Twin Cities Campus
Experimental Surgery M.S. Exp.Surg.
Surgery
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Surgery, MMC 328, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-2590)
Email: surgwww@umn.edu
Website: http://www.catalogs.umn.edu/grad/programs/g167.html

• Program Type: Master's
• Requirements for this program are current for Fall 2014
• Length of program in credits: 42
• This program requires summer semesters for timely completion.
• Degree: Master of Science in Experimental Surgery

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 general surgery program trains medical doctors for the practice of surgery and for academic positions. See the Medical School Catalog for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in laboratory research, either in a basic science or in surgery, after which they begin their senior residency and chief residency training. The Medical School's laboratory departments offer many graduate courses closely related to surgery (see the graduate programs in biochemistry, molecular biology, and biophysics; cellular and integrative physiology; microbiology, immunology, and molecular pathobiology; and pharmacology). These fields also offer opportunities for research work. The Department of Surgery offers supervised work in its experimental research laboratories, as well as in its hospital and outpatient departments in the areas of surgical diagnosis and operative surgery and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery).

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

Prerequisites for Admission
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
• Paper Based - Total Score: 550
• IELTS
  - Total 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, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.
Twin Cities Campus
Experimental Surgery Minor
Surgery
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Surgery, MMC 326, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-2590)
Email: surgwww@umn.edu
Website: http://www.catalogs.umn.edu/grad/programs/g167.html

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 general surgery program trains medical doctors for the practice of surgery and for academic positions. See the Medical School Catalog for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in laboratory research, either in a basic science or in surgery, after which they begin their senior residency and chief residency training. The Medical School's laboratory departments offer many graduate courses closely related to surgery (see the graduate programs in biochemistry, molecular biology, and biophysics; cellular and integrative physiology; microbiology, immunology, and molecular pathobiology; and pharmacology). These fields also offer opportunities for research work. The Department of Surgery offers supervised work in its experimental research laboratories, as well as in its hospital and outpatient departments in the areas of surgical diagnosis and operative surgery and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery).

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

Prerequisites for Admission
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.
Twin Cities Campus

Integrative Biology and Physiology M.S.

Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Integrative Biology and Physiology, Jackson Hall 6-125, 321 Church Street S.E., Minneapolis, MN 55455 (612-625-5902; fax: 612-625-5149)
Email: ibpdept@umn.edu
Website: http://physiology.med.umn.edu/index.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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.

Note: Students enter the Twin Cities M.S. program in integrative biology and physiology only for exceptional reasons. Most Twin Cities graduate work is performed at the Ph.D. level. See the Integrative Biology and Physiology Ph.D. program for more information.

The graduate programs in the Twin Cities have a cardiovascular emphasis, although other areas of specialization are represented.

On the Duluth campus, students can enroll in coursework and participate in research in several basic areas.

The program includes faculty and corresponding research laboratories from the Department of Integrative Biology and Physiology and also the Departments of Medicine; Surgery; Neuroscience; Neurosurgery; Biochemistry, Molecular Biology, and Biophysics; Pharmacology; Physical Medicine and Rehabilitation; Kinesiology; and Animal Science.

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

Prerequisites for Admission
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
  - Paper Based - Total Score: 550
- IELTS
  - Total 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 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 14 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project focuses on some aspect of Physiology. Plan B students complete a project under the direction of a faculty member and present the work to their faculty committee in an oral exam.
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.

Duluth campus: All course requirements for the M.S. degree can be completed on the Duluth campus. Students are expected to fulfill all degree requirements over a period of two to three calendar years. The program includes at least 20 credits in physiology and 6 credits in a minor or related field of study. Incoming students are encouraged to undertake at least two laboratory rotations in faculty research laboratories of their choice. Fulfillment of degree requirements also includes the presentation and defense of a thesis (Plan A). The final written examination and oral defense of the thesis takes place with participation of faculty from both campuses.

Twin Cities campus: Plan A or B degrees are awarded only in exceptional circumstances. A Plan A M.S. degree requires 14 credits in physiology and 6 credits outside of physiology. The degree is based on laboratory research off or on campus, and requires a written thesis or written project and an oral presentation of the work for the final exam. The M.S. degree is Plan A, unless there are special circumstances requiring a Plan B. For Plan B, the final exam is oral.
Twin Cities Campus
Integrative Biology and Physiology Minor

Integrative Biology and Physiology
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Integrative Biology and Physiology, Jackson Hall 6-125, 321 Church Street S.E., Minneapolis, MN 55455 (612-625-5902; fax: 612-625-5149)
Email: ibpdept@umn.edu
Website: http://physiology.med.umn.edu/grad/index.html

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

Physiology may be defined as the application of mathematics, physics, and chemistry to the study of structure and function in living systems. As such, physiology is a "hybrid" field in which expertise from many other disciplines is ordinarily required and combined. The program emphasizes a quantitative approach to understanding the functions of cells, organs, and systems in living animals.

The graduate program in the Twin Cities has a cardiovascular emphasis, although many other areas of specialization are represented.

The program includes faculty and corresponding research laboratories from the Department of Integrative Biology and Physiology and also the Departments of Medicine; Surgery; Neuroscience; Neurosurgery; Biochemistry, Molecular Biology, and Biophysics; Pharmacology; Physical Medicine and Rehabilitation; Kinesiology; and Animal Science.

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

Prerequisites for Admission
Other requirements to be completed before admission:
For the minor, a background in mathematics, physics, chemistry, and biology acceptable to the graduate faculty is required.

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 of 6 graduate credits in physiology is required (with approval by the director of graduate studies) for the master's minor. Ph.D. students seeking a doctoral minor are expected to take PHSL 5101 or the equivalent, plus additional courses for a total of 12 credits. Approval is required by the director of graduate studies.
Twin Cities Campus
Integrative Biology and Physiology Ph.D.
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Integrative Biology and Physiology, Jackson Hall 6-125, 321 Church Street S.E., Minneapolis, MN 55455 (612-625-5902; fax: 612-625-5149)
Email: ibpdept@umn.edu
Website: http://www.umnphysiology.com/grad/home

Program Type: Doctorate
Requirements for this program are current for Fall 2014
Length of program in credits: 53
This program does not require summer semesters for timely completion.
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.

Physiology may be defined as the application of mathematics, physics, and chemistry to the study of structure and function in living systems. As such, physiology is a "hybrid" field in which expertise from many other disciplines is ordinarily required and combined.

The program emphasizes a quantitative approach to understanding the functions of cells, organs, and systems in living animals. Ph.D. students take a core concentration that provides a broad background in the physiology of membranes, cells, transport, and organ systems. Individualized programs are structured to build on the student's strengths and to fill in gaps that would otherwise be an impediment to specific problem solving. Teaching experience is also available to all students.

The graduate program in the Twin Cities has a cardiovascular emphasis, although many other areas of specialization are represented.

Students can enter the Ph.D. program from the Twin Cities or Duluth campus. Highly qualified individuals with solid quantitative backgrounds are encouraged to apply. In the Twin Cities, prospective students also include people with previous medical training who are already at the University of Minnesota or are considering the University of Minnesota Medical School for residency or fellowship training.

