

## Biosystems Engineering–BE

**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. SA: AE 890  
Individual study in biosystems engineering.

**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. SA: AE 891  
Biosystems engineering topics not covered in regular courses.

**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. SA: AE 892  
Current topics in biosystems engineering.

**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  
Master's thesis research.

**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  
Doctoral dissertation research.

**202 The Plant Kingdom**  
Spring. 3(2-3) P:M: (BS 110 or BS 111 or BOT 105 or LBS 144 or LBS 148H or LBS 149H)  
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 Department of 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:M: (BS 110 or BOT 105 or LBS 144 or LBS 148H)  
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:M: (CEM 141 or CEM 151 or LBS 171 or CEM 181H) and (CEM 161 or LBS 171L) and (BOT 105 or BS 111 or LBS 145 or LBS 149H) and completion of Tier I 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(3-0) Interdepartmental with Entomology; Geological Sciences; Zoology; Sociology. Administered by Department of Entomology. RB: 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 years. 3(3-0) Interdepartmental with Geological Sciences. P:M: (BS 110 or BOT 105 or GLG 201 or LBS 144 or LBS 148H) R: Open only to juniors or seniors.  
Evolutionary history of plants, development of ecosystems, and use of plant fossils in the reconstruction of ancient environments and climate.

**336 Useful Plants**  
Fall of odd years. 3(3-0) P:M: (CEM 142 or CEM 143 or CEM 152 or CEM 182H) and (BOT 105 or LBS 145) or (BS 110 and BS 111 and BS 111L) or (LBS 148H and LBS 149H)  
Ways in which plants are used for myriad purposes from food and construction materials to medicines and perfumes. Potential for expanding the uses of plants through biotechnology.

**341 Fundamental Genetics**  
Fall, Spring, Summer. 4(4-0) Interdepartmental with Zoology. Administered by Department of Zoology. P:M: (BS 111 or LBS 145 or LBS 149H)  
Principles of heredity in animals, plants and microorganisms. Classical and molecular methods in the study of gene structure, transmission, expression and evolution.

**355 Ecology**  
Fall, Summer. 3(3-0) Interdepartmental with Zoology. Administered by Department of Zoology. P:M: (BS 110 or LBS 144 or LBS 148H) SA: ZOL 250  
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.

**355L Ecology Laboratory**  
Fall, Summer. 1(0-3) Interdepartmental with Zoology. Administered by Department of Zoology. P:M: (ZOL 355 or concurrently or BOT 355 or concurrently) and 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; Entomology. Administered by Department of Crop and Soil Sciences. P:M: (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:M: (BS 110 or BS 111 or BOT 105 or LBS 145 or LBS 148H or LBS 149H)  
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:M: (BS 110 and BS 111) or (BOT 105 and BOT 106) or (LBS 144 and LBS 145) or (LBS 148 H and LBS 149H) and 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:M: (BOT 105 or BS 110 or LBS 144 or LBS 148H) and (BOT 218 or FOR 204 or HRT 211) and 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:M: (BOT 105 or BS 111 or LBS 145 or LBS 149H) and (CEM 141 or CEM 152) and (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 and Molecular Genetics. Administered by Department of Microbiology and Molecular Genetics. P:M: (BMB 462 or concurrently) RB: (MIC 409) SA: BOT 413, MIC 403, MPH 403  
Viruses and modern molecular biology. Viral replication and gene expression of the major classes of viruses. Virus-cell interactions and viral diseases.

## BOTANY AND PLANT PATHOLOGY BOT

Department of Botany  
and Plant Pathology  
College of Agriculture and  
Natural Resources  
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(0-3) P:M: (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(1-3) Interdepartmental with Biological Science; Microbiology and Molecular Genetics; Zoology. Administered by Natural Science. P:M: (BS111 or concurrently) Not open to students with credit in LBS 159H.  
Principles and applications of common techniques used in cell and molecular biology.

