Ecology, Evolution and Behavior M.S.  
Ecology, Evolution & Behavior  
College of Biological Sciences  
Link to a list of faculty for this program.

Contact Information:
Email: wiggins@umn.edu  
Website: http://www.cbs.umn.edu/eeb/graduateprogram

- Program Type: Master's  
- Requirements for this program are current for Spring 2013  
- Length of program in credits: 30  
- This program requires summer semesters for timely completion.  
- Degree: Master of Science

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

The graduate program in ecology, evolution, and behavior (EEB) links faculty and students interested in the biology of organisms from molecules to ecosystems. Studies address questions from molecular mechanisms of evolution, the interactions of organisms in social groups and populations, the distributions and abundances of species in communities and ecosystems, to global biogeochemical processes. The program provides broad training in the general areas of ecology, evolution, and animal behavior, and specialized courses and research in vertebrate and invertebrate zoology; behavior and ethology; evolution; population genetics; molecular evolution; systematics; population, community, and ecosystem ecology; global ecology; limnology; ecology of vegetation; and theoretical ecology. Opportunities for field research are available in Africa, Central America, and other parts of the world, as well as in local ecosystems, including the Cedar Creek Ecosystem Science Reserve and Itasca Biological Station. Seminars and individually designed tutorials are an important part of student programs and provide an exciting intellectual environment.

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

Prerequisites for Admission  
Courses in inorganic chemistry, organic chemistry, biochemistry, general physics, one year of college calculus, animal biology, genetics, physiology, and plant biology are strongly recommended and provide an important background to pursue graduate work in EEB. Proficiency in a foreign language is not required but is strongly recommended for students who expect to pursue field work in a country where English is not the native language. Deficiencies must be made up early in the graduate program.

Special Application Requirements:  
Students are admitted only in fall semester. Deadline for application is December 1. Refer to the EEB website for more details.

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

**Plan B**: Plan B requires 14 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required. This program may be completed with a minor.

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.

Capstone Project: Plan B requires 10 additional course credits and one to three research papers, which may be written in conjunction with graduate courses. Significant field or laboratory experience and competence in statistics, to include hypothesis testing, regression, and correlation are required.

The M.S. is offered under both Plan A (with thesis) and Plan B (without thesis). Both plans require a minimum of 14 course credits in the major and a minimum of 6 course credits in one or more related fields outside the major. Plan A also requires 10 thesis credits, and Plan B requires 10 additional course credits and one to three research papers, which may be written in conjunction with graduate courses. Significant field or laboratory experience and competence in statistics, to include hypothesis testing, regression, and correlation are required. Degree programs are planned by the student and an advisory committee of three faculty members to meet the student's interests and needs.

**Joint- or Dual-degree Coursework**: Joint Degree Program in Law, Health & the Life Sciences. Student may take a total of 12 credits in common among the academic programs.
Twin Cities Campus
Ecology, Evolution and Behavior Minor
Ecology, Evolution & Behavior
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Email: wiggins@umn.edu
Website: http://www.cbs.umn.edu/eeb/graduateprogram

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2012
- Length of program in credits (Masters): 7
- 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 ecology, evolution, and behavior (EEB) links faculty and students interested in the biology of organisms from molecules to ecosystems. Studies address questions from molecular mechanisms of evolution, the interactions of organisms in social groups and populations, the distributions and abundances of species in communities and ecosystems, to global biogeochemical processes. The program provides broad training in the general areas of ecology, evolution, and animal behavior, and specialized courses and research in vertebrate and invertebrate zoology; behavior and ethology; evolution; population genetics; molecular evolution; systematics; population, community, and ecosystem ecology; global ecology; limnology; ecology of vegetation; and theoretical ecology. Opportunities for field research are available in Africa, Central America, and other parts of the world, as well as in local ecosystems, including the Cedar Creek Ecosystem Science Reserve and Itasca Biological Station. Seminars and individually designed tutorials are an important part of student programs and provide an exciting intellectual environment.

Program Delivery
This program is available:

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

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

A minimum of 7 credits selected from BIOL 5407, BIOL 5409, BIOL 5411, and EEB 4xxx, 5xxx, or 8xxx courses is required for a master's minor in EEB.

