

**Agricultural Engineering—Descriptions  
of  
Courses**

**802. Computational Methods in Food and Agricultural Engineering**  
Fall of odd-numbered years. 3(3-0)  
P: MSM 809. R: Open only to graduate students in College of Engineering.  
Formulation and solution of mathematical equations in food and agricultural engineering. Constitutive equations. Linear and nonlinear problems. Steady state and transient problems. Computer solutions.

**812. Bio-Processing Engineering**  
Spring of even-numbered years. 3(3-0)  
R: Open only to graduate students in College of Engineering.  
Thermodynamics, heat and mass transfer, fluid flow, dehydration. Handling and storage of biological products.  
QA: AE 812

**815. Instrumentation for Food and Agricultural Engineering**  
Fall. 3(3-0)  
R: Open only to graduate students in College of Engineering.  
Theory and techniques of measuring temperature, pressure, flow, humidity, and moisture in biological materials.  
QA: AE 815

**820. Research Methods in Agricultural Engineering**  
Fall. 1(1-0)  
R: Open only to graduate students in College of Agriculture and Natural Resources or College of Engineering.  
Procedures and methods for designing and executing research projects.  
QA: AE 820

**850. Dimensional Analysis and Similitude Modelling**  
Fall. 3(2-2)  
R: Open only to graduate students in College of Agriculture and Natural Resources or College of Engineering.  
Dimensional concepts, systems of measurements and transformation of units, and formation of dimensionless groups. Development of prediction equations, concepts of similarity, and scaling laws. Distortion.  
QA: AE 850

**882. Irrigation and Water Management Engineering**  
Spring of odd-numbered years. 3(3-0)  
P: AE 481, CE 321.  
Design and management of systems for supplemental irrigation. Water supply and transport. Economic and engineering optimization of irrigation design.  
QP: AE 481, CE 321 QA: AE 482

**890. Special Problems**  
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.  
R: Approval of department; application required.  
Individual study in agricultural engineering.  
QA: AE 880

**891. Advanced Topics in Agricultural Engineering**  
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 graduate students in College of Engineering. Approval of department.  
Agricultural engineering topics not covered in regular courses.  
QA: AE 890

**892. Agricultural Engineering Seminar**  
Spring. 1(1-0)  
R: Open only to graduate students in College of Agriculture and Natural Resources or College of Engineering.  
Current topics in agricultural engineering.  
QA: AE 822

**899. Master's Thesis Research**  
Fall, Spring, Summer. 1 to 10 credits. A student may earn a maximum of 10 credits in all enrollments for this course.  
R: Open only to graduate students in Agricultural Engineering. Approval of department.  
QA: AE 899

**999. Doctoral Dissertation Research**  
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course.  
R: Open only to graduate students in Agricultural Engineering. Approval of department.  
QA: AE 999

**AGRICULTURAL  
TECHNOLOGY AND SYSTEMS  
MANAGEMENT ATM**

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

**315. Occupational and Personal Safety**  
Spring. 2(2-0)  
P: CSS 101 or ANS 110 or AEE 101 or HRT 201. R: Open only to College of Agriculture and Natural Resources majors.  
Principles of safety problem solving. Accident causation and prevention. Laws and regulations. Machinery, electrical, chemical and fire safety. Security. Safety program development.  
QA: ATM 415

**326. Principles of Animal Environments**  
Spring. 2(2-0)  
P: MTH 116 or MTH 120; CPS 100 or CPS 130 or CPS 131. R: Open only to College of Agriculture and Natural Resources majors.  
Heat and moisture balances for confined livestock. Interior environment and its control. Waste management.  
QP: MTH 110, CPS 100 QA: ATM 426

**431. Irrigation, Drainage and Erosion Control Systems**  
Fall. 3(2-2)  
P: MTH 116 or MTH 120; CSS 210. R: Not open to freshmen and 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.  
QP: MTH 111, CSS 210 QA: ATM 231, ATM 431

**440. Agricultural Machinery Systems**  
Fall. 3(3-0)  
P: CSS 210; MTH 110 or MTH 116; CPS 100 or CPS 130 or CPS 131. R: Open only to majors in College of Agriculture and Natural Resources.  
Principles, analysis, management, and economics of agricultural machinery systems. Consideration of weather conditions, cultural practices, crop rotation, labor, and energy.  
QP: MTH 108, MTH 111, CPS 100, CPS 112, CPS 115, CSS 210 QA: ATM 440

**490. Independent Study**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course.  
P: ATM 231 or ATM 240 or BCM 311. R: Open only to majors in Agricultural Technology and Systems Management. Approval of department; application required.  
Supervised individual student research and study in agricultural technology and systems management.  
QP: ATM 231, ATM 240, ATM 311 QA: ATM 480