Entering Ph.D. students are expected to take a series of laboratory rotations to familiarize themselves with active areas of research within the degree program. The program includes faculty and corresponding research laboratories from the Department of Integrative Biology and Physiology and also the Departments of Medicine; Surgery; Neuroscience; Neurosurgery; Biochemistry, Molecular Biology, and Biophysics; Pharmacology; Physical Medicine and Rehabilitation; Kinesiology; and Animal Science.

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 3.50.

Other requirements to be completed before admission:
An undergraduate degree with at least one year (three quarters or two semesters) of calculus, one year of physics, one year of biology, and two years of chemistry is required. For the minor, a background in mathematics, physics, chemistry and biology acceptable to the graduate faculty is required.

Special Application Requirements:
For the Ph.D., applicants must take either the General Test of the GRE or the Medical College Admission Test. In addition, all applicants need three letters of recommendation. Admission can be in either fall (preferable) or spring semester.

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
  - Paper Based - Total Score: 550
• IELTS
  - Total 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
17 credits are required in the major.
12 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 4 semesters must be completed before filing a Degree Program Form.

The Ph.D. program requires courses in cellular physiology and medical physiology. Coursework is tailored to the student's interests with input from the director of graduate studies and the student's adviser. During the first year, students rotate through three laboratories, attend weekly seminars, choose an adviser, and begin a research project. A preliminary written exam in physiology is given after the first year and examines the ability of the student to apply concepts learned in core courses. By the end of the second year, students have completed their coursework including a grant-writing class, and selected a laboratory for their thesis research. A preliminary oral exam is given at the end of the second year and tests the student's ability to apply principles of both physiology and the minor or supporting program to a proposed research-based thesis. A minimum of 12 credits must be completed in the minor field or supporting program.

Minor Requirements for Students Majoring in Other Fields: Ph.D. students are expected to take PHSL 5101 or the equivalent plus additional courses for a total of 12 credits.
Twin Cities Campus
Medical Physics M.S.
Radiation Oncology Administration, Radiology
Medical School

Link to a list of faculty for this program.

Contact Information:
University of Minnesota Medical School, Department of Radiation Oncology, Mayo Mail Code 494, 420 Delaware Street S.E., Minneapolis, MN 55455 (phone: 612-626-6154; fax: 612-626-7060)
Email: gerbi001@umn.edu
Website: http://www.med.umn.edu/trad/GraduateProgram/home.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 program is made up of faculty members with primary appointments in departments that include radiation oncology, radiology, physics, engineering, computer science, physiology, dentistry, and biochemistry. In addition to providing clinical experience in areas such as radiation oncology, radiation safety and quality assurance, the program is active in research and provides graduate level training in medical physics. The goal of the program is to prepare students (1) for further education, teaching, and research in medical physics, (2) to qualify to enter a medical physics residency program in radiation oncology or diagnostic radiology, and (3) to provide the mathematical and technical knowledge needed to succeed in the increasingly complex field of medical physics.

Accreditation
This program is accredited by Commission on Accreditation of Medical Physics Education Programs, Inc. (CAMPEP)

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.

A degree in physics or engineering or other physical science. Equivalent of an undergraduate physics minor-at least 2 semesters of calculus based physics and at least 3 upper level physics courses.

Other requirements to be completed before admission:
All students should have some familiarity with physical chemistry, intermediate physics, intermediate mathematics, biostatistics, computer programming, biology, physiology, and biochemistry. This may be demonstrated by coursework completed at the undergraduate level or as part of the graduate program; by reading or practical experience; or by informal competency examinations.

Special Application Requirements:
Three letters of recommendation are required. The General Test of the GRE is required. The computer based GRE exam is provided year-round by the Educational Testing Service. A list of test sites can be found at: http://www.ets.org/gre. Our institution code is R6874 with no department code. If the GRE was taken more than two years prior to application, the applicant will need to retake the examination. We have no absolute GRE cutoff score, but the score is taken into consideration among many individual factors in the evaluation of each application. Applicants are considered for admission in both semesters.

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
- Paper Based - Total Score: 550
- IELTS
  - Total 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 oral.

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 2.8 is required for students to remain in good standing.

The M.S. is offered under one plan. Plan B students complete a project under the direction of a faculty member/advisor, submit a written document to their oral exam committee, and defend their work in front of the committee.

Required Courses M.S.

- **MPHY 5170** - Basic Radiological Physics (3.0 cr)
- **PHYS 5401** - Physiological Physics (4.0 cr)
- **MPHY 5138** - Research Seminar (1.0 - 5.0 cr)
- **MPHY 5173** - Medical and Health Physics of Radiation Therapy (3.0 cr)
- **PHYS 5402** - Radiological Physics (4.0 cr)
- **MPHY 5171** - Medical and Health Physics of Imaging I (3.0 cr)
- **MPHY 5172** - Radiation Biology (3.0 cr)
- **MPHY 5174** - Medical and Health Physics of Imaging II (3.0 cr)
- **MPHY 5139** - Seminar and Journal Club (1.0 cr)

Medical Physics Electives

Other electives as advised.

- **MPHY 5177** - Radiation Therapy Physics Lab: Radiation Physics Basics (3.0 cr)
- or **MPHY 8149** - Advanced Topics in Radiation Therapy Physics (2.0 cr)
- or **MPHY 8148** - Advanced Digital Imaging Science (3.0 cr)
- or **MPHY 8147** - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)

ADDITIONAL REQUIREMENTS (NOT FOR CREDIT)

In the fall semester of their first year, students must take the University ethics training: Responsible Conduct of Research (RCR), Parts 1 (a 3-hour session offered about 4 times/year) and 2.
Twin Cities Campus
Medical Physics Ph.D.
Radiation Oncology Administration, Radiology
Medical School

Link to a list of faculty for this program.

Contact Information:
Therapeutic Radiology, Dept of MMC 494 Mayo 8494A 420 Delaware St SE Minneapolis, MN 55455
Email: gerbi001@umn.edu
Website: http://www.med.umn.edu/trad/GraduateProgram/home.html

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- no
- 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 program is made up of faculty members with primary appointments in departments that include radiation oncology, radiology, physics, engineering, computer science, physiology, dentistry, and biochemistry. In addition to providing clinical experience in areas such as radiation oncology, radiation oncology, radiation safety and quality assurance, the program is active in research and provides graduate level training in medical physics. The goal of the program is to prepare students (1) for further education, teaching, and research in medical physics, (2) to qualify to enter a medical physics residency program in radiation oncology or diagnostic radiology, and (3) to provide the mathematical and technical knowledge needed to succeed in the increasingly complex field of medical physics.

Accreditation
This program is accredited by Commission on Accreditation of Medical Physics Education Programs, Inc. (CAMPEP)

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 degree in physics or engineering or other physical science. Equivalent of an undergraduate physics minor-at least 2 semesters of calculus based physics and at least 3 upper level physics courses.

Other requirements to be completed before admission:
All students should have some familiarity with physical chemistry, intermediate physics, intermediate mathematics, biostatistics, computer programming, biology, physiology, and biochemistry. This may be demonstrated by coursework completed at the undergraduate level or as part of the graduate program; by reading or practical experience; or by informal competency examinations.

Special Application Requirements:
Three letters of recommendation are required. The General Test of the GRE is required. The computer based GRE exam is provided year-round by the Educational Testing Service. A list of test sites can be found at: http://www.ets.org/gre. Our institution code is R6874 with no department code. If the GRE was taken more than two years prior to application, the applicant will need to retake the examination. We have no absolute GRE cutoff score, but the score is taken into consideration among many individual factors in the evaluation of each application. Applicants are considered for admission in both semesters.

