AGRICULTURAL AND BIOLOGICAL ENG (ABE)

ABE Class Schedule (https://courses.illinois.edu/schedule/DEFAULT/DEFAULT/ABE)

Courses

ABE 100  Intro Agric & Biological Engng  credit: 1 Hour. (https://courses.illinois.edu/schedule/terms/ABE/100)
Introduction to the engineering profession with career opportunities in the agricultural and biological engineering discipline. Concepts necessary for becoming a successful engineer including time management, design concepts, ethics, and teambuilding. Familiarization with laboratories, computer facilities, internships, and other opportunities. Team design experience. Emphasis on technical communication and problem-solving skills as well as career planning.

ABE 141  ABE Principles: Biological  credit: 2 Hours. (https://courses.illinois.edu/schedule/terms/ABE/141)
Principles of biology relevant to agriculture, food, energy, and the environment, including microbiology, biochemistry, genetics, plant and animal systems, and ecosystems. Case studies of engineering applications where these biological principles have been taken into account or leveraged for the purpose of design.

ABE 199  Undergraduate Open Seminar  credit: 1 to 5 Hours. (https://courses.illinois.edu/schedule/terms/ABE/199)
May be repeated to a maximum of 12 hours.

ABE 223  ABE Principles: Machine Syst  credit: 2 Hours. (https://courses.illinois.edu/schedule/terms/ABE/223)
Machinery systems for off-road applications: internal combustion engines; fluid power; tractors, and traction; chemical application; grain harvesting. Prerequisite: One of MATH 220, MATH 221, MATH 234.

ABE 224  ABE Principles: Soil & Water  credit: 2 Hours. (https://courses.illinois.edu/schedule/terms/ABE/224)
Engineering principles and methods of design and management of natural resources and environmental systems; watershed and hydrologic cycle; infiltration and surveying; runoff and erosion; water quality; non-point source pollution. Prerequisite: One of MATH 220, MATH 221, MATH 234.

ABE 225  ABE Principles: Bioenvironment  credit: 2 Hours. (https://courses.illinois.edu/schedule/terms/ABE/225)
Principles of environmental control for biological structures: psychrometrics; mass and heat transfer through buildings; ventilation requirements. Prerequisite: One of MATH 220, MATH 221, MATH 234.

ABE 226  ABE Principles: Bioprocessing  credit: 2 Hours. (https://courses.illinois.edu/schedule/terms/ABE/226)
Principles of bioprocess engineering applied to food and agricultural products: material balances; fluid flow; heat and mass transfers; drying; evaporation; fermentation; distillation; process simulation. Prerequisite: One of MATH 220, MATH 221, MATH 234.

ABE 341  Transport Processes in ABE  credit: 3 Hours. (https://courses.illinois.edu/schedule/terms/ABE/341)
Principles of transport processes involving momentum, heat, and mass as applied to biological systems in agriculture, food, energy, and the environment. Credit is not given for both ABE 341 and CHBE 421. Prerequisite: ABE 223, ABE 224, ABE 225, ABE 226, and PHYS 213.

ABE 361  Off-Road Machine Design  credit: 3 Hours. (https://courses.illinois.edu/schedule/terms/ABE/361)
Design and development concepts of agricultural and industrial machines; analysis and synthesis of tillage, planting, harvesting, chemical application, material handling mechanisms, and precision farming tools. Prerequisite: ABE 223 and TAM 212.

ABE 397  Independent Study  credit: 1 to 4 Hours. (https://courses.illinois.edu/schedule/terms/ABE/397)
Individual research, special problems, thesis, development or design work under the supervision of a member of the faculty. May be repeated to a maximum of 8 hours. Prerequisite: Consent of instructor.

ABE 398  Special Topics  credit: 1 to 3 Hours. (https://courses.illinois.edu/schedule/terms/ABE/398)
Subject offerings of new and developing areas of knowledge in agricultural and biological engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate term if topics vary to a maximum of 12 hours.

ABE 424  Principles of Mobile Robotics  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/ABE/424)
The objective of this course is to prepare students in design, navigation, control, and autonomy of aerial and ground robots that operate in harsh, uncertain, and changing field environments. The course will cover three primary aspects of field robotics: perception (sensing), motion control, and data analytics, and bring everything together through labs involving ground robots and flying unmanned aircraft (drones). 4 undergraduate hours. 4 graduate hours. Approved for Letter and S/U grading. Prerequisite: MATH 221, MATH 225, and MATH 285, or ABE 415, or ABE 440, IE 300, or STAT 400 or equiv, CS 125 or equiv., or graduate standing.

ABE 425  Engrg Measurement Systems  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/ABE/425)
Principles of instrumentation systems, including sensing, signal conditioning, computerized data acquisition, test design, data analysis and synthesis. Additional fees may apply. See Class Schedule. 4 undergraduate hours. 4 graduate hours. Credit is not given for both ABE 425 and ME 360. Prerequisite: ECE 205.

