

**Descriptions — Biosystems Engineering
of
Courses**

809. Finite Element Method
Fall, Spring, 3 credits. Interdepartmental with Materials Science and Mechanics, Civil Engineering, and Mechanical Engineering. Administered by Materials Science and Mechanics.
Theory and application of the finite element method to the solution of continuum type problems in heat transfer, fluid mechanics, and stress analysis.

812. Bio-Process Engineering
Spring of odd-numbered years. 3(3-0)
R: Open only to graduate students in the College of Engineering.
Thermodynamics, heat and mass transfer, fluid flow, dehydration. Handling and storage of biological products.
SA: AE 812

815. Instrumentation for Biosystems Engineering
Fall. 3(3-0)
R: Open only to graduate students in the College of Engineering.
Theory and techniques of measuring temperature, pressure, flow, humidity, and moisture in biological materials.
SA: AE 815

820. Research Methods in Biosystems Engineering
Fall. 1(1-0)
R: Open only to graduate students in the College of Agriculture and Natural Resources or College of Engineering.
Procedures and methods for designing and executing research projects.
SA: AE 820

831. Biosystems Analysis
Fall. 3(2-2)
P: MTH 132. R: Not open to students with credit in BE 431.
Systems concepts. Properties of biological systems. Effect of environmental, technological, and economic factors on biological systems.

832. Network Design and Optimization of Biological Systems
Spring. 3(2-2)
P: BE 431 or BE 831
Techniques of process network theory and multi-criteria optimization for designing environmentally sound and economically beneficial biosystems.

833. Artificial Neural Network Applications in Biological Systems
Fall. 3(2-2)
P: BE 431 or BE 831
Neural network algorithms and their application to biological systems.

837. Food Rheology
Fall. 3(3-0) Interdepartmental with Food Science.
Definition, analysis, and measurement of rheological properties to describe the steady shear, dynamic, viscoelastic, extensional, and solid behavior of biological materials. Industrial applications of rheological methods with emphasis on fluid and semi-solid foods.
SA: AE 837

850. Dimensional Analysis and Theory of Models
Fall of odd-numbered years. 3(2-2)
R: Open only to graduate students in the College of Agriculture and Natural Resources or College of Engineering.
Dimensional concepts, systems of measurements and transformation of units, and formation of dimensionless groups. Development of prediction equations. Concepts of similarity, and scaling laws. Distortion.
SA: AE 850

882. Irrigation and Water Management Engineering
Spring of even-numbered years. 3(3-0)
P: BE 481, CE 321.
Design and management of systems for supplemental irrigation. Water supply and transport. Economic and engineering optimization of irrigation design.
SA: AE 882

890. Special Problems
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
R: Approval of department; application required.
Individual study in biosystems engineering.
SA: AE 890

891. Advanced Topics in Biosystems Engineering
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
R: Open only to graduate students in the College of Engineering. Approval of department.
Biosystems engineering topics not covered in regular courses.
SA: AE 891

892. Biosystems Engineering Seminar
Spring. 1(1-0)
R: Open only to graduate students in the College of Agriculture and Natural Resources or College of Engineering.
Current topics in biosystems engineering.
SA: AE 892

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 10 credits. A student may earn a maximum of 99 credits in all enrollments for this course.
R: Open only to master's students in the Biosystems Engineering major.
SA: AE 899

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course.
R: Open only to doctoral students in the Biosystems Engineering major.
SA: AE 999

**BOTANY AND PLANT
PATHOLOGY BOT**

**Department of Botany and Plant
Pathology
College of Natural Science**

105. Plant Biology
Fall, Spring. 3(3-0)
Plant structure, function, development, genetics, diversity and ecology.

106. Plant Biology Laboratory
Fall, Spring. 1 credit.
P: BOT 105 or concurrently.
Cell structure, anatomy, physiology, growth and development, and diversity of plants.

