

**CHM 3164 Biochemistry** **Four hours**  
 A study of macromolecular and metabolic biochemistry with an emphasis on carbohydrates, lipids, and proteins with an introduction to nucleic acids. The chemical basis for biological phenomena, bioenergetics and metabolic regulation is stressed. Three hours lecture-discussion and one three-hour laboratory-quiz period per week. Prerequisite: CHM 3144 or consent of instructor  
 Offered spring semester (odd-numbered years)

**CHM 3174 Environmental Chemistry** **Four hours**  
 Principles and analysis of chemical movement and distribution—both natural and human-induced—in natural environments. Sampling and analytical methods are included for water, soil, and air. Work is conducted both on site in natural habitats and in the laboratory. Prerequisite: CHM 3134 (Same as Au Sable Chem 332)  
 Offered summer, Au Sable Institute

**CHM 4121, 4131 Experimental Physical Chemistry** **Each course, one hour**  
 Laboratory experiments dealing with the content of CHM 4123, CHM 4133. Three hours laboratory per week. Prerequisite: CHM 3144; prerequisite or corequisite: CHM 4123  
 Offered upon sufficient request

**CHM 4123, 4133 Physical Chemistry** **Each course, three hours**  
 A study of the principles of chemistry from an exact, quantitative standpoint. Behavior of matter in the various states, thermodynamic relationships, kinetics of reaction, molecular and atomic structure, phase equilibria, electro-chemistry. Prerequisite: CHM 3144, PHY 2124; prerequisite or corequisite: MTH 1144  
 4123 offered fall semester (even-numbered years)  
 4133 offered spring semester (odd-numbered years)

**CHM 4221, 4222, 4223 Chemistry Research** **One to three hours**  
 Laboratory-based research projects in an area of Chemistry or Biochemistry of interest to the student and supervising faculty. May be repeated for credit, with a maximum of four hours counting toward degree credit in Biochemistry. Prerequisite: consent of instructor  
 Offered each semester

## CM (Construction Management)

**CM 1111 Construction Techniques I** **One hour**  
 Instruction in and application of basic construction techniques by involvement in an actual construction project. Four hours per week.  
 Offered fall semester

**CM 1121 Construction Techniques II** **One hour**  
 Instruction in and application of basic construction techniques by involvement in an actual construction project. Basic instruction in arc welding is included. Four hours per week.  
 Offered spring semester

**CM 1223 Architectural Drafting Lab** **Three hours**

A study of construction details, isometric views, site grading, and the drafting of a residential project. Includes weekly blueprint reading assignments. Exercises are completed using a combination of hand drafting and computer aided drafting. Two three-hour laboratory periods per week.

Offered spring semester

**CM 1313 Materials of Construction** **Three hours**

A comprehensive study of the properties, manufacture, and uses of building construction materials. Three hours lecture-discussion per week.

Offered fall semester

**CM 2233 Construction Methods** **Three hours**

A study of the methods, structural systems, and equipment used in constructing residential, commercial, and heavy construction projects. The use of CABO residential code and the BOCA commercial code are included. Two hours lecture-discussion and one two-hour laboratory period per week.

Offered spring semester

**CM 2323 Statics and Strength for Technology** **Three hours**

A study of forces on statically determinate rigid bodies at rest including analysis of determinate trusses. An introduction to stress and strain in beams and columns is included. Three hours lecture-discussion per week. Prerequisite: MTH 1122 or equivalent

Offered spring semester

**CM 2431 Construction Internship A** **One hour**

Orientation to work on a construction site. The student is responsible to secure summer employment in construction, with assistance from the instructor. Taken prior to CM 2432.

Offered spring semester

**CM 2432 Construction Internship B** **Two hours**

Ten weeks (a minimum of 400 hours) of construction work with prior approval of the major adviser. A written report of activities is required. Credit or equivalence for this course can be earned during the summer months. May be repeated as many as two times for credit, provided subsequent experiences provide additional learning opportunities. Prerequisite: CM 2431

**CM 2513 Surveying** **Three hours**

A study of the fundamentals of measuring techniques as they relate to leveling, construction layout, and mapping. Emphasis is given to the care and use of optical and electronic instruments. Two hours lecture-discussion and one three-hour laboratory period per week. Prerequisite: MTH 1122 or equivalent

Offered fall semester

**CM 3213 Construction Safety and Quality** **Three hours**

A study of safety and quality control as it relates to construction management. Included is instruction adequate to earn the 10-hour OSHA certificate. Three hours lecture-discussion per week. Prerequisite: CM 2233