ABE 430  Project Management  credit: 2 Hours. (https://courses.illinois.edu/schedule/terms/ABE/430)
Engineering team effectiveness; project definition; assessing related technologies; marketing and business planning related to engineering; budgeting and financial analyses of engineering projects; safety, ethics and environmental considerations; intellectual property; engineering proposal presentation. Same as TSM 430. 2 undergraduate hours. 2 graduate hours.

ABE 436  Renewable Energy Systems  credit: 3 or 4 Hours. (https://courses.illinois.edu/schedule/terms/ABE/436)
Renewable energy sources and applications, including solar, geothermal, wind, and biomass. Renewable energy’s role in reducing air pollution and global climate change. Capstone project to design a system for converting renewable energy into thermal or electrical energy. 3 undergraduate hours. 4 graduate hours. Credit is not given for both ABE 436 and TSM 438. Prerequisite: PHYS 211.

ABE 440  Applied Statistical Methods I  credit: 4 Hours. (https://courses.illinois.edu/schedule/terms/ABE/440)
Same as ANSC 440, CPSC 440, FSHN 440, and NRES 440. See CPSC 440.
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**ABE 445 Statistical Methods**  
Credit: 4 Hours.  
Same as ANSC 445 and NRES 445. See ANSC 445.

**ABE 446 Biological Nanoengineering**  
Credit: 3 or 4 Hours.  
Nanodevice design through organization of functional biological components; bio-molecular function and bioconjugation techniques in nanotechnology; modulation of biological systems using nanotechnology; issues related to applying biological nanotechnology in food energy, health, and the environment. 3 undergraduate hours. 4 graduate hours. Prerequisite: MCB 150.

**ABE 454 Environmental Soil Physics**  
Credit: 3 Hours.  
Provides the theoretical basis for understanding and quantifying the physical, hydrological, geotechnical, and thermal properties of soil in relation to environmental processes. Topics include general soil properties as a porous media, particle size, soil structure and aggregation, water retention and potential, flow in saturated soil, flow in an unsaturated soil, soil temperature and heat flow, soil mechanics, infiltration, and soil-plant-water relations. 3 undergraduate hours. 3 graduate hours. Prerequisite: TAM 335 or NRES 201 or consent of instructor.

**ABE 455 Erosion and Sediment Control**  
Credit: 2 Hours.  
Processes, estimation, and control of soil erosion by water, wind and resultant sedimentation. Upland, in-channel, urban, agricultural, disturbed (both military training and mining), and forested environments. Capstone experience in site planning and design. 2 undergraduate hours. 2 graduate hours. Prerequisite: CEE 350 or NRES 401; CEE 380 or NRES 201.

**ABE 456 Land & Water Resources Engineering**  
Credit: 3 or 4 Hours.  
Hydrology, hydraulics, design, construction and cost estimating of structures for the conservation and quality control of soil and water resources; relationship of topography, soils, crops, climate, and cultural practices in conservation and quality control of soil and water for agriculture. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: Credit or concurrent registration in TAM 335.

**ABE 457 NPS Pollution Processes**  
Credit: 2 Hours.  
Principles, concepts, and analysis of processes for nonpoint source pollution involving sediment, inorganic and organic chemicals, and microbial pathogens; hydrologic and pollutant interactions, pollutant fate and transport processes from storm water runoff and percolation; impact of pollutant transport on receiving water and ecosystems. 2 undergraduate hours. 2 graduate hours. Prerequisite: ABE 224 or CEE 350.

**ABE 458 NPS Pollution Modeling**  
Credit: 2 Hours.  
Concepts, principles, and application of modeling for assessment and management of agricultural nonpoint source pollution. Modeling of agroecosystems and land use impacts on hydrologic and water quality response of upland catchments. Model selection, calibration, validation, and application for comparative analysis. Case studies in current watershed management issues, with a focus on agricultural waste and nutrient management, using existing field and watershed nonpoint source pollution models. 2 undergraduate hours. 2 graduate hours. Prerequisite: ABE 457.

**ABE 459 Drainage and Water Management**  
Credit: 3 or 4 Hours.  
Design, construction, performance, and maintenance of agricultural drainage systems to meet both production and water quality objectives. Modeling drainage systems. Principles of conservation drainage. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: Credit or concurrent registration in TAM 335.

**ABE 463 Electrohydraulic Systems**  
Credit: 3 Hours.  
Engineering principles of electrohydraulic control systems related to off-road vehicles. Basics of fluid power systems, concepts of electrohydraulic systems and controls, analysis and design of electrohydraulic control systems, and applications of electrohydraulic control. Additional fees may apply. See Class Schedule. 3 undergraduate hours. 3 graduate hours. Prerequisite: ECE 110 or both ECE 205 and ECE 206; ME 310 or TAM 335.

**ABE 466 Engineering Off-Road Vehicles**  
Credit: 3 Hours.  
Design and application of off-road vehicles for farm and construction use; thermodynamics of engines; measurement of power and efficiencies; power transmission and traction; chassis mechanics; operator environment. 3 undergraduate hours. 3 graduate hours. Credit is not given for both ABE 466 and TSM 464. Prerequisite: ME 300.