- 414 Plant Physiology: Metabolism**  
Fall. 3(3-0) P:M: (CEM 251 or CEM 351) and (BOT 105 or LBS 145) or (BS 110 and BS 111 and BS 111L) or (LBS 148H and LBS 149H)  
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:M: (BOT 105 or BS 111 or LBS 145 or LBS 149H) and (CEM 251)  
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:M: (BOT 414 or BOT 415) and completion of Tier I writing requirement. RB: Laboratory course in biochemistry.  
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:M: (BOT 105 or BS 110 or LBS 144 or LBS 148H)  
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(2-2) Interdepartmental with Entomology; Geological Sciences; Zoology; Sociology. Administered by Department of Entomology. P:M: (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. 4(2-4) P:M: (BOT 105 or BS 110 or LBS 144 or LBS 148H)  
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.
- 424 Algal Biology**  
Fall of even years. 4(2-4) Summer of odd years. 4 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology. P:M: (BS 110 or LBS 144 or LBS 148H) and completion of Tier I writing requirement. RB: (ZOL 355 and ZOL 355L) or (BOT 441)  
Algal taxonomy, systematics, physiology, ecology, and environmental assessment. Lab focus on identification of freshwater algal genera collected from regional habitats. Field trips required.
- 431 Comparative Limnology**  
Summer. 4(2-6) Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology; Fisheries and Wildlife. Administered by Department of Zoology. P:M: (CEM 141 or CEM 151) and (ZOL 355) 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 years. 4(2-4) P:M: (BS 110 and BS 111) or (BOT 105 and BOT 106) or (LBS 144 and LBS 145) or (LBS 148H and LBS 149H)  
Plant anatomy from a structure and function perspective. Physiological, developmental, and ecological significance of cell types, tissue types, and meristems of vegetative and reproductive plant parts.
- 440 Field Ecology and Evolution**  
Summer. 4 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology. Administered by Department of Zoology. P:M: (ZOL 355)  
Solving conceptual and practical research problems in ecology and evolution under field conditions.
- 441 Plant Ecology**  
Fall. 3(3-0) P:M: (BS 110 or LBS 144 or BOT 105 or LBS 148H or ZOL 355) and 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(3-0) Interdepartmental with Zoology. Administered by Department of Zoology. P:M: (ZOL 341) R: Not open to freshmen. SA: ZOL 345  
Processes of evolutionary change in animals, plants. Microbes. Population genetics, microevolution, speciation, adaptive radiation, macroevolution. Origin of Homo sapiens.
- 485 Tropical Biology**  
Spring. 3(3-0) Interdepartmental with Zoology; Entomology. Administered by Department of Zoology. P:M: (ZOL 355) R: Open only to juniors or seniors.  
Tropical biota emphasizing evolutionary and ecological principles compared across tropical ecosystems.
- 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. P:M: Completion of Tier I writing requirement. RB: One year of college biology. 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. P:M: Completion of Tier I writing requirement. RB: One year of college biology. 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: 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. P:M: (BS 110 and BS 111) or (BOT 105 and BOT 106) or (LBS 144 and LBS 145) or (LBS 148H and LBS 149H) and completion of Tier I writing requirement. R: 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:M: (BOT 498) and 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.
- 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.

