one of which should be from an instructor or professor in the department awarding the student's baccalaureate degree. Recommendations should address either the student's academic ability or readiness to pursue a professional graduate degree in EHS, if not both. Recommendations from family members will not be accepted.

Preferred applicants will have work experience related to EHS and have completed collegiate-level coursework in introductory physics, human biology and/or physiology, and psychology.

**Special Application Requirements:**
Applicants must also provide:
- Personal Statement describing your interest in pursuing a MEHS degree and why you would work well in the EHS profession.
- Transcript(s) indicating completion of a baccalaureate degree program and grades obtained in the prerequisite courses
- Resume or CV

International and domestic applicants whose first language is not English must submit current score(s) from one of the English proficiency tests noted below.
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 100
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

- **IELTS**
  - Total Score: 7
  - Reading Score: 6.5
  - Writing Score: 6.5

- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 33 major credits and 0 credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** The Plan C capstone internship project requires a student to apply knowledge and skills acquired from the MEHS coursework and demonstrate their mastery of EHS-related material and concepts in identifying and addressing a particular concern. The project is part of a minimum six-week cooperative internship conducted in an industrial, government, or other organization having an established safety project or in the process of implementing a safety project. A daily work log, written evaluation by the internship supervisor, a two-page executive summary of the project, and an oral presentation are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least two full semesters and a summer session internship course are required.

Courses offered on both the A-F and S/N grading basis must be taken A-F.

**Core Requirements (27 credits)**
Take the following courses:

- **SAFE 6002** - Regulatory Standards and Hazard Control (3.0 cr)
- **SAFE 6011** - System Safety and Loss Control Techniques (3.0 cr)
- **SAFE 6012** - Risk Management and Workers' Compensation (3.0 cr)
- **SAFE 6101** - Principles of Industrial Hygiene (3.0 cr)
- **SAFE 6102** - Advanced Industrial Hygiene and Health Physics (3.0 cr)
- **SAFE 6201** - Fire Prevention and Emergency Preparedness (3.0 cr)
- **SAFE 6302** - Occupational Ergonomics and Injury Management (3.0 cr)
- **SAFE 6401** - Environmental Safety and Legal Implications (3.0 cr)
- **SAFE 6821** - Organization and Administration of Safety Programs (3.0 cr)

**Electives (3 credits)**
Select 3 credits from the following in consultation with the advisor:

- **SAFE 6051** - Construction Safety (3.0 cr)
- **SAFE 6211** - Transportation Safety (3.0 cr)
- **SAFE 6291** - Independent Study in Industrial Safety (1.0 - 3.0 cr)
- **SAFE 6295** - Special Topics: (Various Titles to be Assigned) (1.0 - 3.0 cr)

**Internship (3 credits)**
Take the 3-credit internship no later than 12 months after completing the program coursework.

**SAFE 6997** - Internship in Environmental Health and Safety (3.0 cr)

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Information current as of January 17, 2023
Duluth Campus
Integrated Biosciences M.S
Swenson College of Science & Engineering
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Integrated Biosciences Graduate Program, University of Minnesota, 251 Swenson Science Building, 1035 Kirby Drive, Duluth, MN 55812 (218-726-6898; fax: 218-726-8142)
Email: ibs@d.umn.edu
Website: https://scse.d.umn.edu/integrated-biosciences

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The all-University Integrated Biosciences MS program offers three areas of emphasis: cell, molecular, and physiological (CMP) biology; chemical biology (CB); and ecology, organismal, and population (EOP).

Approved graduate course credits from the University of Minnesota Duluth Integrated Biosciences MS or the University of Minnesota Duluth Chemistry MS may be counted in common with the University of Minnesota Twin Cities campus Integrated Biosciences doctoral program (http://policy.umn.edu/education/gradcreditdegree see 2.b.).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree or equivalent from an accredited college or university in the biological or physical sciences or a related field.

Special Application Requirements:
Applicants are not required to submit GRE scores as part of their application, but may submit GRE scores if they feel that the scores will enhance their application.

International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of January 17, 2023
Program Requirements

Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Use of 4xxx-level courses must be approved by both the advisor and director of graduate studies.

Required Coursework (8 credits)
Take the following courses:
- IBS 8011 - Integrated Biological Systems I (3.0 cr)
- IBS 8013 - Integrated Biological Systems II (3.0 cr)
- IBS 8030 - IBS Research Club (1.0 cr)
- IBS 8099 - The Biological Practitioner (1.0 cr)

Statistics Requirement (3 credits)
Select one of the following courses in consultation with the advisor:
- UMTC course PUBH 6450 may also be used to satisfy this requirement.
- BIOL 5809 - Ecological Statistics (3.0 cr)
- STAT 4060 - Introduction to Biostatistics (3.0 cr)
- STAT 5411 - Analysis of Variance (3.0 cr)
- STAT 5511 - Regression Analysis (3.0 cr)

Electives (9 credits)
Select courses from the following in consultation with the advisor. Other courses can be taken with prior approval by the advisor and director of graduate studies.

IBS 8993 may be taken twice for a total of 4 credits.
- IBS 8012 - Integrated Evolutionary Processes (2.0 cr)
- IBS 8094 - Rotations (1.0 cr)
- IBS 8101 - Cellular Biochemistry (3.0 cr)
- IBS 8102 - Cell, Molecular and Developmental Biology (3.0 cr)
- IBS 8103 - Comparative Animal Physiology (3.0 cr)
- IBS 8201 - Ecological Processes (2.0 cr)
- IBS 8202 - Chemical Biology (3.0 cr)
- IBS 8203 - Methods in Molecular Biosciences (2.0 cr)
- IBS 8993 - Integrated Biosciences Graduate Seminar (2.0 cr)

Thesis Credits
Take 10 master's thesis credits
- IBS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Duluth Campus
Integrated Biosciences Minor
Swenson College of Science & Engineering
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Integrated Biosciences Graduate Program, University of Minnesota, 251 Swenson Science Building, 1035 Kirby Drive, Duluth, MN 55812 (218-726-6898; fax: 218-726-8142)
Email: ibs@d.umn.edu
Website: https://scse.d.umn.edu/integrated-biosciences

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The all-University Integrated Biosciences graduate program offers students an opportunity to study in three areas of emphasis: cell, molecular, and physiological (CMP) biology emphasis, chemical biology (CB) emphasis, and ecology, organismal, and population (EOP) biology emphasis.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Integrated Biosciences director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

The minimum cumulative GPA for minor field coursework is 2.80.

Minor Coursework (6 to 12 credits)
Masters students select 6 credits, and doctoral students select 12 credits from the following in consultation with the Integrated Biosciences director of graduate studies.

IBS 8011 - Integrated Biological Systems I (3.0 cr)
IBS 8012 - Integrated Evolutionary Processes (2.0 cr)
IBS 8013 - Integrated Biological Systems II (3.0 cr)
IBS 8030 - IBS Research Club (1.0 cr)
IBS 8099 - The Biological Practitioner (1.0 cr)
IBS 8993 - Integrated Biosciences Graduate Seminar (2.0 cr)
IBS 8101 - Cellular Biochemistry (3.0 cr)
IBS 8102 - Cell, Molecular and Developmental Biology (3.0 cr)
IBS 8103 - Comparative Animal Physiology (3.0 cr)
IBS 8201 - Ecological Processes (2.0 cr)
IBS 8202 - Chemical Biology (3.0 cr)
IBS 8203 - Methods in Molecular Biosciences (2.0 cr)
Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Duluth Campus

Master of Engineering M.Eng.
Swenson College of Science & Engineering
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, M.Eng. Program, Engineering Building 176, 1303 Ordean Court, Duluth, MN 55812 (218-726-7126; fax: 218-726-6907).
Email: rrdavis@d.umn.edu
Website: https://www.academics.d.umn.edu/engineering-meng

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The professional Master of Engineering (MEng) emphasizes the practice of engineering in either the private or public sector. The program focuses on developing competencies in the areas of engineering design, problem solving, and practice beyond what can be achieved in earning a bachelor of science degree in a given engineering discipline.