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
  - Paper Based - Total Score: 550

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Information current as of September 19, 2014
IELTS
- Total 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
48 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

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.

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

Ph.D. students take preliminary written exams at the end of the first year of study or as soon as possible after completing the core course sequence in topics in physics for medicine and biology. An oral preliminary exam focuses on the plan for thesis research and the student's grasp of related information and is taken by the fall of the third year of full-time registration or its equivalent. Additionally, 24 thesis credits are required.

Required Courses
MPHY 5170 - Basic Radiological Physics (3.0 cr)
PHYS 5401 - Physiological Physics (4.0 cr)
MPHY 5138 - Research Seminar (1.0 - 5.0 cr)
MPHY 5173 - Medical and Health Physics of Radiation Therapy (3.0 cr)
PHYS 5402 - Radiological Physics (4.0 cr)
PHAR 5201 - Applied Health Sciences Terminology (2.0 cr)
MPHY 5171 - Medical and Health Physics of Imaging I (3.0 cr)
MPHY 5172 - Radiation Biology (3.0 cr)
MPHY 5174 - Medical and Health Physics of Imaging II (3.0 cr)
MPHY 5177 - Radiation Therapy Physics Lab: Radiation Physics Basics (3.0 cr)
MPHY 8149 - Advanced Topics in Radiation Therapy Physics (2.0 cr)
MPHY 5139 - Seminar and Journal Club (1.0 cr)

Medical Physics Electives
Electives will be based on focus of program objectives with advisor.
MPHY 8148 - Advanced Digital Imaging Science (3.0 cr)
or
MPHY 8147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
or Other electives as advised.

ADDITIONAL REQUIREMENTS (NOT FOR CREDIT)
In the fall semester of their first year, students must take the University ethics training:
Responsible Conduct of Research (RCR), Parts 1 (a 3-hour session offered about 4 times/year) and 2.
Microbiology, Immunology, and Cancer Biology M.S.

Twin Cities Campus

Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Microbiology, 1460 Mayo Building, 420 Delaware Street S.E., Minneapolis MN 55455 (612-624-5947; fax: 612-626-0623)
Email: micab@umn.edu
Website: http://micab.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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.

Note: Students are not admitted directly into the master's program; it is available only by special arrangement with the program.

Students prepare for careers in biomedical research and teaching by completing broad training in molecular biology or biological sciences, and focused specialization in one of three concentrations (microbiology, immunology, or cancer biology). The program offers exceptional research opportunities for graduate training in autoimmunity, biotechnology, cancer biology and therapy, environmental microbiology, genetic engineering of microorganisms, lymphocyte activation and development, microbial pathogenesis, molecular genetics of disease, tumor immunology, vaccine development, and vascular biology and inflammation.

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 3.50.

Applicants must have a bachelor's degree (B.S. preferred).

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: 96
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 85

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
Plan A: Plan A requires 12 to 18 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.
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.

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

Students are not admitted directly into the master's program; it is available only by special arrangement with the program. Students complete 14 MICA course credits, 6 credits in the minor or related field, and 10 thesis credits. Students must write and defend a thesis based on original research.
Twin Cities Campus

Microbiology, Immunology, and Cancer Biology Minor

Medical School - Adm

Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Microbiology, 1460 Mayo Building, 420 Delaware Street S.E., Minneapolis MN 55455 (612-624-5947; fax: 612-626-0623)
Email: micab@umn.edu
Website: http://micab.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.
- No

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 prepare for careers in biomedical research and teaching by completing broad training in molecular biology or biological sciences, and focused specialization in one of three concentrations (microbiology, immunology, or cancer biology). The program offers exceptional research opportunities for graduate training in autoimmunity, biotechnology, cancer biology and therapy, environmental microbiology, genetic engineering of microorganisms, lymphocyte activation and development, microbial pathogenesis, molecular genetics of disease, tumor immunology, vaccine development, and vascular biology and inflammation.

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 3.50.

Applicants must have a bachelor's degree (B.S. preferred).

Other requirements to be completed before admission:
Required courses include calculus, general chemistry, organic chemistry, and physics. A minimum of two upper-level biology courses, which may include biochemistry, genetics, cell biology, molecular biology, microbiology, or immunology, etc. are also required.

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: 96

Key to test abbreviations (GRE, TOEFL).

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.

Students enrolled in a University master's or doctoral program are eligible for the MICaB minor. Requirements for the master's- and doctoral-level MICaB minor include: completion of 8 MICaB credits from 2 of the following 4-credit courses: MICA 8002, MICA 8003, MICA 8004; and the approval of the MICaB director of graduate studies. Doctoral students must also complete at least 4, but no more
than 10, additional MICAB credits in consultation with the MICaB director of graduate studies.
Twin Cities Campus
Microbiology, Immunology, and Cancer Biology Ph.D.
Medical School - Adm
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Microbiology, 1460 Mayo Building, 420 Delaware Street S.E., Minneapolis MN 55455 (612-624-5947; fax: 612-626-0623)
Email: micab@umn.edu
Website: http://micab.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 48 to 72
- This program does not require summer semesters for timely completion.
- NA
- 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.

Students prepare for careers in biomedical research and teaching by completing broad training in molecular biology or biological sciences, and focused specialization in one of three concentrations (microbiology, immunology, or cancer biology). The program offers exceptional research opportunities for graduate training in autoimmunity, biotechnology, cancer biology and therapy, environmental microbiology, genetic engineering of microorganisms, lymphocyte activation and development, microbial pathogenesis, molecular genetics of disease, tumor immunology, vaccine development, and vascular biology and inflammation.

Accreditation
This program is accredited by NA

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 3.50.

Applicants must have a bachelor's degree (B.S. preferred).

Other requirements to be completed before admission:
Required courses include calculus, general chemistry, organic chemistry, and physics. A minimum of two upper-level biology courses, which may include biochemistry, genetics, cell biology, molecular biology, microbiology, or immunology, etc. are also required.

Research experience is required. Relevant undergraduate experience includes honors thesis work, paid or volunteer work in a research laboratory and summer internships. It does not include laboratory courses that accompany science courses such as biology. Postbaccalaureate research experience is preferred but not required.

Special Application Requirements:
The program evaluates applications based on four equally weighted criteria: academics (GPA and GRE scores), letters (3) of recommendation, a personal statement, and research experience. The average GPA and GRE scores of accepted applicants are typically 3.50 and 80th percentile, respectively (no GRE Subject Test is required). Letters of recommendation from research advisers or mentors are preferred as these individuals can comment knowlegably on the student's potential in biomedical research. Applicants' personal statements should describe their research in general and their specific contribution to it, their rationale for seeking a doctoral degree, and any information they wish to share regarding their backgrounds and interest in the MICaB Program. Finally, applicants should provide specific details of their research experiences (project titles, mentors, dates, locations, etc.), along with a list of relevant abstracts, publications, etc.

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: 96
    - Paper Based - Total Score: 600
  • IELTS
    - Total Score: 7
  • MELAB
    - Final score: 85

The preferred English language test is Test of English as Foreign Language

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

11 to 12 credits are required in the major.
12 to 13 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.