111L. Cell and Molecular Biology Laboratory
Fall, Spring, Summer. 2 credits. Interdepartmental with Biological Science, Microbiology, and Zoology. Administered by Biological Science.
P: BS 111 or concurrently
Principles and applications of common techniques used in cell and molecular biology.

202. The Plant Kingdom
Spring. 3(2-3)
P: BS 110 or BOT 105 or LBS 144.
Morphology of the major plant groups with an emphasis on structure, reproduction and evolution. Field trips required.

205. Pests, Society and Environment
Fall, Spring. 3(3-0) Interdepartmental with Entomology. Administered by Entomology.
Nature of pests and their impact on society. Principles of integrated pest management in relation to environmental quality and sustainable development.

218. Plants of Michigan
Fall. 3(2-3)
P: BS 110 or BOT 105 or LBS 144.
Plant taxa of Michigan and the Great Lakes region and the major habitats in which they occur. Principles and rationale of classification. Relationships between life histories, morphology and environment. Field trips required.

301. Introductory Plant Physiology
Fall, Spring. 3(2-3)
P: CEM 141 or CEM 151; CEM 161; BOT 105 or BS 111 or LBS 145. R: Completion of Tier 1 writing requirement.
General principles of plant physiology relating plant structure to function. Cell physiology, water relations, effects of light and temperature, respiration, photosynthesis, mineral nutrition, and hormone action.

319. Introduction to Earth System Science
Fall. 3 credits. Interdepartmental with Entomology, Geological Sciences, Zoology, and Sociology. Administered by Entomology.
P: Completion of one course in biological or physical science.
Systems approach to Earth as an integration of geochemical, geophysical, biological and social components. Global dynamics at a variety of spatio-temporal scales. Sustainability of the Earth system.

335. Plants Through Time
Spring of odd-numbered years. 3(3-0) Interdepartmental with Geological Sciences.
P: BS 110 or BOT 105 or GLG 201 or LBS 144. R: Juniors and above.
Evolutionary history of plants, the development of ecosystems, and the use of plant fossils in the reconstruction of ancient environments and climate.

336. Useful Plants
Fall of odd-numbered years. 3(3-0)
P: CEM 142 or CEM 143 or CEM 152; BOT 105 or BS 110, BS 111 or LBS 144, LBS 145.
Ways in which plants are used for myriad purposes from food and construction materials to medicines and perfumes. The potential for expanding the uses of plants through biotechnology will be explored.

341. Fundamental Genetics
Fall, Spring, Summer. 4 credits. Interdepartmental with Zoology. Administered by Zoology.
P: BS 111 or LBS 145.
Principles of heredity in animals, plants and microorganisms. Formal and molecular methods in the study of gene structure, transmission, expression and evolution.

355. Ecology
Fall. 3(3-0) Summer. 3 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology. Administered by Zoology.
P: BS 110 or LBS 144. R: Completion of Tier I writing requirement.
Plant and animal ecology. Interrelationships of plants and animals with the environment. Principles of population, community, and ecosystem ecology. Application of ecological principles to global sustainability.
SA: ZOL 250