An MEng student's focus will be in Civil Engineering, Chemical Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering or Mining and Minerals Processing.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
1. An undergraduate engineering degree from an ABET accredited program or equivalent, or by approval by the MEng director of graduate studies in a related discipline such as computer science, geology, or physics.
2. Two letters of recommendation: academic and/or professional references.
3. GRE scores (recommended) but not required.

Industrial experience and professional licensure will be considered for applicants with a grade point average less than the preferred minimum.

Special Application Requirements:
International and domestic applicants whose native language is not English must submit score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80
Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 30 major credits and 0 credits outside the major. The is no final exam. A capstone project is required.

**Capstone Project:** The capstone project comprises 3 to 6 project credits selected and completed in consultation with the advisor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A maximum of 6 4xxx-level credits, approved by the advisor, can be applied to the MEng.

Courses offered on both the A-F and S/N grading basis must be taken A-F, with a minimum grade of C earned for each course.

**Engineering Capstone Project (3 to 6 credits)**
Take 3 to 6 credits from the following in consultation with the advisor:
- CE 5555 - Project Credits: Master of Engineering (Civil) (3.0 - 6.0 cr)
- CHE 5555 - Project Credits: MEng - Chemical Engineering (3.0 - 6.0 cr)

**Electives**
Select courses as needed, in consultation with the advisor, to complete the 30-credit minimum.
- CE 5027 - Advanced Concrete Materials and Repair (3.0 cr)
- CE 5115 - Structural Dynamics (3.0 cr)
- CE 5116 - Seismic Design and Analysis (3.0 cr)
- CE 5127 - Bridge Analysis and Design (3.0 cr)
- CE 5128 - Prestressed Concrete Structures (3.0 cr)
- CE 5129 - Post-Tensioned Concrete Structures (3.0 cr)
- CE 4131 - Design of Wood and Masonry Structures (3.0 cr)
- CE 5134 - Advanced Steel Design (3.0 cr)
- CE 5135 - Advanced Reinforced Concrete Design (3.0 cr)
- CE 5136 - Structural Systems (3.0 cr)
- CE 5137 - Advanced Structural Analysis and Design (3.0 cr)
- CE 5201 - Water Policy (3.0 cr)
- CE 5203 - Stream Crossing and Culvert Design (3.0 cr)
- CE 5216 - Applications in Environmental Modeling (3.0 cr)
- CE 5226 - Water Resources Engineering (3.0 cr)
- CE 5237 - Water Quality Engineering (3.0 cr)
- CE 5241 - Water Chemistry (3.0 cr)
- CE 5246 - Environmental Remediation Technologies (3.0 cr)
- CE 5251 - Design of Chemical Physical Unit Operations in Water Treatment (4.0 cr)
- CE 5315 - Design of Traffic Systems (3.0 cr)
- CE 5316 - Pavement Analysis and Design (3.0 cr)
- CE 5317 - Traffic Flow Theory and Modeling (3.0 cr)
- CE 5318 - Pavement Maintenance, Rehabilitation, and Management (3.0 cr)
- CE 5320 - Advanced Pavement Materials, Design and Construction (3.0 cr)
- CE 5326 - Highway Planning and Design (3.0 cr)
- CE 5420 - Advanced Soil Mechanics (3.0 cr)
- CE 5421 - Applied Geostatistics (3.0 cr)
- CE 5422 - Numerical Modeling in Geotechnical Engineering (3.0 cr)
- CE 5426 - Rock Mechanics (3.0 cr)
- CE 5515 - Sustainable Design and Construction (SUSTAIN) (3.0 cr)
- CE 5525 - Decision, Risk and Reliability (3.0 cr)
- CE 5545 - Design of Structures with Advanced Materials (3.0 cr)
- CHE 5011 - Process Optimization: Lean Six Sigma (3.0 cr)
- CHE 5121 - Advanced Thermodynamics (3.0 cr)
- CHE 5131 - Polymer Engineering (3.0 cr)
- CHE 5301 - Advanced Chemical Reactor Design (3.0 cr)
- CHE 5601 - Biochemical Engineering I (3.0 cr)
- CHE 5612 - Hazardous Waste Process Engineering (3.0 cr)
- CHE 5621 - Particle Technology (3.0 cr)
CHE 5701 - Biochemical Engineering II (3.0 cr)
CHE 5711 - Biomedical Engineering (3.0 cr)
CHE 5991 - Graduate Independent Study in Chemical Engineering (1.0 - 3.0 cr)
CHE 5995 - Special Topics in Chemical Engineering: (Various Titles to be Assigned) (1.0 - 4.0 cr)
EE 5151 - Digital Control System Design (3.0 cr)
EE 5161 - Linear State-Space Control Systems (3.0 cr)
EE 5311 - Design of VLSI Circuits (4.0 cr)
EE 5315 - Multiprocessor-Based System Design (3.0 cr)
EE 5351 - Introduction to Robotics and Mobile Robot Control Architectures (3.0 cr)
EE 5477 - Antennas and Transmission Lines (3.0 cr)
EE 5501 - Energy Conversion System (3.0 cr)
EE 5522 - Power Electronics I (3.0 cr)
EE 5533 - Grid- Resiliency, Efficiency and Technology (3.0 cr)
EE 5621 - Microelectronics Technology (3.0 cr)
EE 5741 - Digital Signal Processing (3.0 cr)
EE 5745 - Medical Imaging (3.0 cr)
EE 5765 - Modern Communication (4.0 cr)
EE 5801 - Introduction to Artificial Neural Networks (3.0 cr)
EE 5995 - Special Topics: (Various Titles to be Assigned) (1.0 - 3.0 cr)
EE 8151 - Optimal Control Systems (3.0 cr)
EE 8741 - Digital Image Processing (4.0 cr)
EE 8765 - Digital Communications (3.0 cr)
IE 5305 - Supply Chain Management (3.0 cr)
IE 5315 - Organizational Control Methods (3.0 cr)
IE 5325 - Advanced Engineering Economics (3.0 cr)
IE 5335 - Engineered Products and Services (3.0 cr)
IE 5365 - Independent Study in Industrial Engineering (1.0 - 4.0 cr)
ME 5110 - Analytic Techniques in Mechanical Engineering (3.0 cr)
ME 5120 - Advanced Dynamics and Control (3.0 cr)
ME 5210 - Advanced Thermal Fluid Sciences (3.0 cr)
ME 5220 - Advanced Mechanics of Materials (3.0 cr)
ME 5305 - Computational Fluid Dynamics (3.0 cr)
ME 5315 - Nondestructive Evaluation of Engineering Materials (3.0 cr)
ME 5325 - Sustainable Energy System (3.0 cr)
ME 5345 - Smart Materials and Structures (3.0 cr)
ME 5355 - Gas Turbines (3.0 cr)
Duluth Campus
Mathematical Sciences M.S.
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
UMD Mathematics/Statistics 140 Solon Campus Center, 1117 University Dr, Duluth, MN 55812, (phone: 218-726-8747 or 218-726-8254)
Email: umdmathstat_dgs@d.umn.edu
Website: https://scse.d.umn.edu/about/departments-and-programs/mathematics-statistics-department

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 36
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Mathematical Sciences MS program is for those wishing to pursue careers that use applied mathematics and statistics in science, industry, business, and teaching, and for those wishing to go on for doctoral degrees in mathematics or statistics. It emphasizes the use of modern modeling techniques and computational methods with areas of concentration available in continuous modeling, probability/statistics, and discrete mathematics. A Statistics track is available to interested students.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

An undergraduate degree in mathematics or statistics is preferred. Students with degrees in any major and with a substantial background in mathematics or statistics are also encouraged to apply.