Beginning study in the fall, students spend their first year on major coursework, identifying an adviser by doing laboratory rotations, selecting a concentration, and initiating their thesis research project. The program encourages students to take at least two of the three MICA track core courses, but only requires one. In the fall semester of their second year, all students take MICA 8012, which highlights the integrated nature of the three tracks and helps prepare the students for their written and oral qualifying examinations (taken in the spring semester of the second year). Students also take courses that support studies in their focus area during their first two years.

In addition to coursework and research, students have opportunities to participate in laboratory meetings, journal clubs, and student research seminars, and to assist in laboratory courses. Most students complete the Ph.D. in four to five years.
**Twin Cities Campus**

**Neuroscience M.S.**

*Neuroscience*  
*Medical School*

Link to a list of faculty for this program.

**Contact Information:**  
Department of Neuroscience, 6-145 Jackson Hall, 321 Church Street S.E., Minneapolis, MN 55455 (612-626-6474; fax: 612-626-6460)  
Email: neurosci@umn.edu  
Website: http://www.neuroscience.umn.edu

- Program Type: Master's  
- Requirements for this program are current for Fall 2014  
- Length of program in credits: 48  
- 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.

Neuroscience is an interdisciplinary field of inquiry. The objects of this inquiry, the brain and nervous system, are sufficiently complex and unique among biological systems to require experimental and analytical approaches that cross the traditional boundaries of molecular and cell biology, behavioral biology, biochemistry, genetics, pharmacology, physiology, and psychology. In some instances, neuroscientific inquiry may also encompass computer science, information processing, engineering, physics, and mathematics.

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

**Prerequisites for Admission**  
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, 12 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 4 semesters must be completed before filing a Degree Program Form.

The course requirements for a master’s degree are the same as those for a Ph.D. degree. See the Program Requirements of the Neuroscience Ph.D.
Twin Cities Campus

Neuroscience Minor

Neuroscience
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Neuroscience, 6-145 Jackson Hall, 321 Church Street S.E., Minneapolis, MN 55455 (612-626-6474; fax: 612-626-6460)
Email: neurosci@umn.edu
Website: http://www.neuroscience.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- Length of program in credits (Doctorate): 16
- 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.

Neuroscience is an interdisciplinary field of inquiry. The objects of this inquiry, the brain and nervous system, are sufficiently complex and unique among biological systems to require experimental and analytical approaches that cross the traditional boundaries of molecular and cell biology, behavioral biology, biochemistry, genetics, pharmacology, physiology, and psychology. In some instances, neuroscientific inquiry may also encompass computer science, information processing, engineering, physics, and mathematics.

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

Prerequisites for Admission
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 doctoral minor program is developed in consultation with the director of graduate studies for neuroscience. Students are required to take one of the following core courses.

Function/Structure: NSC 5561 - Systems Neuroscience (4 cr) or
Cellular/Molecular: NSC 5461 - Cellular and Molecular Neuroscience (4 cr)

In addition, students are required to take elective neuroscience courses for a total minimum of 12 credits (including the core courses).
Twin Cities Campus

Neuroscience Ph.D.

Neuroscience
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Neuroscience, 6-145 Jackson Hall, 321 Church Street S.E., Minneapolis, MN 55455 (612-626-6474; fax: 612-626-6460)
Email: neurosci@umn.edu
Website: http://www.neuroscience.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 50
- This program requires summer semesters for timely completion.
- 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.

Neuroscience is an interdisciplinary field of inquiry. The objects of this inquiry, the brain and nervous system, are sufficiently complex and unique among biological systems to require experimental and analytical approaches that cross the traditional boundaries of molecular and cell biology, behavioral biology, biochemistry, genetics, pharmacology, physiology, and psychology. In some instances, neuroscientific inquiry may also encompass computer science, information processing, engineering, physics, and mathematics.

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

Prerequisites for Admission

Special Application Requirements:
Applicants are required to take the GRE General Test. Students whose native language is not English are required to take the TOEFL and obtain a minimum score of 625 (paper), 263 (computer), or 107 (Internet); or obtain 6.5 on the IELTS examination. There are no minimum GPA or GRE score requirements.

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
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5

The preferred English language test is Test of English as Foreign Language

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

20 credits are required in the major.
6 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 4 semesters must be completed before filing a Degree Program Form.

The neuroscience Ph.D. curriculum begins in the summer session with the intensive laboratory course in cellular and molecular neurobiology (NSC 5551), held at the Itasca Biological Station and Laboratories.

The core curriculum continues on the Twin Cities campus with NSC 5461, 5561, 5661, and 8211. While taking these courses, students explore research opportunities in the faculty's laboratories and thereby select a thesis adviser.

Students will also participate in journal clubs (NSC 8320) to discuss work in the field of Neuroscience. Elective courses totaling 6 credits are required and selected in consultation with the adviser.

Students with sufficient background and previous course experience may apply for a waiver of specific requirements. A student, if they so choose, must take at least 12 elective credits to receive a minor (typical minors include cell biology, physiology, statistics, psychology, and medicine; medicine is primarily for students in the M.D. Ph.D. program). Students are also expected to participate in teaching neuroscience and to attend the weekly colloquium, as well as neuroscience seminars and sessions devoted to professional development. Students are strongly encouraged to attend seminars in other areas and departments that may interest them.

**Summer - First Year**
NSc 5551: Cell & Molecular Neurobiology Lab at Itasca (4 cr)

**Fall - First Year**
NSc 5461: Cellular & Molecular Neuroscience (4 cr)
NSc 5561: Systems Neuroscience (4 cr)

**Spring - First Year**
NSc 5661: Behavioral Neuroscience (3 cr)
NSc 8211: Developmental Neurobiology (3 cr)
NSc 8320: Neuroscience Seminar Series Journal Club (Section 2) (1 cr)

**Spring - Second Year**
NSc 8320: Neuroscience Seminar Series Journal Club (Section 2) (1 cr)
Twin Cities Campus
Orthoptics Post-baccalaureate Certificate
Ophthalmology
Medical School

Link to a list of faculty for this program.

Contact Information:
Minnesota Lions Children's Eye Clinic
(University of Minnesota Physicians and University of Minnesota Amplatz Children's Hospital)
701 25th Ave S. Ste 300
Minneapolis, MN 55454
612-365-8365
612-365-8351 (Fax)
Email: kmerrill@umphysicians.umn.edu

• Program Type: Post-baccalaureate credit certificate/licensure/endorsement
• Requirements for this program are current for Fall 2014
• Length of program in credits: 14
• This program requires summer semesters for timely completion.
• Degree: Orthoptics PostBaccalaureate 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 Orthoptic Certificate program is a vital part of the ophthalmic health care profession. This is a specialized profession, the focus of which is the evaluation and treatment of disorders of vision, eye movements, and eye alignment in children and adults. The study of orthoptics follows a logical sequence of studies vital to the understanding of the visual system. The didactic education is integrated with practical clinical experience. Orthoptists work with ophthalmologists, eye physicians and surgeons, as part of the medical team. They are employed in a variety of settings, including university and teaching hospitals, children's hospitals, and solo or multi-specialty group medical practices. An orthoptist sees a variety of patients of all ages, although due to the nature of their visual disorders, the majority of the patients are young children; some individuals with multiple health concerns are also evaluated as they commonly have ocular/binocular problems. After completing an Orthoptic Certificate, a student earns national certification as an orthoptist through written and practical examinations administered by the American Orthoptic Council.

