

Agricultural Systems Technology

Agricultural Systems Technology
Division of Plant Science & Technology
205 Agricultural Engineering Building
(573) 882-7510

Agricultural Systems Technology integrates physical systems with agricultural science and technology skills to provide graduates with abilities to function in sales, service and maintenance management positions in agribusiness industries. The uniqueness of agricultural systems technology 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 Technology. A minor is available, as well as a certificate in Precision Agriculture Technology (<http://catalog.missouri.edu/collegeofagriculturefoodandnaturalresources/additionalcertificatesminors/cert-precision-agriculture-technology/>).

Faculty

Professor D. Brune*
Assistant Professor J. Zhou
Assistant Teaching Professor K. Shannon
Associate Extension Professor T. Lim*
Assistant Extension Professor J. Zulovich*
Extension Specialist D. Downing
Professor Emeritus S. Borgelt, A. Thompson

- * 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 Technology (<http://catalog.missouri.edu/collegeofagriculturefoodandnaturalresources/agriculturalsystemstechnology/bs-agricultural-systems-technology/>)
- Minor in Agricultural Systems Technology (<http://catalog.missouri.edu/collegeofagriculturefoodandnaturalresources/agriculturalsystemstechnology/minor-agricultural-systems-technology/>)

The Department of Agricultural Systems Technology also offers a Certificate in Precision Agriculture Technology (<http://catalog.missouri.edu/collegeofagriculturefoodandnaturalresources/additionalcertificatesminors/cert-precision-agriculture-technology/>).

Graduate

While MU does not offer graduate degrees in AST, 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/>).

The Department of Agricultural Systems Technology does offer a Graduate Certificate in Precision Agriculture Technology (<http://catalog.missouri.edu/collegeofagriculturefoodandnaturalresources/additionalcertificatesminors/grad-cert-precision-agriculture-technology/>).

AG_S_TCH 1020: Introduction to Agricultural Systems Technology

Introductory course that acquaints students with the general technical areas of Agricultural Systems Technology. A systematic problem-solving approach is applied to problems derived from each of six technical areas within Agricultural Systems Technology. The six areas in addition to agricultural safety include applied physical principles, surface water management, ohms law, electrical circuits, machinery systems and technology, grain and feed material handling and, drone technology systems and introduction to precision agriculture.

Credit Hours: 3

AG_S_TCH 1040: Physical Principles for Agricultural Applications

A basic course in quantitative reasoning and problem solving for agricultural systems technology. Mathematics and Physics applications for agricultural systems. Topic areas include technical mathematics, motion, energy, simple machines, and power transmission.

Credit Hours: 3

Recommended: MATH 1100 or higher

AG_S_TCH 2199: Seminar in Professional Development

ASM faculty meet with and discuss what it means to be a professional in the field of Agricultural Systems Technology. In general, the course includes aspects of what it means to be a professional, to develop a resume, tips for interviewing, finding a job, and building one's career. A second major aspect of the course is to explore the field of Agricultural Systems Technology to gain a better understanding of various potential career paths available to students in Agricultural Systems Technology. Graded on A-F basis only.

Credit Hour: 1-3

Prerequisites: AST Freshman, Sophomores, Transfer students or instructor consent

Recommended: AG_S_TCH 1020

AG_S_TCH 2220: Agricultural/Industrial Facility Systems

Fundamental principles and practices are presented to evaluate and organize floor plans for new and existing facilities. Overview of concrete, wood and steel as basic construction materials is provided to understand selection of which materials best fit various facility system applications. A fundamental understanding of basic building loads is covered to select which structural systems best fit various facility systems. Various building indoor environmental conditions are presented to understand that temperature, humidity and indoor air quality change depending upon facility function. Target indoor conditions along with outside design conditions drive the selection of building envelope insulation levels. Building heating energy use is estimated to select appropriate building envelope insulation levels. Basic ventilation rates are calculated to control indoor building moisture and provide adequate indoor air quality. An emphasis on computer-based facility operation and management is addressed to understand the relationships between building operation (indoor temperature and ventilation delivered), building envelope insulation level and outdoor weather conditions from both a design and

annual perspective on total energy use. An overview of indoor lighting systems and lighting energy use is presented using a life cycle analyses perspective.

