845 Commodity Market Analysis
Fall. 3(3-0) RB: (AEC 835)
Applied econometric analysis of commodity markets. Emphasis on specification and estimation of demand and supply models for forecasting. Modeling for policy evaluation. Futures and options markets. Microcomputer applications.

851 Agricultural Firm Management
Summer. 3(3-0)
Managerial processes for planning and controlling agricultural firms. Applications of financial concepts, budgets, simulations, and cognitive and information systems to developed and developing countries. Predictive and prescriptive analysis.

853 Financial Management in Agriculture
Spring. 3(3-0)
Financial and investment analysis tools and concepts and their application to decisions faced by agricultural, agribusiness, and food industry firms. Financial institutions and instruments, credit programs, and financial sector performance in low-income and high-income countries.

855 Agricultural Production Economics
Fall. 3(3-0) RB: (EC 801 and EC 805) and (AEC 835 and EC 823)
Analysis of production models using econometrics, mathematical programming, and simulation. Systems science perspective.

857 Strategic Management in Agribusiness
Fall. 3(3-0) SA: AEC 891A
Managerial problems faced by agribusiness firms. Strategies to interpret and respond to forces affecting the industry. Case study approach.

861 Agriculture in Economic Development
Fall. 3(3-0)
Role of agriculture in economic development of low- and middle-income countries. Theories of agricultural growth. Policy issues. Case studies.

865 Agricultural Benefit-Cost Analysis
Spring. 3(3-0)
Benefit-cost analysis of agricultural and natural resource projects, including financial and economic analysis. Case studies in project design and appraisal in low and high income countries.

874 Field Data Collection and Analysis in Developing Countries
Summer of odd years. 3(3-0) RB: (AEC 861) SA: AEC 891C
Designing and conducting socioeconomic surveys to inform agricultural production, marketing, and environment/natural resource issues in developed and developing countries. Research proposal preparation, questionnaire design, sampling, data collection, and data processing and analysis using computers.

890 Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to graduate students in Agricultural Economics. Approval of department.
Independent study of selected topics in agricultural economics.

891 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.
Selected topics in analytical methods, agri-food systems economics and management, and agricultural and natural resource development and policy.

898 Master's Research
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 master's students in the Agricultural Economics major. Approval of department.
Master's degree Plan B research.

899 Master's Thesis Research
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to master's students in the Agricultural Economics major. Approval of department.
Master's thesis research.

923 Advanced Environmental and Resource Economics
Spring of even years. 3(3-0) Interdepartmental with Economics; Forestry; Park, Recreation and Tourism Resources; Resource Development. RB: (AEC 829 and EC 805)
Advanced economic theory of environmental management and policy. Treatment of externalities and market and non-market approaches to environmental improvement. Topics in conservation and sustainable economic growth. Applications to research and policy.

925 Environmental and Resource Economics Research
Spring of odd years. 3(3-0) Interdepartmental with Forestry; Resource Development; Park, Recreation and Tourism Resources; Economics. RB: (AEC 829 and EC 805) SA: AEC 991H
Topics such as contingent or non-market valuation, institutional analysis, pollution prevention, environmental quality and location, recreational demand modeling, and environmental risk management. Research process in environmental and resource economics.

930 Dynamic Analysis in Agriculture and Natural Resources
Spring. 3(3-0) RB: (EC 801 and EC 812A) R: Open only to Ph.D. students in the College of Agriculture and Natural Resources or College of Business or College of Social Science or approval of department. SA: AEC 991E
Methods of dynamic optimization and their application to agricultural and natural resources problems. Discrete time dynamic programming, calculus of variations, and discrete time maximum principle.

932 Information Economics and Institutions in Agriculture and Natural Resources
Fall. 3(3-0) RB: (AEC 800 or AEC 810 or AEC 841) and (EC 812A and EC 812B) R: Open only to Ph.D. students in the Colleges of Agriculture and Natural Resources or Business or Social Science.
Applications to issues in agriculture, agribusiness, the food system, natural resources, and the environment. Asymmetric information, incomplete markets, principal/agent issues, transaction costs, and the design of contracts and other institutions.

977 Professional Practice in Agricultural Economics
Spring. 3(3-0) R: Open only to Ph.D. students in the Department of Agricultural Economics or Department of Economics. SA: AEC 947
Matching appropriate tools to applied problems in agricultural and resource economics. Individual and team preparation, under tight deadlines, of professional analyses and oral presentations for diverse audiences. Use of peer review.

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.

992 Seminar in Agricultural Economics
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course. R: Open only to Ph.D. students in Agricultural Economics. Approval of department; application required.
Price analysis, development, risk, trade, dynamic modeling research methods, finance and environmental economics.

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 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 Agricultural Engineering
College of Agriculture and Natural Resources

150 Metal Fabrication Technology
Fall. 2(1-2) R: Open only to students in the Biosystems Engineering or Building Construction Management major.
Physical principles and safety techniques for electric and gas welding. Soldering, brazing, cutting, tool use, machine shop equipment use, and hot and cold metalworking.

195 National Electrical Code Review
Fall. 3(3-0) RB: (AE 094 or BCM 230) SA: AE 095
Electrical installation problems. Principles of and compliance with the National Electrical Code.

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

252 Gasoline and Diesel Engine Technology
Fall. 3(2-2) SA: AE 052
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
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 326
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.

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.

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. RB: (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.

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(1-0) Interdepartmental with Natural Science; Engineering; Social Science. Administered by 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.

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 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.

289 Civilizations, Food Crops and the Environment
Fall, Spring. 3(3-0) Interdepartmental with Crop and Soil Sciences. SA: TCC 289
Role of the major food crops in the survival of civilizations and cultures from the past to the present, and the resulting environmental impacts.

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.