This program requires two semesters and a summer term of coursework.

Accreditation
This program is accredited by American Association of Certified Orthoptists

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 2.00.

Required prerequisites
Course Group 0

Other requirements to be completed before admission:
Requirements for entry into the Orthoptics Certificate Program include the following:
1. Completion of baccalaureate degree with GPA at least 2.0.
2. Successful completion of one year in a hospital/clinic-based ophthalmic technician training program (e.g., Regions Hospital)

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 GPA of 2.8 is required for students to remain in good standing.

The 2.8 GPA requirement complies with University of Minnesota policy.

Orthoptics Required Courses
  OPH 5501 - Orthoptics I (4.0 cr)
  OPH 5601 - Orthoptics II (5.0 cr)
  OPH 5701 - Orthoptics III (5.0 cr)

Required Core

Orthoptic Certificate
Twin Cities Campus
Otolaryngology Ph.D. Otol.
Otolaryngology
Medical School

Link to a list of faculty for this program.

**Contact Information:**
Department of Otolaryngology, MMC 396, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-625-3200; fax: 612-625-2101)
Website: [http://www.ent.umn.edu](http://www.ent.umn.edu)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 55
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy in Otolaryngology

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 program prepares students in both clinical and experimental aspects of otolaryngology. The Ph.D.Otol. degree requires a publishable thesis. Rotations at University of Minnesota Medical Center-Fairview, Minneapolis Veterans Administration Medical Center, Regions Hospital, Minneapolis Children's Hospital, and Hennepin County Medical Center provide a wide range of opportunity for clinical education and surgical experience.

Opportunities for independent research are provided in the laboratories of audiology, auditory electrophysiology, auditory neurophysiology, biochemistry, cancer biology, cell biology and genetics, electron microscopy, electrophysiology, histochemistry, morphometry, psychoacoustics, temporal bone pathology, tumor immunology, skin-flap physiology, laryngeal physiology, mandibular bone physiology, microvascular tissue transfer, and vestibular physiology. Graduates of the program have careers in teaching, research, and professional practice.

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

**Prerequisites for Admission**
Other requirements to be completed before admission:
Requires a bachelor's or master's degree, preferably in an area related to otolaryngology or, for those pursuing the degree in conjunction with a residency in otolaryngology, an M.D. degree.

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

**Program Requirements**
19 credits are required in the major.
12 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 2.80 is required for students to remain in good standing.

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

The number of credits varies depending on preparation and the research undertaken. Most students take a total of about 55 credits. A minimum of 12 credits in the minor or supporting program, plus 24 doctoral thesis credits, are required. An advisory committee, including the student, the adviser, and the director of graduate studies, determines coursework in the major. At least one seminar is selected from seminars such as OTOL 8247, 8248, 8249, and 8250. Understanding and application of basic statistics and experimental...
methodology are expected. Statistics coursework is usually necessary. Choice of statistics courses is made with the guidance of the director of graduate studies.

All students are expected to publish a research paper in a peer-reviewed journal. Students concurrently in an otolaryngology residency usually take five to six years to complete research, course, and dissertation requirements.
Twin Cities Campus
Pharmacology M.S.
Pharmacology
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Pharmacology, 6-120 Jackson Hall, 321 Church Street S.E., Minneapolis MN 55455 (612-625-9997; fax: 612-625-8408)
Email: phclgrad@umn.edu
Website: http://www.pharmacology.med.umn.edu/graduate.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30 to 36
- 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.

Pharmacology is the study of the interactions of chemicals with biological systems. Courses and research training in biochemistry, biophysics, genetics, and molecular biology provide a solid foundation for performing original research in pharmacology, neuropharmacology, and cancer chemotherapy.

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 3.50.

A four-year B.A. or B.S. degree (or its equivalent) in a basic science program is generally required.

Other requirements to be completed before admission:
Candidates for admission are evaluated on the basis of undergraduate record, GRE score, previous research experience, and letters of recommendation.

Special Application Requirements:
Applicants must submit scores from the General Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives.

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: 100
  - Paper Based - Total Score: 600
* IELTS
  - Total Score: 7.5

The preferred English language test is Test of English as Foreign Language

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 A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is written and 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: A research project approved by the advisor and Director of Graduate Studies.

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.

Students are required to maintain a GPA of 3.00. Students who fail to maintain this standard must petition the Director of Graduate Studies for permission to remain in the program.
Twin Cities Campus
Pharmacology Minor
Pharmacology
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Pharmacology, 6-120 Jackson Hall, 321 Church Street S.E., Minneapolis MN 55455 (612-625-9997; fax: 612-625-8408)
Email: phclgrad@umn.edu
Website: http://www.pharmacology.med.umn.edu/graduate.html

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2014
• 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.

Pharmacology is the study of the interactions of chemicals with biological systems. Courses and research training in biochemistry, biophysics, genetics, and molecular biology provide a solid foundation for performing original research in pharmacology, neuropharmacology, and cancer chemotherapy.

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

Prerequisites for Admission
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 master's minor requires a minimum of 9 credits in pharmacology approved by the director of graduate studies. A doctoral minor requires a minimum of 12 credits in pharmacology approved by the director of graduate studies. There are no special requirements (e.g., specific courses, written examination).
Pharmacology Ph.D.
Medical School

Contact Information:
Department of Pharmacology, 6-120 Jackson Hall, 321 Church Street S.E., Minneapolis MN 55455 (612-625-9997; fax: 612-625-8408)
Email: phclgrad@umn.edu
Website: http://www.pharmacology.med.umn.edu/graduate.html

• Program Type: Doctorate
• Requirements for this program are current for Fall 2014
• Length of program in credits: 48
• This program requires summer semesters for timely completion.
• 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.

Pharmacology is the study of the interactions of chemicals with biological systems. Courses and research training in biochemistry, biophysics, genetics, and molecular biology provide a solid foundation for performing original research in pharmacology, neuropharmacology, and cancer chemotherapy.

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 3.50.

A four-year B.A. or B.S. degree (or its equivalent) in a basic science program is generally required.

Other requirements to be completed before admission:
Candidates for admission are evaluated on the basis of undergraduate record, GRE score, previous research experience, and letters of recommendation.

Special Application Requirements:
Applicants must submit scores from the General Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives.

Applicants must submit scores from the General Test of the GRE, with scores above the 80th percentile in all categories preferred.

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: 100
  - Paper Based - Total Score: 600
• IELTS
  - Total Score: 7.5

The preferred English language test is Test of English as Foreign Language

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
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.

Students are required to maintain a GPA of 3.00. Students who fail to maintain this standard must petition the Director of Graduate Studies for permission to remain in the program.

For more detailed information, contact the Director of Graduate Studies in Pharmacology.

Joint- or Dual-degree Coursework: Joint Program in Law, Health and the Life Sciences. Student may take a total of 12 credits in common among the academic programs.
Twin Cities Campus
Physical Therapy D.P.T.
Physical Medicine & Rehabilitation
Medical School

Link to a list of faculty for this program.