Credit Hours: 3

Recommended: MATH 1100 or higher. AG_S_TCH 1040

AG_S_TCH 2340: Pesticide Application Equipment

A course that teaches the safe use of pesticides for animals and plant protection, the selection of PPE, personal and environmental protection; pesticide labels and regulations for plants and animals. The course introduces pest identification such as insects and weeds. The principles of pesticide application; understanding the pesticide label; sprayer hydraulics and spray atomization; calibration, mixing calculations and compatibility of tank mixes. Hand operated equipment, small sprayer systems, and large field sprayers are compared. Precision pesticide application including the operation of drones and variable rate technology to reduce the volume of spray needed will be discussed. Students earn their private applicators license.

Credit Hours: 3

Recommended: AG_S_TCH 1040. MATH 1100 or higher

AG_S_TCH 2360: Fluid Power

Basic power hydraulic theory and application. Hydraulic systems, components and circuits are demonstrated using hydraulic trainers. Items demonstrated include hydraulic motors, cylinders, couplers, hoses and connectors.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 3007: Topics in Agricultural Systems Technology-Physical

Current and new technical developments in agricultural systems technology.

Credit Hours: 3

Prerequisites: Instructor's consent

Recommended: 6 hours in AG_S_TCH or instructor's consent

AG_S_TCH 3225: Sensors and Control for Agricultural Systems

This course deals with the basic principles and technologies to take measurements and controls of agricultural systems, including farm machinery, soil, plants, livestock and other parameters that are important to production agriculture. Examples include sensors and control devices of yield monitors, planters, sprayers, soil P, N, K and moisture. Sensors, tools, and systems used in agricultural systems will be introduced to allow students to become familiar and confident in using and troubleshooting sensors and control systems. Students will also learn knowledge and skills for data interpretation and use of the data to improve production.

Credit Hours: 3

Recommended: MATH 1100 or equivalent, AG_S_TCH 1040

AG_S_TCH 4140: Electricity: Wiring and Equipment

(cross-leveled with AG_S_TCH 7140). Fundamental electrical AC and DC power applications, code requirements, and safety considerations. Topics such as single -phase and three-phase circuits design, analysis, and safety; electric motor performance characteristics; magnetic motor

controls; electrical conductor and safety equipment selection; lighting system technology and design; electric power usage; power factor, relays, magnetic control switches, programmable logic controllers, solar power, wind power variable frequency drives, electric over hydraulic systems. and basic electrical theory are discussed. Emphasis on selection and use of electrical wiring materials and equipment for agricultural and industrial applications.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 4160: Internet of Things for Agricultural Technology

Introduction to basic concepts and applications of Internet of Things (IoT) technology in agriculture and its impacts on farming and the agricultural industry. Show-case of typical IoT systems used on farms, farm equipment and how information is stored in the digital cloud. Hands on experience using essential IoT components, including hardware (wireless sensors, controllers, computers and network devices) and software. IoT systems will be used to monitor and control the physical environment for plant, livestock, soil, water, and food systems in controlled environment and field conditions. The course will also cover introduction of block chains, network security and emerging technologies for data processing and analytics.

Credit Hours: 3

Prerequisites: MATH 1100 or equivalent

Recommended: AG_S_TCH 4140, AG_S_TCH 1040, BIOL_EN 4380

AG_S_TCH 4220: Material Handling and Conditioning

(cross-leveled with AG_S_TCH 7220). Course addresses principles required for safely processing drying, storing and handling food grain and feed materials; selection of material handling machines; analysis and development of systems for on-farm and commercial scale processing drying, storing and handling grain and bulk materials.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 4320: Agricultural Equipment and Machinery

(cross-leveled with AG_S_TCH 7320). Selection, sizing, and operational principles of tractors and machinery systems. Cost analysis and computer techniques applied to planning and management of agricultural machine systems, principles, operation, and application of agricultural machinery. This course also develops an understanding of mechanical power trains, introduction to traction, and chassis mechanics. Topics include an introduction to thermodynamics, machine field capacity, power train requirements, power transfer, modern lubricants, traction, ballasting, weight distribution and equipment selection for tillage, planting, grain and forage harvesting, and transporting materials.