Special Application Requirements:
Application deadline is January 15 for full consideration in fellowships and other financial assistance; later applications are accepted.

International and domestic applicants whose first language is not English must submit score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 26 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 36 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project comprises 4 credits of MATH 8744, or STAT 8774 for students pursuing the Statistics track.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser and director of graduate studies approval.

All students must complete at least 26 MATH or STAT course credits, at least 15 of which must be MATH course credits for those students not pursuing the Statistics track.

Theoretical Core (11 to 14 credits)
Students pursuing the Statistics track are exempt from MATH 5371, and must complete 11 credits from the following theoretical core courses. All other students must select 14 credits. Courses from the Core Electives can be substituted for theoretical core coursework with advisor and director of graduate studies approval.

MATH 5201 - Real Variables (4.0 cr)
MATH 5327 - Advanced Linear Algebra (3.0 cr)
MATH 5371 - Abstract Algebra I (3.0 cr)
STAT 5571 - Probability (4.0 cr)

Core Electives

Applied Analysis
MATH 5202 - Applied Functional Analysis (3.0 cr)
MATH 5260 - Dynamical Systems (3.0 cr)
MATH 5270 - Modeling with Dynamical Systems (3.0 cr)
MATH 5280 - Partial Differential Equations (3.0 cr)
MATH 5810 - Linear Programming (3.0 cr)
MATH 8201 - Real Analysis (3.0 cr)

Algebra and Discrete Math
MATH 5330 - Theory of Numbers (3.0 cr)
MATH 5347 - Applied Algebra and Cryptology (3.0 cr)
MATH 5365 - Graph Theory (3.0 cr)
MATH 5366 - Enumerative Combinatorics (3.0 cr)
MATH 5372 - Abstract Algebra II (3.0 cr)

Probability and Statistics
STAT 5411 - Analysis of Variance (3.0 cr)
STAT 5511 - Regression Analysis (3.0 cr)
STAT 5515 - Multivariate Statistics (3.0 cr)
STAT 5521 - Applied Time Series Analysis (3.0 cr)
STAT 5531 - Probability Models (4.0 cr)
STAT 5572 - Statistical Inference (4.0 cr)
STAT 8611 - Linear Models (3.0 cr)

Graduate Seminar (1 cr)
Take the following course:
MATH 8980 - Graduate Seminar (1.0 cr)

Graduate Colloquium and Comprehensive Exam (1 cr)
Take the following courses:
MATH 8990 - Graduate Colloquium (0.5 cr)
MATH 8991 - Comprehensive Exam (0.5 cr)

Computation (0 to 3 credits)
Select at least 3 credits from the following in consultation with the advisor. Students pursuing the Statistics track are exempt from this requirement.

MATH 5233 - Mathematical Foundations of Bioinformatics (3.0 cr)
MATH 5271 - Data-Driven Dynamical Systems Modeling (3.0 cr)
MATH 5830 - Numerical Analysis: Approximation and Quadrature (4.0 cr)
MATH 5840 - Numerical Analysis: Systems and Optimization (4.0 cr)
MATH 5850 - Numerical Differential Equations (4.0 cr)
STAT 5411 - Analysis of Variance (3.0 cr)
STAT 5511 - Regression Analysis (3.0 cr)
STAT 5515 - Multivariate Statistics (3.0 cr)
STAT 5521 - Applied Time Series Analysis (3.0 cr)

Electives
Select elective credits as needed, in consultation with the director of graduate studies, to complete minimum credit requirements including the minimum number of MATH or STAT credits. Selections can include courses outside the major.

Plan Options

Plan A
Thesis Credits
Take 10 master's thesis credits, in consultation with the advisor, after submission of the Graduate Degree Plan.

MATH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Project Credits (4 credits)
Take 4 project credits from the following, in consultation with the advisor, after submission of the Graduate Degree Plan. Students pursuing the Statistics track should take STAT 8774.

MATH 8774 - Plan B Final Project Research (1.0 - 4.0 cr)
or STAT 8774 - Plan B Final Project Research (1.0 - 4.0 cr)

Program Sub-plans
A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

Statistics
Theoretical Core (4 credits)
Take the following course:

STAT 5572 - Statistical Inference (4.0 cr)

Statistics Electives (9 credits)
Take at least 9 credits from the following in consultation with the advisor:

STAT 5411 - Analysis of Variance (3.0 cr)
STAT 5511 - Regression Analysis (3.0 cr)
STAT 5515 - Multivariate Statistics (3.0 cr)
STAT 5521 - Applied Time Series Analysis (3.0 cr)
STAT 5531 - Probability Models (4.0 cr)
STAT 8611 - Linear Models (3.0 cr)
Duluth Campus
Mathematical Sciences Minor
Mathematics & Statistics
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Mathematics and Statistics, 140 Solon Campus Center, 1117 University Drive, Duluth, MN 55812 (218-726-8747; fax: 218-726-8399)
Email: mathstat@d.umn.edu
Website: https://scse.d.umn.edu/about/departments-and-programs/mathematics-statistics-department

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Mathematical Sciences minor is for those wishing to pursue careers in other fields that use mathematics or statistics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A strong background in mathematics and/or statistics.

Other requirements to be completed before admission:
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Mathematical Sciences director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Minor coursework offered on both the A-F and S/N grading basis must be taken A-F, with a minimum grade of B- earned for each course.

Minor Coursework (6 to 12 credits)
Masters students select 6 credits, and doctoral students select 12 credits from the following in consultation with the Mathematical Sciences director of graduate studies.
- MATH 5201 - Real Variables (4.0 cr)
- MATH 5327 - Advanced Linear Algebra (3.0 cr)
- STAT 5571 - Probability (4.0 cr)
- MATH 5233 - Mathematical Foundations of Bioinformatics (3.0 cr)
- MATH 5202 - Applied Functional Analysis (3.0 cr)
- MATH 5260 - Dynamical Systems (3.0 cr)
MATH 5270 - Modeling with Dynamical Systems (3.0 cr)
MATH 5280 - Partial Differential Equations (3.0 cr)
MATH 5810 - Linear Programming (3.0 cr)
MATH 8201 - Real Analysis (3.0 cr)
MATH 5330 - Theory of Numbers (3.0 cr)
MATH 5347 - Applied Algebra and Cryptology (3.0 cr)
MATH 5365 - Graph Theory (3.0 cr)
MATH 5366 - Enumerative Combinatorics (3.0 cr)
MATH 5372 - Abstract Algebra II (3.0 cr)
STAT 5411 - Analysis of Variance (3.0 cr)
STAT 5511 - Regression Analysis (3.0 cr)
STAT 5515 - Multivariate Statistics (3.0 cr)
STAT 5521 - Applied Time Series Analysis (3.0 cr)
STAT 5531 - Probability Models (4.0 cr)
STAT 5572 - Statistical Inference (4.0 cr)
STAT 8611 - Linear Models (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Duluth Campus
Mechanical Engineering M.S.M.E.
UMD Mechanical/Industrial Engineering
Swenson College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Email: mie@d.umn.edu
Website: https://scse.d.umn.edu/msme

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science in Mechanical Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MSME combines professional engineering coursework with research in a field within mechanical engineering. Focus areas include thermo/fluids, materials/manufacturing, dynamics/control, and mechanical design and analysis. There are two options for completing an MSME degree: Plan A (thesis option), and Plan B (project option). Plan A includes writing and defending a thesis which requires in-depth research equivalent to 10 credits out of 30 total credits. Plan B includes a capstone project equivalent to 3 credits out of 30 total credits and targets practicing engineers.

