

- 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.

Building Construction Management–BCM

- 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 and BCM 423 or concurrently 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.
Development of a residential project and business plan.
- 436 Commercial Building Projects (W)**
Fall, Spring, 3(1-4) P:M: (ACC 230 and BCM 423 or concurrently 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; application 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) P:NM: (BCM 422 or BCM 385) RB: A degree or experience in 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) P:NM: (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.

BUSINESS

BUS

The Eli Broad College of Business and The Eli Broad Graduate School of Management

- 309 Business Information Systems and Technology**
Fall, Spring, Summer, 3(3-0) P:M: (CSE 101 or concurrently) R: Open only to juniors or seniors in the College of Business.
Role of information technology in shaping and supporting business processes in a global marketplace. Effects on organizations and individuals.

CELL AND MOLECULAR BIOLOGY

CMB

College of Natural Science

- 800 Cell and Molecular Biology Seminar**
Fall, Spring, 1(1-0) A student may earn a maximum of 5 credits in all enrollments for this course. R: Open only to students in the Cell and Molecular Biology major.
Current literature in such areas of cell and molecular biology as gene expression, intracellular transport, cell signalling, regulation of cell growth and cell structure.
- 880 Laboratory Rotation**
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 students in the Cell and Molecular Biology major.
Participation in research projects in laboratories of Cell and Molecular Biology faculty.
- 892 Research Forum**
Fall, 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to students in the Cell and Molecular Biology major.
Advanced graduate students present their laboratory research.
- 999 Doctoral Dissertation Research**
Fall, Spring, Summer, 1 to 6 credits. A student may earn a maximum of 60 credits in all enrollments for this course. R: Open only to students in the Cell and Molecular Biology major.
Doctoral dissertation research.