Agricultural Systems Management

Leon G. Schumacher, Chair
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Division of Food Systems and Bioengineering
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Agricultural systems management integrates physical systems with agricultural science and management skills to provide graduates with abilities to function in sales, service and maintenance management positions in agribusiness industries. The uniqueness of agricultural systems management graduates lies in their knowledge of the principles of physical systems that are the backbone of modern agricultural and food industries. The department offers the Bachelor of Science with a major in Agricultural Systems Management. A minor is also available.

Faculty

Professor D. Brune*, W. Downs, L. Schumacher*
Associate Professor D. Baker*, S. Borgelt*, K. Sudduth**, A. Thompson**
Assistant Professor B. Broz, B. Koc*, T. Lim*, J. Zulovich*
Research Associate K. Funkenbusch
Extension Associate D. Downing
Professor Emeritus D. Currence, J. Frisby, B. Hires, J. Hoehne, D. Pfost

* Graduate Faculty Member - membership is required to teach graduate-level courses, chair master's thesis committees, and serve on doctoral examination and dissertation committees.
** Doctoral Faculty Member - membership is required to chair doctoral examination or dissertation committees. Graduate faculty membership is a prerequisite for Doctoral faculty membership.

Undergraduate

• BS in Agricultural Systems Management (http://catalog.missouri.edu/undergraduategraduate/collegeofagriculturefoodandnaturalresources/agriculturalsystemsmanagement/bs-agricultural-systems-management)
• Minor in Agricultural Systems Management (http://catalog.missouri.edu/undergraduategraduate/collegeofagriculturefoodandnaturalresources/agriculturalsystemsmanagement/minor-agricultural-systems-management)

Graduate

While MU does not offer graduate degrees in ASM, the University does offer post-baccalaureate opportunities in a number of related areas, both within the College of Agriculture, Food and Natural Resources, and in the other Schools and Colleges that make up the University. The catalog provides a complete list of these degree options (http://catalog.missouri.edu/degreesanddegreeprograms).

AG_S_M 1020: Introduction to Agricultural Systems Management
Introductory course that acquaints students with the general technical areas of Agricultural Systems Management. A systematic problem-solving approach is applied to problems derived from each of the technical areas within Agricultural Systems Management.

Credit Hours: 3

AG_S_M 1040: Physical Principles for Agricultural Applications
Introductory survey course to help students: formulate problems; understand units/accuracy; learn basic definitions; understand simple machines, power transmission, fluid statics, electricity, heat-flow, and temperature/moisture relationships.

Credit Hours: 3
Prerequisites: MATH 1100

AG_S_M 2007: Topics in Agricultural Systems Management-Physical
Current and new technical developments in agricultural systems management.

Credit Hours: 3
Prerequisites: Instructor's consent
Recommended: 6 hours in AG_S_M or instructor's consent

AG_S_M 2199: Seminar in Professional Development
This course is taught once a year in the Spring semester. The course explores the concept of what it means to be a professional in the field of Agricultural Systems Management. The course includes aspects of what it means to be a professional, such as resume writing, interviewing, finding a job, and building one's career. A second major aspect of the course is to explore the field of Agricultural Systems Management to gain a better understanding of various potential career paths available to students in Agricultural Systems Management. Graded on A-F basis only.

Credit Hour: 1-3
Prerequisites: ASM Freshman or Sophomores or instructor consent
Recommended: AG_S_M 1020

AG_S_M 2220: Agricultural/Industrial Structures
A building science course looking at construction materials, structural component selection, ventilation, moisture control and energy use. Math reasoning proficiency course.

Credit Hours: 3
Prerequisites or Corequisites: AG_S_M 1040
Prerequisites: MATH 1100

AG_S_M 2320: Internal Combustion Power
Basic internal combustion engine principles, mechanisms, combustion cycles, fuels, fuel injection, electrical systems, engine testing.

Credit Hours: 3
Prerequisites: MATH 1100
Recommended: AG_S_M 1040

AG_S_M 2340: Pesticide Application Equipment
Principles of pesticide application; sprayer hydraulics and spray atomization; calibration, mixing calculations and compatibility of tank mixes; personal and environmental protection; pesticide labels and regulations. Students earn their private applicators license.

Credit Hours: 3
Prerequisites: MATH 1100
### AG_S_M 2345: Chemical Application Systems
Systems, components and operation practices used in the chemical application industry. Liquid and granular application systems and respective components will be studied along with procedures for minimizing drift, system calibration, recommended maintenance, and off-season storage procedures.