Credit Hours: 4

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 4350: Problems in Agricultural Systems Technology

Supervised independent study at the undergraduate level.

Credit Hour: 1-5

Prerequisites: instructor's consent

AG_S_TCH 4360: Precision Agriculture Science and Technology

(same as PLNT_SCI 4360, SOIL 4360; cross-leveled with AG_S_TCH 7360, SOIL 7360, PLNT_SCI 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: SOIL 2100, or PLNT_SCI 2110; MATH 1100; AG_S_TCH 1040

AG_S_TCH 4365: Machinery Management Using Precision Agriculture Technology

(cross-leveled with AG_S_TCH 7365). The focus of this course involves the use of planters, combines, and chemical sprayers to manage the seeding, fertilization, chemical application, and harvesting activities via GPS technologies. One will learn how to manage these tools efficiently and accurately. Valuable precision agriculture management skills are emphasized. The equipment's geographic location and is 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.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040, and AG_S_TCH 4360 or PLNT_SCI 4360 or SOIL 4360

AG_S_TCH 4366: Data Management and Analysis Using Precision Agriculture Technology

(cross-leveled with AG_S_TCH 7366). Course begins with a section on how to minimize errors while collecting spatial datasets in agricultural applications. 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 implements data analytical techniques such as interpolation. The course also focuses 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.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040, AG_S_TCH 4360, STAT 1200

AG_S_TCH 4368: Profit Strategies Using Precision Agriculture Technology

(cross-leveled with AG_S_TCH 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 or higher

Recommended: AG_S_TCH 1040, AG_S_TCH 4360, STAT 1200

AG_S_TCH 4370: In-Service Course Agriculture System Technology

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. F. Precision Agriculture.

Credit Hour: 1-8

Prerequisites: Instructor's consent

Recommended: 10 credits from Agricultural System Technology courses; a B.S. degree in Agriculture

AG_S_TCH 4390: Optimization and Management of Food and Agricultural Systems

(same as F_S 4390; cross-leveled with F_S 7390, AG_S_TCH 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.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 4420: Surface Water Management

(cross-leveled with AG_S_TCH 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 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 4460: Irrigation and Drainage

(cross-leveled with AG_S_TCH 7460). Soil, water, plant relationships. Selection and layout of irrigation and drainage systems.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 4940: Agricultural Systems Technology 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_TCH 4945: Experiential Learning in Industry Internship in Agricultural Systems Technology

Learning experience combining observation, application, and reflection in a discipline-based industry internship. Course appears on transcript for zero credit and does not count toward full-time enrollment. No tuition or fees are charged. Graded on S/U basis only.

Credit Hours: 0

Prerequisites: instructor's consent

AG_S_TCH 7001: Topics in Agricultural Systems Technology

Initial offering of a course in a specific subject matter area related to Agricultural Systems Technology. The course is offered when proposed by a faculty member in that area of expertise.

Credit Hours: 3

AG_S_TCH 7020: Agricultural Safety and Health

(cross-leveled with AG_S_TCH 4020). Protecting agricultural workers and the general public in our age of technological and scientific advancement has become one of the most challenging and rewarding career fields. This online agricultural safety and health class will prepare you to respond to these needs, to analyze agricultural hazardous and rural public health situations, to develop and implement safety programs and apply governmental regulations associated with production agriculture. It covers safety training strategies, safety management systems, workplace safety behaviors, safety standards and compliance, risk assessment and risk management, safety performance measurement, safety leadership, and safety and health program design amongst agricultural populations. Additionally, students will develop an understanding of how to develop a safety risk management plan for a farm or other agricultural related business.

Credit Hours: 3

AG_S_TCH 7085: Problems in Agricultural Systems Technology

Supervised individual study at the graduate level.

