AGRICULTURAL AND BIOLOGICAL ENGINEERING (CALS)

Program Information

The degrees of Master of Science, Master of Engineering, and Doctor of Philosophy are offered with graduate programs in agricultural and biological engineering through the College of Engineering. Students must have an undergraduate or graduate degree in Engineering or meet specific articulation requirements in order to pursue an advanced degree in engineering.

For students without an engineering degree, The Master of Science and Doctor of Philosophy degrees in agricultural and biological engineering are offered in the areas of agricultural operations management and applied science through the College of Agricultural and Life Sciences. Students must have a degree in a related field or meet specific articulation requirements.

A combination B.S./M.S. or B.S./M.E. for Engineering students program allows up to 12 graduate credits to be double-counted toward fulfillment of both degrees. Contact the graduate coordinator for qualifications and details. A 30-credit, nonthesis master's degree program is also available to students interested in completing the requirements in 1 year.

The Master of Science, Master of Engineering, and Doctor of Philosophy (Engineering) degrees are offered in the following areas of research:

Agricultural production engineering includes development and application of precision agriculture concepts and tools, weather and climate risk in agriculture, decision support systems, food security, pesticide application, post-harvest operations robotics and other machine systems and environmental control systems. Applications to space biology are included in cooperation with NASA at Kennedy Space Center.

Biological engineering includes includes biocomplexity analysis, ecological modeling, risk and decision analysis, bioprocess design, plant biotechnology, process microbiology, food process engineering, environmental biotechnology, bioreactors, and packaging science.

Information systems includes development and application of GIS and remote sensing, communications, mathematical modeling, data solutions, and expert systems techniques to biological and agricultural systems.

Land and water resources includes soil-water-plant relations, irrigation, water quality, watershed hydrology, BMP and TMDL studies, hydrologic modeling, ecological restoration, environmental fate and transport of nanoparticles, waste management, and water reuse.

Students also may choose to participate in interdisciplinary concentrations in hydrologic sciences, geographic information sciences, particle science and technology, and interdisciplinary ecology.

The Master of Science and Doctor of Philosophy (CALS) in the **agricultural operations management** area of specialization provide for scientific training and research in technical agricultural management. Typical plans of study focus on advanced training in environmental systems management, production systems management, construction and process management and technical sales management.

In addition, for students with basic science degrees, the Master of Science and Doctor of Philosophy programs with a specialization in **applied sciences** through the College of Agricultural and Life Sciences provides advanced training in problem-solving capabilities, interdisciplinary research, and methods for applying science to real-world problems and issues. Typical emphasis is on:

1. the use of engineering methods and approaches, such as mathematical modeling, optimization, and information technologies, in application of science to problems of various spatial and temporal scales; and
2. an interdisciplinary experience in research at the doctoral level.

The requirements for a master's degree normally take 2 years to complete. The length of time required for the Doctor of Philosophy degree depends partly on the research topic, but normally takes 3 to 4 years.

Additional information can also be found on the graduate studies pages on the department website at www.abe.ufl.edu (http://www.abe.ufl.edu).

Degrees Offered

Degrees Offered with a Major in Agricultural and Biological Engineering

- Doctor of Philosophy
  - without a concentration
  - concentration in Geographic Information Systems
  - concentration in Global Systems Agroecology
  - concentration in Hydrologic Sciences
  - concentration in Wetland Sciences
- Master of Science
  - without a concentration
  - concentration in Agroecology
  - concentration in Geographic Information Systems
  - concentration in Hydrologic Sciences
  - concentration in Wetland Sciences

Requirements for these degrees are given in the Graduate Degrees (http://gradcatalog.ufl.edu/graduate/degrees/) section of this catalog.

Courses

Agricultural and Biological Engineering Departmental Courses

Code	Title	Credits
ABE 5009	Control Methods in SmartAg Systems	3
ABE 5038	Recent Developments and Applications in Biosensors	3
ABE 5152	Fluid Power Circuits and Control	3
ABE 5310	Advanced Controlled Environment Agriculture Systems Design	3
ABE 5442	Advanced Agricultural Process Engineering	3
ABE 5643C	Biological Systems Modeling	3
ABE 5646	Biological and Agricultural Systems Simulation	3
ABE 5648	Modeling Coupled Natural-Human Systems	3
ABE 5653	Rheology and Mechanics of Agricultural and Biological Materials	3
ABE 5663	Advanced Applied Microbial Biotechnology	3
ABE 5707C	Agricultural Waste Management	3