**Credit Hours:** 2-3  
**Prerequisites:** MATH 1100 or equivalent

### AG_S_M 2360: Fluid Power
Basic power hydraulic theory. Hydraulic systems, components and circuits. Math reasoning proficiency course.

**Credit Hours:** 3  
**Prerequisites:** MATH 1100  
**Recommended:** AG_S_M 1040

### AG_S_M 3350: Problems in Agricultural Systems Management
Supervised independent study at the undergraduate level.

**Credit Hours:** 1-5  
**Prerequisites:** instructor's consent

### AG_S_M 4020: Agricultural Safety and Health
Analysis, organization and implementation of agriculture safety and health programs. Physical and economic impact of accidents, standards and liabilities. Role of man in the man-machine system.

**Credit Hours:** 3  
**Prerequisites:** Junior or senior standing or instructor’s consent

### AG_S_M 4025: Principles of Injury Prevention
Basic foundations of injury causation and prevention in home, motor vehicle, public and work environments. Graded on A-F basis only.

**Credit Hours:** 3  
**Prerequisites:** Junior or Senior standing or Instructor’s consent required  
**Recommended:** ENGLISH 1000, MATH 1100

### AG_S_M 4030: Legal Aspects of Occupational Safety and Health
A review of the common legal issues facing safety practitioners in the workplace. Includes OSHA, EPA and DOT regulations; workers’ compensation, as well as common liability issues. Graded on A-F basis only.

**Credit Hours:** 2  
**Prerequisites:** junior or senior standing or instructor's consent  
**Recommended:** ENGLISH 1000, MATH 1100

### AG_S_M 4035: Occupational Safety Management
Introduction to occupational safety and health administration and management. Focus on development and management of safety programs and obtaining employee involvement in occupational safety programs. Graded on A-F basis only.

**Credit Hours:** 2  
**Prerequisites:** Junior or Senior standing or Instructor’s consent

### AG_S_M 4040: Fire Protection and Prevention
An overview of the current problems and technology in the fields of fire protection and fire prevention, with emphasis on industrial needs, focusing on the individual with industrial safety responsibilities. Graded on A-F basis only.

**Credit Hours:** 3  
**Prerequisites:** junior or senior standing or instructor’s consent  
**Recommended:** ENGLISH 1000, MATH 1100

### AG_S_M 4045: Occupational Safety
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. Graded on A-F basis only.

**Credit Hours:** 3  
**Prerequisites:** Junior or Senior standing or Instructor’s consent  
**Recommended:** ENGLISH 1000, MATH 1100

### AG_S_M 4050: Electricity: Wiring and Equipment
Home and agricultural electricity; emphasis on proper selection and use of electrical wiring materials and equipment. Basic electrical theory.

**Credit Hours:** 3  
**Prerequisites:** MATH 1100

### AG_S_M 4140: Electricity: Wiring and Equipment
Home and agricultural electricity; emphasis on proper selection and use of electrical wiring materials and equipment. Basic electrical theory.

**Credit Hours:** 3  
**Prerequisites:** MATH 1100

### AG_S_M 4150: Biorenewable Systems Technology
Converting biorenewable resources into bioenergy and biobased products. Biorenewable concepts as they relate to drivers of change, feedstock production, processes, products, co-products, economics, transportation and logistics, and marketing.

**Credit Hours:** 3  
**Prerequisites:** MATH 1100, CHEM 1100 and AG_EC 1041

### AG_S_M 4160: Internet of Things for Precision Agriculture Technology
Introduction to basic concepts and applications of Internet of Things (IoT) technology in agriculture, and its impacts on farming and agricultural industry. Show-case of typical IoT systems used in farms, on farm equipment and in cloud. Hands on experience on essential IoT components, including hardware (wireless sensors, controllers, computers and network devices) and software.

**Credit Hours:** 3  
**Prerequisites:** MATH 1100, AG_S_M 1040  
**Recommended:** AG_S_M 4140, BIOL_EN 4380

### AG_S_M 4220: Material Handling and Conditioning
Principles required for processing and handling food and feed materials; selection of machines; analysis and development of systems for processing and handling grain and bulk material.

