



# Minor in Plant, Animal and Microbial Biotechnology

## Required Courses

The minor requires 15-16 credits. These courses may overlap requirements for the primary degree at the discretion of the student's major department. Contact Susan Gruber ([grubers@msu.edu](mailto:grubers@msu.edu)) for more information. To add the minor, students should e-mail a request to Kathy Delaney ([delaney@msu.edu](mailto:delaney@msu.edu)).

<b>All of the following courses (8 credits):</b>	CR	semester
BMB 401 Comprehensive Biochemistry Fall, Spring, Summer. PR: CEM 252	4	_____
HRT 486 Biotechnology in Agriculture: Applications and Ethical Issues Fall even years. PR: BS 161 or PLB 105	3	_____
HRT/ANS/BE/CSS 461 Seminar in Plant, Animal and Microbial Biotechnology Spring PR: (ANS 425 or concurrently) or (BE 360 or concurrently) or (CSS 451 or concurrently) or (MMG 445 or concurrently)	1	_____

<b>One of the following courses (3 or 4 credits):</b>	CR	semester
ANS 314 Genetic Improvement of Domestic Animals Spring. PR: (BS 161 or 181H or LB 145) completion of Tier I writing and (STT 200, or 201, or 231, or 421, or 464)	4	_____
CSS 350 Introduction to Plant Genetics Spring. PR: BS 161 or PLB 105	3	_____
ZOL 341 Fundamental Genetics Fall, Spring, Summer PR: BS 161 or 181H, or LB 145	4	_____

<b>One of the following courses (3 credits)</b>	CR	semester
ANS 425 Animal Biotechnology Spring. PR: (BS 161 or 181H, or LB 145) and (CEM 143 or 251)	3	_____
BE 360 Microbial Systems Engineering Spring. PR: (BE 230 or concurrently) and (MTH 235 or concurrently)	3	_____
CCS 451 Biotechnology Applications for Plant Breeding and Genetics Spring. PR: CSS 350 or ZOL 341	3	_____
MMG 445 Microbial Biotechnology Fall, Summer. PR: (MMG 301 or BMB 401 or 461) completion of Tier I	3	_____

<b>One of the following courses (1 credit) or approval of department.*</b>	CR	semester
ANS 490 Independent Study	1	_____
BE 490 Independent Study	1	_____
CSS 490 Independent Study	1	_____
HRT 492 Undergraduate Research	1	_____

\* Completion of this minor requires participation in a research experience. Please see the next page.



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### Laboratory Research Requirement

Students pursuing this minor are required to participate in a research experience. For most students, this requirement is met by enrolling in one or more credits of Independent Study or Undergraduate Research, working on a research project in the lab of a Professor in their department or a related discipline. In some cases, the requirement may also be fulfilled by work a student has done on a non-credit Undergraduate Research Program project or work as a student employee in a research lab.

Plans for Independent Study and the alternate options must be approved by one of the Professors who serve as advisors for the minor. Students are encouraged to contact one of the following individuals before finalizing their plans:

Dr. David Douches, Plant, Soil and Microbial Sciences ([douchesd@msu.edu](mailto:douchesd@msu.edu))

Dr. Catherine Ernst, Animal Science ([ernstc@msu.edu](mailto:ernstc@msu.edu))

Dr. Rebecca Grumet, Horticulture ([grumet@msu.edu](mailto:grumet@msu.edu))

Dr. Wei Liao, Biosystems Agricultural Engineering ([liaow@msu.edu](mailto:liaow@msu.edu))

Students will be required to provide documentation of their completed research experience. Acceptable forms include:

- a. A completed Independent Study or Undergraduate Research form with the signature of the Professor, and a passing grade for these credits reported at the end of the project.

OR

- b. A written description of a non-credit project (approximately one page), and written confirmation from the supervising faculty member that the experience was equivalent to at least one credit of Independent Study .

Documentation should be submitted to Susan Gruber, A164 Plant and Soil Sciences.