321. *Economic Policy Processes II*

Winter. 3(3-0) 320 or approval of department.

Continuation of 320 with emphasis on behavioral analysis and simulated participation in the process through case examples and problems.

340. *Managerial Economics*

Spring. 3(3-0) EC 201. Interdepartmental with Food Systems Economics and Management.

Production, consumption decisions and their interrelation. Pricing of market and non-market goods. Effects of monetary and fiscal policies. Applications to problems in food system or community management.

363. *Economic Development of Tropical Africa*

Spring. 3(3-0) EC 200 and 201, or 210. Interdepartmental with and administered by the Economics Department.

African economic development in historical perspective. Analysis of contemporary economic development problems faced by tropical African countries. Alternative strategies for African economic development.

370. *Applied Statistics*

Winter. 3(3-0) Students may not receive credit in both PAM 370 and AEC 830. One course in statistics, one course in food systems economics and management or public affairs management. Interdepartmental with Food Systems Economics and Management.

Interpretation and use of statistical results in decision making. Sampling index numbers, tabular analysis, trend estimation, regression models, decision theory.

401. *Production Economics and Management*

(AEC 401.) Fall. 4(4-0) Not open to graduate students in Agricultural Economics, Economics or Resource Development. Interdepartmental with the Resource Development Department and Food Systems Economics and Management and administered by Food Systems Economics and Management.

Economic principles of production. Industry supply and factor demand analysis. Management concepts and choice criteria. Interrelationships of production and consumption decisions. Welfare economics. Examples drawn from agriculture.

404. *Social Accounts and Community Choice*

Winter. 3(3-0) 303 or approval of department.

Social accounting as a framework for problem definition and measurement of policy effectiveness. Conceptualization of social accounts. Use of selected social indicators in policy formulation and decision making.

406. *Public Expenditures: Theory and Policy*

Fall, Spring. 4(4-0) EC 201 or 210. Interdepartmental with and administered by the Economics Department.

Expenditure theory; objectives and rationale of government activity in the market system; efficiency criteria in government decision-making; planning-programming-budgeting systems and cost-benefit analysis.

417. *Land Economics*

Fall, Spring. 4(4-0) Interdepartmental with the Resource Development and Economics Departments and Food Systems Economics and Management and administered by the Resource Development Department.

Factors affecting man's economic use of land and space resources. Input-output relationships; development, investment, and enterprise location decisions. Land markets; property rights, area planning; zoning and land use controls.

460. *Location Analysis*

Winter. 4(4-0) 417 or 401 or EC 324. Interdepartmental with the Resource Development and Economics Departments, and Food Systems Economics and Management and administered by the Resource Development Department.

Forces affecting location decisions of firms, households and governments. Applications to agricultural, industrial, and regional developments.

462. *Agricultural and Rural Development in Developing Nations*

(AEC 462.) Fall. 3(3-0) 201 or EC 201; PAM 260 recommended. Interdepartmental with Agriculture and Food Systems Economics and Management and administered by Food Systems Economics and Management.

Traditional agricultural systems and the incentive environment for economic growth in rural areas. Adjustment to technological, institutional and human change. Strategies for rapid agricultural transformation.

473. *Introduction to Systems Analysis*

Spring. 3(3-0) MTH 111. Interdepartmental with Food Systems Economics and Management.

Principles of systems analysis applied to ecological, physical, economic and social phenomena. Case studies. Interpretation and design of systems models. Systems concepts in decision making.

480. *Independent and Supervised Study*

Fall, Winter, Spring, Summer. 1 to 9 credits. May re-enroll for a maximum of 9 credits. Approval of department.

AGRICULTURAL ENGINEERING A E

College of Agriculture and Natural Resources

152. *Introduction to Agricultural Engineering I*

(252.) Fall. 1(1-0)

An introduction to the agricultural engineering profession with an examination of existing problems.