**Credit Hours:** 3  
**Prerequisites:** MATH 1100, AG_S_M 1040 and junior standing
AG_S_M 4225: Preservation of Grain Quality
Principles and management for grain quality preservation. Grain drying and grain storage. Psychrometrics. Fan and airflow. Grain handling methods and system planning. Grain quality measurement and end-use value analysis.
Credit Hours: 2
Prerequisites: MATH 1100. Recommended AG_S_M 1040 and AG_S_M 4220

AG_S_M 4320: Agricultural Equipment and Machinery
(cross-leveled with AG_S_M 7320). Operation of agricultural machinery. Selection and management of equipment.
Credit Hours: 3
Prerequisites: MATH 1100, AG_S_M 1040

AG_S_M 4330: Principles for Food Processing
(same as F_S 4330; cross-leveled with AG_S_M 7330, F_S 7330). Introduction to basic engineering concepts used to process raw materials. Principle topics include energy and material balance, fluid flow, heat transfer, refrigeration and freezing, and preservation.
Credit Hours: 3
Prerequisites: MATH 1100, AG_S_M 1040 or PHYSCS 1210

AG_S_M 4350: Problems in Agricultural Systems Management
Supervised independent study at the undergraduate level.
Credit Hour: 1-5
Prerequisites: instructor's consent

AG_S_M 4360: Precision Agriculture Science and Technology
(same as PLNT_S 4360, SOIL 4360; cross-leveled with AG_S_M 7360, PLNT_S 7360, SOIL 7360). Precision agriculture is an information-based approach to farming whereby variability is managed to optimize crop production and reduce environmental pollution. This course provides an overview of precision agriculture technologies (like GIS, GPS, remote sensing), mapping methods, and case studies illustrating decisions and management.
Credit Hours: 3
Prerequisites: PLNT_S 2100 or SOIL 2100, or PLNT_S 2110

AG_S_M 4365: Machinery Management Using Precision Agriculture Technology
(cross-leveled with AG_S_M 7365). Planters, combines, fertilizer application equipment, and sprayer management along with GPS technologies are the focus of the course. One will learn how to manage these tools efficiently and accurately. Valuable precision agriculture management skills emphasized.
Credit Hours: 3
Prerequisites: MATH 1100
Recommended: AG_S_M 1040, and AG_S_M 4360 or PLNT_S 4360 or SOIL 4360

AG_S_M 4366: Data Management and Analysis Using Precision Agriculture Technology
(cross-leveled with AG_S_M 7366). Course begins with a section on how to minimize errors while collecting spatial datasets. Datasets may include yield data, soil chemical and physical properties with real-time sensors, and soil nutrient data from grids or management zones. The course then continues with a section regarding data analytical techniques such as interpolation. The second half of the course will focus on writing prescriptions based on actual data obtained from industry leader experts. This portion of the course will integrate industry experts as well as hardware/software tools. Graded on A-F basis only.
Credit Hours: 3
Prerequisites: MATH 1100; AG_S_M 1040 and AG_S_M 4360 or PLNT_S 4360 or SOIL 4360
Recommended: STAT 1200 or instructor consent

AG_S_M 4368: Profit Strategies Using Precision Agriculture Technology
(cross-leveled with AG_S_M 7368). Course begins with section on how Precision Agriculture Technology can be used to benefit a farm's financial sustainability. Discussion of various types of farm operations and currently available Precision Agriculture Technology that is already developed and in use will be examined. The course continues by considering cost factors that create barriers for farm operators to adopt Precision Agriculture. The second half of the course will focus on developing a plan to implement various technologies into an existing farm operation and draft a business plan for cost, equipment, and transition the farm into using the following types of technologies, GPS, GIS, VRA, RS, RTK and other types of tracking and monitoring systems. Graded on A-F basis only.
Credit Hours: 3
Prerequisites: MATH 1100; AG_S_M 1040; AG_S_M 4360 or PLNT_S 4360 or SOIL 4360 or instructor consent
Recommended: STAT 1200

AG_S_M 4390: Optimization and Management of Food and Agricultural Systems
(same as F_S 4390, HSP_MGMT 4390; cross-leveled with AG_S_M 7390, F_S 7390, HSP_MNGMT 7390). This course is designed to introduce the student to the concept of layers and interacting systems within an operation and the analytical methods of modeling and simulation to make effective management decisions for optimal system design and function. Recommended AG_S_M 1040
Credit Hours: 3
Prerequisites: MATH 1100