**491. Special Topics in Agricultural Technology and Systems Management**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course.  
P: ATM 231 or ATM 240 or BCM 311. R: Open only to majors in Agricultural Technology and Systems Management.  
Special topics in agricultural technology and systems management.  
QP: ATM 231, ATM 240, ATM 311 QA: ATM 490

**804. Agricultural Mechanization in Developing Countries**  
Fall of odd-numbered years. 3(3-0)  
R: Open only to graduate students in College of Agriculture and Natural Resources or College of Engineering.  
Human, animal and mechanical power for smaller farms. Machine selection, local manufacturing, ownership patterns.  
QA: ATM 804

**807. Human Factors Engineering**  
Fall of even-numbered years. 3(3-0)  
R: Open only to graduate students in College of Agriculture and Natural Resources or College of Engineering.  
Ergonomics. Analysis of machine designs, operation, and working environment in relation to human limitations and capabilities. Procedures to develop maximum human-machine compatibility and performance.  
QA: ATM 807

**831. Water, Technology and International Development**  
Spring of odd-numbered years. 3(3-0)  
P: AE 481 or ANR 489 or ATM 431 or CSS 210. R: Open only to graduate students in College of Agriculture and Natural Resources or College of Engineering.  
Water resources planning and development for irrigated agriculture. Technological, agronomic, environmental, social and political constraints. Case studies.  
QP: CSS 210, ATM 431, AE 481, ANR 399 QA: ATM 890

**836. Microclimate and Its Measurement**  
Spring. 4(3-3) Interdepartmental with Geography.  
The climate near the Earth's surface. Energy balance, thermal radiation exchange, heat fluxes, temperature sensors, wind speed and direction, humidity and evapotranspiration and their measurement.  
QA: ATM 436, ATM 808

**840. Analysis of Physical Systems**  
Fall. 3(3-0)  
P: ATM 440 or BCM 311 or MGT 306. R: Open only to graduate students in College of Agriculture and Natural Resources.  
Identification and definition of systems problems in agricultural and construction industries. Model formulation and estimation.  
QP: ATM 440, ATM 311, MGT 306 QA: ATM 806

**845. Process Network Theory Applied to Agroecosystems**  
Spring of even-numbered years. 4(4-0)  
R: Open only to graduate students in College of Agriculture and Natural Resources or College of Engineering.  
Numerical framework for the technical, economic and environmental analysis of agricultural and biological systems.  
QA: ATM 890

**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.  
QA: ATM 880

**891. Advanced Topics in Agricultural Technology and Systems Management**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course.  
R: Open only to graduate students in College of Agriculture and Natural Resources or College of Engineering.  
New developments in agricultural technology and systems management.  
QA: ATM 890

**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 graduate students in Agricultural Technology and Systems Management. Approval of department.  
QA: ATM 899

**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. Approval of department.  
QA: ATM 999

## AGRICULTURE AND NATURAL RESOURCES ANR

### College of Agriculture and Natural Resources

**350. Leadership Development for Agriculture and Natural Resources**  
Spring. 2(2-0)  
R: Not open to freshmen and sophomores. Approval of college; application required.  
Preparation for community leadership. Field observation of social, economic and political problems. Emphasis on awareness, action and involvement. Seminars and interviews.  
QA: ANR 350

**392. Agriculture and Natural Resources Seminar**  
Spring. 1(2-0)  
R: Not open to freshmen and sophomores.  
Current agricultural, natural resources and environmental problems and solutions. Discussion leaders from various disciplines.  
QA: ANR 425

**475. International Studies in Agriculture and Natural Resources**  
Fall, Spring, Summer. Given at various off campus sites. 2 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course.  
R: Approval of college; application required.  
Study-travel experience emphasizing contemporary problems affecting agriculture and natural resources in the world, national and local communities. Case studies and interviews with officials, community leaders and leading professionals.  
QA: ANR 475

**481. Agricultural Research Systems in Developing Countries**  
Summer. 2(2-0) Interdepartmental with Agricultural Economics, Animal Science, and Crop and Soil Sciences.  
R: Open only to seniors and graduate students in the College of Agriculture and Natural Resources.  
Planning, organizing and managing agricultural research systems. Problems and alternative reforms to improve research productivity. Adapting new agricultural technology in developing countries.  
QA: ANR 480

**489. Integrated Approaches to Agriculture and Natural Resources Problems**  
Fall, Spring. 3(2-2)  
P: MTH 110 or MTH 116; EC 201 or EC 202. R: Open only to seniors in the College of Agriculture and Natural Resources.  
Holistic solutions to resource management and allocation: an integrated, multidisciplinary team approach to case study problems.  
QP: MTH 109, MTH 110, MTH 111, EC 201, EC 202

**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 and sophomores.  
Special topics in agriculture and natural resources.  
QA: ANR 480

**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 and seniors in the College of Agriculture and Natural Resources. Approval of department; application required.  
Supervised professional experiences in agencies and businesses related to a student's major field of study.  
QA: ANR 399