- 355L. Ecology Laboratory**
 Fall. 1(0-3) Summer. 1 credit. Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology. Administered by Zoology.
 P: ZOL 355 or concurrently. R: Completion of Tier I writing requirement.
 Population, community and ecosystem ecology utilizing plant and animal examples to demonstrate general field principles.
- 362. Management of Turfgrass Pests**
 Fall. 4(3-2) Interdepartmental with Crop and Soil Sciences, and Entomology. Administered by Crop and Soil Sciences.
 P: CSS 232.
 Chemical, biological, and cultural methods of managing weeds, diseases, and insect pests of turfgrass. Environmental considerations in pest management.
- 402. Biology of Fungi**
 Fall. 3(2-3)
 P: BS 110, BS 111 or BOT 105 or LBS 140 or MIC 302.
 Major groups of fungi: characteristics, habitats and diversity. Significance of fungi in nature and their economic importance.
- 405. Introductory Plant Pathology**
 Spring. 4(2-4)
 P: BS 110, BS 111 or BOT 105 or LBS 140. R: Completion of Tier I writing requirement. Not open to students with credit in BOT 407.
 Important plant diseases and the organisms that cause them. Principles of disease management including application of chemicals, plant breeding, biological control, and genetic engineering.
- 407. Diseases and Insects of Forest and Shade Trees**
 Spring. 4(3-3) Interdepartmental with Entomology.
 P: BOT 105 or BS 110 or LBS 144; BOT 218 or FOR 204 or HRT 211. R: Completion of Tier I writing requirement. Not open to students with credit in BOT 405.
 Diseases, insects, and environmental problems affecting trees in forests, parks, suburbs, and nurseries. Methods of control.
- 412. Environmental Plant Physiology**
 Fall. 3(3-0)
 P: BOT 105 or BS 111 or LBS 145; CEM 141 or 152; CEM 161.
 General concepts underlying interactions between plants and the environment. Light sensing and utilization. Energy budgets. Water uptake and utilization. Mineral nutrition.
- 413. Virology**
 Spring. 3(3-0) Interdepartmental with Microbiology. Administered by Microbiology.
 P: MIC 409 or BCH 462.
 Viruses and modern molecular biology. Viral replication and gene expression of the major classes of viruses. Virus-cell interactions and viral diseases.
- 414. Plant Physiology: Metabolism**
 Fall. 3(3-0)
 P: CEM 251; BOT 105 or BS 110, BS 111 or LBS 144, LBS 145.
 General principles underlying metabolic processes of plants. Photosynthesis, translocation and water relations, nitrogen metabolism, cell wall biosynthesis, and structures associated with those processes.
- 415. Plant Physiology: Growth, Development and the Environment**
 Spring. 3(3-0)
 P: CEM 251; BOT 105 or BS 110, BS 111 or LBS 140.
 Principles of plant growth and development with emphasis on environmental and hormonal factors that control progression of the plant through its life cycle. Tissue culture and genetic engineering in plants.
- 416. Experiments in Plant Physiology and Molecular Biology**
 Fall. 4(2-5)
 P: BOT 414 or BOT 415. R: Completion of Tier I writing requirement.
 Experiments illustrating principles of plant physiology and molecular biology. Advanced techniques such as agrobacterium mediated gene transfer, DNA cloning, enzyme linked immunoassays (ELISA), protein and DNA electrophoresis.
- 418. Plant Systematics**
 Spring. 3(2-3) Summer. 3 credits. Given only at W.K. Kellogg Biological Station.
 P: BOT 105 or BS 110, BS 111 or LBS 140.
 Classification and evolution of higher plants, with emphasis on identification, characteristics of plant families, and systematic theory and practice.
- 419. Advanced Earth System Science**
 Spring. 3 credits. Interdepartmental with Entomology, Geological Sciences, Zoology, and Sociology. Administered by Entomology.
 P: ENT 319
 Systems science theory applied to analysis of the biological, geological, physical, and social causes and consequences of global changes. Issues of sustaining the Earth system.
- 423. Wetland Plants and Algae**
 Fall, Summer of even-numbered years. 4(2-4)
 P: BS 110, BS 111 or BOT 105, BOT 106 or LBS 144, LBS 145.