153. *Introduction to Agricultural Engineering II*

(253.) Winter. 1(1-0)

Communication techniques, library use, letter and technical report writing techniques as used in the agricultural engineering profession.

154. *Introduction to Agricultural Engineering III*

(254.) Spring. 1(1-0)

An analysis of the agricultural engineering profession with an examination of educational requirements for employment in various areas of the profession.

200. *Computers and Information Processing in Agriculture and Natural Resources*

Spring. 3(3-0)

Evaluation of the present and future role and application of electronic computers in the area of agriculture and natural resources.

202. *Physical Principles of Mechanical Processes*

Fall, Spring. 3(1-4)

Theory and skills in metallurgy, heat treating, cold metal, sheet metal, plumbing, arc and oxy-acetylene welding and machine operations.

239. *Housing Conservation*

Spring. 2(2-0)

Skills and techniques in conserving, repairing and remodeling existing housing. Structural components of housing and evaluation of housing structure.

243. *Automotive and Recreational Engines*

Spring. 3(3-0)

The principles and maintenance of engines used in automobiles and recreational vehicles. Fuels, lubricants and emission control. Basic engineering principles are developed in a manner that requires no prior technical training.

352. *Physical Principles of Biological Processes*

Fall. 3(3-0) MTH 215, PHY 289.

Basic scientific principles and engineering theory applied to biological systems and products.

353. *Physical Principles of Plant Environment*

Winter. 3(3-0) 352.

Physical processes and properties of the biosphere as related to engineering the plant environment.

354. *Physical Principles of Animal Environment*

Spring. 3(2-2) 352.

Interrelationship of environmental factors and physiological responses of animals for planning, design and control of optimum environmental systems.

355. *Principles of Structures and Machines*

Winter. 3(3-0) MMM 211.

Stress and deflection analysis of simple structures and machines. Estimation of loads and selection of materials. Course will be oriented towards applications in agricultural engineering.

402. *Teaching Agricultural Mechanics*

Winter, Spring. 5(2-6) Juniors.

Teaching theory and developing skills in agricultural mechanics in secondary and vocational schools. School and farm shop planning and management. Emphasis on equipment and material selection, metallurgy, metal work and welding.

425. *Farmstead Materials Handling*

Spring. 3(2-2) Juniors.

Systems and equipment for handling grain, hay, fertilizer, water and wastes on the farm. Systems design and evaluation.

IDC. *Introduction to Meteorology*

For course description, see Interdisciplinary Courses.

IDC. *Introduction to Meteorology Laboratory*

For course description, see Interdisciplinary Courses.

IDC. *Microclimatology*

For course description, see Interdisciplinary Courses.

437. *Principles of Food Engineering*

Winter. 5(5-0) 220.

Principles and use of electricity, steam, refrigeration and hydraulics in food plants. Emphasis will be placed on specialized processing equipment, their design features, materials of construction and automatic control.

444. *Agricultural Production Machinery*

Spring. 3(2-2).

Basic principles of agricultural machines. Selection, care and operation of agricultural machinery for obtaining optimum conditions for crop production.

445. Hydraulic Power Transmission
Winter. 3(2-2) MTH 111, PHY 237.

Pressures, flows and losses in hydraulic power transmission systems. Operation and performance of pumps, valves, actuators, and complete systems found on agricultural and light industrial mobile equipment.

459. Special Problems
Fall, Winter, Spring, Summer. 1 to 5 credits. May re-enroll for a maximum of 5 credits. Approval of department.

462. Pollution Control
Winter of even-numbered years. 4(3-2) 352.

Application of biological, chemical, physical and engineering principles of pollution control to optimize the production and processing of food and fiber with respect to the quality of the total environment.

471. Electric Power and Control
Fall. 4(3-2) E E 345.

Electric motors, controls and circuits; switching logic, devices and circuit design.

474. Processing Biological Products
Winter of odd-numbered years. 4(3-2) 352, M E 311.

Engineering principles of unsteady-state heat transfer, heat exchangers, drying, storage and refrigeration as applied to the processing of biological products.