A minimum of 12 credits selected from BIOL 5407, BIOL 5409, BIOL 5411, and EEB 4xxx, 5xxx, or 8xxx courses is required for a doctoral minor in EEB.
Twin Cities Campus
Ecology, Evolution and Behavior Ph.D.  
Ecology, Evolution & Behavior  
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:  
Email: wiggins@umn.edu  
Website: http://www.cbs.umn.edu/eeb/graduateprogram

- Program Type: Doctorate  
- Requirements for this program are current for Spring 2013  
- Length of program in credits: 48  
- 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 ecology, evolution, and behavior (EEB) links faculty and students interested in the biology of organisms from molecules to ecosystems. Studies address questions from molecular mechanisms of evolution, the interactions of organisms in social groups and populations, the distributions and abundances of species in communities and ecosystems, to global biogeochemical processes. The program provides broad training in the general areas of ecology, evolution, and animal behavior, and specialized courses and research in vertebrate and invertebrate zoology; behavior and ethology; evolution; population genetics; molecular evolution; systematics; population, community, and ecosystem ecology; global ecology; limnology; ecology of vegetation; and theoretical ecology. Opportunities for field research are available in Africa, Central America, and other parts of the world, as well as in local ecosystems, including the Cedar Creek Ecosystem Science Reserve and Itasca Biological Station. Seminars and individually designed tutorials are an important part of student programs and provide an exciting intellectual environment.

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

Prerequisites for Admission  
Courses in inorganic chemistry, organic chemistry, biochemistry, general physics, one year of college calculus, animal biology, genetics, physiology, and plant biology are strongly recommended and provide an important background to pursue graduate work in EEB. Proficiency in a foreign language is not required but is strongly recommended for students who expect to pursue field work in a country where English is not the native language. Deficiencies must be made up early in the graduate program.

Special Application Requirements:  
Students are admitted only in fall semester. Deadline for application is December 1. Refer to the EEB website for more details.

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
24 credits are required in 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 2 semesters must be completed before filing a Degree Program Form.

A minimum of 24 graduate level course credits and 24 thesis credits are required in the major. At least 12 course credits are required for a minor. Significant field or laboratory experience, proficiency in using computers in research, and competence in advanced statistics are required. Students are expected to gain some appreciation of history or philosophy of science and are required to teach a minimum of two semesters at 50 percent time. Degree programs are planned by the student and an advisory committee of three to five faculty members.

Joint- or Dual-degree Coursework: Joint Degree Program in Law, Health & the Life Sciences: Student may take a total of 12 credits in common among the academic programs.
Microbial Ecology Minor

Contact Information:
Microbial Ecology Minor Program, University of Minnesota, 439 Borlaug Hall, 191 Upper Buford Circle, Saint Paul, MN 55108 (612-624-2706)
Email: micecol@umn.edu

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2011
• 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.

This minor is available to master's (M.S.) and doctoral (Ph.D.) students. Microbial ecology is an interdisciplinary research area concerned with the relationships between microorganisms and their natural environment. The microbial ecology minor offers core coursework in microbiology, microbial physiology, microbial genetics, microbial genomics, microbial ecology, ecology, and theoretical ecology. Additional courses and opportunities to interact with others interested in microbial ecology are also part of the minor. The microbial ecology/biotechnology seminar series allows students and faculty to interact with microbial ecologists from other universities. The curriculum encourages interdisciplinary interaction, communication, and synthesis.

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

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

The master's minor requires 6 graduate credits, all of which must be outside the student's major department and must include at least one laboratory course in microbiology (e.g., MICB 4215) and one ecology (EEB) course chosen from the list below. The remaining courses also are chosen from this list with the guidance and approval of the director of graduate studies.

The doctoral minor requires 12 graduate credits, 9 credits of which must come from the core courses listed below (contact the director of graduate studies for potential alternatives to these courses). The remaining credits must come from at least two courses chosen from this list, but may not be in the student's major.

Core courses:
EEB 5053 (4 cr)
MICB 4111 (3 cr)
MICB 4121 (3 cr)
MICA 8002 (4 cr)

Additional courses
CE 8541
CE 8542
CE 8551
EEB 4601
EEB 4609
PLPA 8102
PLPA 8103
SOIL 5515
SOIL 5611

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Information current as of October 01, 2012
Microbial Engineering M.S.

