

# MECHANIZED SYSTEMS MANAGEMENT (MSYM)

## MSYM 109 Physical Principles in Agriculture and Life Sciences

**Prerequisites:** MATH 101 or 102 or 103 or 104 or 106; or placement in MATH 102 or 104 or 106.

**Notes:** Students cannot receive credit for both MSYM 109 and PHYS 141 or 151.

**Description:** Fundamental principles of mechanics, heat, electricity, magnetism and electromagnetism and their relationship to energy utilization and conservation. Principles then applied to problem situations in agriculture and life sciences.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Format:** LEC

**Prerequisite for:** FDST 363, MSYM 363; MSYM 109L; MSYM 232; MSYM 245; MSYM 262; MSYM 312; MSYM 342; MSYM 354, SOIL 354, WATS 354; MSYM 364; MSYM 452, MSYM 852, WATS 452, AGRO 452  
**ACE:** ACE 4 Science

## MSYM 109L Physical Principles in Agriculture and Life Sciences

### Laboratory

**Prerequisites:** MSYM 109 or parallel, or PHYS 151

**Description:** Laboratory experiments on mechanics, heat, electricity, magnetism and electromagnetism and their relationship to energy utilization and conservation in agriculture and life sciences.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Format:** LAB

## MSYM 162 Introduction to Mechanized Systems Management

**Description:** Basic principles of describing and evaluating mechanized systems relevant to agriculture, food, energy, and water. Problem solving using systems-thinking. Exploration of major and career opportunities. Academic success and planning.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Format:** LEC

## MSYM 232 Power and Machinery Principles

**Prerequisites:** MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211

**Description:** Operational characteristics of IC engines, field, materials-handling, and processing machines and their components. Includes analyses, estimations, and objective comparisons of performance; principles for adjustment and calibration of metering systems; and cost-effective sizing of machines. Exercises include using ASABE Standards and available reports of machine performance (tractor test reports, etc.).

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

## MSYM 245 Electrical Service Systems

**Prerequisites:** MSYM 109 or high school physics.

**Description:** Utilization of electric energy in agricultural production, processing, and residential applications. Wiring installations; selection of safe and adequate circuit devices; service equipment and conductors; and electric motors and their control; and energy management.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Prerequisite for:** MSYM 412; MSYM 416

## MSYM 262 Problem Solving in Mechanized Systems Management

**Prerequisites:** MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211.

**Notes:** Open to MSYM majors only.

**Description:** Use of computational tools to solve problems relevant to mechanized systems management. Professional communication of technical information. Discussion of current and emerging issues relevant to the major.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Format:** LEC

**Offered:** SPRING

## MSYM 299 Career Experiences

**Prerequisites:** Permission and advanced approval of plan or work.

**Description:** Student participation in physical systems applications. May include participation in mechanization-related areas of agribusiness, production practices, and processing operations; research in laboratory, greenhouse and field; or preparation of teaching materials.

**Credit Hours:** 1-5

**Min credits per semester:** 1

**Max credits per semester:** 5

**Max credits per degree:** 12

**Format:** IND

## MSYM 312 Engine Power Systems

**Prerequisites:** MSYM 109 or general physics.

**Description:** Internal combustion engine power systems used in agriculture with primary emphasis on power needs for both mobile and fixed operations, characteristics of power sources and energy resources, and selection and use of power units.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

## MSYM 342 Animal Housing Systems

**Prerequisites:** MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211

**Description:** Production facilities for livestock and poultry will be developed with emphasis on building and feedlot layout, ventilation, heating and cooling systems; energy utilization; and construction materials and methods.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Offered:** FALL

**MSYM 354 Soil Conservation and Watershed Management**

**Crosslisted with:** SOIL 354, WATS 354

**Prerequisites:** AGRO/SOIL 153; and MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211

**Description:** Watershed hydrology, soil erosion, erosion control, water management, and land surveying and mapping. Includes rainfall-runoff relationships; determination of watershed characteristics; terraces, waterways, vegetative filters, and residue management; ponds, wetlands, non-point source pollution control, and water conservation; profile and topographic surveying.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Offered:** FALL

