

978 Research Methodologies in Agricultural and Resource Economics
 Spring. 3(3-0) R: Open only to Ph.D. students in the College of Agriculture and Natural Resources or College of Business or College of Social Science. SA: AEC 991F
 Alternative research philosophies, types of knowledge, and kinds of research. Critical appraisal of facts, theories, and values in economic research. Testing and communication of research results. Development of a research proposal.

991 Advanced Topics in Agricultural Economics
 Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to Ph.D. students in the colleges of Agriculture and Natural Resources, Business, and Social Science; or with department approval.

Advanced topics such as price analysis, finance, risk and modeling techniques, agri-food systems, environmental economics and management, and agricultural and natural resource development and policy.

999 Doctoral Dissertation Research
 Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to Ph.D. students in Agricultural Economics. Approval of department.

Doctoral dissertation research.

AGRICULTURAL ENGINEERING AE

Department of Biosystems and Agricultural Engineering College of Agriculture and Natural Resources

150 Metal Fabrication Technology
 Fall. 2(1-2) SA: ATM 150
 Physical principles and safety techniques for electric and gas welding. Soldering, brazing, cutting, tool use, machine shop equipment use, and hot and cold metalworking.

240 Machine Systems and Management
 Spring. 3(2-2) P:M: (CSE 101 or CSE 131 or AT 090) SA: ATM 240
 Principles, analysis, performance, operation, and management of agricultural machines.

252 Gasoline and Diesel Engine Technology
 Fall. 3(2-2) SA: ATM 252
 Operating principles of gasoline and diesel engines and their systems. Operation and maintenance requirements.

254 Fluid Power Technology
 Spring. 2(2-2) R: Open only to students in Agriculture and Natural Resources. SA: AE 054, ATM 254
 Fluid power in mobile equipment. Operation and characteristics of system components and circuits. Component disassembly. System testing and diagnosis. Offered first ten weeks of semester.

261 Principles of Animal Environments
 Spring. 2(1-2) Interdepartmental with Animal Science. SA: AE 061, ATM 261
 Animal environment requirements. Heat and moisture production rates. Psychrometrics of air and building materials. Heat loss and ventilation systems. Offered first ten weeks of semester.

490 Independent Study
 Fall, Spring, Summer. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course. P:NM: AE 152 or ME 391 or MTH 235. R: Open only to students in the College of Agriculture and Natural Resources. Approval of department; application required.
 Supervised individual student research and study in agricultural engineering.

491 Special Topics in Agricultural Engineering
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. P:NM: AE 152 or ME 391 or MTH 235. R: Open only to students in the College of Agriculture and Natural Resources. Approval of department.
 Special topics in agricultural engineering.

AGRICULTURAL TECHNOLOGY AT

Institute of Agricultural Technology College of Agriculture and Natural Resources

290 Independent Study in Agricultural Technology
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to freshmen or sophomores in the Institute of Agricultural Technology.
 Supervised individual study on experimental, theoretical or applied topics related to agricultural science and technology.

291 Selected Topics in Agricultural Technology
 Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to freshmen or sophomores in the Institute of Agricultural Technology.
 Selected topics of current interest in agricultural science and technology.

293 Professional Internship in Agricultural Technology
 Fall, Spring, Summer. 3 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to freshmen or sophomores in the Institute of Agricultural Technology.
 Supervised professional experience in agencies, business and industry related to a student's major field of study.

AGRICULTURAL TECHNOLOGY AND SYSTEMS MANAGEMENT ATM

Department of Biosystems and Agricultural Engineering College of Agriculture and Natural Resources

431 Irrigation, Drainage and Erosion Control Systems
 Fall. 3(2-2) RB: (MTH 116 and CSS 210) R: Not open to freshmen or sophomores.
 Principles of soil and water conservation engineering including: land and soil surveying, basic hydraulics, hydrology, soil moisture, and soil and water conservation practices with applications to irrigation, drainage and erosion control systems.

890 Special Problems
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Approval of department.
 Individual study of selected topics.

899 Master's Thesis Research
 Fall, Spring, Summer. 1 to 10 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to master's students in Agricultural Technology and Systems Management.
 Masters thesis research.

999 Doctoral Dissertation Research
 Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to Ph.D. students in Agricultural Technology and Systems Management.
 Doctoral dissertation research.

AGRICULTURE AND NATURAL RESOURCES ANR

College of Agriculture and Natural Resources

101 Preview of Science
 Fall. 1 credit. Interdepartmental with Natural Science; Engineering; Social Science. Administered by College of Natural Science. R: Approval of college.
 Overview of natural sciences. Transitional problems. Communications and computer skills. Problem-solving skills. Diversity and ethics problems in science. Science and society.

101A Academic and Career Decision Making
 Fall, Spring. 2(2-0)
 Exploration of the career possibilities in agriculture, natural resources and related areas.

Agriculture and Natural Resources—ANR

- 110 New Student Seminar: Issues and Ideas in Agriculture and Natural Resources**
Fall. 1(0-2) R: Open only to freshmen or sophomores or juniors in the College of Agriculture and Natural Resources

Issues in agriculture and natural resources. Personal and professional development through discussion and interactive experiences.

- 192 Environmental Issues Seminar**

Fall, Spring. 1 credit. A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Natural Science; Engineering; Social Science; Communication Arts and Sciences. Administered by College of Natural Science. R: Open only to students in the College of Agriculture and Natural Resources or College of Engineering or College of Natural Science or College of Communication Arts and Sciences or College of Social Science. Approval of college.

Environmental issues and problems explored from a variety of perspectives, including legal, scientific, historical, political, socio-economic, and technical points of view.