475. Introduction to Operations Research
Winter. 4(4-0) MTH 215, CPS 120. Interdepartmental with Systems Science.

Methodology and basics of operations research; formulation and analysis of probabilistic models of inventory, waiting line, and reliability processes; random process simulation and network planning models.

476. Food Process Engineering
Spring of odd-numbered years. 4(3-2) 352.

Description and analysis of systems utilized in processing of foods for human consumption.

481. Soil and Water Engineering
Spring of even-numbered years. 4(3-2) M E 332 or C E 321.

Engineering analysis, design and construction of drainage, irrigation and erosion control systems.

493. Energy Conversion Systems
Spring. 4(3-2) M E 311.

Principles of energy conversion with emphasis on the internal combustion engine. Thermodynamic analysis, performance characteristics, and power transmission.

494. Systems of Agricultural Machines
Spring of even-numbered years. 4(3-2) 355.

Systems of machines used in field and farmstead operations. Engineering principles for machines dealing with biological materials.

804. Agricultural Mechanization in Developing Countries
Spring. 3(3-0) Approval of department.

Principles of mechanical equipment selection for organized agricultural enterprises. Machinery specifications and standards, performance efficiency, cost and use, and management factors. Domestic and foreign considerations.

805. Environmental Measurements
Fall. 4(3-3)

Methods and techniques for accurate measurement and interpretation of environmental parameters. Temperature, humidity, wind and air flow characteristics, radiation, light intensity, gaseous and particulate concentrations in atmospheric microclimates will be discussed.

806. Analysis of Agricultural Systems
Spring. 3(3-0) SYS 810.

Identification and definition of systems problems in agriculture. Model formulation and estimation. Several models of current interest are considered.

807. Man-Machine Relationships
Fall. 3(3-0) Approval of department.

Analysis of machine design, operation and working environment in relation to human limitations and capabilities, analysis of procedures used to develop maximum compatibility between man and machine.

811. Technical Problems
Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 9 credits.

812. Bio-Processing Engineering
Winter. 3(3-0) Approval of department.

Topics will be presented pertaining to thermodynamics, heat and mass transfer, thermal processing, fluid flow, dehydration and freeze drying of biological products or biological processes.

814. Physical Properties of Agricultural Products
Winter. 3(3-0) Approval of department.

Physical and mechanical behavior of fruits and vegetables, forages, grains and other agricultural products under constant and dynamic loading. Related to design parameters for production, handling and processing machinery.

815. Instrumentation for Agricultural Engineering Research
Fall. 3(3-0)

Theory, method and techniques of measuring temperature, pressure, flow, humidity, and moisture for biological materials. Associated recording and indicating equipment.

820. Research Methods in Agricultural Engineering
Fall. 1(1-0)

Discussion of procedures for initiating, developing, carrying out, and completing research projects.

822. Seminar
Spring. 1(1-0)

840. Advanced Power and Machinery
Spring. 3(2-2) 493, 494.

Analysis of agricultural machine components and systems. Emphasis on hydraulic power transmission, controls, and management of machinery systems.

899. Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

990. Advanced Topics in Agricultural Engineering
Fall, Winter, Spring. 3(3-0) May re-enroll for a maximum of 9 credits. Approval of department.

New developments in agricultural engineering. Subjects to be covered include atmospheric turbulence, optimization of agricultural systems, measurement systems, food engineering, agricultural rheology and finite element methods.

999. Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Physical Systems in Agriculture and Natural Resources — PSA

223. Commercial Food Processing Systems
Fall. 3(3-0).

Processes and systems used in handling, processing and distribution of food; the need for processing systems and their influence on food quality.

258. Technical Skills
Fall, Winter. 2 to 7 credits. May re-enroll for a maximum of 10 credits. Majors and approval of department.

Selection, operation, and maintenance of physical components of electrical, mechanical, environmental and water management systems in agriculture and natural resources industries, including system design and component installation.