Undergraduate students in the Mechanical Engineering program who are interested in pursuing the Master of Mechanical Engineering at UMD may apply for admission to the Integrated BSME/MSME Degree Program (IDP). Students in the IDP Program start their graduate coursework prior to the completion of their undergraduate degree and may apply up to 9 credits of coursework to both their undergraduate B.S.M.E. and graduate M.S.M.E. degrees. Admission to the IDP Program is limited to highly qualified upper-division undergraduates.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Completion of BS degree in mech eng or admission to integrated BSME/MSME program at UMD. Applicants with other undergraduate degrees may be considered; however, additional coursework may be required.

Graduate Record Examination (GRE) scores are not required for admission, but will be considered if provided.

Other requirements to be completed before admission:
Applicants must provide two letters of recommendation concerning their academic ability and readiness for graduate education.

Special Application Requirements:
International and domestic applicants whose native language is not English must submit score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
• IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 30 major credits and up to null credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: The Plan B capstone project requires 3 credits of ME 8310, completed in consultation with the advisor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

In consultation with the advisor and director of graduate studies, a maximum of 6 4xxx-level credits, and a maximum of 6 credits from fields outside mechanical engineering will be considered. Students in the integrated BSME/MSME sub-plan may not apply any 4xxx credits to the MSME degree.

Courses offered on both the A/F and S/N grading basis must be taken A/F.

Core Courses (12 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 5110</td>
<td>Analytic Techniques in Mechanical Engineering</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5120</td>
<td>Advanced Dynamics and Control</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5210</td>
<td>Advanced Thermal Fluid Sciences</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5220</td>
<td>Advanced Mechanics of Materials</td>
<td>3.0 cr</td>
</tr>
</tbody>
</table>

Electives (6 - 15 credits)

Plan A take at least 6 credits, and Plan B take at least 15 credits from the following in consultation with the advisor. For Plan B students at least 9 of the 15 credits must be at the 5xxx level.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 4112</td>
<td>Heat and Mass Transfer</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 4135</td>
<td>Robotics and Controls</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 4145</td>
<td>CAD/CAM</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>ME 4175</td>
<td>Machine Design</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 4365</td>
<td>Global Sustainability Experience in Design/Manufacturing in Africa</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 4375</td>
<td>Pipeline Engineering</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5305</td>
<td>Computational Fluid Dynamics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5315</td>
<td>Nondestructive Evaluation of Engineering Materials</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5325</td>
<td>Sustainable Energy System</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5335</td>
<td>Introduction to Finite Element Analysis</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5345</td>
<td>Smart Materials and Structures</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5355</td>
<td>Gas Turbines</td>
<td>3.0 cr</td>
</tr>
</tbody>
</table>

Program Sub-plans

A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

Integrated Bachelor of Science in Mechanical Engineering/Master of Science in Mechanical Engineering

The Swenson College of Science and Engineering offers an integrated Bachelor of Science in Mechanical Engineering (BSME) and Master of Science in Mechanical Engineering (MSME) degree. The integrated BSME/MSME program offers students the opportunity to earn a bachelor's degree and a master's degree in five years.

The integrated degree program (IDP) offers the benefits of a streamlined pathway from the undergraduate to the graduate program and flexibility in fulfilling required courses for both degrees during the senior year (up to 9 credits of approved 5000-level courses can be applied to the MSME). Admission to the IDP is limited to highly qualified upper-division undergraduates.
Eligibility requirements for the integrated program:
Application is open to UMD BSME students who
- apply at least two semesters before completing the bachelors degree;
- hold a minimum cumulative GPA of 3.30; and
- have an MSME advisor selected prior to admission.

It is preferred that students in the integrated degree program complete a thesis-based (Plan A) masters degree.

Both the BSME and MSME degrees must be completed in their entirety. The graduate degree cannot be earned before the undergraduate requirements are satisfied.
**Duluth Campus**

**Physics M.S.**

UMD-Physics & Astronomy

Swenson College of Science and Engineering

Link to a list of faculty for this program.

**Contact Information:**

Department of Physics, University of Minnesota Duluth, 371 Marshall W. Alworth Hall, 1023 University Drive, Duluth, MN 55812 (218-726-7124; fax: 218-726-6942)

Email: umdphys@d.umn.edu

Website: [http://www.d.umn.edu/physics/grad/](http://www.d.umn.edu/physics/grad/)

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Physics MS program provides a grounding in the fundamentals of physics, combined with significant research involvement. The primary areas of research are computational physics, high-energy neutrino physics, experimental work in condensed-matter physics, and observational and theoretical work in physical limnology and oceanography.

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.00.

An undergraduate degree in physics or related field is required.

Other requirements to be completed before admission:

- Three letters of recommendation are required.

The application deadline is July 15; however, applications received by April 1 receive full consideration.

**Special Application Requirements:**

International and domestic applicants whose first language is not English must submit current score(s) from the following tests:

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

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Information current as of January 17, 2023
Program Requirements

Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project requires a written report representing a minimum of 120 hours of total effort.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Core Courses (11 credits)
Take the following courses. Take PHYS 5090 twice for a total of 2 credits.
- PHYS 5090 - Physics Seminar (1.0 cr)
- PHYS 5501 - Advanced Classical Mechanics (3.0 cr)
- PHYS 5511 - Electrodynamics (3.0 cr)
- PHYS 5521 - Quantum Mechanics I (3.0 cr)

Methods Course (3 credits)
Select one of the following courses in consultation with the advisor:
- PHYS 5052 - Computational Methods in Physics (3.0 cr)
- PHYS 5053 - Data Analysis Methods in Physics (3.0 cr)
- PHYS 5061 - Experimental Methods (3.0 cr)

Electives
Select credits as needed to complete the 20 course credits required for the Plan A or the 30-credit minimum for the Plan B.

Plan Options

Plan A
Thesis Credits
Take 10 master's thesis credits.
- PHYS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
**Duluth Campus**

**Physics Minor**

UMD-Physics & Astronomy
Swenson College of Science and Engineering

Link to a list of faculty for this program.

**Contact Information:**
Department of Physics, University of Minnesota Duluth, 371 Marshall W Alworth Hall, 1023 University Drive, Duluth, MN 55812 (218-726-7124; fax: 218-726-6942)
Email: umdphys@d.umn.edu
Website: [http://www.d.umn.edu/physics/grad/](http://www.d.umn.edu/physics/grad/)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Physics minor provides a background in the fundamental and specialized Physics topics for interdisciplinary-minded students whose majors are in other disciplines.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

**Special Application Requirements:**
Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Physics director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Courses offered on both the A-F and S/N grading basis must be taken A-F.

The minimum cumulative GPA for courses applied to the minor is 3.00.

**Minor Coursework (6 to 12 credits)**
Masters students select 6 credits, and doctoral students select 12 credits in consultation with the Physics director of graduate studies. Other courses can be chosen with approval by the Physics director of graduate studies. No more than 1 credit of PHYS 5090 can be applied to the minor.

- PHYS 5033 - Introduction to Particle Physics (3.0 cr)
- PHYS 5041 - Optics (3.0 cr)
- PHYS 5052 - Computational Methods in Physics (3.0 cr)
- PHYS 5053 - Data Analysis Methods in Physics (3.0 cr)
- PHYS 5061 - Experimental Methods (3.0 cr)
- PHYS 5063 - Theoretical Methods (3.0 cr)
- PHYS 5071 - Quantum Computation (3.0 cr)
- PHYS 5090 - Physics Seminar (1.0 cr)
- PHYS 5501 - Advanced Classical Mechanics (3.0 cr)
Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Duluth Campus
Integrated Biosciences Ph.D.
Swenson College of Science & Engineering
University of Minnesota Duluth

Link to a list of faculty for this program.