AG_S_M 4420: Surface Water Management
(cross-leveled with AG_S_M 7420). Topics include hydrology; soil erosion precautions; elementary surveying; selection and layout of ponds, terraces and water control structures.
Credit Hours: 3
Prerequisites: MATH 1100; AG_S_M 1040

AG_S_M 4460: Irrigation and Drainage
(cross-leveled with AG_S_M 7460). Soil, water, plant relationships. Selection and layout of irrigation and drainage systems. Recommended: AG_S_M 1040
AG_S_M 4940: Agricultural Systems Management Internship
Combines study, observation, and employment with industry or government agency in an area of Agricultural Systems Management. A special problem / learning experience is selected by internship company representative, faculty problem advisor and student. Written and oral reports evaluated by faculty.
Credit Hour: 2-5
Prerequisites: Instructor's consent
Recommended: Sophomore standing and minor or major in Agricultural Systems Management

AG_S_M 4970: Agricultural Systems Management - Capstone
Capstone course required of Agricultural Systems Management majors. Team project involving extensive use of the students education, oral presentations and comprehensive written reports are required. Class experiences include but may not be limited to system selection and comparison, replacement and operating cost calculations, life cycle costing, and business feasibility analysis.
Credit Hours: 3
Prerequisites: Senior Standing

AG_S_M 4970W: Agricultural Systems Management - Capstone - Writing Intensive
Capstone course required of Agricultural Systems Management majors. Team project involving extensive use of the students education, oral presentations and comprehensive written reports are required. Class experiences include but may not be limited to system selection and comparison, replacement and operating cost calculations, life cycle costing, and business feasibility analysis.
Credit Hours: 3
Prerequisites: AG_S_M 1040 and Senior Standing

AG_S_M 7001: Topics in Agricultural Systems Management
Initial offering of a course in a specific subject matter area related to Agricultural Systems Management. The course is offered when proposed by a faculty member in that area of expertise.
Credit Hours: 3

AG_S_M 7020: Agricultural Safety and Health
(cross-leveled with AG_S_M 4020). Analysis, organization and implementation of agriculture safety and health programs. Physical and economic impacts of accidents, standards and liabilities. Role of man in the man-machine system.
Credit Hours: 3

AG_S_M 7085: Problems in Agricultural Systems Management
Supervised individual study at the graduate level.
Credit Hour: 1-99

AG_S_M 7140: Electricity: Wiring and Equipment
(cross-leveled with AG_S_M 4140). Home and agricultural electricity; emphasis on proper selection and use of electrical wiring materials and equipment. Basic electrical theory.
Credit Hours: 3

AG_S_M 7220: Material Handling and Conditioning
(cross-leveled with AG_S_M 4220). Principles required for processing and handling food and feed materials; selection of machines; analysis and development of systems for processing and handling grain and bulk materials.
Credit Hours: 3
Prerequisites: MATH 1100
Corequisites: AG_S_M 1040

AG_S_M 7320: Agricultural Equipment and Machinery
(cross-leveled with AG_S_M 4320). Operation of agricultural machinery. Selection and management of equipment.
Credit Hours: 3
Prerequisites: MATH 1100, AG_S_M 1040

AG_S_M 7360: Precision Agriculture Science and Technology
(same as PLNT_S 7360 and SOIL 7360; cross-leveled with AG_S_M 4360, PLNT_S 7360, SOIL 7360). Precision agriculture is an information-based approach to farming wherebyvariability is managed to optimize crop production and reduce environmental pollution. This course provides an overview of precision agriculture technologies (like GIS, GPS, remote sensing), mapping methods, and case studies illustrating decisions and management.
Credit Hours: 3
Prerequisites: SOIL 2100, PLNT_S 2110 or instructor's consent

AG_S_M 7365: Machinery Management Using Precision Agriculture Technology
(cross-leveled with AG_S_M 4365). This course focuses on agricultural equipment that is commonly used in conjunction with GPS technology. Planters, combines, fertilizer application equipment and sprayer application equipment are commonly equipped with GPS equipment to control and record operational parameters. These parameters focus around the equipments geographic location and can be recorded simultaneously with the volume of product applied and weather information (wind, temperature, humidity, etc.). GPS guidance is one of the main technologies to be studied throughout this course. The management of this equipment and the GPS technologies used to control and record this information is the focus of the course.
Credit Hours: 3
Recommended: AG_S_M 1040, and AG_S_M 4360 or PLNT_S 4360 or SOIL 4360

AG_S_M 7366: Data Management and Analysis Using Precision Agriculture Technology
(cross-leveled with AG_S_M 4366). Course begins with a section on how to minimize errors while collecting spatial datasets. Datasets may include yield data, soil chemical and physical properties with real-time sensors, and soil nutrient data from grids or management zones. The course then continues with a section regarding data analytical techniques.
such as interpolation. The second half of the course will focus on writing prescriptions based on actual data obtained from industry leader experts. This portion of the course will integrate industry experts as well as hardware/software tools. Graded on A-F basis only.