322. Systems Analysis in Agricultural Production
Fall. 3(3-0) MTH 111 or 109, CPS 110 or 120.

Simulation of processes and operations for food, feed, fiber and energy flow in agriculture and natural resources. Analysis of interrelationships between physical systems.

324. Processing Systems for Biological Products
Spring. 4(4-0) MTH 109 or 111, PHY 238.

Physical processes which influence biological products during production, handling, processing and distribution. Mass and heat balances, fluid flow, steam generation, psychrometrics, heat exchange, refrigeration and dehydration will be discussed.

416. Light Structural Systems
(A E 416.) Fall. 4(4-0) PHY 237 or approval of department.

Functional planning of animal structures. Properties of building materials and selecting building components to satisfy requirements of light structures.

421. Electrical Energy Utilization
(A E 421.) Spring. 4(3-2) PHY 238 or approval of department.

Efficient utilization of electrical energy; selection, operation and control of electrical equipment. Design of electrical systems.

431. Irrigation, Drainage and Erosion Control Systems
(A E 431.) Spring. 4(3-2) SLS 210 or approval of department.

Use of surveying, design, construction and cost estimates of drainage, irrigation and water control systems.

443. Machinery and Tractor Systems

(A E 443.) Fall, Spring. 4(3-2) A E 243 or approval of department.

Characteristics of basic agricultural field machinery. Diesel engine, fuel injection and combustion chamber characteristics. Torque and power transmission, tractor stability and implement hitching.

AGRICULTURE AG

College of Agriculture and Natural Resources

124A. Introduction to Careers in Vocational and Practical Arts Education—Agriculture

Fall. 2(1-2) Interdepartmental with and administered by Education.

275. Exploring International Agriculture

Spring. 3(3-0) Interdepartmental with Natural Resources.

Exploration of overseas assignments with international agencies; potential world food actualities and potentialities; special problems of the tropics compared with those in temperate regions.

350. Leadership Development for Agriculture and Natural Resources

Winter, Spring. 3(3-0) May re-enroll for a maximum of 6 credits. Approval of department. Interdepartmental with Natural Resources.

Leadership development. Preparation for community leadership. Firsthand look at social, economic, and political problems. Series of seminars, interviews, field trips. Emphasis on awareness, action, and involvement.

399. Agriculture Internship

Fall, Winter, Spring, Summer. Zero credit. [10 credits.]† Juniors and approval of department. Interdepartmental with Natural Resources.

An opportunity for exposure to the applied aspects of a student's major. Supervision and evaluation conducted by faculty and cooperating agencies.

401. Agriculture and Natural Resources Communications

Winter, Spring. 3(2-2) JRN 201 or other writing course and approval of department.

Techniques, strategies and practices in development of agricultural and natural resources information programs. Including writing, public relations, TV and radio production for specialized and general audiences.

402. Agriculture and Natural Resources Communications Internship

Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 6 credits. 401, approval of college.

Internship with professionals in communications field with emphasis on student's areas of interest —writing, radio, TV, publications, etc.

425. Agriculture and Natural Resources Seminar

Spring. 2(2-0) Interdepartmental with Natural Resources.

Current agricultural, natural resources, and environmental problems and solutions as presented by discussion leaders from various disciplines, arranged by undergraduate students.

†See page A-2, item 3.

IDC. The Impact of Animal Resource Management Upon the World's Developing Nations

For course description, see Interdisciplinary Courses.

462. Agricultural and Rural Development in Developing Nations

Fall. 3(3-0) PAM 201 or EC 201; PAM 260 recommended. Interdepartmental with Public Affairs Management and Food Systems Economics and Management and administered by Food Systems Economics and Management.

Traditional agricultural systems and the incentive environment for economic growth in rural areas. Adjustment to technological, institutional and human change. Strategies for rapid agricultural transformation.

471. Environmental Topics in Nonmetropolitan Regions

Fall. 4(4-0) Nomination of students by own department and approved by participating faculty. Interdepartmental with the College of Natural Science and Natural Resources and administered by Natural Resources.