Biological Process Technology Institute

College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
M.S. Program in Microbial Engineering, University of Minnesota, 1479 Gortner Avenue, Suite 140, Saint Paul, MN 55108 (612-624-6774; fax 612-625-5780)
Email: mce@umn.edu
Website: http://www.bti.umn.edu/MicE

- Program Type: Master's
- Requirements for this program are current for Fall 2011
- Length of program in credits: 32
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

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

Microbial engineering is an interdisciplinary program that combines an understanding of basic principles in microbiology, biochemistry, molecular biology, chemical engineering, and related sciences. Students are trained in the industrial application of microorganisms, cultured cells, and immunologic agents. Students learn both modern basic microbiology and biological engineering and can either proceed to a Ph.D. program in a related discipline or work directly with research and development staff in biotechnology industries. Supporting courses may be chosen from specific fields including biochemistry, microbiology, food science, genetics and cell biology, or pharmacognosy. The program is coordinated by the BioTechnology Institute (BTI) and involves faculty from 10 departments and 5 institutes of the University.

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

Prerequisites for Admission
Typically, applicants with a bachelor's degree in biological sciences, biochemistry, chemistry, or chemical engineering apply. Recommended academic preparation includes one year each of calculus, organic chemistry, physics, microbiology, and a background in a field such as basic chemical engineering, biology, physical chemistry, or genetics. Background deficiencies can be made up during the first year of graduate work. Most students enter the program with a GPA of 3.40 or higher.

Special Application Requirements:
Three letters of recommendation, scores from the General Test of the GRE, the TOEFL score for international applicants, transcripts, Curriculum Vitae, and an autobiographical statement including occupational goals must be submitted to the director of graduate studies. Applications are accepted for fall semester only. To receive full consideration for financial aid, students must apply for fall semester admission by March 1.

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
  - Speaking test score: 0

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 oral.

**Plan B:** Plan B requires 14 major credits and 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.

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

The M.S. requires 32 credits. Plan A students carry out a research project (10 cr) resulting in a M.S. thesis presented to the graduate faculty. Plan B students complete a summer (about 2 ½ months) preceptorship (4 cr) in a private company research laboratory or at a research institute in the University and prepare a Plan B project paper based on this research.

The two-year program comprises coursework in a specialized program of microbiology, molecular biology, immunology, and chemical engineering. The major program courses are the chemical engineering and microbiology courses. All students must take MICE 5355 - Advanced Ferment/Biocatalysis Laboratory. In addition, students must attend research seminars during the first-year spring semester and the following year present a research seminar in a biotechnology seminar series.

Students may choose supporting coursework (at least 6 cr) from specified fields, including biochemistry, food science, pharmacology, plant biology, genetics, cell biology, bioinformatics, and engineering.

Plan B students complete a preceptorship in a private company research laboratory or at a research institute in the University, and prepare a Plan B paper based on the research project. Presentation of the original laboratory research thesis/project to the graduate faculty is required at the end of the second year.
Microbial Engineering Minor
Biological Process Technology Institute
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
M.S. Program in Microbial Engineering, University of Minnesota, 1479 Gortner Avenue, Suite 140, Saint Paul, MN 55108 (612-624-6774; fax 612-625-5780)
Email: mice@umn.edu
Website: http://www.bti.umn.edu/MicE

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2011
- 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.

Microbial engineering is an interdisciplinary program that combines an understanding of basic principles in microbiology, biochemistry, molecular biology, chemical engineering, and related sciences. Students are trained in the industrial application of microorganisms, cultured cells, and immunologic agents. Students learn both modern basic microbiology and biological engineering. Courses may be chosen from specific fields including biochemistry, microbiology, food science, genetics and cell biology, or pharmacognosy. The program is coordinated by the BioTechnology Institute (BTI) and involves faculty from 10 departments and 5 institutes of the University.

Note: The minor in microbial engineering is offered at the doctoral level only.

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

Students must complete at least 12 credits, selected in consultation with the director of graduate studies for microbial engineering.
Twin Cities Campus
Plant Biological Sciences M.S.
Plant Biology
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Plant Biological Sciences Graduate Program, 1445 Gortner Avenue, Room 256, St. Paul, MN 55108 (612-625-4222; fax:612-625-1738)
Email: pbiogp@umn.edu
Website: http://www.cbs.umn.edu/plantbio/gradprog

- Program Type: Master's
- Requirements for this program are current for Fall 2011
- 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.