 Identification, ecology and community relations of algae and aquatic vascular plants common to the Great Lakes area. Algae and aquatic plants as indicators of environmental change. Field trips required.
- 431. Comparative Limnology**
 Summer. 4 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology and Fisheries and Wildlife. Administered by Zoology.
 P: CEM 141 or CEM 151; ZOL 250. R: Not open to students with credit in FW 472.
 Physical, chemical, and biological aspects of lakes and streams. Introduction to freshwater biology, and population and community ecology.
- 434. Plant Structure and Function**
 Fall of odd-numbered years. 4(2-4)
 P: BS 110, BS 111 or BOT 105, BOT 106 or LBS 144, LBS 145.
 Plant anatomy from a structure and function perspective. The physiological, developmental, and ecological significance of cell types, tissue types, and meristems of vegetative and reproductive plant parts.
- 441. Plant Ecology**
 Fall. 3(3-0)
 P: BS 110 or BOT 105 or LBS 144. R: Completion of Tier I writing requirement.
 Ecology of plants and their communities. Effects of biotic and climatological factors influencing global distribution of plant communities. Community structure and function, microclimatology, ecophysiology, and adaptation.
- 445. Evolution**
 Fall. 3 credits. Interdepartmental with Zoology. Administered by Zoology.
 P: ZOL 341. R: Not open to freshmen. Completion of Tier I Writing Requirement
 Processes of evolutionary change in animals, plants, microbes. Population genetics, microevolution, speciation, adaptive radiation, macroevolution. Origin of Homo sapiens.
 SA: ZOL 345
- 485. Tropical Biology**
 Spring. 3(3-0) Interdepartmental with Zoology and Entomology. Administered by Zoology.
 P: ZOL 250. R: Open only to juniors and seniors.
 Tropical biota emphasizing evolutionary and ecological principles compared across tropical ecosystems.
- 485L. Field Tropical Biology**
 Spring, Summer. 2 credits. Interdepartmental with Zoology and Entomology. Administered by Zoology.
 P: ZOL 485 or concurrently. R: Open only to juniors and seniors. Approval of department.
 Intensive field experience to study tropical ecosystems. Individual project required. Given at various sites in Costa Rica by the Organization for Tropical Studies.
- 490. Directed Studies**
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
 R: Approval of department.
 Directed study of published literature in an area of botany and plant pathology.
- 490H. Honors Directed Studies**
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
 R: Approval of department.
 Directed study of published literature in an area of botany and plant pathology.
- 495. Botanical Garden Internship**
 Fall, Spring, Summer. 2 to 8 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
 R: Open only to juniors or seniors in the Botany and Plant Pathology major. Approval of department.
 Activities, functions and organization of botanical gardens. Principles of live plant curation.
- 498. Undergraduate Research**
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
 R: Completion of Tier I writing requirement. Approval of department.
 Laboratory and/or field research in an area of botany and plant pathology.
- 499. Senior Seminar**
 Spring. 2(2-0) A student may earn a maximum of 4 credits in all enrollments for this course.
 P: BOT 498 R: Completion of Tier I writing requirement.
 A capstone experience that focuses on current developments and issues in plant biology. Scientific writing and oral presentation.
- 800. Seminar in Plant Biology**
 Fall, Spring. 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course.
 R: Open only to graduate students.
 Current research and approaches in plant biology.
- 801. Seminar in Plant Pathology**
 Fall, Spring. 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course.
 R: Open only to graduate students.
 Current research and approaches in plant pathology.
- 802. Selected Topics in Botany**
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
 R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources.
 Recent developments in botany.