## AMERICAN STUDIES AMS

### College of Arts and Letters

**491. Perspectives in American Studies**  
Fall. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.  
R: Not open to freshmen and sophomores.  
Methods and significant works in American Studies. Topics vary.  
QA: AMS 410

**492. Seminar in American Studies**  
Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.  
R: Open only to majors in Arts and Letters, James Madison College, and Lyman Briggs School.  
Selected topics in American life emphasizing interdisciplinary approaches. Topics vary.  
QA: AMS 411

**881. American Studies Theory, Methods, and Bibliography**  
Fall. 3(3-0)  
Methods and bibliographical sources of American Studies research. Interdisciplinary approaches to studying American culture.  
QA: A L 801

**890. Independent Study**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.  
R: Approval of college.  
Special projects, directed reading, and research arranged by an individual graduate student and a faculty member in areas supplementing regular course offerings.  
QA: A L 803

**891. Special Topics in American Studies**  
Fall, Spring, Summer. 4(4-0) A student may earn a maximum of 12 credits in all enrollments for this course.  
R: Approval of college.  
Special topics supplementing regular course offerings proposed by faculty for graduate students on a group study basis.  
QA: A L 802

**899. Master's Thesis Research**  
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course.  
R: Approval of college.  
Directed research leading to a master's thesis in partial fulfillment of Plan A master's degree requirements.

## AMERICAN THOUGHT AND LANGUAGE ATL

### Department of American Thought and Language College of Arts and Letters

**0102. Preparation for College Writing**  
Fall, Spring. 0(0-2)/1(10-2) See page A-2, item 3.]  
C: ATL 1004 R: Designated score on English placement test.  
Practice in applying the principles of English grammar, syntax, and word usage to writing.  
QA: ATL 0991

**1004. Preparation for College Writing**  
Fall, Spring. 3(3-0)  
C: ATL 0102 R: Designated score on English placement test.  
Composing, revising, and editing. Active reading and pre-writing strategies. Style, mechanics, and usage. Organization and proofreading.  
QA: ATL 1144, ATL 1154

**101. Library Resources**  
Fall, Spring, Summer. 1(1-0)  
Use of libraries for researching college assignments and papers. Emphasis on bibliographic and reference tools.  
QA: ATL 117

**110. Writing: Science and Technology**  
Fall, Spring. 4(4-0)  
P: Designated score on English placement test or ATL 1004. R: Not open to students with credit in MC 111, MC 112, LBS 133, ATL 120, ATL 125, ATL 130, ATL 140, ATL 145, ATL 150, ATL 195H.  
Drafting, revising, and editing compositions derived from readings on American science and technology to develop skills in narration, persuasion, analysis, and documentation.  
QA: ATL 1154, ATL 1164, ATL XY2, ATL XY3

**120. Writing: American Philosophy, Literature, and the Arts**  
Fall, Spring. 4(4-0)  
P: Designated score on English placement test or ATL 1004. R: Not open to students with credit in MC 111, MC 112, LBS 133, ATL 110, ATL 120, ATL 130, ATL 140, ATL 145, ATL 150, ATL 195H.  
Drafting, revising, and editing compositions derived from readings on American philosophy, literature, and the arts to develop skills in narration, persuasion, analysis, and documentation.  
QA: ATL 1154, ATL 1164, ATL XY2, ATL XY3

**125. Writing: The American Ethnic and Racial Experience**  
Fall, Spring. 4(4-0)  
P: Designated score on English placement test or ATL 1004. R: Not open to students with credit in MC 111, MC 112, LBS 133, ATL 110, ATL 120, ATL 130, ATL 140, ATL 145, ATL 150, ATL 195H.  
Drafting, revising, and editing compositions derived from readings on the experience of American ethnic and racial groups to develop skills in narration, persuasion, analysis, and documentation.  
QA: ATL 1154, ATL 1164, ATL XY2, ATL XY3

**130. Writing: American Radical Thought**  
Fall, Spring. 4(4-0)  
P: Designated score on English placement test or ATL 1004. R: Not open to students with credit in MC 111, MC 112, LBS 133, ATL 110, ATL 120, ATL 125, ATL 140, ATL 145, ATL 150, ATL 195H.  
Drafting, revising, and editing compositions derived from readings on American radical thought to develop skills in narration, persuasions, analysis, and documentation.  
QA: ATL 1154, ATL 1164, ATL XY2, ATL XY3

**140. Writing: Women in America**  
Fall, Spring. 4(4-0)  
P: Designated score on English placement test or ATL 1004. R: Not open to students with credit in MC 111, MC 112, LBS 133, ATL 110, ATL 120, ATL 125, ATL 130, ATL 145, ATL 150, ATL 195H.  
Drafting, revising, and editing compositions derived from readings on women in America to develop skills in narration, persuasion, analysis, and documentation.  
QA: ATL 1154, ATL 1164, ATL XY2, ATL XY3