- 202 Michigan's Agricultural and Natural Resources Heritage**

Fall. 2(2-0) Interdepartmental with ANR Education and Communication Systems. P:M: Completion of Tier I writing requirement.

Michigan's historical agricultural and natural resources. Orientation to sources for research and learning. Self-directed study integrating agricultural and natural resources heritage to family, community and careers.

- 210 Pathways in Connected Learning**

Fall, Spring. 3(2-2) R: Approval of college.

Active, self-directed, and reflective learning associated with agriculture and natural resource issues, self and social development, and ethical choice making. Development of a learning plan and design of a learning portfolio. Individual and group presentations.

- 250 Global Issues in Agriculture and Natural Resources**

Fall. 3(3-0) Interdepartmental with Community, Agriculture, Recreation and Resource Studies. P:M: Completion of Tier I writing requirement. SA: AEE 301

Globalization. Economic, political, and social issues related to natural resources and agricultural production. Historical perspectives and future projections.

- 292 Applications in Environmental Studies**

Fall. 2(1-2) Interdepartmental with Natural Science; Engineering; Communication Arts and Sciences; Social Science. Administered by College of Natural Science. P:M: (NSC 192) R: Open only to students in the Specialization in Environmental Studies.

Community engagement project. Projects vary depending on student's major and area of environmental interest.

- 310 Connected Learning Seminar I**

Fall, Spring, Summer. 3(3-0) P:M: (ANR 210)

Learner-directed critical analysis of contemporary issues in agriculture and natural resources. Communication of outcomes to professional communities. Collaborative learning integrated with individual experiences.

- 311 Connected Learning Seminar II**

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course. P:M: (ANR 310)

Advanced analysis and presentation of contemporary issues in agriculture and natural resources.

- 392 Agriculture and Natural Resources Seminar**

Spring. 1(2-0) R: Not open to freshmen or sophomores.

Current agricultural, natural resources and environmental problems and solutions. Discussion leaders from various disciplines.

- 410 Connected Learning Transitions**

Fall, Spring. 3(3-0) P:M: (ANR 310)

Synthesis and analysis of structured experiences in agriculture and natural resources. Personal and interpersonal development, personal and professional integrity, communication competence, and critical and reflective thinking.

- 475 International Studies in Agriculture and Natural Resources**

Fall, Spring, Summer. 2 to 6 credits. Fall: Given at various off campus sites.. Spring: Given at various off campus sites.. Summer: Given at various off campus sites.. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of college; application required.

Study-travel experience. Contemporary problems affecting agriculture and natural resources in world, national and local communities. Case studies and interviews with officials, community leaders and leading professionals.

- 490 Independent Study in Agriculture and Natural Resources**

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to sophomores or juniors or seniors or graduate students in the College of Agriculture and Natural Resources.

Supervised individual study in topics related to agriculture and natural resources.

- 491 Selected Topics**

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Not open to freshmen or sophomores.

Special topics in agriculture and natural resources.

- 493 Professional Internship in Agriculture and Natural Resources**

Fall, Spring, Summer. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors in the College of Agriculture and Natural Resources. Approval of department; application required. A student may earn a maximum of 6 credits in all enrollments for any or all of these courses: ABM 493, AEE 493, ANR 493, ANS 493, CSS 493, EEP 493, FIM 493, FW 493, HRT 493, PKG 493, PLP 493, PRR 493, and RD 493.

Supervised professional experiences in agencies and businesses related to a student's major field of study.

- 810 International Food Laws and Regulations**

Fall, Spring, Summer. 3(3-0) RB: Food science, law, food safety or related disciplines.

Survey of food laws of various countries and regions.

- 811 U.S. Food Laws and Regulations**

Fall, Spring, Summer. 3(3-0) RB: (ANR 810) Food science, law or food safety. Not open to students with credit in FSC 421.

Food laws and regulations of the United States.

- 828 Food Safety Seminar Series**

Fall, Spring. 1(1-0) Interdepartmental with Veterinary Medicine; Natural Science; Social Science. Administered by College of Veterinary Medicine. RB: Enrollment in graduate program in related discipline

Selected current topics covering the broad areas of food safety as they relate to production, processing, transport, microbiology, toxicology, and social and human dimensions.

- 829 Problems in Food Safety**

Fall. 1(1-0) Interdepartmental with Veterinary Medicine; Natural Science; Social Science. Administered by College of Veterinary Medicine. RB: Enrollment in graduate program in related discipline

In-depth discussion of selected problems in food safety.

AMERICAN STUDIES

AMS

College of Arts and Letters

- 210 American Popular Culture**

Fall. 4(4-0) P:M: Completion of Tier I writing requirement.

Significant social issues in American popular culture. American studies theory and methods employed to analyze thematic and historical cultural representations in popular culture.

- 250 American Art**

Spring. 3(3-0) Interdepartmental with History of Art; American Studies. Administered by Department of Art and Art History.

Major developments and themes in non-indigenous American art (painting, sculpture, architecture, material culture) from its colonial origins through the 20th century.

- 265 Transcultural Perspectives**

Spring. 3(3-0) P:M: Completion of Tier I writing requirement.

Comparative study of contemporary and historical cultural discourses of and about the Americas and their place in the global commons. Implications of cultural identities, especially as shaped by age, race, ethnicity, gender and sexuality. Borders and tourism and the import and export of technologies, media and commodities.

- 280 Major Themes in American Studies**

Fall. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. P:M: Completion of Tier I writing requirement.

Major themes pertaining to the history, culture and study of the United States. Historiography and methods of the interdisciplinary study of the United States in relation to other cultures and countries.