**Descriptions — Botany and Plant Pathology
of
Courses**

- 803. Selected Topics in Plant Pathology**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources.
Recent developments in plant pathology.
- 804. Special Problems in Plant Pathology**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources.
Faculty directed individualized study of a selected problem.
- 805. Special Problems in Physiology and Biochemistry**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources.
Faculty directed individualized study of a selected problem.
- 806. Special Problems in Genetics and Molecular Biology**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources.
Faculty directed individualized study of a selected problem.
- 807. Special Problems in Mycology**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate students in College of Natural Science and College of Agriculture and Natural Resources.
Faculty directed individualized study of a selected problem.
- 808. Special Problems in Anatomy and Morphology**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources.
Faculty directed individualized study of a selected problem.
- 809. Special Problems in Ecology, Systematics, and Evolution**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources.
Faculty directed individualized study of a selected problem.
- 810. Current Concepts in Plant Pathology**
Spring. 3(3-0)
P: BOT 405 or BOT 414 or BOT 415.
Recent findings in mycology, plant virology, bacteriology, nematology, disease physiology and epidemiology.
- 812. Epidemiology of Plant Diseases**
Spring of even-numbered years. 3(3-0)
P: BOT 810.
Study of populations of plant pathogens within populations of plant hosts as affected by the environment and human involvement.
- 817. Ecology and Evolution in Aquatic Systems**
Summer. 4 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology and Fisheries and Wildlife. Administered by Zoology.
P: ZOL 250 or ZOL 431.
Experimental field studies of population and community ecology of freshwater lakes and streams. Emphasis on interactions among species and between biotic and abiotic factors.
- 823. Flowering Plant Diversity**
Fall of odd-numbered years. 4(2-4)
P: BOT 418.
Evolutionary diversity of flowering plants. Family characteristics, patterns of distribution, systems of classification, evolutionary trends, economic importance.
- 824. Principles and Methods of Plant Systematics**
Spring of even-numbered years. 4(2-4)
P: BOT 823.
Classification methods, quantification of evolutionary relationships, phenetic, phyletic molecular, and cladistic approaches.
- 826. Tropical Biology: An Ecological Approach**
Spring, Summer. 8 credits. Interdepartmental with Zoology.
R: Approval of department; application required.
Principles of tropical ecology at the population, community, and ecosystem levels. Given at various sites in Costa Rica by the Organization for Tropical Studies.
- 827. Tropical Managed Ecosystems**
Spring, Summer. 8(4-8)
R: Approval of department; application required.
The scientific and social dimensions of sustainable development in the tropics. Given at various sites in Costa Rica by the Organization for Tropical Studies.
- 830. Paleobotany**
Fall of even-numbered years. 3(2-3) Interdepartmental with Geological Sciences.
R: Open only to graduate students. Approval of department.
Survey of fossil plants: preservation, occurrence, geological relations, taphonomy, whole plant reconstruction, evolutionary history, and paleoecology.
- 842. Application of Ecological Principles**
Spring. 2 credits. Given only at W.K. Kellogg Biological Station. A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Zoology.
R: Approval of department.
Workshops and discussions with experts from industry, regulatory agencies, conservation groups, and academe on application of basic ecology and evolutionary biology to real-world problems.
- 844. Organelle Genetics**
Spring of odd-numbered years. 3(3-0) Interdepartmental with Zoology.
P: BCH 462; ZOL 341.
Organization, structure, function, heredity, molecular biology and manipulation of chloroplasts and mitochondria. Biological interaction between nucleus and organelles.
- 845. Ecology and Evolution: the Interface**
Fall. 3 credits. Interdepartmental with Zoology and Entomology. Administered by Zoology.
P: BOT 849
Conceptual and methodological issues common to both ecology and evolutionary biology.
- 847. Advanced Mycology**
Spring of even-numbered years. 4(2-4)
P: BOT 402.
Systematics, identification, physiology, genetics, and molecular biology of plant pathogenic fungi.
- 849. Evolutionary Biology**
Spring of even-numbered years. 3(3-0) Interdepartmental with Zoology.
P: ZOL 341, STT 422 or concurrently.
Major conceptual, theoretical and empirical questions in evolutionary biology. Readings and lectures are synthesized in student discussions and on paper.
- 851. Quantitative Methods in Ecology and Evolution**
Fall. 3(3-0) Interdepartmental with Zoology. Administered by Zoology.
P: STT 465.
Interpretation and analysis of ecological and evolutionary biology data. Statistical computer software.
- 856. Plant Molecular Biology**
Spring. 3(3-0) Interdepartmental with Biochemistry.
P: ZOL 341.
Recent advances in genetics and molecular biology of higher plants.
- 860. Ecology and Evolution in Terrestrial Systems**
Summer. 4 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology and Crop and Soil Sciences.
P: STT 422.
Field experimental and quantitative approaches to ecological and evolutionary mechanisms.
- 863. Environmental Plant Physiology**
Spring of odd-numbered years. 3(3-0) Interdepartmental with Horticulture.
P: BOT 301 or BOT 414 or BOT 415.
Interaction of plant and environment. Photobiology, thermophysiology, and plant-water relations.
- 864. Plant Biochemistry**
Spring. 3(3-0) Interdepartmental with Biochemistry. Administered by Biochemistry.
P: BCH 401 or BCH 462.
Biochemistry unique to photosynthetic organisms. Photosynthetic and respiratory electron transport, nitrogen fixation, carbon dioxide fixation, lipid metabolism, carbon partitioning, cell walls, biosynthesis of plant hormones.
- 865. Plant Growth and Development**
Fall. 3(3-0)
P: BOT 415.
Physiology and biochemistry of growth and development as regulated by internal and external factors. Biosynthesis and action of plant hormones. Environmental factors: light and temperature.
- 870. Plant Nematology**
Spring of even-numbered years. 3 credits. Interdepartmental with Entomology. Administered by Entomology.
P: BOT 405.
Biology, host parasite relationships and management of selected nematode diseases of economic plants.
- 880. Plant Virology**
Fall of odd-numbered years. 4(2-4)
P: BCH 462, BOT 810.
Biology and molecular aspects of viruses causing plant disease.