Contact Information:
Integrated Biosciences Graduate Program, University of Minnesota, 251 Swenson Science Building, 1035 Kirby Drive, Duluth, MN 55812 (218-726-6898; fax: 218-726-8152)
Email: ibs@d.umn.edu
Website: https://scse.d.umn.edu/integrated-biosciences

- Program Type: Doctorate
- Requirements for this program are current for Fall 2022
- Length of program in credits: 50
- This program does not require summer semesters for timely completion.
- The Integrated Biosciences Ph.D. is an All-University program delivered on the Twin Cities and Duluth Campuses. The University of Minnesota Twin Cities is the degree granting authority for the Integrated Biosciences Ph.D. program in Duluth.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The all-university Integrated Biosciences PhD program offers three areas of emphasis: cell, molecular, and physiological (CMP) biology; chemical biology (CB); and ecology, organismal, and population (EOP) biology.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree or equivalent from an accredited college or university in the biological or physical sciences or a related field.

Other requirements to be completed before admission:
Recommended undergraduate courses for applicants pursuing the Ph.D. degree include one year each of chemistry, biology, physics, calculus, and advanced chemistry. One semester (minimum) of statistics is also recommended.

EOP emphasis: one year of calculus; one semester each of ecology and evolutionary biology; and one course in two of the following subjects genetics, cell biology, biochemistry are recommended.

CMP emphasis: one year of organic chemistry; one genetics course; one cell biology course; and one biochemistry course are recommended.

CB emphasis: one year of organic chemistry; one biochemistry course; and one course in cell biology are recommended.

Special Application Requirements:
Applicants are not required to submit GRE scores as part of their application, but may submit GRE scores if they feel that the scores will enhance their application.

International and domestic applicants whose first language is not English must submit current score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
Program Requirements
26 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Use of 4xxx-level courses must be approved by both the advisor and director of graduate studies.

Required Coursework (8 credits)
Take the following courses:
IBS 8011 - Integrated Biological Systems I (3.0 cr)
IBS 8013 - Integrated Biological Systems II (3.0 cr)
IBS 8030 - IBS Research Club (1.0 cr)
IBS 8099 - The Biological Practitioner (1.0 cr)

Statistics Requirement (3 credits)
Select one of the following in consultation with the advisor:
UMTC course PUBH 6450 may also be used to satisfy this requirement.
BIOL 5809 - Ecological Statistics (3.0 cr)
STAT 4060 - Introduction to Biostatistics (3.0 cr)
STAT 5411 - Analysis of Variance (3.0 cr)
STAT 5511 - Regression Analysis (3.0 cr)

Seminar (2 credits)
Take the following:
IBS 8993 - Integrated Biosciences Graduate Seminar (2.0 cr)

Electives (13 credits)
Select 13 credits from the following in consultation with the advisor:
IBS 8012 - Integrated Evolutionary Processes (2.0 cr)
IBS 8094 - Rotations (1.0 cr)
IBS 8101 - Cellular Biochemistry (3.0 cr)
IBS 8102 - Cell, Molecular and Developmental Biology (3.0 cr)
IBS 8103 - Comparative Animal Physiology (3.0 cr)
IBS 8201 - Ecological Processes (2.0 cr)
IBS 8202 - Chemical Biology (3.0 cr)
IBS 8203 - Methods in Molecular Biosciences (2.0 cr)

Thesis (24 credits)
Take 24 doctoral thesis credits.
IBS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Duluth Campus

Water Resources Science M.S.
Swenson College of Science & Engineering
University of Minnesota Duluth

Link to a list of faculty for this program.

Contact Information:
Water Resources Science, University of Minnesota, 173 McNeal Hall, 1985 Buford Avenue, St. Paul MN 55108 (612-624-7456 fax: 612-625-1263)
Email: wrs@umn.edu
Website: http://wrs.umn.edu/

- Program Type: Master's
- Requirements for this program are current for Fall 2022
- Length of program in credits: 30 to 32
- This program does not require summer semesters for timely completion.
- University of Minnesota, Twin Cities
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This cross-campus interdisciplinary program provides comprehensive training in water resources science, with integration across scientific disciplines. A structured interdisciplinary graduate curriculum is offered. The program includes a set of core courses plus electives in the following areas of interest: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. A Limnology and Oceanography track is also offered. Approximately 50 courses offered within 15 other graduate programs are available to students majoring in water resources science.

The goal of the program is to produce scientists with strong technical skills in disciplines relevant to water resources and a broad understanding of 1) the hydrologic cycle and associated ecosystems, 2) the interconnectedness of the sciences involved in managing aquatic resources, and 3) the interplay between the biophysical sciences and social sciences in developing and implementing public policies related to water.

Students in the program develop the breadth of scientific knowledge appropriate to understand the complicated aquatic ecosystems and watersheds on which they will work, as well as social dimensions of the topic, including the public policy and legal frameworks in which water resources are protected and managed.

The program involves faculty from the following departments on the Twin Cities campus: Applied Economics; Bioproducts and Biosystems Engineering; Civil Engineering; Earth Sciences; Ecology, Evolution, and Behavior; Entomology; Environmental and Occupational Health; Fisheries, Wildlife, and Conservation Biology; Forest Resources; Geography; Horticultural Science; Plant Biology; and Soil, Water, and Climate. It also involves faculty from the following departments on the Duluth campus: Biology; Chemical Engineering; Chemistry; Civil Engineering; Earth and Environmental Science; Geography; Mechanical Engineering and Physics; as well as the Large Lakes Observatory and the Natural Resources Research Institute in Duluth.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Most applicants have a bachelors degree in a physical or biological science discipline or engineering field; however, individuals from a variety of backgrounds are welcome to apply.

Other requirements to be completed before admission:
Recommended academic preparation includes at least two courses each in calculus, chemistry, and physics, at least one course in the biological sciences, and some experience or background in statistics.

Availability of funding and willingness of a member of the graduate faculty to serve as an advisor are important criteria for admission to the program.
Special Application Requirements:
Applications must include:

- 3 letters of recommendation from professors qualified to estimate the applicants class rank, and to evaluate their ability to complete a masters program, or persons who can assess the applicants professional or research potential.
- Résumé of academic and professional experience.
- Statement of purpose, including the proposed emphasis area.

Students may be admitted any semester but are strongly encouraged to submit their application by December 1 for fall semester admission. More specific application instruction can be found on the programs website: wrs.umn.edu/prospective-students

International and domestic applicants whose first language is not English must submit score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan A:** Plan A requires 22 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required. **Capstone Project:** The Plan B project is defined by the faculty advisor, and can involve field, laboratory, or computer work and the analysis, synthesis, or interpretation of data. The Plan B option is well suited to students who have little undergraduate coursework in water resources science and thus need more coursework to gain the combination of depth and breadth needed in this field.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Courses offered on both the A-F and S/N grade basis must be taken A-F with a minimum grade of C-.

**Core Courses (13 credits)**
Select at least one course from each of the following groups in consultation with the advisor:

**Hydrology**
- Take one or more courses from the following:
  - CE 4228 - Watershed Engineering (3.0 cr)
  - EES 5201 - Watershed Hydrology (3.0 cr)
  - EES 5250 - Hydrogeology (4.0 cr)
  - GEOG 4446 - Water Processes and Management (3.0 cr)
LIM 5101 - Physical Limnology (3.0 cr)

Environmental/Water Chemistry
Take one or more courses from the following:
CE 5241 - Water Chemistry (3.0 cr)
CHEM 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
CHEM 5212 - Advanced Environmental Chemistry (3.0 cr)
LIM 5102 - Chemical Limnology (3.0 cr)

Limnology
Take one or more courses from the following:
BIOL 5833 - Stream Ecology (3.0 cr)
BIOL 5861 - Lake Ecology (3.0 cr)
EES 5103 - Geological Paleolimnology (3.0 cr)
LIM 5010 - Integrated Approaches to the Study of Inland Waters (3.0 cr)
LIM 5103 - Geological Paleolimnology (3.0 cr)

Water Policy
Take the following course:
WRS 5101 - Water Policy (3.0 cr)

WRS Seminar
Take the following course for .5 credits.
WRS 8100 - Interdisciplinary Seminar in Water Resources (0.5 - 3.0 cr)

Ethics and Responsible Conduct in Research
Take the following course:
WRS 8581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

WRS Electives (9 to 17 credits)
Plan A students select 9 credits, and Plan B students select 17 credits from the following, in consultation with the advisor. Plan A students cannot apply WRS 8095 to this requirement.