Plant biological sciences encompasses all aspects of the basic biology of both higher and lower plants. Major emphases include molecular and physiological approaches to development; physiological, structural, and functional studies at the cellular and organismal levels; systematic and evolutionary biology; and molecular genetics and applied biotechnology. Students study plants from the subcellular and molecular to the whole plant and community levels of biological organization. They also have opportunities for laboratory and field research at state, national, and international levels. Each student's program is planned to meet individual requirements within the framework of a multidisciplinary core of coursework. Seminars are an integral part of the program.

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

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

Special Application Requirements:
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. Students may apply at any time; however, submission of all application materials by December 15 is required in order to ensure priority consideration for fellowships and teaching and research assistantships awarded for the next academic year.

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
• MELAB
  - Final score: 80

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

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

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

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.

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

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.

PBIO 5960 - Itasca PBS Graduate Student Experience (1 cr)
PBS 8081 - Integrative Plant Biology: Connecting Molecules to Ecosystems (3 cr)
PBS 8900 (SEC 001) - PBS Colloquium (1 cr)
PBS 8900 (SEC 003) - Graduate Student Seminar (1 cr)
PBS 8123 - Research Ethics in Plant and Environmental Sciences (0.5 cr)
PBS 8994 - Directed Research (1-5 cr)
GRAD 8101 - Teaching in Higher Education (3 cr; A-F grade option)
Twin Cities Campus

Plant Biological Sciences Minor

Plant Biology

College of Biological Sciences

Contact Information:
Plant Biological Sciences Graduate Program; 1445 Gortner Avenue, Room 256, St. Paul, MN 55108 (612-625-4222; fax: 612-625-1738)
Email: pbiogp@umn.edu
Website: http://www.cbs.umn.edu/plantbio/gradprog

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2011
- 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.

Plant biological sciences encompasses all aspects of the basic biology of both higher and lower plants. Major emphases include molecular and physiological approaches to development; physiological, structural, and functional studies at the cellular and organismal levels; systematic and evolutionary biology; and molecular genetics and applied biotechnology. Students study plants from the subcellular and molecular to the whole plant and community levels of biological organization. They also have opportunities for laboratory and field research at state, national, and international levels. Each student's program is planned to meet individual requirements within the framework of a multidisciplinary core of coursework. Seminars are an integral part of the program.

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

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

For students majoring in other fields, a master's minor in plant biological sciences may be obtained by completing 6 credits selected from the four disciplinary areas by the DGS.

To obtain the doctoral minor, Ph.D. students must complete 12 credits selected from the four disciplinary areas by the DGS.
Plant biological sciences encompasses all aspects of the basic biology of both higher and lower plants. Major emphases include molecular and physiological approaches to development; physiological, structural, and functional studies at the cellular and organismal levels; systematic and evolutionary biology; and molecular genetics and applied biotechnology. Students study plants from the subcellular and molecular to the whole plant and community levels of biological organization. They also have opportunities for laboratory and field research at state, national, and international levels. Each student's program is planned to meet individual requirements within the framework of a multidisciplinary core of coursework. Seminars are an integral part of the program.

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

**Prerequisites for Admission**
Prospective students are expected to have completed a year of coursework in at least three of the following four areas: differential and integral calculus; organic and inorganic chemistry; biology; and physics. For students with demonstrated ability, background deficiencies as determined by the admissions committee can be made up during the first year of graduate studies. All admitted students are assigned to an adviser in the graduate program before they begin their studies.

**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. Students may apply at any time; however, submission of all application materials by December 15 is required in order to ensure priority consideration for fellowships and teaching and research assistantships awarded for the next academic year.

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
- MELAB
  - Final score: 80

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

Program Requirements
18 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 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.

PBIO 5960 - Itasca PBS Graduate Student Experience (1 cr)
PBS 8081 - Integrative Plant Biology: Connecting Molecules to Ecosystems (3 cr)
PBS 8900 (SEC 001) - PBS Colloquium (1 cr)
PBS 8900 (SEC 003) - Graduate Student Seminar (2 cr)
PBS 8901 - Preparation of Research Proposal (1 cr)
PBS 8123 - Research Ethics in Plant and Environmental Sciences (0.5 cr)
PBS 8888 Doctoral Thesis Credits (24 cr)
PBS 8994 - Directed Research (1-5 cr)
GRAD 8101 - Teaching in Higher Education (3 cr; A-F grade option)