491* ***Selected Topics***
Fall, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 4 credits.
P: AEE 101 or AEE 401. R: Open only to Agribusiness and Natural Resources Education and Agriculture and Natural Resources Communications majors.
Topics selected to meet students needs in agriculture and natural resources communications or agriscience and natural resources education.
QP: AEE 401 ORAEE 360

801* ***Global Development Through Agricultural and Extension Education***
Fall. 3(3-0)
P: AEE 806 R: None
Application of education theories, principles and practices in planning, conducting and evaluation (formal and non-formal) education programs that focus on international development through agricultural and extension education.
QA: AEE 802

802* ***Program Administration in Agricultural and Extension Education***
Fall. 3(3-0)
R: None None None None
Theoretical constructs of organizational concepts, management concepts and practices applicable to Extension Education and Agricultural Education.
QA: AEE 851

803* ***Instructional Strategies in Agricultural and Extension Education***
Spring. 3(3-0)

Strategies and methods for effectively assessing learning needs, developing or selecting appropriate teaching strategies, using teaching strategies and evaluating their effectiveness with groups of learners.
QA: AEE 824

804* ***Communication Strategies in Agricultural and Extension Education***
Fall. 3(3-0)
R: Senior and above Agriculture and Natural Resources
Strategy for effective communication for diverse audiences. Emphasis on new information delivery systems-such as satellites & computers. Writing and preparing oral presentations for varied agricultural and Extension audiences is required.
QA: AEE 830

805* ***Leadership Development in Agricultural and Extension Education***
Spring. 3(3-0)

Assessing leader values, style, behavior and principles, philosophical and sociological bases for leadership development with applications in the Agricultural and Extension Education.
QA: AEE 858

806* ***Program Planning and Evaluation in Agricultural and Extension Education***
Spring of odd-numbered years, Summer of even-numbered years. 3(3-0)
P: Graduate Student R: Graduate Student
Principles of planning and evaluating programs in agricultural and extension education.
QA: AEE 810 AEE 860

807* ***The Research Process in Agricultural and Extension Education***
Fall. 3(3-0)

Principles and practices of planning, designing, conducting, and reporting research in agricultural and extension education.
QA: AEE 881 AEE 881

811* ***Education Through Extension***
Fall. 3(3-0)

Examination and analysis of the function, organization and operation of extension education programs.
QA: AEE 806

821* ***Principles and Philosophy of Agriscience Education***
Summer. 3(3-0)

Principles and philosophy that provide bases for analyzing and developing Agriscience Education courses, curricula, and programs.
QA: AEE 820

822* ***Teaching Supervised Agricultural Experiences (SAE)***
Summer of odd-numbered years. 3(3-0)
R: Graduate
The principles and practices involved in teaching high school youth in school sponsored agriscience laboratory learning.
QA: AEE 826 AEE 822

890* ***Readings and Independent Study in Agricultural and Extension Education***
Fall, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 4 credits.
P: Approval by Agricultural and Extension Education Instructor. R: Graduate Students
Study by an individual and/or group basis in the various areas of Agricultural and Extension Education.
QA: AEE 883

891* ***Selected Topics in Agricultural and Extension Education(MTC)***
Fall, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 6 credits.
R: Graduate
Topics selected to focus on contemporary issues and problems in Agricultural & Extension Education.

892* ***Seminar in Agricultural and Extension Education(MTC)***
Fall, Spring, Summer. 3(3-0) May reenroll for a maximum of 6 credits.

Seminar on selected issues in Agricultural and Extension Education. Students expected to contribute through individual reports/contributions and through active discussion.
QA: AEE 885

893* ***Professional Field Experience in Agricultural and Extension Education(MTC)***
Fall, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 4 credits.
R: Graduate Students
The practice, observation and analysis of and through field based experiences in Agricultural and Extension Education.
QA: AEE 881

898* ***Masters Plan B Research(W)***
Fall, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 3 credits.
R: Masters Students/Agricultural and Extension Education/Plan B Agriculture and Natural Resources Agricultural and Extension Education
Masters Students Plan B Research
QA: AEE 889

899* ***Masters Thesis Research(W)***
Fall, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 4 credits.
R: Masters Agriculture and Natural Resources Agricultural and Extension Education
Masters Thesis Research
QA: AEE 899

901* ***Worldwide Agricultural and Extension Education Systems***
Spring. 3(3-0)
P: AEE 801 or AEE 811 or AEE 821 R: Graduate
A comparative course on selected systems of Agricultural and Extension Education in different countries with attention to philosophical and structural differences and similarities of organization, programs, staffing, staff development and delivery.