BIOL 4761 - Ichthyology (3.0 cr)
BIOL 5201 - Leverage bioinformatic tools to manage big data and answer primary biology questions (3.0 cr)
BIOL 5801 - Microbial Ecology (2.0 cr)
BIOL 5805 - Fisheries Ecology and Management (3.0 cr)
BIOL 5808 - Landscape Ecology: Theory and Application (3.0 cr)
BIOL 5809 - Ecological Statistics (3.0 cr)
BIOL 5833 - Stream Ecology (3.0 cr)
BIOL 5861 - Lake Ecology (3.0 cr)
BIOL 5863 - Ecosystems Ecology (3.0 cr)
BIOL 5870 - Wetland Ecology (3.0 cr)
CE 4213 - Open Channel Hydraulics (3.0 cr)
CE 4215 - Hydraulic Design (3.0 cr)
CE 4228 - Watershed Engineering (3.0 cr)
CE 5203 - Stream Crossing and Culvert Design (3.0 cr)
CE 5216 - Applications in Environmental Modeling (3.0 cr)
CE 5237 - Water Quality Engineering (3.0 cr)
CE 5241 - Water Chemistry (3.0 cr)
CE 5246 - Environmental Remediation Technologies (3.0 cr)
CHEM 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
CHEM 5212 - Advanced Environmental Chemistry (3.0 cr)
EES 5103 - Geological Paleolimnology (3.0 cr)
EES 5201 - Watershed Hydrology (3.0 cr)
EES 5210 - Glacial and Quaternary Geology (4.0 cr)
EES 5220 - Advances in Paleoclimatology (3.0 cr)
EES 5250 - Hydrogeology (4.0 cr)
EES 5260 - Fluvial Geomorphology (3.0 cr)
EES 5601 - Introduction to Stream Restoration (3.0 cr)
EES 5603 - Stream Crossing Design (2.0 cr)
EES 5602 - Stream Restoration Practice (2.0 cr)
GEOG 4446 - Water Processes and Management (3.0 cr)
GIS 5572 - Environmental Application of GIS (4.0 cr)
LIM 5010 - Integrated Approaches to the Study of Inland Waters (3.0 cr)
LIM 5011 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters (2.0 cr)
LIM 5012 - Integrated Approaches to the Study of Inland Waters II (3.0 cr)
LIM 5013 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters II (2.0 cr)
LIM 5101 - Physical Limnology (3.0 cr)
LIM 5102 - Chemical Limnology (3.0 cr)
LIM 5103 - Geological Paleolimnology (3.0 cr)
LIM 5105 - Research Frontiers and New Directions in Limnology and Environmental Science (1.0 cr)
PHYS 5541 - Fluid Dynamics (3.0 cr)
WRS 8095 - Plan B Project (3.0 cr)

Plan A
Take 10 masters thesis credits.
WRS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Limnology and Oceanography
The science of inland waters, or "limnology," includes the study of streams, lakes, ponds, and wetlands. While Lake Superior falls into this category, the style of research, particularly the nature of sampling and the scale of the processes investigated, makes the study of Lake Superior and other Great Lakes more akin to oceanography than to classical limnology. A program that focuses on the study of both limnology and oceanography strengthens understanding of both systems, through comparative studies and by fostering interaction between groups that focus more strongly on one or the other system. Limnology and oceanography are by necessity interdisciplinary fields, with major components contributed by biological, geological, physical, and chemical sciences. Such interdisciplinary fields in the modern research university require mechanisms to ensure cross-fertilization of ideas, approaches, methods, techniques, and knowledge. The limnology and oceanography track in WRS provides just such a much-needed mechanism.

The goal of the program is to produce scientists with strong technical skills in aquatic science and a broad understanding of limnology and oceanography.

The faculty advisor must be a member of the limnology and oceanography track faculty.

Core Courses (11 credits)

Limnology
Take the following courses:
LIM 5010 - Integrated Approaches to the Study of Inland Waters (3.0 cr)
LIM 5011 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters (2.0 cr)
LIM 5013 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters II (2.0 cr)

Water Policy
Take the following course:
WRS 5101 - Water Policy (3.0 cr)

Ethics
Take the following course:
WRS 8581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

Seminar
Take the following course for .5 credits
WRS 8100 - Interdisciplinary Seminar in Water Resources (0.5 - 3.0 cr)

WRS Electives
Plan A students take at least 11 credits from the following list and may not use WRS 8095 as an elective. Plan B students take at least 19 credits from the following list:
BIOL 4761 - Ichthyology (3.0 cr)
BIOL 5201 - Leverage bioinformatic tools to manage big data and answer primary biology questions (3.0 cr)
BIOL 5801 - Microbial Ecology (2.0 cr)
BIOL 5805 - Fisheries Ecology and Management (3.0 cr)
BIOL 5808 - Landscape Ecology: Theory and Application (3.0 cr)
BIOL 5809 - Ecological Statistics (3.0 cr)
BIOL 5833 - Stream Ecology (3.0 cr)
BIOL 5851 - Open Channel Hydraulics (3.0 cr)
BIOL 5861 - Lake Ecology (3.0 cr)
BIOL 5863 - Ecosystems Ecology (3.0 cr)
BIOL 5870 - Wetland Ecology (3.0 cr)
CE 4213 - Open Channel Hydraulics (3.0 cr)
CE 4215 - Hydraulic Design (3.0 cr)
CE 4228 - Watershed Engineering (3.0 cr)
CE 5203 - Stream Crossing and Culvert Design (3.0 cr)
CE 5216 - Applications in Environmental Modeling (3.0 cr)
CE 5237 - Water Quality Engineering (3.0 cr)
CE 5241 - Water Chemistry (3.0 cr)
CE 5246 - Environmental Remediation Technologies (3.0 cr)
CHEM 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
CHEM 5212 - Advanced Environmental Chemistry (3.0 cr)
EES 5103 - Geological Paleolimnology (3.0 cr)
EES 5201 - Watershed Hydrology (3.0 cr)
EES 5210 - Glacial and Quaternary Geology (4.0 cr)
EES 5220 - Advances in Paleoclimatology (3.0 cr)
EES 5250 - Hydrogeology (4.0 cr)
EES 5260 - Fluvial Geomorphology (3.0 cr)
EES 5601 - Introduction to Stream Restoration (3.0 cr)
EES 5603 - Stream Crossing Design (2.0 cr)
EES 8602 - Stream Restoration Practice (2.0 cr)
GEOG 4446 - Water Processes and Management (3.0 cr)
GIS 5572 - Environmental Application of GIS (4.0 cr)
LIM 5010 - Integrated Approaches to the Study of Inland Waters (3.0 cr)
LIM 5011 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters (2.0 cr)
LIM 5012 - Integrated Approaches to the Study of Inland Waters II (3.0 cr)
LIM 5013 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters II (2.0 cr)
LIM 5101 - Physical Limnology (3.0 cr)
LIM 5102 - Chemical Limnology (3.0 cr)
LIM 5103 - Geological Paleolimnology (3.0 cr)
LIM 5105 - Research Frontiers and New Directions in Limnology and Environmental Science (1.0 cr)
PHYS 5541 - Fluid Dynamics (3.0 cr)
WRS 8095 - Plan B Project (3.0 cr)

Plan A
Register for 10 credits
  WRS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
**Duluth Campus**

**Water Resources Science Minor**

*Swenson College of Science & Engineering*

*University of Minnesota Duluth*

Link to a list of faculty for this program.