881. Molecular and Biochemical Plant Pathology
Spring of odd-numbered years. 3(2-2)
P: BCH 462, ZOL 341, BOT 810; BOT 414 or BOT 415.
Biochemical and molecular bases of host-pathogen interactions. Mechanisms of pathogenicity and the nature of disease resistance.

884. Prokaryotic Diseases of Plants
Fall of even-numbered years. 4(2-4)
P: BOT 810.
Description of prokaryotic genera associated with plant diseases, identification, physiology, and genetics. Laboratory techniques.

885. Plant Diseases in the Field
Summer of odd-numbered years. 2(1-3)
P: BOT 810. R: Open only to graduate students.
Diagnosis of plant diseases and disorders in a field setting. Field trips and independent study are required.

891. Current Topics in Ecology and Evolution
Summer. 1 credit. Given only at W.K. Kellogg Biological Station. A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Zoology and Crop and Soil Sciences. Administered by Zoology.
Presentation and critical evaluation of theoretical and empirical developments by visiting scientists.

897. Community and Ecosystem Ecology
Spring. 4(4-0) Interdepartmental with Zoology and Fisheries and Wildlife. Administered by Zoology.
Structure and function of natural communities and ecosystems. Community analysis along environmental gradients. Succession, food web analysis, energy flow, nutrient cycling, and effects of human activities on ecosystems.

899. Masters Thesis Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 24 credits in all enrollments for this course.
R: Open only to graduate students.
Research in anatomy, bryology cell biology, ecology, genetics, molecular biology, morphology, mycology, paleobotany, pathology, physiology and systematics.

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course.
R: Open only to doctoral students.
Research in anatomy, bryology cell biology, ecology, genetics, molecular biology, morphology, mycology, paleobotany, pathology, physiology and systematics.

BUILDING CONSTRUCTION MANAGEMENT BCM

Department of Agricultural Engineering
College of Agriculture and Natural Resources
College of Engineering

124. Construction Materials
Fall, Spring. 3(3-0)
Properties of construction materials and their application in residential and light commercial construction.
SA: BCM 126

125. Architectural Drafting
Fall, Spring. 3(2-3)
P: BCM 124 or concurrently.
Architectural drafting including site plans, floor plans, foundation plans, elevations, sections, and details. Print reading including plan analysis of assemblies and details. Emphasizes residential construction.
SA: BCM 126

227. Commercial Building Construction Methods
Fall, Spring. 3(3-0)
P: BCM 125 R: Open only to students in the Building Construction Management major.
Methods, codes, and plans for constructing commercial buildings. Construction system details: site preparation, foundations, floors, framing systems, and roof systems.

230. Utilities
Fall, Spring. 3(3-0)
P: BCM 227; MTH 116 or MTH 120 R: Not open to freshmen. Open only to students in the Building Construction Management major or to juniors or seniors in the Civil Engineering major.
Heating, cooling, plumbing and electrical utilities in residential and light commercial construction utilizing applicable codes.