907* ***Research Project Design and Implementation***
Spring. 3(3-0)
P: AEE 807
Principles and practices of selecting, developing and analyzing research instruments. Analyzing and interpreting both quantitative and qualitative data in Agricultural and Extension Education.
QP: AEE 881 AEE 881 QA: AEE 881 AEE 881

911* ***Nonformal Learning***
Fall of even-numbered years, , Summer of odd-numbered years. 3(3-0)
P: AEE 811 or equivalent
Examination of theories and philosophies that define learning in out-of-school settings. Alternative strategies for facilitating nonformal learning.

912* ***Advanced Extension Administration***
Spring. 3(3-0)
P: AEE 802, AEE 811
Advanced practices and applications necessary for effective management/administration within Extension Education.
QA: AEE 851

999* ***Doctoral Dissertation Research(W)***
Fall, Spring, Summer. 1 to 36 credits. May reenroll for a maximum of 0 credits.
R: PhD ANR AEE
Doctoral dissertation research. Credits used to complete this Ph.D. thesis.
QA: AEE 999

AGRICULTURAL ECONOMICS AEC

811* ***Institutional and Behavioral Economics***
Fall. 3(3-0) Interdepartmental with the Department(s) of Economics, Resource Development.
P: EC 324, EC 326
Inst., behavior, performance. Collective action, public choice, property rights, agency, transaction-info. costs, behavioral theory of firm-consumers, gov., externalities, income dist., order, evolution, learning, uncertainly legimation, altruism.
QA: AEC 810 AEC 809

815*. ***Applied Welfare Economics***
Fall of odd-numbered years. 3(3-0)
P: EC 480, EC 805A or EC 812A, EC 805B or EC 813A
Concepts and issues in Welfare Economics with application to problems in development, agricultural policy and trade, marketing and finance, environmental policy.

817*. ***Political Economy of Agricultural and Trade Policy***
P: EC 428 or EC 820A, EC 805A or EC 812A, EC 805B or EC 813A
Concepts of policy analysis and decision. Evolution of agricultural sector problems, behavior and policy over development process. Macroeconomic and trade impacts. International policies and trade. Trade and development. Current policy issues.
QA: AEC 860 AEC 861

821*. ***The Economics of Environmental Resources***
Fall. 3(3-0) Interdepartmental with the Department(s) of Economics, Resource Development, Forestry, Park and Recreation Resources.
P: EC 325 or equivalent R: None
Economic principles used to understand environmental conflicts and to evaluate public policy alternatives. Applications to water quality, land use, conservation, development, and global environmental issues.
QA: FOR 809

835*. ***Introductory Econometrics***
P: STT 430 R: Graduate
Estimation and interpretation of multiple regression models and their modifications when usual assumptions are not valid. Applications focus on problems faced by agricultural economists.
QP: STT 422 QA: EC835

841*. ***Organization and Performance of Agricultural Markets***
Spring. 3(3-0)
P: EC 324 or equivalent R: Graduate
Analytical approaches to the study of organization and performance of agricultural markets. Institutions and processes for coordinating food and agricultural systems. Issues of organization, control and public policy.
QA: AEC 841

845*. ***Commodity Market Analysis***
Fall. 3(3-0)
P: AEC 835 or Departmental Approval R: Graduate
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; and microcomputer applications.
QA: AEC 843

851*. ***Agricultural Firm Management***
Summer. 3(3-0)
P: FSM 330 or FI 391 or EC 325 R: Graduate
Managerial processes for planning and controlling agricultural firms. Applications of financial concepts, budgets, simulations, cognitive and information systems to developed and developing countries. Predictive and prescriptive analysis.
QA: AEC 851