**Contact Information:**

Water Resources Science, 173 McNeal Hall, 1985 Buford Avenue, St. Paul MN 55108 (612-624-7456; fax: 612-625-1263)

Email: wrs@umn.edu

Website: http://wrs.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2022
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Water Resources Science (WRS) students take a deep dive into the science behind planning, management, and designs necessary for our public policies related to water. Students will gain a holistic understanding of the hydrologic cycle and associated ecosystems as well as the interplay between biophysical sciences and social sciences.

The WRS graduate minor is structured in a similar interdisciplinary manner to complement many other graduate degree programs. The program involves faculty from the following departments on the Duluth campus: American Indian Studies; Biology; Chemical Engineering; Chemistry and Biochemistry; Civil Engineering; Earth and Environmental Sciences; Geography and Philosophy; Mechanical and Industrial Engineering; Physics and Astronomy; and Political Science; as well as the Large Lakes Observatory, Natural Resources Research Institute, and Environmental Protection Agency in Duluth.

**Program Delivery**

This program is available:

- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

**Special Application Requirements:**

Students interested in the minor are strongly encouraged to confer with their major field advisor and director of graduate studies, and the Water Resources Science director of graduate studies regarding feasibility and requirements.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Minor coursework offered on both the A-F and S/N grading basis must be taken A-F, with a minimum grade of C- earned for each course.

**Required Course (3 credits)**

Take the following course:

WRS 5101 - Water Policy (3.0 cr)

**Electives (6 to 9 credits)**

Masters students select 6 credits, and doctoral students select 9 credits from the following in consultation with the Water Resources Science director of graduate studies:

- BIOL 5833 - Stream Ecology (3.0 cr)
- BIOL 5861 - Lake Ecology (3.0 cr)
- CE 4228 - Watershed Engineering (3.0 cr)
CE 5241 - Water Chemistry (3.0 cr)
CHEM 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
CHEM 5212 - Advanced Environmental Chemistry (3.0 cr)
EES 5103 - Geological Paleolimnology (3.0 cr)
EES 5201 - Watershed Hydrology (3.0 cr)
EES 5250 - Hydrogeology (4.0 cr)
GEOG 4446 - Water Processes and Management (3.0 cr)
LIM 5010 - Integrated Approaches to the Study of Inland Waters (3.0 cr)
LIM 5101 - Physical Limnology (3.0 cr)
LIM 5102 - Chemical Limnology (3.0 cr)
LIM 5103 - Geological Paleolimnology (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Doctoral
Duluth Campus
Water Resources Science Ph.D.
Swenson College of Science & Engineering
University of Minnesota Duluth

Link to a list of faculty for this program.

Contact Information:
Water Resources Science, 173 McNeal Hall, 1985 Buford Avenue, St. Paul MN 55108 (612-624-7456; fax: 612-625-1263)
Email: wrs@umn.edu
Website: https://wrs.umn.edu/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2022
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- The Water Resource Science Ph.D. is an All-University program delivered on the Twin Cities and Duluth Campuses. The University of Minnesota Twin Cities is the degree granting authority for the Water Resources Science Ph.D. program in Duluth.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This cross-campus interdisciplinary program provides comprehensive training in water resources science, with integration across scientific disciplines. A structured interdisciplinary graduate curriculum is offered. The program includes a set of core courses plus electives in the following areas of emphasis at the PhD level: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. Approximately 50 courses offered within 15 other graduate programs are available to students majoring in water resources science.

The goal of the program is to produce scientists with strong technical skills in disciplines relevant to water resources and a broad understanding of 1) the hydrologic cycle and associated ecosystems, 2) the interconnectedness of the sciences involved in managing aquatic resources, and 3) the interplay between the biophysical sciences and social sciences in developing and implementing public policies related to water. Students in the program develop the breadth of scientific knowledge appropriate to understand the complicated aquatic ecosystems and watersheds on which they will work, as well as social dimensions of the topic, including the public policy and legal frameworks in which water resources are protected and managed.

The program involves faculty from the following departments on the Twin Cities campus: Applied Economics; Bioproducts and Biosystems Engineering; Chemistry; Civil Engineering; Earth Sciences; Ecology, Evolution, and Behavior; Entomology; Environmental and Occupational Health; Fisheries, Wildlife, and Conservation Biology; Forest Resources; Horticultural Science; Landscape Architecture; Soil, Water, and Climate; and the Humphrey Institute of Public Affairs. It also involves faculty from the following departments on the Duluth campus: Biology; Chemical Engineering; Chemistry; Civil Engineering; Earth and Environmental Sciences; Mechanical Engineering and Physics; as well as the Large Lakes Observatory and the Natural Resources Research Institute in Duluth.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Most applicants have a bachelors degree in a physical or biological science discipline or engineering field; however, individuals from a variety of backgrounds are welcome to apply.

Other requirements to be completed before admission:
Recommended academic preparation includes at least two courses each in calculus, chemistry, and physics, at least one course in the biological sciences, and some experience or background in statistics.

Availability of funding and willingness of a member of the graduate faculty to serve as an adviser are important criteria for admission to the program.

Special Application Requirements:
Applications must include:
- 3 letters of recommendation from professors qualified to estimate the applicants class rank, and to evaluate their ability to complete a masters program, or persons who can assess the applicants professional or research potential.
- Résumé of academic and professional experience.
- Statement of purpose, including the proposed emphasis area.

Students may apply for admission any semester but are strongly encouraged to submit their application by December 1 for fall semester admission. More specific application instructions can be found on the program website: wrs.umn.edu/prospective-students

International and domestic applicants whose first language is not English must submit score(s) from one of the following tests:

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Coursework is tailored to student interests, and many areas of emphasis are possible. Core courses are offered on both the Twin Cities and Duluth campuses.

Courses offered on both the A-F and S/N grade basis must be taken A-F with a minimum grade of C-.

Core Courses (13 cr)
Select at least one course from each of the following groups in consultation with the advisor:

**Hydrology**

Take 1 or more course(s) from the following:
- **CE 4228** - Watershed Engineering (3.0 cr)
- **GEOG 4446** - Water Processes and Management (3.0 cr)
- **EES 5201** - Watershed Hydrology (3.0 cr)
- **EES 5250** - Hydrogeology (4.0 cr)
- **LIM 5101** - Physical Limnology (3.0 cr)
Environmental/Water Chemistry
Take 1 or more course(s) from the following:
- CE 5241 - Water Chemistry (3.0 cr)
- CHEM 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
- CHEM 5212 - Advanced Environmental Chemistry (3.0 cr)
- LIM 5102 - Chemical Limnology (3.0 cr)

Limnology
Take 1 or more course(s) from the following:
- BIOL 5833 - Stream Ecology (3.0 cr)
- BIOL 5861 - Lake Ecology (3.0 cr)
- EES 5103 - Geological Paleolimnology (3.0 cr)
- LIM 5010 - Integrated Approaches to the Study of Inland Waters (3.0 cr)
- LIM 5103 - Geological Paleolimnology (3.0 cr)

Water Policy
Take the following course:
- WRS 5101 - Water Policy (3.0 cr)

Ethics and Responsible Conduct in Research
Take the following course:
- WRS 8581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

WRS Seminar
Take the following course for .5 credits.
- WRS 8100 - Interdisciplinary Seminar in Water Resources (0.5 - 3.0 cr)

Electives (11 cr)
Select credits from the following, in consultation with the advisor, to complete the 24 course credits required. Other courses can be selected with advisor approval.