**ABE 469 Industry-Linked Design Project**  
Credit: 4 Hours.  
Industry-submitted and sponsored design projects which utilize principles of design, engineering analysis and functional operation of engineering systems. Design teams develop concepts, evaluate alternatives, model and analyze solutions, and build and test a final product. Emphasizes on communication skills, technical writing, and interaction with industry representatives. 4 undergraduate hours. 4 graduate hours. Prerequisite: One of ABE 361, CHBE 421, TAM 335; or credit or concurrent registration in ME 370. This course satisfies the General Education Criteria for: Advanced Composition

**ABE 474 Indoor Environmental Control**  
Credit: 3 or 4 Hours.  
Analysis of indoor environments and relationship with humans, animals and plants. Interactions between facilities operation and both human comfort and animal plant production. Psychrometrics, occupant health and comfort, structural heat transfer, heating and cooling loads, and energy and mass balances as related to indoor environment, air properties, and ventilation. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: TAM 335, and ME 300 or CHBE 321, or consent of instructor.

**ABE 476 Indoor Air Quality Engineering**  
Credit: 4 Hours.  
Principles and applications of indoor air quality. Particle mechanics, gas kinetics, air quality sampling principles and techniques, air cleaning technologies such as filters, cyclones, electrostatic precipitation for indoor environments; ventilation effectiveness for pollutant control. Research or design project. 4 undergraduate hours. 4 graduate hours. Prerequisite: PHYS 213, MATH 285, and TAM 335.

**ABE 482 Package Engineering**  
Credit: 3 Hours.  
Same as FSHN 469. See FSHN 469.
ABE 483  Engrg Properties of Food Matls  credit: 3 Hours. (https://courses.illinois.edu/schedule/terms/ABE/483)
Physical properties of foods and biological materials; properties relating to equipment design and the sensing and control of food processes; thermal, electromagnetic radiation, rheological, and other mechanical properties. 3 undergraduate hours. 3 graduate hours. Prerequisite: TAM 251; either CHBE 421 or both ME 330 and TAM 335.

ABE 488  Bioprocessing Biomass for Fuel  credit: 3 Hours. (https://courses.illinois.edu/schedule/terms/ABE/488)
Engineering and scientific principles governing bioprocessing of biomass for production of ethanol and other fermentation products. Process unit operations; conventional and alternative feed stock materials; recovery of value-added coproducts and other variables involved in producing fuel ethanol; process simulation; economic analysis. 3 undergraduate hours. 3 graduate hours. Prerequisite: CHBE 321 and TAM 335.

ABE 497  Independent Study  credit: 1 to 4 Hours. (https://courses.illinois.edu/schedule/terms/ABE/497)
Individual research, special problems, thesis, development or design work under the supervision of a member of the faculty. 1 to 4 undergraduate hours. No graduate credit. May be repeated to a maximum of 8 hours. Prerequisite: Consent of instructor.

ABE 498  Special Topics  credit: 1 to 4 Hours. (https://courses.illinois.edu/schedule/terms/ABE/498)
Subject offerings of new and developing areas of knowledge in agricultural and biological engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. 1 to 4 undergraduate hours. 1 to 4 graduate hours. May be repeated in the same or separate terms if topics vary to a maximum of 16 hours.

ABE 501  Graduate Research I  credit: 1 Hour. (https://courses.illinois.edu/schedule/terms/ABE/501)
Basic research orientation, research methods, presentation skills, laboratory practices, case studies, and professional and ethical conduct.

ABE 502  Graduate Research II  credit: 1 Hour. (https://courses.illinois.edu/schedule/terms/ABE/502)
Research methodology, teaching methods, lecture preparation and delivery, critical review of scientific articles, peer review and publishing, mentoring and peer relationships, time management, and intellectual property.

ABE 594  Graduate Seminar  credit: 0 Hours. (https://courses.illinois.edu/schedule/terms/ABE/594)
Presentations of thesis research by graduate students; other presentations on teaching or current research issues related to agricultural and biological engineering. Approved for S/U grading only. May be repeated up to a maximum of 6 times.

ABE 597  Independent Study  credit: 1 to 4 Hours. (https://courses.illinois.edu/schedule/terms/ABE/597)
Individual investigations or studies of any phases of agricultural engineering selected by the student and approved by the advisor and the faculty member who will supervise the study. May be repeated to a maximum of 16 hours. Prerequisite: Consent of instructor.

ABE 598  Special Topics  credit: 1 to 4 Hours. (https://courses.illinois.edu/schedule/terms/ABE/598)
Subject offerings of new and developing areas of knowledge in agricultural and biological engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary to a maximum of 8 hours.

ABE 599  Thesis Research  credit: 0 to 16 Hours. (https://courses.illinois.edu/schedule/terms/ABE/599)
Approved for S/U grading only. May be repeated.