Contact Information:
Program in Physical Therapy, MMC 388, 420 Delaware Street S.E., Minneapolis, MN 55455, (612-624-2662; fax: 612-625-4274)
Email: ptquest@umn.edu
Website: http://physther.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 141
- This program requires summer semesters for timely completion.
- Courses in this Program are taught on campus for the first 7 semesters, with numerous off-site clinic visits scheduled throughout semester 2-7. The remaining 2 semesters of the Program consist of 4 full-time clinical internships. These internships occur off-campus in physical therapy clinics.
- Degree: Doctor of Physical Therapy

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 Physical Therapy Program, a division within the Department of Physical Medicine and Rehabilitation, offers a professional doctoral degree in physical therapy (D.P.T.). Physical therapy is a health care discipline involved with the study and rehabilitation of movement impairments such as muscular weakness, impaired coordination, joint stiffness, and pain, which can lead to functional problems affecting self care, employment, ambulation, etc. Graduates are prepared to promote proper health care and quality of living by maximizing human movement following disease or injury or by preventing its loss. The program requires three years of year-round, full-time graduate study. Academic coursework and research activity are completed during the first seven semesters. The final two semesters are devoted to clinical internships.

Accreditation
This program is accredited by Commission on Accreditation in Physical Therapy Education (CAPTE) (APTA).

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 University of Minnesota Program in Physical Therapy has no required or preferred undergraduate major. Any baccalaureate degree or equivalent from an accredited institution is accepted.

Other requirements to be completed before admission:
To be eligible for admission, the student must complete a baccalaureate degree, or its foreign equivalent, from an accredited institution by June 1st of the year of admission, including the required prerequisite courses or their equivalents.

Applicant must complete at least 100 hours of volunteer or work experience in a physical therapy setting. Exposure to multiple and varied areas of practice in physical therapy and additional health care exposure are considered an important preparation. The GRE General exam only is required. TOEFL is required for international students. Two letters of recommendation.

Special Application Requirements:
Below is a list of required prerequisite coursework to be taken before entering the program. Courses must be taken A-F, unless receiving Advanced Placement (AP) credit. A minimum grade of C is required in all prerequisite coursework. It is recommended that these courses be taken within the previous five years. Courses may be taken at any accredited college. Students are expected to be skillful with computer applications for word processing and creating spreadsheets.
- General biology, with lab
- A second biology course of the student's choice, with lab
- Human anatomy
Human physiology
- General chemistry or inorganic chemistry - minimum two courses, with lab
- General physics, which includes mechanics and electricity - minimum two courses, with lab
- General psychology
- Abnormal psychology
- Statistics - ANOVA and regression analysis content strongly recommended
- Introductory calculus (pre-calculus not acceptable; Intro to Calculus or Short Calculus acceptable)
- Medical terminology

For all AP courses on the transcript, a score must be entered. This will be the score issued by the College Board. Students must also forward a copy of the College Board Report to the admissions coordinator to keep on file.

If distance learning courses are taken from an accredited college or university for college credit, there is no limit to the number that may be taken through distance education.

All prerequisite courses and an undergraduate degree must be completed before the student enrolls in the professional program. Students may apply with two remaining prerequisites in progress. Past students have found that biochemistry, and human/animal biology classes have been helpful preparation for the D.P.T. curriculum.

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
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5

The preferred English language test is Test of English as Foreign Language

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
141 credits are required in the major.
This program may not be completed with a minor.

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

The program requires 141 major field credits, of which 101 are core academic credits and 40 are clinical internship credits. Nine credits of research are included in the core academic credits and a scientific poster presentation and written exam based on this research culminates the project. No minor or related field is required. Students must maintain a cumulative GPA of 2.80 while in the program.
Twin Cities Campus
Rehabilitation Science M.S.
Physical Medicine & Rehabilitation
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Physical Medicine and Rehabilitation, MMC 388, 420 Delaware Street S.E., Minneapolis, MN, 55455 (612-625-3966; fax: 612-625-4274)
Email: adamc002@umn.edu
Website: http://www.rehabscience.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30 to 33
- 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.

Note: The Rehabilitation Science Program prefers Ph.D. applicants over M.S. applicants. The M.S. track often applies to students who are in need of a trial program to determine whether or not the Ph.D. track is a good fit. In addition, the M.S. track is used for students who initially begin the Ph.D., but find that the Ph.D. is not the best fit and subsequently switch to the M.S.

The graduate program in rehabilitation science is a post-professional program designed to train rehabilitation scientists and academicians. The program includes occupational and physical therapists and students with other backgrounds interested in rehabilitation research. The program's philosophy provides students with 1) a strong foundation in research methodology, 2) a concentrated educational experience specifically tailored toward a student's specific research question in rehabilitation science, and 3) a working knowledge of the importance of a collaborative, interdisciplinary approach to the scientific process.

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.

Minimum US equivalent bachelor's degree.

Other requirements to be completed before admission:
Applicants must hold a US equivalent bachelor's degree or graduate degree in a discipline related to rehabilitation such as biomedical engineering, medicine, occupational therapy, physical therapy, or speech/audiology. International students must hold a comparable foreign degree from an accredited program. Depending on the educational background of the applicant, admission may be contingent upon completion of selected prerequisite coursework.

Special Application Requirements:
In addition to the University's application (including personal statement and fee), applicants must submit the following materials: GRE General Test scores (scores in the 60th percentile or higher are preferred); official transcripts; three letters of reference; and TOEFL score for international students. Student must also have an agreed-upon faculty adviser at the time of applying. Compatibility of research interests is a major determinant in the student/adviser relationship.

The Rehabilitation Science Program prefers Ph.D. applicants over M.S. applicants. The M.S. track often applies to students who are in need of a trial program to determine whether or not the Ph.D. track is a good fit. In addition, the M.S. track is used for students who initially begin the Ph.D., but find that the Ph.D. is not the best fit and subsequently switch to the M.S.

GRE score is mandatory. Scores in the 50th percentile or higher are preferred.

Applicants must submit their test score(s) from the following:
- GRE
- General Test - Verbal Reasoning: 154
- General Test - Quantitative Reasoning: 155
- General Test - Analytical Writing: 4

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

**TOEFL**
- Internet Based - Total Score: 88
- Internet Based - Listening Score: 21
- Internet Based - Writing Score: 23
- Internet Based - Reading Score: 21
- Internet Based - Speaking Score: 23

**IELTS**
- Total Score: 6.5

The preferred English language test is Test of English as Foreign Language (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 A:** Plan A requires 14 major credits, 9 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 14 to 21 major credits and 9 to 16 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** The Plan B project is a demonstration of the student's familiarity with the tools of research or scholarship in their major field, the ability to work independently, and the ability to present the results of their investigation effectively, by completing at least one Plan B project. The graduate faculty in each major field may require as many as three such projects. The Plan B project(s) should involve a combined total of approximately 120 hours (the equivalent of three full-time weeks) of work. The graduate faculty in each major field specifies both the nature and extent of the options available to satisfy this requirement, and whether the requirement is to be satisfied in conjunction with, or independent of, the courses in the student's program.

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 semesters must be completed before filing a Degree Program Form.