855*. ***Agricultural Production Economics***
Spring. 3(3-0)
P: EC 480 and 805A R: Graduate
Principles and ag. applications of static production economics including study of capital inputs that yield services over several time periods. Investment/disinvestment models. Intro. to methods for incorporating risk and technological change into models
QA: AEC 805

861*. ***Agriculture in Economic Development(MTC)***
Fall. 3(3-0)
P: EC326; FSM / PAM 462 or instructor's approval R: Graduate
Role of Agriculture in Economic development of low-and-middle income countries. Theories of agricultural growth. Agricultural policy issues in developing countries. Case studies.
QA: AEC 862

865*. ***Benefit-Cost Analysis***
Spring. 3(3-0)
P: EC 326; EC 327 or EC 428 or instructor's approval R: Graduate
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.
QA: AEC 863

892A*. ***Agri-Business Management***
Fall of odd-numbered years. 3(3-0)
P: FSM 429
Identify and analyze common managerial problems faced by agri-business firms. Examine strategies used to interpret and respond to change trends and other forces affecting the industry.

892B*. ***Applied Operations Research***
Spring of odd-numbered years. 3(3-0)
P: EC 480
Use and interpretation of operations research techniques for problems encountered by ag. economists. Emphasis on linear programming and its variations, quadratic programming, spatial equilibrium, models and risk programming.
QA: AEC 837

892C*. ***Field Data Collection and Analysis in Developing Countries***
Summer of odd-numbered years. 3(3-0)
P: STT 430; FSM 462 or AEC 862 R: Graduate
Principles for conducting agricultural production and marketing studies/surveys-in developing countries; preparing research proposals; data processing and analysis.
QA: AEC 868

892D*. ***Decision Support Systems for Agriculture***
Fall of even-numbered years. 2(2-0)
P: FSM 330
Support of decision making through development and design of agricultural information systems stressing the role of databases and modelbases. Concepts illustrated through the use of case studies.
QA: AEC 853

892E*. ***Seminar in Agricultural and Trade Policy***
Spring of even-numbered years. 1 to 3 credits.
P: EC 805A and EC 805B or EC 812A and EC 813A
Explorations of agricultural and trade policy subject matter not covered in regular course offerings. Domestic agricultural policy issues. Trade and international policy issues.

892F*. ***Rural Development Policy***
Summer of even-numbered years. 1 to 3 credits.
P: AEC 811 or 817; RD 461 or 960
Rural and community development policy; including role of tax policies, education and training, public infrastructure and institutional alternatives. Theory and application

892G*. ***Independent and Supervised Study***
Fall, Spring, Summer. 1 to 3 credits.
R: Graduate
Arranged seminars initiated by faculty or students; supervised readings; individual study of selected problems.
QA: AEC 882

898*. ***Master's Research***
Fall, Spring, Summer. 1 to 4 credits.
R: X

QA: AEC 889

899*. ***Master's Thesis Research***
Fall, Spring, Summer. 1 to 6 credits.
R: X

QA: AEC 899

921*. ***Theory of Resource and Environmental Economics***
Spring of even-numbered years. 3(3-0) Interdepartmental with the Department(s) of Economics, Resource Development, Forestry, Park and Recreation Resources.
P: AEC 821, EC 805A
Economic theory of environmental change and control. Market and non-market allocation mechanisms. Temporal issues of conservation and growth. Contemporary issues in research and policy.

947*. ***Analysis of Food Systems Organization***
Summer. 3(3-0)
P: AEC 841, AEC 811(new), AEC 845, EC 807, EC 809 or approval of Dept. R: Graduate
Professional practice as an agricultural economist dealing with public and private policy issues related to the organization and performance of food systems. Professional presentations. Implications of current professional literature.
QA: AEC941

991A*. ***Advanced Price Analysis(MTC)***
Fall of even-numbered years. 1 to 2 credits.
P: AEC 845, AEC 991C or departmental approval R: Graduate
Advanced topics in price analysis and commodity markets. Emphasis on current research on risk in agriculture; the econometric analysis of time series; and topics in agricultural finance.
QA: AEC 995