Offered spring semester

- CM 3223 Concrete Technology** **Three hours**  
 A study of the design and control of concrete mixtures and of the design of simple reinforced concrete structural elements. Concrete Field Testing Certification instruction included. Instruction in concrete form work is considered. Two hours lecture-discussion and one two-hour laboratory period per week. Prerequisite: ME 3114 or CM 2323  
 Offered spring semester (even-numbered years)
- CM 3313 Structural Design of Wood** **Three hours**  
 A study of the design of wood structures including concrete form work. Emphasis is on statically determinate connections, beams, trusses, and columns under various load conditions. Two hours lecture-discussion and one two-hour laboratory period per week. Prerequisite: CM 2323 or ME 3114  
 Offered upon sufficient request
- CM 3414 Estimating I** **Four hours**  
 An introduction to construction estimating and bid preparation with an emphasis on quantity takeoff. Residential and light commercial projects are emphasized with integration of construction accounting. Three one hour lecture-discussions and one two-hour laboratory period per week. Prerequisite: CM 2233  
 Offered fall semester
- CM 3501, 3502, 3503 Selected Topics** **One to three hours**  
 Study of a specific area of the construction industry, such as work methods or equipment selection. May be used for independent study. May be repeated for different topics. Prerequisite: consent of department head  
 Offered upon sufficient request
- CM 3524 Mechanical Systems for Buildings** **Four hours**  
 Study of heating and cooling principles and equipment, and principles and design of water supply and waste systems for buildings. Model codes are considered, plus reading of residential and commercial mechanical systems plans. Two ninety-minute lecture-discussions and one two-hour laboratory period per week.  
 Offered fall semester (even-numbered years)
- CM 3602 Electrical Systems for Buildings** **Two hours**  
 A study of power, lighting, signal, and control wiring systems for buildings. Includes consideration of the National Electric Code. Reading residential and commercial electrical plans is included. Two hours lecture-discussion per week.  
 Offered fall semester (odd-numbered years)
- CM 3712 Computer Assisted Construction Management** **Two hours**  
 Instruction in the use of construction management software as applied to project documentation and communication. Instruction may include the use of the Web for project management. One hour lecture-discussion and one two-hour laboratory per week. Prerequisites: CM 1223 with 'C' or better, CM 2233, junior standing  
 Offered fall semester
- CM 4123 Steel Structures** **Three hours**  
 A study of the design of steel structural elements typically found in buildings and a consideration of steel erection procedures. Two hours lecture-discussion and one two-hour laboratory period per week. (Same as ME 4123) Prerequisite: CM 2323 or ME 3114  
 Offered spring semester (odd-numbered years)

**CM 4323 Construction Contracting** **Three hours**

A study of the management aspects of the construction industry including contracts, specifications, insurance, labor relations, and labor law. Ethical issues relevant to construction are discussed. Three hours lecture-discussion per week. Prerequisite: senior standing or consent of instructor

Offered spring semester

**CM 4423 Estimating II** **Three hours**

A detailed study and application of pricing and bidding techniques using blueprints and specifications. Projects include several commercial building projects along with a competitive bid simulation involving area contractors. An introduction to construction financing is included. Prerequisites: CM 3414 and senior standing or consent of instructor

Offered spring semester

**CM 4513 Building Design Lab** **Three hours**

The design, development, and presentation of an elementary architectural program as employed for a residence or small commercial building. Working drawings are required. Six hours laboratory per week. May be repeated once for credit. Prerequisite: senior standing or consent of instructor

Offered fall semester

**CM 4613 Construction Project Scheduling and Cost Control** **Three hours**

A study of construction project management systems with emphasis on time and cost control. Critical path method time-control procedures and cost-tracking methods are included. Two hours lecture-discussions and one two-hour laboratory per week. Prerequisite: senior standing or consent of instructor

Offered fall semester

**CM 4713 Construction Management** **Three hours**

This capstone course involves application of management techniques on an actual construction project. Planning, estimating, procurement, project execution, supervision of CM 1111/1121 students, and dealing with subcontractors is included. One one-hour planning session and eight hours laboratory per week. Prerequisite: senior standing

Offered each semester

**CMN (Christian Ministries)**

**CMN 1632 WILD Adventure Program** **Two hours**

An intensive multi-day experience available to incoming first-year and transfer students accepted into the Wilderness Impact on Leadership and Discipleship (WILD) Program. The focus is upon group living and interpersonal dynamics designed to enhance personal spiritual growth through participation in outdoor pursuit activities such as backpacking, canoeing, rock climbing, and rappelling. Significant time is spent on the JBU challenge course leading up to a 7-day trip into a pristine backcountry location (e.g., the Boundary Waters, the Rocky Mountains, the Smoky Mountains). Additional fee associated with this course.

Offered fall semester @ 10 days before First Year Student Orientation