M.S. Plan A students must complete a minimum of 23 graduate course credits, in addition to 10 thesis credits. MS Plan B students must complete a minimum of 30 graduate course credits. The breakdown of credit requirements is as follows for both Plan A and Plan B: 14 credits or more of RSC course work, which include 4 credits from a core group of courses (RSC 5106, RSC 5206, RSC 5306, RSC 8106, RSC 8206, RSC 8306); 3 credits of statistics coursework (acceptable courses include, but are not limited to PUBH 6450 - Biostatistics I, PUBH 6451 - Biostatistics II, EPSY 8261 - Statistical Methods I, EPSY 8262 - Statistical Methods II), and 6 or more additional graduate credits from Rehab Science or from other graduate disciplines. For Plan B students, the remaining 7 graduate credits are determined in consultation with the student's advisor. Students may minor in a supporting field, but minors are not required. Minor areas of past students include gerontology, kinesiology, and public health. If a student chooses to declare a minor, the student must follow the minor requirements of the program offering the minor. The student's adviser may require additional courses. Students pursuing Plan A (with thesis) have the additional requirement of registering for 10 thesis credits.
Twin Cities Campus
Rehabilitation Science Minor
Physical Medicine & Rehabilitation
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Physical Medicine and Rehabilitation, MMC 388, 420 Delaware Street S.E., Minneapolis, MN, 55455 (612-625-3966; fax: 612-625-4274)
Email: adamc002@umn.edu
Website: http://www.rehabscience.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 graduate program in rehabilitation science is a post-professional program designed to train rehabilitation scientists and academicians. The program includes occupational and physical therapists and students with other backgrounds interested in rehabilitation research. The program's philosophy provides students with 1) a strong foundation in research methodology, 2) a concentrated educational experience specifically tailored toward a student's specific research question in rehabilitation science, and 3) a working knowledge of the importance of a collaborative, interdisciplinary approach to the scientific process.

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.

Minimum US equivalent bachelor's degree.

Other requirements to be completed before admission:
Applicants must hold a bachelor's degree or graduate degree in a discipline related to rehabilitation such as biomedical engineering, medicine, occupational therapy, physical therapy, or speech/audiology. International students must hold a comparable foreign degree from an accredited program. Depending on the educational background of the applicant, admission may be contingent upon completion of selected prerequisite coursework.

Special Application Requirements:
The student must inform the director of graduate studies (DGS) in writing of his or her intent to pursue the minor. A rehabilitation science faculty admissions committee determines student admission for the minor. To be admitted, a student must be an active graduate student pursuing an equivalent graduate degree in another field. The student must be in good academic standing within his or her major program. The student must have a mutually agreed-upon graduate faculty member in rehabilitation science serve as a reviewer on the student's dissertation committee and serve as the minor field examiner on the final exam committee.

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.

Master's students must complete a minimum of 6 RSC credits. Doctoral students must complete a minimum of 12 RSC credits. All students pursuing the minor must take the RSC courses on the A-F grade basis, and maintain at least a 3.0 GPA in those courses. Up to 2 RCS independent study credits are allowed for the master's, and up to 4 RCS independent study credits are allowed for the doctoral degree.
Below is a list of eligible rehabilitation science courses. Independent courses are indicated with an asterisk (*).

RSC 5101 - Math Tools for Research Applications (1 cr)
RSC 5106 - RSC Past, Present, Future (1 cr)
RSC 5135 - Advanced Biomechanics I: Kinematics (3 cr)
RSC 5200 - Intro to TMS
RSC 5206 - Academic Ethos (1 cr)
RSC 5231 - Clinical Biomechanics (3 cr)
*RSC 5294 - Independent Study in Rehabilitation Science (credits arranged)
RSC 5306 - Scientific and Professional Presentation (1 cr)
RSC 5814 - Age, Exercise, and Rehabilitation (2 cr)
RSC 5841 - Rehabilitation Science Instrumentation and Methodology (4 cr)
RSC 5901 - Scholarly Inquiry in Health Sciences (4 cr)
RSC 8106 - Critical Analysis of Scientific Literature (2 cr)
*RSC 8130 - Current Literature (credits arranged)
*RSC 8170 - Special Topics in Rehabilitation Science (credits arranged)
*RSC 8185 - Problems in Rehabilitation Science (credits arranged)
RSC 8192 - Research Design in Rehabilitation Science (3 cr)
RSC 8206 - Grant Writing (2 cr)
RSC 8282 - Problems in Human Movement (4 cr)
RSC 8306 - Peer Review and Publication (2 cr)
Twin Cities Campus

Rehabilitation Science Ph.D.
Physical Medicine & Rehabilitation
Medical School

Link to a list of faculty for this program.

Contact Information:
Dept of Physical Medicine and Rehabilitation, MMC 388, 420 Delaware Street SE, Minneapolis, MN, 55455 (phone: 612-625-3966; fax: 612-625-4274)
Email: adamc002@umn.edu
Website: http://www.rehabscience.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- 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 graduate program in rehabilitation science is a post-professional program designed to train rehabilitation scientists and academicians. The program includes occupational and physical therapists and students with other backgrounds interested in rehabilitation research. The program's philosophy provides students with 1) a strong foundation in research methodology, 2) a concentrated educational experience specifically tailored toward a student's specific research question in rehabilitation science, and 3) a working knowledge of the importance of a collaborative, interdisciplinary approach to the scientific process.

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.

Minimum US equivalent bachelor's degree.

Professional, graduate, or master's degree preferred but not required.

Other requirements to be completed before admission:
Applicants must hold a US equivalent bachelor's degree or graduate degree in a discipline related to rehabilitation such as biomedical engineering, medicine, occupational therapy, physical therapy, or speech/audiology. International students must hold a comparable foreign degree from an accredited program. Depending on the educational background of the applicant, admission may be contingent upon completion of selected prerequisite coursework.

Special Application Requirements:
In addition to the University's application (including personal statement and fee), applicants must submit the following materials: official GRE General Test scores (scores in the 60th percentile or higher are preferred); official transcripts; three letters of recommendation; and TOEFL scores for international students. Student must also have an agreed-upon faculty adviser at the time applying. Compatibility of research interests is a major determinant in the student/adviser relationship.

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 154
  - General Test - Quantitative Reasoning: 155
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 88
  - Internet Based - Listening Score: 21

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Information current as of September 19, 2014
Program Requirements
16 credits are required in the major.
20 credits are required outside the major.
24 thesis credits 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 1 semesters must be completed before filing a Degree Program Form.

The Ph.D. degree requires a minimum of 36 graduate credits, in addition to 24 dissertation credits. The minimum of 36 graduate credits is broken down as follows: 16 credits of Rehabilitation Science (RSC) credits, which include 6 credits of departmental core courses (RSC 5106, RSC 5206, RSC 5306, RSC 8106, RSC 8206, RSC 8306); 12 additional graduate credits which may be a combination of RSC courses or courses from other disciplines; and 8 graduate credits of approved statistics coursework. Minors are allowed, but not required. Sample minors of past students include gerontology, neuroscience, and public health. If a student chooses to declare a minor, the student must follow the minor requirements of the program offering the minor. RSC courses and statistics courses cannot be applied to the credits needed for the minor degree. Acceptable statistics courses include, but are not limited to: PUBH 6450-Biostatistics I, PUBH 6451-Biostatistics II, EPSY 8261-Statistical Methods I, and EPSY 8262-Statistical Methods II. To fulfill the requirement students need to take both courses in the respective series (Biostats I and Biostats II; Stat Methods I and Stat Methods II). Students cannot fulfill the statistics requirement by taking only PUBH 6450 - Biostatistics I and EPSY 8261 - Statistical Methods I. In addition to these minimum requirements, the adviser may require additional courses. Students should meet with their advisers prior to each semester to plan their courses of study.