**MSYM 363 Heat and Mass Transfer**

**Crosslisted with:** FDST 363

**Prerequisites:** MATH 104 or 106; MSYM 109 or PHYS 141 or 151.

**Description:** Fundamentals of food engineering including material and energy balances, fluid mechanics, heat transfer and mass transfer.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**MSYM 364 Agricultural Products Processing and Handling**

**Prerequisites:** MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211

**Description:** Analysis of processing and handling operations. Chemical and physical characteristics of agricultural products. Application of psychrometrics. Power requirements, capacities, and efficiencies of drying and conveying systems. Discussion of safety issues, logistics, and survey of industry technologies.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Offered:** SPRING

**MSYM 395 Internship in Mechanized Systems Management**

**Prerequisites:** Junior standing.

**Notes:** Completion of internship approval form is required. The internship proposal is subject to approval by the Department of Biological Systems Engineering. Pass/No Pass only.

**Description:** Practical experience, directed learning, and career exploration and development in a selected business, industry, agency, or educational institution.

**Credit Hours:** 1-3

**Min credits per semester:** 1

**Max credits per semester:** 3

**Max credits per degree:** 5

**Format:** FLD

**MSYM 400A Occupational Safety**

**Prerequisites:** Junior standing

**Notes:** Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.

**Description:** Identifies safety and health risks in industrial work environments. Focus on how managers and supervisors meet their responsibilities for providing a safe workplace for their employees. Includes the identification and remediation of workplace hazards.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**MSYM 400B Agricultural Safety and Health**

**Notes:** Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.

**Description:** Safety concepts, principles, practices, rules and regulations as they relate to agriculture will be explored. Developing and conducting safety programs, and conducting safety inspections and accident investigations are other aspects of the course.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**MSYM 400E Biorenewable Systems Technology**

**Notes:** Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.

**Description:** The science, engineering, economics and business of converting biorenewable resources into bioenergy and biobased products. Biorenewable concepts as they relate to drivers of change, feedstock production, economics, transportation and logistics, and marketing.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**MSYM 400J Machinery Management Using Precision Agriculture Technology**

**Prerequisites:** Junior standing

**Notes:** Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.

**Description:** Management of agricultural equipment that is commonly used in conjunction with GPS technology such as planters, combines, fertilizer application equipment, and sprayer application equipment.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**MSYM 400K Chemical Application Systems**

**Notes:** Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.

**Description:** Systems, components, operation practices, and safety procedures used in the chemical application industry. Liquid and granular application systems and respective components will be studied along with procedures for equipment sizing and maintenance, minimizing drift, system calibration, and safe handling-transportation-storage-disposal and spill clean-up of agrichemicals.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Format:** LEC