Credit Hours: 3  
Prerequisites: MATH 1100; AG_S_M 1040 and AG_S_M 7360 or equivalent  
Recommended: STAT 1200 or instructor consent

AG_S_M 7368: Profit Strategies Using Precision Agriculture Technology  
(cross-leveled with AG_S_M 4368). Course begins with section on how Precision Agriculture Technology can be used to benefit a farm’s financial sustainability. Discussion of various types of farm operations and currently available Precision Agriculture Technology that is already developed and in use will be examined. The course continues by considering cost factors that create barriers for farm operators to adopt Precision Agriculture. The second half of the course will focus on developing a plan to implement various technologies into an existing farm operation and draft a business plan for cost, equipment, and transition the farm into using the following types of technologies, GPS, GIS, VRA, RS, RTK and other types of tracking and monitoring systems. Graded on A-F basis only.

Credit Hours: 3  
Prerequisites: MATH 1100; AG_S_M 1040; AG_S_M 4360 or PLNT_S 4360 or SOIL 4360 or instructor consent  
Recommended: STAT 1200

AG_S_M 7370: In-Service Course Agriculture Systems Management- Farm Power and Machinery  
A. Farm Power and Machinery  B. Farm Buildings and Conveniences  C. Soil and Water Management  D. Rural Electrification and Processing  E. Agricultural Construction and Maintenance  
Basic principles relating to agricultural systems management. Applies principles and subject matter in successful classroom presentation at the high school level.

Credit Hour: 1-8  
Prerequisites: 10 credits from Agricultural Systems Management courses; a B.S. degree in Agriculture or instructor's consent

AG_S_M 7390: Optimization and Management of Food and Agriculture Systems  
(same as F_S 7390, HSP_MGMT 7390; cross-leveled with AG_S_M 4390, F_S 4390, HSP_MGMT 4390). This course is designed to introduce the student to the concept of layers and interacting systems within an operation and the analytical methods of modeling and simulation to make effective management decisions for optimal system design and function.

Credit Hours: 3  
Prerequisites: instructor's consent

AG_S_M 7420: Surface Water Management  
(cross-leveled with AG_S_M 4420). Topics include hydrology; soil erosion precautions; elementary surveying; selection and layout of ponds, terraces and water control structures.

Credit Hours: 3  
Prerequisites: MATH 1100; AG_S_M 1040

AG_S_M 7440: Water Quality and Pollution Control  
(cross-leveled with AG_S_M 4440). Applies scientific principles to a variety of water quality problems arising from activities associated with nonpoint pollution, agricultural chemicals, land disposal of wastes, on-site sewage disposal and individual drinking water systems.

Credit Hours: 3  
Prerequisites: MATH 1100

AG_S_M 7460: Irrigation and Drainage  
(cross-leveled with AG_S_M 4460). Soil, water, plant relationships. Selection and layout of irrigation and drainage systems.

Credit Hours: 3  
Prerequisites: AG_S_M 4420 or instructor's consent

AG_S_M 8085: Problems in Agricultural Systems Management  
Supervised individual study at the graduate level.

Credit Hours: 3

AG_S_M 8090: Thesis Research in Agricultural Systems Management  
Independent investigation to be presented as a thesis. Graded on a S/U basis only.

Credit Hour: 1-99

AG_S_M 8340: Agricultural Mechanization Systems  

Credit Hours: 3

AG_S_M 8360: Internet of Things for Precision Agriculture Technology  
Wireless sensor network and communication technologies of precision agriculture systems (tractors, sprayers, combines, trucks, and field equipment) establishing real time cloud synchronization of data. Evaluation of big data (spatial, economics, environmental, imagery) and how statistical tools can be used to analyze this information.

Credit Hours: 3  
Prerequisites: AG_S_M 4360, AG_S_M 7360