Credit Hour: 2-99

AG_S_TCH 7140: Electricity: Wiring and Equipment

(cross-leveled with AG_S_TCH 4140). Fundamental electrical AC and DC power applications, code requirements, and safety considerations. Topics such as single -phase and three-phase circuits design, analysis, and safety; electric motor performance characteristics; magnetic motor controls; electrical conductor and safety equipment selection; lighting system technology and design; electric power usage; power factor, relays, magnetic control switches, programmable logic controllers, solar power, wind power variable frequency drives, electric over hydraulic systems. and basic electrical theory are discussed. Emphasis on selection and use of electrical wiring materials and equipment for agricultural and industrial applications.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 7220: Material Handling and Conditioning

(cross-leveled with AG_S_TCH 4220). .Course addresses principles required for safely processing drying, storing and handling food grain and feed materials; selection of material handling machines; analysis and

development of systems for on-farm and commercial scale processing drying, storing and handling grain and bulk materials.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 7320: Agricultural Equipment and Machinery

(cross-leveled with AG_S_TCH 4320). Selection, sizing, and operational principles of tractors and machinery systems. Cost analysis and computer techniques applied to planning and management of agricultural machine systems, principles, operation, and application of agricultural machinery. This course also develops an understanding of mechanical power trains, introduction to traction, and chassis mechanics. Topics include an introduction to thermodynamics, machine field capacity, power train requirements, power transfer, modern lubricants, traction, ballasting, weight distribution and equipment selection for tillage, planting, grain and forage harvesting, and transporting materials.

Credit Hours: 4

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 7330: Principles for Food Processing

(same as F_S 7330; cross-leveled with F_S 4330). 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 or Corequisites: Instructor's consent

Prerequisites: MATH 1100 and AG_S_TCH 1040 or PHYSICS 1210

AG_S_TCH 7360: Precision Agriculture Science and Technology

(same as PLNT_SCI 7360 and SOIL 7360; cross-leveled with AG_S_TCH 4360, PLNT_SCI 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

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Credit Hours: 3

Prerequisites: MATH 1100 or higher

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(cross-leveled with AG_S_TCH 4366). Course begins with a section on how to minimize errors while collecting spatial datasets in agricultural applications. 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 implements data analytical techniques such as interpolation. The course also focuses 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.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040, AG_S_TCH 4360, STAT 1200

AG_S_TCH 7368: Profit Strategies Using Precision Agriculture Technology

(cross-leveled with AG_S_TCH 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 or higher

Recommended: AG_S_TCH 1040, AG_S_TCH 4360, STAT 1200

AG_S_TCH 7370: In-Service Course Agriculture Systems Technology

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Credit Hour: 1-8

Prerequisites: 10 credits from Agricultural Systems Technology courses; a B.S. degree in Agriculture or instructor's consent

AG_S_TCH 7390: Optimization and Management of Food and Agriculture Systems

(same as F_S 7390; cross-leveled with AG_S_TCH 4390, F_S 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: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 7420: Surface Water Management

(cross-leveled with AG_S_TCH 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 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 7440: Water Quality and Pollution Control

(cross-leveled with AG_S_TCH 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_TCH 7460: Irrigation and Drainage

(cross-leveled with AG_S_TCH 4460). Soil, water, plant relationships. Selection and layout of irrigation and drainage systems.

Credit Hours: 3

Prerequisites: MATH 1100 or higher

Recommended: AG_S_TCH 1040

AG_S_TCH 8085: Problems in Agricultural Systems Technology

Supervised individual study at the graduate level.

Credit Hours: 3

AG_S_TCH 8090: Thesis Research in Agricultural Systems Technology

Independent investigation to be presented as a thesis. Graded on a S/U basis only.

Credit Hour: 1-99

AG_S_TCH 8340: Agricultural Technology Systems

Review of current literature. Case study of mechanization systems. Computer analysis of management alternatives.

Credit Hours: 3

AG_S_TCH 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_TCH 4360, AG_S_TCH 7360

AG_S_TCH 9090: Thesis Research in Agricultural Systems Technology

Independent investigation to be presented as a thesis. Graded on a S/U basis only.

Credit Hour: 1-99