Joint- or Dual-degree Coursework:DPT/PhD-Rehabilitation Science
Twin Cities Campus

Stem Cell Biology M.S.
Stem Cell Institute
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Stem Cell Biology Institute, 2001 6th Street S.E., Mail Code 2873, Minneapolis, MN 55455-3007 (612-625-0602; fax: 612-624-2436)
Email: ander607@umn.edu
Website: http://www.stemcell.umn.edu/graduate_programs/master_of_science/home.htm

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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.

This degree program offers training in stem cell biology, a rapidly growing interdisciplinary field that rests on foundations provided by molecular, cellular, and developmental biology. Students will take lecture, lab, and seminar courses in these various disciplines, in addition to stem cell biology. They will interact with members of the Stem Cell Institute through participation in research seminars and journal clubs, and will spend a full calendar year conducting stem cell research in the laboratory of a stem cell biology graduate program faculty member. This research will form the basis of the master's thesis.

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 3.20.

A bachelor's degree or foreign equivalent in biological science or a related field.

Special Application Requirements:
Applicants must upload 1) a personal statement (500 words or less) outlining previous research experience, research interests, and long- and short-term goals; 2) a curriculum vitae or resume; 3) the names of three individuals whom the student has asked to write letters of recommendation; and 4) unofficial transcripts to the Apply Yourself on-line application web site.

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: 94
  - Internet Based - Listening Score: 22
  - Internet Based - Writing Score: 24
  - Internet Based - Reading Score: 22
  - Internet Based - Speaking Score: 26
• Paper Based - Total Score: 580
• IELTS
  - Total Score: 7
  - Listening Score: 6.2
  - Reading Score: 6.2
  - Writing Score: 6.2
  - Speaking Score: 6.2
• MELAB
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**

**Plan A:** Plan A requires 14 to 16 major credits, 4 to 6 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 2.80 is required for students to remain in good standing.

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

Students must demonstrate familiarity with the tools of research and scholarship in their major field, the ability to work independently, and the ability to present the results of their investigation effectively, by completing a master's thesis and taking an oral exam.

The M.S. is a multidisciplinary program that prepares the basic science undergraduate for a career in research, teaching, or industry within the field of stem cell biology. In addition to taking courses in two or three semesters, students will concurrently conduct research for a full calendar year; this research will form the basis for the thesis.

**Required Courses**

All students are required to take these courses.

**Required Courses**

- SCB 5051 - Stem Cell Biology Practical Training Module (1.0 cr)
- SCB 5054 - Stem Cell Institute Research Seminar and Journal Club (2.0 cr)
- SCB 8181 - Stem Cell Biology (3.0 cr)

**Required Molecular Biology Course**

At least one of these courses is required.

- BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- or GCD 4034 - Molecular Genetics (3.0 cr)

**Required courses - at least one of these three is required.**

At least one of these courses is required.

- GCD 8161 - Advanced Developmental Biology (3.0 cr)
- or GCD 8008 - Mammalian Gene Transfer and Expression (2.0 cr)
- or Either 5xxx or 8xxx level course, must be approved by SCB program before registration.
Twin Cities Campus

Stem Cell Biology Minor

Stem Cell Institute

Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Stem Cell Biology Institute, 2001 6th Street S.E., Mail Code 2873, Minneapolis, MN 55455-3007 (612-625-0602; fax: 612-624-2436)
Email: SCBgrad@umn.edu
Website: http://www.stemcell.umn.edu/graduate_programs/master_of_science/home.htm

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- Length of program in credits (Masters): 12
- Length of program in credits (Doctorate): 12
- This program requires 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 degree program offers training in stem cell biology, which is a rapidly growing interdisciplinary field that rests on foundations provided by molecular, cellular, and developmental biology. Students will take lecture, lab, and seminar courses in these various disciplines, in addition to stem cell biology. They will interact with members of the Stem Cell Institute through participation in research seminars and journal clubs, and will spend a full calendar year conducting stem cell research in the laboratory of a stem cell biology graduate program faculty member. This research will form the basis of the master's thesis.

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

Prerequisites for Admission

Special Application Requirements:
Applicants must be admitted to a Ph.D. program and obtain approval from the director of graduate studies in stem cell biology to enroll in the minor program.

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.

In addition to the major requirement appropriate to the student's specific program, the stem cell biology minor will require 12 credits from designated courses with a minimum GPA 3.00.

The main research project must be done in the lab of a member of the stem cell biology graduate faculty.
**Twin Cities Campus**

**Surgery M.S. Surg.**

**Surgery**  
**Medical School**

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

**Contact Information:**
Department of Surgery, University of Minnesota, 420 Delaware Street S.E., MMC 195, Minneapolis, MN 55455 (612-626-2590)  
Email: surgwww@umn.edu  
Website: [http://www.surg.umn.edu](http://www.surg.umn.edu)

- Program Type: Master's  
- Requirements for this program are current for Fall 2014  
- Length of program in credits: 63  
- This program requires summer semesters for timely completion.  
- Degree: Master of Science in Surgery

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 general surgery program trains medical doctors for the practice of surgery and for academic positions. See the Medical School Catalog for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in laboratory research, either in a basic science or in surgery, after which they begin their senior residency and chief residency training. The Medical School's laboratory departments offer many graduate courses closely related to surgery (see the graduate programs in biochemistry, molecular biology, and biophysics; cellular and integrative physiology; microbiology, immunology, and molecular pathobiology; and pharmacology). These fields also offer opportunities for research work. The Department of Surgery offers supervised work in its experimental research laboratories, as well as in its hospital and outpatient departments in the areas of surgical diagnosis and operative surgery and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery).

**Program Delivery**

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

**Prerequisites for Admission**

Other requirements to be completed before admission:  
Prospective students must be in the general surgery training program and have two to three clinical years of training completed.

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 47 major credits, 6 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 towards program requirements is not permitted.

The master's degree in surgery (M.S.Surg.) is offered Plan A only. Students spend two to three years in the Medical School's general surgery program. A minimum of 53 course credits (47 in the major, plus 6 in the minor or related fields) plus 10 thesis credits are required for a total of 63 credits.
Twin Cities Campus
Surgery Ph.D. Surg.
Surgery
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Surgery, University of Minnesota, MMC 328, 420 Delaware Street S.E., Minneapolis, MN 55455
Email: surgwww@umn.edu
Website: http://www.surg.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 103
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy in Surgery

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.

*Candidates are currently in our training program and we do not accept outside applications.

The general surgery program trains medical doctors for the practice of surgery and for academic positions. See the Medical School Catalog for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in laboratory research, either in a basic science or in surgery, after which they begin their senior residency and chief residency training. The Medical School's laboratory departments offer many graduate courses closely related to surgery (see the graduate programs in biochemistry, molecular biology, and biophysics; cellular and integrative physiology; microbiology, immunology, and molecular pathobiology; and pharmacology). These fields also offer opportunities for research work. The Department of Surgery offers supervised work in its experimental research laboratories, as well as in its hospital and outpatient departments in the areas of surgical diagnosis and operative surgery and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery).

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

Prerequisites for Admission
Other requirements to be completed before admission:
Prospective students must be in the general surgery training program and have two to three clinical years of training completed.

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
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Part 1 (Composition) 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
67 credits are required in the major.
12 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.