991B*. ***International Agricultural Development***
Spring of even-numbered years. 2(2-0)
P: AEC 861, EC 805A and 805B or EC 812A and 813A R: Ph.D. students Agricultural Economics or Economics
Advanced topics and analytical methods in international agricultural development research. New theory and its application to specific problems in development.
QA: AEC 995

991C*. ***Risk Analysis***
Fall of odd-numbered years. 3(3-0)
P: AEC 855 R: Graduate
Examination of individual and firm response to alternative sources of risk.
QA: AEC 882

991D*. ***Frontiers in Agricultural and Trade Policy***
Fall of even-numbered years. 1 to 3 credits.
P: AEC 817 plus EC 826A,B & C or EC 812A, B, or EC 813 A, B, C. R: Ph.D candidates only
Exploration of advanced topics and the application of analytical methods in agricultural and trade policy. New theory and its applications. Building analytical frameworks for policy research. New policy issues.
QA: AEC 995

991E*. ***Dynamic Models in Agricultural Economics***
Spring of odd-numbered years. 2(2-0)
P: EC 480, EC 812A
Introduction to methods of dynamic optimization and application to agricultural and natural resources problems. Topics include discrete time dynamic programming, calculus of variations, and discrete time maximum principle.
QA: AEC 839

991F*. ***Methodological Approaches to Research***
Summer of even-numbered years. 2(2-0)
R: None
Selection, planning, and conduct of research. Alternative research approaches. Role of theory, beliefs, and valuations. Critical appraisal of research studies.
QA: AEC 972

991G*. ***Agricultural Finance***
Spring of odd-numbered years. 1 to 2 credits.
P: AEC 855 and 991C
Applications of financial theory and management techniques to problems in agriculture. Topics include asset valuation, portfolio management, capital structure, and risk management.

991H*. ***Environmental Economics Research Topic***
Summer of odd-numbered years. 1 to 2 credits.Interdepartmental with the Department(s) of .
P: AEC 821, EC 805A R: None
Current research in environmental economics including methods for valuing environmental change, temporal analysis of environmental resources, and game-theoretic aspects of market and non-market institutions.
QA: AEC 995

999*. ***Doctoral Dissertation Research***
Fall, Spring, Summer. 1 to 12 credits.
R: X

QA: AEC 999

AGRICULTURAL ENGINEERING AE

152W*. ***Food and Agricultural Engineering***
Spring. 1(2-0)
R: Freshman, Sophomore
Overview of worldwide problems related to food production. Energy issues, food distribution, food processing, conservation of natural resources, food production on an international scale.
QA: AE 152

336*. ***Principles of Agricultural Machines***
Spring. 3(3-0)
P: MMM 211, CE 321 or CHE 311 or ME 332. R: Open only to Engineering majors.
Processes performed by agricultural production machines. Power systems, tillage mechanics, traction, metering, distribution, conveying, fluidization, mixing, separation, and atomization. Machinery management.
QP: MMM 211 CE 321ORME 332OR QA: AE 374

338*. ***Principles of Food Processing Equipment***
Spring. 3(3-0)
P: MMM 211, CHE 311 or CE 321 or ME 332 R: Engineering
Principles of equipment used in processing raw materials into finished or intermediate products in a food processing plant.
QP: MMM 211 CE 321ORME 332OR QA: AE 374

353*. ***Engineering Principles of the Plant Environment***
Fall. 3(3-0)
P: BOT 105 or BS 110; CEM 141, MTH 235, ME 201. R: Open only to Engineering majors.
Analysis of the soil-plant-atmosphere continuum. Thermodynamics effects on plant environment: water, soil heat flow, radiation, and soil water movement.
QP: CEM 141 MTH 310ME 311BOT 205OR
QA: AE 353

356*. ***Electric Power and Control***
Spring. 3(2-2)
P: EE 345 or EE 200 R: Juniors and Above Engineering
Alternating current circuits, power distribution, electrical machines, protection, and programmable motor controllers. Design project related to food and agricultural industries.
QP: PHY 288 EE 345OREE 300 QA: AE 356

