

Descriptions—Biosystems Engineering of Courses

882. Irrigation and Water Management Engineering

Spring of even 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 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. 2(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: 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 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 148H)
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) 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; 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: (BCH 462 or concurrently)
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(2-2) 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. 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(2-6) Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology; and Fisheries and Wildlife. Administered by Zoology. P: (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: 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.
- 440. Field Ecology and Evolution**
Summer. 4 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology. Administered by Zoology. P: (ZOL 355)
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. 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(3-0) Interdepartmental with Zoology. Administered by Zoology. P: (ZOL 341) R: Not open to freshmen.
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; 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 12 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.
- 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.

**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 academe 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, 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 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 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 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**
Fall. 4(4-0) Interdepartmental with Zoology. Administered by 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. 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.

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**

**101. Principles of Building
Construction Management**

Fall. 2(2-0)

Historical developments and current issues and trends in commercial and residential construction industries.

**124. Residential Construction
Materials and Methods**

Spring. 3(3-0) P: (BCM 101)

Properties of construction materials and their application in residential construction.
SA: BCM 126

**210. Commercial Construction
Methods**

Fall. 3(3-0) P: (BCM 124)

Commercial construction: principles, materials, assemblies and commercial blueprints.

211. Building Codes

Fall. 3(3-0) P: (BCM 210 or concurrently)

Construction codes: structural, mechanical, electrical and plumbing. Building safety and accessibility.
SA: BCM 227

222. Statics and Strengths of Materials
Spring. 3(3-0) P: (MTH 124 and PHY 321 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: (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: (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.

Measurement of quantities for construction projects. Work breakdown structure. Industry standards.

SA: BCM 324

322. Structural Systems

Fall. 3(3-0) P: (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: (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(3-0) 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.

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: (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: (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 or Landscape Architecture or Urban and Regional Planning major. 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.

SA: BCM 352

411. Construction Project Scheduling

Spring. 3(2-2) P: (STT 200 or STT 201) and (BCM 315 and BCM 322) R: Open only to juniors or seniors in the Building Construction Management or Civil Engineering major. 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. PERT.

SA: BCM 311

415. Cost Estimating and Analysis

Fall. 3(2-2) P: (BCM 315) and (BCM 385 or concurrently) C: BCM 411 concurrently.

Estimation of construction project costs: direct and indirect, labor, material, and equipment. Overhead and profit. Bidding. Computer-based estimating.

SA: BCM 324

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.

Approved through Spring semester 2001

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.