**MSYM 412 Hydraulic Power Systems****Prerequisites:** MSYM 245**Description:** Theory and application of fluids under controlled pressure to perform work in mobile and industrial applications. Positive displacement (PD) pumps, linear and rotary hydraulic actuators (hydraulic cylinders and motors), valves, and electric over hydraulic systems will be studied in detail. Fluid power circuit development on both hydraulic benches and computer simulated environments will be performed with emphasis on circuit analysis, and system troubleshooting.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Format:** LEC**Offered:** SPRING**MSYM 416 Sensors and Control Systems for Agri-Industries****Prerequisites:** MSYM 245 or permission.**Description:** Application of sensors for measurement of process control variables and implementation of microcomputer-based measurement and control systems. Basic electrical and electronic instrumentation plus control of electrically, pneumatically and/or hydraulically powered systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Format:** LEC**MSYM 431 Site-specific Crop Management****Crosslisted with:** AGEN 431, AGRO 431**Prerequisites:** Senior standing; AGRO/SOIL 153; AGRO 204.**Description:** Principles and concepts of site-specific management. Evaluation of geographic information systems for crop production practices. Practical experience with hardware and software necessary for successful application of information affecting crop management.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Format:** LEC**MSYM 433 Equipment and Tractor Testing****Crosslisted with:** MSYM 833**Prerequisites:** MSYM 232; and STAT 218 or STAT/MATH 380 or MECH 321**Notes:** Offered spring semester in even-numbered calendar years.**Description:** Principles and procedures involved in testing agricultural equipment and tractors. Actual test planned, scheduled, conducted and reported. Test may be based upon procedures used at the Nebraska Tractor Testing Laboratory or involve other equipment being used for research in the department.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Format:** LEC**Offered:** SPRING**MSYM 436 Embedded Controls for Agricultural Applications****Crosslisted with:** AGEN 436, AGEN 836, MSYM 836**Prerequisites:** AGEN/BSEN 260 or MSYM 416**Description:** Introduction to the basics of embedded controller programming, and the development of Controller Area Network (CAN) bus systems in agricultural applications. Interfacing sensors with analog and digital signals, closed loop control of actuators, transmission and reception of CAN messages, programming of CAN messages in a distributed controller set up for sensor data acquisition, and actuator control will be studied.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Format:** LEC**Offered:** FALL**MSYM 452 Irrigation Systems Management****Crosslisted with:** MSYM 852, WATS 452, AGRO 452**Prerequisites:** MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211**Notes:** AGRO/SOIL 153 recommended.**Description:** Irrigation management and the selection, evaluation, and improvement of irrigation systems. Includes soil-water measurement, crop water use, irrigation scheduling, irrigation efficiency, measurement of water flow, irrigation systems, groundwater and wells, pumping systems, applying chemicals with irrigation systems, and environmental and water resource considerations.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Format:** LEC**Offered:** FALL**Prerequisite for:** AGEN 854, MSYM 854; AGEN 955, AGRO 955, CIVE 955, GEOL 985; MSYM 855**MSYM 462 Equipment Systems****Crosslisted with:** MSYM 862**Prerequisites:** Senior standing in MYSM**Notes:** Capstone course.**Description:** Team-based activities to evaluate equipment systems, make technical and economic recommendations, develop professional written and oral reports. Topics include equipment system performance and management, project scheduling and planning, cost estimation, reliability analysis, and risk assessment.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Format:** LEC**ACE:** ACE 10 Integrated Product**MSYM 465 Food Engineering Unit Operations****Crosslisted with:** FDST 465, FDST 865, MSYM 865**Prerequisites:** FDST/MSYM 363.**Description:** Unit operations and their applications to food processing.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Format:** LEC

**MSYM 469 Bio-Atmospheric Instrumentation**

**Crosslisted with:** AGRO 469, GEOG 469, HORT 407, METR 469, NRES 469, AGRO 869, GEOG 869, HORT 807, METR 869, MSYM 869, NRES 869

**Prerequisites:** Junior standing; MATH 106; 4 hrs physics; physical or biological science major.

**Description:** Discussion and practical application of principles and practices of measuring meteorological and related variables near the earth's surface including temperature, humidity, precipitation, pressure, radiation and wind. Performance characteristics of sensors and modern data collection methods are discussed and evaluated.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Groups:** Physical Geography

**MSYM 475 Water Quality Strategy**

**Crosslisted with:** NRES 475, NRES 875, SOCI 475, SOCI 875, SOIL 475, WATS 475, AGRO 475, AGRO 875, CIVE 475, CIVE 875, CRPL 475, CRPL 875, GEOL 475, GEOL 875, MSYM 875, POLS 475, POLS 875

**Prerequisites:** Senior standing.

**Notes:** Capstone course.

**Description:** Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**ACE:** ACE 10 Integrated Product

**Groups:** American Government&Public Pol

**MSYM 492 Special Topics in Mechanized Systems Management**

**Crosslisted with:** MSYM 892

**Prerequisites:** Permission

**Description:** Subject matter in emerging areas of Mechanized Systems Management not covered in other courses within the curriculum. Topics, activities, and delivery methods vary.

**Credit Hours:** 1-6

**Min credits per semester:** 1

**Max credits per semester:** 6

**Max credits per degree:** 6

**Format:** LEC

**MSYM 496 Principles and Problems in Mechanized Agriculture**

**Crosslisted with:** MSYM 896

**Prerequisites:** 15 hours in MSYM or closely related area.

**Description:** Individual or group projects in research, literature review, or extension of course work under the supervision and evaluation of a departmental faculty member.

**Credit Hours:** 1-5

**Min credits per semester:** 1

**Max credits per semester:** 5

**Max credits per degree:** 12

**Format:** IND

**MSYM 499H Honors Thesis**

**Prerequisites:** Admission to the University Honors Program and permission

**Notes:** AGRI 299H recommended.

**Description:** Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.

**Credit Hours:** 3-6

**Min credits per semester:** 3

**Max credits per semester:** 6

**Max credits per degree:** 6

**Format:** IND