Descriptions—Biosystems Engineering of Courses

882. Irrigation and Water Management Engineering
Spring of even years. 3(3-0) P: BE 451, 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

893. 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 893

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 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: BOT 105 or concurrently. Cell structure, anatomy, physiology, growth and development, and diversity of plants.

111L. Cell and Molecular Biology Laboratory
Fall, Spring, Summer. 3(1-3) 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: NS 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

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 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; 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 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 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(4-0) Interdepartmental with Zoology. Administered by Zoology. P: (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 Zoology. P: (BS 110 or LBS 144 or LBS 149H) 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, Summer. 1(0-3) Interdepartmental with Zoology. Administered by Zoology. P: (ZOL 355 or concurrently or BOT 355 or concurrently or BOT 355 concurrently) and Completion of Tier 1 writing requirement. Population, community and ecosystem ecology utilizing plant and animal examples to demonstrate general field principles.

362. Management of Turfgrass Pests
Fall. 3(2-3) P: BS 110, BS 111 or BOT 105 or LBS 140 or MCM 392. Major groups of fungi: characteristics, habitats and diversity. Significance of fungi in nature and their economic importance.

405. Introductory Plant Pathology
Spring. 4(5-0) P: BS 110, BS 111 or BOT 105 or LBS 140. R: Completion of Tier 1 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 216 or FGR 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 110 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.
434. Plant Structure and Function
Fall of odd 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 systems, 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 Zoology. P: (ZOL 353) R: Completion of Tier I writing requirement. Solving conceptual and practical research problems in ecology and evolution under field conditions.

441. Plant Ecology
Fall. 3(3-0) P: BS 110 or BOT 105 or LBS 144, LBS 145. Ecology of plants and their communities. Effects of biotic and climatological factors influencing global distribution of plant communities. Community structure and function, microclimatology, ecoscience, and adaptation.

445. Evolution

485. Tropical Biology
Spring. 3(2-3) Interdepartmental with Zoology; Entomology. Administered by Zoology. P: (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. 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 curating.

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. 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.
Descriptions—Botany and Plant Pathology of Courses

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 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.

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.

830. Paleobotany
Fall of even 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. 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 academics on application of basic ecology and evolutionary biology to real-world problems.

847. Advanced Mycology
Spring of even years. 4(2-4) P: BOT 402. Systematics, identification, physiology, genetics, and molecular biology of plant pathogenic fungi.

849. Evolutionary Biology
Spring. 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. 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 and Microbiology. Administered by 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. P: 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: BOT 301 or BOT 414 or BOT 415. Interaction of plant and environment. Photobiology, thermobiology, and plant-water relations.

864. Plant Biochemistry

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 years. 3(2-3) 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 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 years. 3(2-2) P: BCH 462, ZOL 341, 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: 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: 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 Zoology. Presentation and critical evaluation of theoretical and empirical developments by visiting scientists.

896. Population and Community Ecology

897. Community and Ecosystem Ecology
Spring. 4(4-0) Interdepartmental with Zoology; 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.
305. Site Construction and Measurement
Fall, Spring. 3(2-2) P: BCM 230
Site construction methods, materials and equipment for buildings, soil, foundation, erosion and storm water. Layout, leveling, surveying and underground utilities.

311. Construction Project Scheduling
Fall, Spring. 3(2-2) P: BCM 230 or concurrently; BCM 322 R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major. C: BCM 324 concurrently.
Basic construction project scheduling procedures. Work breakdown structure, critical path method and scheduling logic. Activity durations, status reports, resource allocation and control. Approved through Summer semester 2001

315. Construction Quantity Surveying
Spring. 3(2-2) P: (BCM 305 or concurrently and CSE 101) R: Open only to students in the Building Construction Management or Civil Engineering major.
SA: BCM 324

322. Structural Systems
Fall, Spring. 3(3-0) P: (BCM 227 and BCM 230 or concurrently) 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(2-2) P: (BCM 230 or concurrently) and (BCM 322 or concurrently) 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. Approved through Fall semester 2000

325. Real Estate Principles and Construction Finance
Fall, 4(4-0) P: (EC 201 or EC 202) and (MTH 124) 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: (CSE 101) R: Open only to juniors or seniors in the Building Construction Management major.
Graphic communication methods used in construction organizations.

385. Construction Documents and Contracts
Spring. 3(2-0) P: (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.

401. Construction Safety Management
Spring. 3(3-0) P: (BCM 385) R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major.

403. Land Development
Fall. 3(3-0) P: (BCM 211 and BCM 305) and (BCM 325 or concurrently or UP 334) R: Open only to seniors in the Building Construction Management or Civil Engineering major. C: BCM 416 concurrently.

415. Cost Estimating and Analysis
Fall. 3(2-2) P: (BCM 315 and BCM 325 or concurrently) R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major. C: BCM 416 concurrently.

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.

423. Construction Project Management
Fall. 3(3-0) P: (BCM 411 or concurrently and BCM 415 or concurrently) R: Open only to seniors in the Building Construction Management or Civil Engineering major.
Construction management principles and practices. Project planning and controls.

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