Take 11 or more credit(s) from the following:
- BIOL 4761 - Ichthyology (3.0 cr)
- BIOL 5201 - Leverage bioinformatic tools to manage big data and answer primary biology questions (3.0 cr)
- BIOL 5801 - Microbial Ecology (2.0 cr)
- BIOL 5805 - Fisheries Ecology and Management (3.0 cr)
- BIOL 5808 - Landscape Ecology: Theory and Application (3.0 cr)
- BIOL 5809 - Ecological Statistics (3.0 cr)
- BIOL 5833 - Stream Ecology (3.0 cr)
- BIOL 5861 - Lake Ecology (3.0 cr)
- BIOL 5863 - Ecosystems Ecology (3.0 cr)
- BIOL 5870 - Wetland Ecology (3.0 cr)
- CE 4213 - Open Channel Hydraulics (3.0 cr)
- CE 4215 - Hydraulic Design (3.0 cr)
- CE 4228 - Watershed Engineering (3.0 cr)
- CE 5203 - Stream Crossing and Culvert Design (3.0 cr)
- CE 5216 - Applications in Environmental Modeling (3.0 cr)
- CE 5237 - Water Quality Engineering (3.0 cr)
- CE 5241 - Water Chemistry (3.0 cr)
- CE 5246 - Environmental Remediation Technologies (3.0 cr)
- CHEM 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
- CHEM 5212 - Advanced Environmental Chemistry (3.0 cr)
- EES 5103 - Geological Paleolimnology (3.0 cr)
- EES 5201 - Watershed Hydrology (3.0 cr)
- EES 5210 - Glacial and Quaternary Geology (4.0 cr)
- EES 5220 - Advances in Paleoclimatology (3.0 cr)
- EES 5250 - Hydrogeology (4.0 cr)
- EES 5260 - Fluvial Geomorphology (3.0 cr)
- EES 5601 - Introduction to Stream Restoration (3.0 cr)
- EES 5603 - Stream Crossing Design (2.0 cr)
- EES 8602 - Stream Restoration Practice (2.0 cr)
- GEOG 4446 - Water Processes and Management (3.0 cr)
- GIS 5572 - Environmental Application of GIS (4.0 cr)
- LIM 5010 - Integrated Approaches to the Study of Inland Waters (3.0 cr)
- LIM 5011 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters (2.0 cr)
- LIM 5012 - Integrated Approaches to the Study of Inland Waters II (3.0 cr)
- LIM 5013 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters II (2.0 cr)
- LIM 5101 - Physical Limnology (3.0 cr)
- LIM 5102 - Chemical Limnology (3.0 cr)
- LIM 5103 - Geological Paleolimnology (3.0 cr)
• LIM 5105 - Research Frontiers and New Directions in Limnology and Environmental Science (1.0 cr)
• PHYS 5541 - Fluid Dynamics (3.0 cr)

**Thesis (24 cr)**
Take for a total of 24 credits.
**WRS 8888** - Thesis Credits: Doctoral (1.0 - 24.0 cr)

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**Program Sub-plans**
A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

**Limnology and Oceanography**
The science of inland waters, or "limnology," includes the study of streams, lakes, ponds, and wetlands. While Lake Superior falls into this category, the style of research, particularly the nature of sampling and the scale of the processes investigated, makes study of Lake Superior and other Great Lakes more akin to oceanography than to classical limnology. A program that focuses on the study of both limnology and oceanography strengthens understanding of both systems, through comparative studies and by fostering interaction between groups that focus more strongly on one or the other system. Limnology and oceanography are by necessity interdisciplinary fields, with major components contributed by biological, geological, physical, and chemical sciences.

This track within the cross-campus interdisciplinary WRS program provides comprehensive training in limnology and oceanography. As is the case for the WRS graduate program as a whole, the limnology and oceanography program includes a set of core courses plus electives in the subfield of limnology and oceanography.

The goal of the program is to produce scientists with strong technical skills in aquatic science and a broad understanding of limnology and oceanography. Faculty on both Twin Cities and Duluth campuses participate in the limnology and oceanography track.

PhD students pursuing this track must have at least two members of the limnology and oceanography track faculty on their committee including the advisor.

**Core Courses (11 cr)**
Take the following courses:

- **Limnology**
  - LIM 5010 - Integrated Approaches to the Study of Inland Waters (3.0 cr)
  - LIM 5011 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters (2.0 cr)
  - LIM 5013 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters II (2.0 cr)

- **Water Policy**
  - WRS 5101 - Water Policy (3.0 cr)

- **Ethics and Responsible Conduct in Research**
  - WRS 5581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

- **WRS Seminar**
  - Take the following course for .5 credits.
  - WRS 8100 - Interdisciplinary Seminar in Water Resources (0.5 - 3.0 cr)

**Electives (13 cr)**
Select credits from the following, in consultation with the advisor, to complete the 24 course credits required. Other courses can be selected with advisor approval.

- **BIOL 4761** - Ichthyology (3.0 cr)
- **BIOL 5201** - Leverage bioinformatic tools to manage big data and answer primary biology questions (3.0 cr)
- **BIOL 5801** - Microbial Ecology (2.0 cr)
- **BIOL 5805** - Fisheries Ecology and Management (3.0 cr)
- **BIOL 5808** - Landscape Ecology: Theory and Application (3.0 cr)
- **BIOL 5809** - Ecological Statistics (3.0 cr)
- **BIOL 5833** - Stream Ecology (3.0 cr)
- **BIOL 5861** - Lake Ecology (3.0 cr)
- **BIOL 5863** - Ecosystems Ecology (3.0 cr)
- **BIOL 5870** - Wetland Ecology (3.0 cr)
- **CE 4213** - Open Channel Hydraulics (3.0 cr)
- **CE 4215** - Hydraulic Design (3.0 cr)
- **CE 4226** - Watershed Engineering (3.0 cr)
- **CE 5203** - Stream Crossing and Culvert Design (3.0 cr)
- **CE 5216** - Applications in Environmental Modeling (3.0 cr)
- **CE 5237** - Water Quality Engineering (3.0 cr)
- **CE 5241** - Water Chemistry (3.0 cr)
- **CE 5246** - Environmental Remediation Technologies (3.0 cr)

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Information current as of January 17, 2023
• CHEM 5150 - Organic and Stable Isotope Biogeochemistry (3.0 cr)
• CHEM 5212 - Advanced Environmental Chemistry (3.0 cr)
• EES 5103 - Geological Paleolimnology (3.0 cr)
• EES 5201 - Watershed Hydrology (3.0 cr)
• EES 5210 - Glacial and Quaternary Geology (4.0 cr)
• EES 5220 - Advances in Paleoclimatology (3.0 cr)
• EES 5250 - Hydrogeology (4.0 cr)
• EES 5260 - Fluvial Geomorphology (3.0 cr)
• EES 5601 - Introduction to Stream Restoration (3.0 cr)
• EES 5603 - Stream Crossing Design (2.0 cr)
• EES 8602 - Stream Restoration Practice (2.0 cr)
• GEOG 4446 - Water Processes and Management (3.0 cr)
• GIS 5572 - Environmental Application of GIS (4.0 cr)
• LIM 5010 - Integrated Approaches to the Study of Inland Waters (3.0 cr)
• LIM 5011 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters (2.0 cr)
• LIM 5012 - Integrated Approaches to the Study of Inland Waters II (3.0 cr)
• LIM 5013 - Laboratory and Discussion in Integrated Approaches to the Study of Inland Waters II (2.0 cr)
• LIM 5101 - Physical Limnology (3.0 cr)
• LIM 5102 - Chemical Limnology (3.0 cr)
• LIM 5103 - Geological Paleolimnology (3.0 cr)
• LIM 5105 - Research Frontiers and New Directions in Limnology and Environmental Science (1.0 cr)
• PHYS 5541 - Fluid Dynamics (3.0 cr)