## Botany and Plant Pathology–BOT

- 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:NM: (BOT 405 or BOT 414 or BOT 415)  
Recent findings in mycology, plant virology, bacteriology, nematology, disease physiology and epidemiology.
- 811 Molecular and Genetic Aspects of Plant Development**  
Fall of even years. 3(2-2) Interdepartmental with Horticulture. Administered by Department of Horticulture. RB: (ZOL 341 or CSS 350) and (BOT 415 and ZOL 320)  
Genetic mechanisms controlling plant development. Model systems and internal, nonenvironmental factors. Methods for the study of plant development. The plant genome. Genetics underlying developmental diversity in higher plants.
- 812 Epidemiology of Plant Diseases**  
Spring of even years. 3(3-0) P:NM: (BOT 810)  
Study of populations of plant pathogens within populations of plant hosts as affected by the environment and human involvement.
- 824 Principles and Methods of Plant Systematics**  
Spring. 3(3-0)  
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.
- 828 Conservation and Genetics**  
Fall of even years. 3(2-2) Interdepartmental with Fisheries and Wildlife; Zoology. Administered by Department of Fisheries and Wildlife. P:NM: (ZOL 341 or CSS 350 or ANS 314)  
Population and evolutionary genetic principles applied to ecology, conservation, and management of fish and wildlife at the individual, population, and species level.
- 835 Biogeography**  
Spring of odd years. 3(3-0) Interdepartmental with Fisheries and Wildlife; Geography; Zoology. Administered by Department of Fisheries and Wildlife. RB: Courses in evolution and ecology at undergraduate level.  
Geographical distributions of plants and animals; biogeographic realms. Ecological and evolutionary mechanisms determining distributional patterns. Application of biogeography to conservation problems.
- 842 Application of Ecological Principles**  
Spring. 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Zoology.  
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.
- 847 Advanced Mycology**  
Spring of even years. 4(2-4) P:NM: (BOT 402)  
Systematics, identification, physiology, genetics, and molecular biology of plant pathogenic fungi.
- 849 Evolutionary Biology**  
Spring. 3(3-0) Interdepartmental with Zoology. P:NM: (ZOL 341 and 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 Department of Zoology. RB: (STT 465)  
Interpretation and analysis of ecological and evolutionary biology data. Statistical computer software.
- 855 Molecular Evolution: Principles and Techniques**  
Fall of odd years. 3(3-0) Interdepartmental with Zoology; Microbiology and Molecular Genetics. Administered by Department of Zoology. RB: (ZOL 341 or ZOL 445)  
Current techniques used to characterize and compare genes and genomes. Types of genetic variation, assays of variation. Emphasis on data analysis, and computer use to conduct a phylogenetic analysis to compare organisms and infer relationships.
- 856 Plant Molecular Biology**  
Spring. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology. P:NM: (ZOL 341)  
Recent advances in genetics and molecular biology of higher plants.
- 863 Environmental Plant Physiology**  
Spring of odd years. 3(3-0) Interdepartmental with Horticulture. P:NM: (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 and Molecular Biology. Administered by Department of Biochemistry and Molecular Biology. P:NM: BMB 401 or BMB 462. SA: BCH 864  
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:NM: (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 Nematode Management in Crop Systems**  
Summer of even years. 3(2-3) Interdepartmental with Entomology. Administered by Department of Entomology. P:NM: (BOT 405) SA: BOT 870  
Biology, host parasite relationships and management by farming and cropping systems of selected nematode diseases of economic plants.
- 880 Plant Virology**  
Fall of odd years. 4(2-4) P:NM: (BMB 462 and BOT 810)  
Biology and molecular aspects of viruses causing plant disease.
- 881 Molecular and Biochemical Plant Pathology**  
Spring of odd years. 3(2-2) P:NM: (BMB 462 and ZOL 341 and BOT 810) and (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 years. 4(2-4) P:NM: (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 years. 2(1-3) P:NM: (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; Crop and Soil Sciences. Administered by Department of Zoology.  
 Presentation and critical evaluation of theoretical and empirical developments by visiting scientists.
- 896 Population and Community Ecology**  
 Fall. 4(4-0) Interdepartmental with Zoology. Administered by Department of Zoology.  
 Population dynamics of animals and plants utilizing life tables and projection matrices. Species interaction. Life history theory. Structure and dynamics of communities. Succession.
- 897 Ecosystem Ecology**  
 Spring. 4(4-0) Interdepartmental with Zoology; Fisheries and Wildlife. Administered by Department of Zoology.  
 Structure and function of natural ecosystems. Succession, food web analysis, energy flow, nutrient cycling, and effects of human activities on ecosystems. Global environmental change. Ecosystem management and restoration.
- 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.