250. Construction Mechanics and Equipment Management
Fall. 3(2-3)
R: Open only to Building Construction Management or Agricultural Technology and Systems Management students.
Principles, applications, techniques, tools, materials and resources in building construction mechanics and light construction equipment management.

252. Current Issues in the Building and Housing Industries
Fall. 3(3-0)
Impacts of government policies and regulations on the building and housing industries. Land use, construction technology, energy. Economics, demographics, and lifestyle choices.

311. Construction Project Scheduling
Fall, Spring. 3(2-2)
P: BCM 230 or concurrently; BCM 322 C: BCM 324 concurrently. R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major.
Basic construction project scheduling procedures. Work breakdown structure, critical path method and scheduling logic. Activity durations, status reports, resource allocation and control.

322. Structural Design
Fall, Spring. 4(5-0)
P: BCM 227; PHY 231 or PHY 231B. R: Open only to Building Construction Management or Agricultural Technology and Systems Management majors.
Mechanics, material strengths and section properties developed and applied to structural design using wood, steel and concrete. Beams, columns, footings, and foundation walls.

324. Construction Estimation
Fall, Spring. 4(3-2)
P: BCM 230 or concurrently; BCM 322 C: BCM 311 concurrently. R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major.
Estimating construction projects: labor, material, overhead, and profit in unit and detailed formats. Job cost accounting and control. Estimation software.

325. Construction and Real Estate Finance
Fall, Spring. 4(4-0)
P: EC 201 or EC 202; MTH 116 or MTH 120. R: Open only to Building Construction Management, Civil Engineering, and College of Business majors.
Financial methods and instruments utilized in construction, rehabilitation, development, and purchase of real estate. Terms, contracts, valuation, brokerage, taxation, risk, and interest rate analysis.

340. Residential Design Evaluation
Fall. 3(3-0)
P: BCM 126 or HED 160. R: Not open to freshmen and sophomores. Open only to Building Construction Management and Human Environment and Design majors.
Qualitative methods for evaluating residential building designs. Design impacts on building occupants: children, families, singles, handicappers, elderly.

349. Construction Renovation
Spring. 3(3-0)
P: BCM 227. R: Open only to Building Construction Management or Human Environment and Design majors or to juniors and seniors in Historic Preservation Specialization.
Preservation, rehabilitation, remodeling and restoration of existing buildings. Analysis of building adaptability and design. Economic feasibility and codes. Historical and social considerations.

422. Construction Contracts
Fall, Spring. 3(3-0)
P: BCM 227, BCM 311, BCM 324. R: Open only to seniors and graduate students in Building Construction Management and Civil Engineering.
Construction contracts for commercial and residential projects. Contract procedures, bidding, changes, substitutions. Insurance, bonding, claims, disputes, and payments. Specifications. Responsibilities of owner and contractors.

423. Construction Project Management
Fall, Spring. 3(3-0)
P: BCM 311, BCM 324. R: Open only to seniors and graduate students in Building Construction Management and Civil Engineering.
Construction management principles and practices. Site and project management.

451. Concepts of Fire Safe Construction
Fall. 3(3-0)
P: BCM 230 or HED 350. R: Open only to Building Construction Management majors.
Safety and fire integrity of structures: principles, terminology, and techniques of construction affecting life. Applicable codes. Materials and assemblies. Suppression and detection systems.

452. Commercial Utility Systems
Spring. 3(3-0)
P: BCM 230. R: Open only to Building Construction Management, Mechanical Engineering, Civil Engineering, and Human Environment and Design majors.
Primary electrical, heating, ventilating, air conditioning, plumbing, elevator, and fire detection and suppression systems for commercial buildings.

453. Land Development
Spring. 3(3-0)
P: BCM 227 and BCM 325. R: Open only to Building Construction Management, Civil Engineering, History of Art, Landscape Architecture, and Urban Planning majors.
Methods and practices of land development for residential and commercial uses. Market research. Land use regulations. Legal documentation. Site analysis and design. Case studies.