430*. ***Power and Control Hydraulics***
Spring. 3(2-2)
P: CE 321 or ME 332 or CHE 311 R: Engineering
Hydraulic fluid properties. Pump and motor performance parameters. Control valves and hydraulic circuitry components. Analysis and design of hydraulic systems.
QP: CE 321 ORCHE 340ORME 332 QA: AE 493

438*. ***Design of Machinery Structures***
Fall. 3(3-0)
P: MMM 306; AE 336 or AE 338. R: Open only to majors in College of Engineering. Not open to students with credit in ME 471.
Design of structural components and systems in machines. Tension, compression, torsion, bending and combined loadings. Joint connections.
QP: MMM 211 QA: AE 461

481*. ***Agricultural and Small Watershed Hydrology***
Spring. 4(5-0)
P: CPS 130 or CPS 131; CE 321 or CHE 311 or ME 332, AE 353 or CE 312. R: Open only to Engineering majors.
Relationships between rainfall, infiltration, runoff, interflow, subsurface drainage, ephemeral streamflow, and soil erosion. Runoff prediction using computer modeling of runoff.
QP: CPS 112 CE 321ORCHE 311OR QA: AE 481

486W*. ***Agricultural Engineering Design Fundamentals***
Fall. 2(2-0)
P: AE 353 or AE 356 or AE 336 R: Seniors and above Engineering
Concepts, methods, and procedures uniquely associated with the design process. Emphasis is on the total design process from problem identification to final specifications.
QA: AE 495

488W*. ***Agricultural Engineering Design Project***
Spring. 3(0-6)
P: AE 486 R: Senior Engineering
Individual or team pursuit of a design project selected in AE 486. Information expansion, developing alternatives, evaluation, selection of a concluding project.
QA: AE 496

490*. ***Independent Study***
Fall, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 5 credits.
P: AE 152 or ME 391 or MTH 235. R: Open only to Engineering majors. Approval of department.
Supervised individual student research and study in agricultural engineering.
QP: AE 152 ORME 391ORMTH 310 QA: AE 480

491*. ***Special Topics in Agricultural Engineering***
Fall, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 12 credits.
P: AE 152 or ME 391 or MTH 235. R: Open only to Engineering majors. Approval of department.
Special topics in agricultural engineering.
QP: AE 152 ORME 391ORMTH 310 QA: AE 490

802*. ***Advanced Computational Methods in Food and Agricultural Engineering***
Fall of odd-numbered years. 3(3-0)
R: Undergraduate Degree in 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.

809*. ***Finite Element Method***
Spring. 3(3-0) Interdepartmental with the Department(s) of Metallurgy, Mechanics, and Materials Science, Mechanical Engineering.
P: Approval of Department R: Graduate student
Theory and application of the finite element method to the solution of continuum type problems in heat transfer, fluid mechanics and stress analysis.
QA: AE 809

812*. ***Bio-Processing Engineering***
Spring of odd-numbered years. 3(3-0)
R: Undergraduate Degree in Engineering
Thermodynamics, heat and mass transfer, fluid flow, dehydration, materials handling and storage of biological products.
QA: AE 812

815*. ***Instrumentation***
Fall. 3(3-0)
P: MTH 235 R: Graduate students Undergraduate Degree in Engineering
Theory, method and techniques of making engineering measurements (such as temperature, pressure, flow, humidity, and moisture) in biological materials. Recording and indicating equipment.
QA: AE 815

850*. ***Dimensional Analysis and Similitude Modeling***
Fall. 3(2-2)
R: Graduate students Undergraduate Degree in Engineering
Dimensional concepts; systems of measurements and transformation of units; formation of dimensionless groups; development of prediction equations; concepts of similarity; scaling laws; and distortion.
QA: AE 850

882*. ***Irrigation and Water Management Engineering***
Spring of even-numbered years. 3(3-0)
P: CE 321, AE 481 R: Senior or above Undergraduate Degree in Engineering
Engineering design of irrigation systems in humid areas. System design, management, water supply, water transport, and economic and engineering optimization of irrigation design.
QP: AE 481 CE 321 QA: AE 482

890*. ***Special Problems***
Fall, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 9 credits.
R: Graduate students Approval of department; application required.
Individual student research and study in Agricultural Engineering.
QA: AE 880