ABE 5805	Advanced Life Cycle Assessment in Water-Energy-Food Systems	3
ABE 5815C	Food and Bioprocess Engineering Design	4
ABE 5936	Writing Grant Proposals for Scholarships and Fellowships	2
ABE 6005	Applied Control for Automation and Robots	3
ABE 6017	Stochastic Modeling in Ecology and Hydrology	3
ABE 6031	Instrumentation in Agricultural Engineering Research	3
ABE 6035	Advanced Remote Sensing: Science and Sensors	3
ABE 6037C	Remote Sensing in Hydrology	3
ABE 6252	Advanced Soil and Water Management Engineering	3
ABE 6254	Simulation of Agricultural Watershed Systems	3
ABE 6265	Vadose Zone Modeling	3
ABE 6266	Nanotechnology in Water Research	3
ABE 6615	Advanced Heat and Mass Transfer in Biological Systems	3
ABE 6644	Agricultural Decision Systems	3
ABE 6645C	Computer Simulation of Crop Growth and Management Responses	3
ABE 6649C	Advanced Biological Systems Modeling	3
ABE 6654C	Advanced Bio-Based Products from Renewable Resources	3
ABE 6840	Data Diagnostics	3
ABE 6905	Individual Work in Agricultural and Biological Engineering	1-4
ABE 6910	Supervised Research	1-5
ABE 6931	Seminar	1
ABE 6933	Special Topics in Agricultural and Biological Engineering	1-4
ABE 6940	Supervised Teaching	1-5
ABE 6971	Research for Master's Thesis	1-15
ABE 6972	Research for Engineer's Thesis	1-15
ABE 6974	Nonthesis Project	1-6
ABE 6986	Applied Mathematics in Engineering and Agriculture	3
ABE 7979	Advanced Research	1-12
ABE 7980	Research for Doctoral Dissertation	1-15
AGG 5607	Communicating in Academia	3
AOM 5456	Applied Methods in SmartAg Systems	3
EGN 5949	Practicum/Internship/Cooperative Work Experience	1-6
EGN 6913	Engineering Graduate Research	0-3
STA 6348	Bayesian Analysis for Machine Learning and Uncertainty Quantification	3
STA 6703	Statistical Machine Learning	3
STA 6709	Spatial Statistics & Hierarchical Modeling for Dependent Data	3

College of Agricultural and Life Sciences Courses

Code	Title	Credits
ALS 5156	Agricultural Ecology Principles and Applications	3
ALS 5905	Individual Study	1-4
ALS 5932	Special Topics	1-4
ALS 6046	Grant Writing	2
ALS 6166	Exotic Species and Biosecurity Issues	3
ALS 6921	Colloquium on Plant Pests of Regulatory Significance	1
ALS 6925	Integrated Plant Medicine	4
ALS 6931	Plant Medicine Program Seminar	1
ALS 6935	Topics in Biological Invasions	3
ALS 6942	Principles of Plant Pest Risk Assessment and Management	3
ALS 6943	Internship in Plant Pest Risk Assessment and Management	1-10
ANS 6936	Graduate Seminar in Animal Molecular and Cell Biology	1-2
BCH 5045	Graduate Survey of Biochemistry	4
FNR 6933	Seminar	1
STA 6093	Introduction to Applied Statistics for Agricultural and Life Sciences	3
STA 6329	Matrix Algebra and Statistical Computing	3

Student Learning Outcomes

Agricultural & Biological Engineering (PHD)

SLO 1   Knowledge
Employ mathematics, science and engineering principles to solve problems in the discipline of Agricultural and Biological Engineering

SLO 2   Skills
Apply, analyze, and synthesize content knowledge to plan and conduct scholarly activities that make original contributions to the knowledge base in the field of study by identifying components or processes of agricultural and/or biological systems to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints.

SLO 3   Professional Behavior
Display ethical behavior, cultural sensitivity, teamwork, professional conduct and effective communication.

Agricultural & biological engineering (MS)

SLO 1   Knowledge
Identifies, describes, explains, and applies the mathematics, science and engineering principles of the discipline of Agricultural and Biological Engineering.

SLO 2   Skills
Apply, analyze, and synthesize content knowledge to solve problems by identifying components or processes of agricultural and/or biological systems to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints.

SLO 3   Professional Behavior
Display ethical behavior, cultural sensitivity, teamwork, professional conduct and effective communication