- 124 Residential Construction Materials and Methods**  
 Spring. 3(3-0) P:NM: (BCM 101) SA: BCM 126  
 Properties of construction materials and their application in residential construction.
- 210 Commercial Construction Methods**  
 Fall. 3(3-0) P:M: (BCM 101 and BCM 124)  
 Commercial construction: principles, materials, assemblies and commercial blueprints.
- 211 Building Codes**  
 Fall. 3(3-0) P:M: (BCM 210 or concurrently) SA: BCM 227  
 Construction codes: structural, mechanical, electrical and plumbing. Building safety and accessibility.
- 222 Statics and Strengths of Materials**  
 Spring. 3(3-0) P:M: (MTH 124 and PHY 231 and BCM 210) Not open to students with credit in MSM 205 or MSM 211.  
 Equilibrium of forces. Free body diagrams. Force components. Bending moments. Stress and strain. Mechanical properties of materials. Beams and trusses. Computer applications. Indeterminate structures.
- 230 Utility Systems**  
 Spring. 4(4-0) P:M: (BCM 210) R: Open only to sophomores or juniors or seniors in the Building Construction Management or Civil Engineering major.  
 Heating, cooling, ventilating, electrical, gas, lighting, water, waste water, telecommunications, fire protection, safety security and sound control systems in residential and commercial construction. Applicable codes.
- 305 Site Construction and Measurement**  
 Fall. 3(2-2) P:M: (BCM 230)  
 Site construction methods, materials and equipment for buildings, soil, foundation, erosion and storm water. Layout, leveling, surveying and underground utilities.
- 315 Construction Quantity Surveying**  
 Spring. 3(2-2) P:M: (BCM 305 or concurrently and CSE 101) R: Open only to students in the Building Construction Management or Civil Engineering major. SA: BCM 324  
 Measurement of quantities for construction projects. Work breakdown structure. Industry standards.
- 322 Structural Systems**  
 Fall. 3(3-0) P:M: (BCM 211) and (BCM 222 or MSM 205 or MSM 211) Not open to students with credit in CE 406.  
 Structural design using wood, steel and concrete. Beams, columns, footings, and foundation walls. Loading, soils.
- 324 Construction Estimation**  
 Fall, Spring. 4(3-2) P:M: (BCM 230 or concurrently and BCM 322) R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major. C: BCM 311 concurrently.  
 Estimating construction projects: labor, material, overhead, and profit in unit and detailed formats. Job cost accounting and control. Estimation software.

- 325 Real Estate Principles and Construction Finance**  
 Fall. 4(4-0) P:M: (EC 201 or EC 202) and (MTH 124 or concurrently) R: Open only to juniors or seniors in the Building Construction Management major.  
 Financial methods and instruments utilized in construction, rehabilitation, development, and purchase of real estate. Terms, contracts, valuation, brokerage, taxation, risk, and interest rate analysis.
- 328 Construction Presentation Graphics**  
 Spring. 2(1-2) P:M: (CSE 101) R: Open only to juniors or seniors in the Building Construction Management major.  
 Graphic communication methods used in construction organizations.
- 353 Land Development**  
 Spring. 3(3-0) P:M: (BCM 211 and BCM 305 and BCM 325 or concurrently) R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering or Landscape Architecture or Urban and Regional Planning major. SA: BCM 352, BCM 403  
 Methods and practices of land development. Market research. Financial feasibility. Land use regulations. Legal documentation. Site analysis and design. Case studies.
- 385 Construction Documents and Contracts**  
 Spring. 3(3-0) P:M: (BCM 305 and CSE 101) R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major. Not open to students with credit in BCM 422.  
 Construction contracts for commercial and residential projects. Contract procedures, bidding, changes, substitutions. Specifications. Insurance, bonding, claims, disputes, and payments. Responsibilities of owners and contractors.
- 401 Construction Safety Management**  
 Spring. 3(3-0) P:NM: (BCM 385) R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major.  
 Construction safety with OSHA emphasis. General safety and health provisions, records, and safety management programs. Personnel protection and life saving equipment. Economic impact of safety program.
- 403 Land Development**  
 Fall. 3(3-0) P:M: (BCM 211 and BCM 305 and BCM 325 or concurrently) R: Open only to seniors in the Building Construction Management or Civil Engineering or Landscape Architecture or Urban and Regional Planning major. SA: BCM 352 Not open to students with credit in BCM 453.  
 Methods and practices of land development. Market research. Financial feasibility. Land use regulations. Legal documentation. Site analysis and design. Case studies.
- 411 Construction Project Scheduling**  
 Fall, Spring. 3(2-2) P:M: (STT 200 or STT 201) and (BCM 315 or concurrently and BCM 322) R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major. SA: BCM 311 C: BCM 415 concurrently.  
 Basic construction project scheduling procedures. Work breakdown structure, critical path method and scheduling logic. Activity durations, status reports, resource allocation and control.

## BUILDING CONSTRUCTION MANAGEMENT

BCM

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

- 101 Principles of Building Construction Management**  
 Fall. 2(2-0)  
 Historical developments and current issues and trends in commercial and residential construction industries.