

Biosystems Engineering—BE

- 818 Comprehensive Nutrient Management Planning**
Fall. 3(2-2) Interdepartmental with Animal Science. Administered by Department of Animal Science.
Development of comprehensive nutrient management plans (CNMP) for animal feeding operations. Trends in animal production, environmental issues, and diet formulation and their impact on manure production. Development of CNMP for a specific animal feeding operation.
- 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. SA: AE 820
Procedures and methods for designing and executing research projects.
- 831 Biosystems Analysis**
Fall. 3(2-2) RB: (MTH 132) 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) RB: (BE 431 or BE 831)
Techniques of process network theory and multi-criteria optimization for designing environmentally sound and economically beneficial biosystems.
- 850 Dimensional Analysis and Theory of Models**
Fall of odd years. 3(2-2) R: Open only to graduate students in the College of Agriculture and Natural Resources or College of Engineering. SA: AE 850
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.
- 852 Systems Modeling and Simulation**
Fall of even years. 3(3-0) Interdepartmental with Fisheries and Wildlife; Forestry; Resource Development. Administered by Department of Fisheries and Wildlife. RB: (STT 422 or STT 442 or STT 464 or GEO 463)
General systems theory and concepts. Modeling and simulation methods. Applications of systems approach and techniques to natural resource management, and to ecological and agricultural research.
- 853 Applied Systems Modeling and Simulation for Natural Resource Management**
Spring of odd years. 3(2-2) Interdepartmental with Fisheries and Wildlife; Forestry; Resource Development; Zoology. Administered by Department of Fisheries and Wildlife. RB: (FW 820 or BE 486 or ZOL 851) or approval of department. R: Open only to seniors and graduate students
Mathematical models for evaluating resource management strategies. Stochastic and deterministic simulation for optimization. System control structures. Team modelling approach.

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

BUILDING CONSTRUCTION MANAGEMENT

BCM

Department of Agricultural Engineering College of Agriculture and Natural Resources

- 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) RB: (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 or concurrently 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 or EC 251H or EC 252H) and (MTH 124 or MTH 132 or LBS 118) 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 or CSE 131 or CSE 231 or CSS 110 or LBS 126) 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 or CSE 131 or CSE 231 or CSS 110 or LBS 126) 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) RB: (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.
- 411 Construction Project Scheduling**
Fall, Spring. 3(2-2) P:M: (STT 200 or STT 201 or STT 315 or STT 421) 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.
- 415 Cost Estimating and Analysis**
Fall. 3(2-2) P:M: (BCM 315 and BCM 385) SA: BCM 324 C: BCM 411 concurrently.
Estimation of construction project costs: direct and indirect, labor, material, and equipment. Overhead and profit. Bidding. Computer-based estimating.
- 423 Construction Project Management**
Fall, Spring. 3(3-0) P:M: (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.
- 435 Residential Building Projects (W)**
Fall, Spring. 3(1-4) P:M: (ACC 230 or ACC 201 or concurrently or ACC 202 or ACC 251H) and (BCM 423 and BCM 328 and BCM 353) and completion of Tier I writing requirement. R: Open only to seniors in the Building Construction Management major.
Development of a residential project and business plan.
- 436 Commercial Building Projects (W)**
Fall, Spring. 3(1-4) P:M: (ACC 230 or ACC 201 or ACC 202 or ACC 251H) and (BCM 423 and BCM 328 and BCM 353 or concurrently) and completion of Tier I writing requirement. R: Open only to seniors in the Building Construction Management major.
Evaluation, procurement and management of commercial building projects.
- 490 Independent Study**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to Building Construction Management majors. Approval of department required.
Special problems in acquisition and development of residential land, design, construction technology, building materials, finance, marketing, construction management, or land use codes and regulations.
- 491 Special Topics in Building Construction Management**
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P:M: (BCM 210) R: Open only to Building Construction Management majors. Approval of department.
Topics such as computer methods in building construction management, construction technology, solar energy, special land use codes or new technology management.
- 810 Construction Systems**
Fall, Spring. 1(1-0) Not open to students with credit in BCM 124 or BCM 210.
Introduction to construction materials and methods in the U.S. with emphasis on steel and wood construction.
- 811 Advanced Project Scheduling**
Fall of odd years. 3(2-2)
Critical path analysis for effective and logical scheduling of construction projects. Identification of project activities and their relationships. Schedule development, analysis, and updating. Relationship of project costs and resources to the schedule. Effective communication of schedule information.
- 817 Construction Management Information Systems**
Spring. 3(2-2) R: Approval of department; application required.
Information generation and utilization for the management of construction projects. Integration of construction management software, conceptual modeling and knowledge-based models.
- 822 Legal Issues in Construction**
Spring. 3(3-0) RB: A degree or experience in construction management, civil engineering, human environment and design, interior design, architecture, urban planning, landscape architecture or law.
Application of Michigan and Federal case law to construction and development claims and litigation.
- 823 Advanced Construction Project Management**
Fall, Spring. 3(3-0) RB: (BCM 411 and BCM 415) R: Open only to graduate students in Building Construction Management.
Project management issues, services and documentation. Bidding, cost accounting, scheduling. Project planning and controlling.
- 890 Special Problems**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to graduate students in College of Agriculture and Natural Resources. Approval of department; application required.
Individual study in land acquisition and development, design, construction, management, finance, marketing, and structural analysis.
- 891 Advanced Topics in Building Construction Management**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to graduate students in College of Agriculture and Natural Resources. Approval of department.
Advanced topics in building construction management.
- 892 Construction Management Research Seminar**
Fall. 2(2-0) R: Open only to graduate students in the College of Agriculture and Natural Resources or College of Engineering, or College of Human Ecology.
Current areas and topics of research in construction management. Resources of research results, analysis of existing research and development of preliminary proposal.
- 898 Master's Research**
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 master's students in the Building Construction Management major.
Masters degree Plan B research paper.
- 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 graduate students in Building Construction Management.
Master's thesis research.