Environmental topics in nonmetropolitan regions including issues on: production agriculture, service industries, non-agricultural uses, rural urban balance, discussion topics and case studies.

475. International Studies in Agriculture and Natural Resources

Spring, Summer. 3 to 9 credits. Approval of the college. Interdepartmental with Natural Resources.

Study-travel experience emphasizing contemporary problems affecting agriculture in the world, national, and local communities. Field trips, case studies, interviews with leading experts, government officials, community leaders. Supervised individual study.

AMERICAN STUDIES AMS

College of Arts and Letters

301. Issues in American Civilization

Fall, Winter, Spring. 3(3-0) May re-enroll for a maximum of 9 credits. Not applicable to major requirements.

Selected issues in American life past and present, with materials drawn from such disciplines as history, social sciences, philosophy, literature and the arts. Topics vary.

410. Perspectives in American Studies

Fall. 3 credits. Juniors in American Studies or approval of American Studies Committee.

Methods and significant works, for majors in the American Studies program. Offered by members of the relevant departments.

411. Problems in American Civilization

Winter, Spring. 3 credits. Majors must re-enroll for a maximum of 6 credits. 410, Juniors in American Studies or approval of American Studies Committee.

Seminar approach to selected problems in American life employing the objectives and approaches of interdisciplinary studies. Offered by members of relevant departments, for majors in the American Studies program.

AMERICAN THOUGHT AND LANGUAGE ATL

University College

Students may earn credit in only one of the courses in each of the following three groups:
1. 121, 131, 141, 151, 161, 171, 181, 191H
2. 122, 132, 142, 152, 162, 172, 182, 192H
3. 123, 133, 143, 153, 163, 173, 183, 193H

101A. Comprehensive English

(100.) Fall, Winter, Spring, Summer. 3(3-1) No student may receive credit in both 101A and 101B. Admission by examination or approval of department.

Instruction and practice in reading and writing. Emphasis upon mastery of fundamental skills needed for a variety of reading and writing assignments.

101B. Comprehensive English

(100.) Fall, Winter, Spring, Summer. 3(3-1) No student may earn credit in both 101A and 101B. Admission by examination or approval of department.

Instruction and practice in reading and writing. Instruction in reading is emphasized.

102. Comprehensive English

Fall, Winter, Spring, Summer. 3(3-1) 101A or 101B.

Continuation of 101 with emphasis on writing and reading.

103. Comprehensive English

Fall, Winter, Spring, Summer 3(3-1) 102.

Continuation of 102 with emphasis on reading and writing on American cultural topics.

117. Use of Libraries

Fall, Winter. 1(1-0)

The use of libraries, with emphasis on M.S.U. Library. Course will stress knowledge and use of bibliographic and reference resources.

121. American Expression

(111A.) Fall, Winter, Spring, Summer. 3(3-0) Satisfactory grade on English proficiency examination or in Comprehensive English.

Aims to improve the student's ability to read and write and to acquaint him with his American heritage. Selected reading and theme topics.

122. American Expression

(112A.) Fall, Winter, Spring, Summer. 3(3-0) Three credits in the first term of any ATL sequence numbered 121 or above; or satisfactory performance in Comprehensive English.

Aims to improve the student's ability to read and write, and to acquaint him with his American heritage. Selected reading and theme topics.

123. American Expression

(113A.) Fall, Winter, Spring, Summer. 3(3-0) Three credits in the second term of any ATL sequence numbered 121 or above; or satisfactory performance in Comprehensive English.

Aims to improve the student's ability to read and write, and to acquaint him with his American heritage. Selected reading and theme topics.

131. Major Documents in American Experience

(111B.) Fall, Winter, Spring, Summer. 3(3-0) Satisfactory grade on English proficiency examination or in Comprehensive English.

Aims to acquaint the student with significant works, and to improve his abilities at reading and writing. Selected readings and theme topics.