### Descriptions of Courses

BOTANY AND PLANT PATHOLOGY/NATURAL SCIENCE

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tr>
<td><strong>880. Plant Virology</strong>&lt;br&gt;Fall of even numbered years.</td>
<td>Fall, Spring, 3(2-4)&lt;br&gt;P: BCM 465, BOT 816. R: Open only to graduate students.</td>
<td>Open only to Building Construction Management students. Not open to freshmen and sophomores.</td>
<td>BCM 214, BCM 215, BCM 415</td>
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<tr>
<td><em><em>881</em>. Molecular and Biochemical Plant Pathology</em>*&lt;br&gt;Spring of odd-numbered years.</td>
<td>Spring, 3(2-2)&lt;br&gt;P: BCM 462; BOT 414 or BOT 415; BOT 816; ZOL 341. R: Open only to graduate students.</td>
<td>Laboratory techniques.</td>
<td>BCM 216, BCM 217, QM 412</td>
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<td><em><em>884</em>. Prokaryotic Diseases of Plants</em>*&lt;br&gt;Fall of odd-numbered years.</td>
<td>Fall, 4(2-2)&lt;br&gt;P: BOT 816.</td>
<td>Description of prokaryotic gena associated with plant disease identification, physiology, and genetics.</td>
<td>BCM 214, BCM 215, BCM 415</td>
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<tr>
<td><em><em>885</em>. Plant Diseases in the Field</em>*&lt;br&gt;Summer.</td>
<td>Summer, 2(1-3)&lt;br&gt;P: BOT 816. R: Open only to graduate students.</td>
<td>Diagnosis of plant diseases and disorders in a field setting.</td>
<td>BC 453, ZOL 441, BOT 415, BOT 405</td>
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<tr>
<td><em><em>888</em>. Master's Thesis Research</em>*&lt;br&gt;Fall, Spring, Summer.</td>
<td>Fall, Spring, Summer, 1 to 12 credits.</td>
<td>May enroll for a maximum of 24 credits.</td>
<td>BC 456, QM 416, QM 417</td>
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<tr>
<td><em><em>889</em>. Doctoral Dissertation Research</em>*&lt;br&gt;Fall, Spring, Summer.</td>
<td>Fall, Spring, Summer, 1 to 24 credits.</td>
<td>May enroll for a maximum of 29 credits.</td>
<td>BC 456, QM 416, QM 417</td>
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### BUILDING CONSTRUCTION MANAGEMENT

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<tr>
<td><em><em>129</em>. Residential Construction Materials, Methods and Drafting</em>*&lt;br&gt;Fall, Spring, Summer.</td>
<td>Fall, Spring, Summer, 3(3-4)&lt;br&gt;P: BCM 128. R: Open only to Building Construction Management students. Not open to students with credit in HED 150. Materials, methods, codes and drafting in residential construction.</td>
<td>Not open to freshmen and sophomores.</td>
<td>BCM 214, BCM 215, BCM 415</td>
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<tr>
<td><em><em>227</em>. Commercial Building Construction Methods</em>*&lt;br&gt;Fall, Spring.</td>
<td>Fall, Spring, 3(3-0)&lt;br&gt;P: BCM 126. R: Open only to Building Construction Management students. Methods, codes, and plans for constructing commercial buildings. Construction system details: site preparation, foundations, floors, framing systems, and roof systems.</td>
<td>Not open to freshmen and sophomores.</td>
<td>BCM 215, BCM 214, BCM 217</td>
</tr>
<tr>
<td><em><em>230</em>. Utilities</em>*&lt;br&gt;Fall, Spring.</td>
<td>Fall, Spring, 3(0-0)&lt;br&gt;P: BCM 465, BOT 816. R: Open only to graduate students.</td>
<td>Open only to Building Construction Management students. Heating, cooling, plumbing and electrical utility in residential and light commercial construction utilizing applicable codes.</td>
<td>BCM 216, BCM 217, QM 412</td>
</tr>
<tr>
<td><em><em>250</em>. Construction Mechanics and Equipment Management</em>*&lt;br&gt;Fall.</td>
<td>Fall, 3(2-3)&lt;br&gt;R: Open only to Building Construction Management and Agricultural Technology and Systems Management students.</td>
<td>Principles, applications, techniques, tools, materials and resources in building construction mechanics and light construction equipment management.</td>
<td>BCM 201, BCM 327</td>
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<tr>
<td><em><em>252</em>. Current Issues in the Building and Housing Industries</em>*&lt;br&gt;Fall.</td>
<td>Fall, 3(0-3)&lt;br&gt;R: Open only to Building Construction Management students.</td>
<td>Impacts of government policies and regulations on the building and housing industries. Land use, construction technology, energy, economics, demographics, and lifestyle choices.</td>
<td>BCM 250</td>
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### 311. Quantitative Methods in Building Technology Management<br>Fall, Spring. | Fall, Spring, 3(0-0)<br>P: MTH 116 or MTH 120; CPS 100 or CPS 150. | Not open to freshmen and sophomores. | MTH 108, MTH 111, CPS 110, CPS 130, CPS 150, CPS 151 |

### 329*. Structural Design<br>Fall, Spring. | Fall, Spring, 4(5-0)<br>P: BCM 227; PHY 231. R: Open only to Building Construction Management majors. | Not open to freshmen and sophomores. | BCM 214, BCM 312, BCM 313 |

### 334*. Construction Estimation<br>Fall. | Fall, Spring, 3(3-0)<br>P: BCM 230, BCM 322. R: Open only to Building Construction Management majors. | Not open to freshmen and sophomores. | BCM 217, BCM 412, BCM 416 |

### 344*. Residential Design Evaluation<br>Fall. | Fall, Spring, 3(3-0)<br>P: BCM 126 or HED 168. | Not open to freshmen and sophomores. | BCM 215 |

### 349*. Construction Renovation<br>Fall. | Spring, 3(0-0)<br>P: BCM 227. R: Open only to Building Construction Management and Human Environment and Design majors. | Preservation, rehabilitation, remodeling and restoration of existing buildings. Analysis of building adaptability and design. Feasibility and codes. | BCM 217, BCM 239, BCM 339 |

### 351*. Concepts of Fire Safe Construction<br>Fall. | Spring, 3(0-0)<br>P: BCM 117. R: Open only to Building Construction Management majors. | Safety and fire integrity of structures: principles, terminology, and techniques of construction affecting life, applicable codes. | BCM 210, BCM 218, BCM 490 |

### 423*. Construction Project Management<br>Fall, Spring. | Fall, Spring, 3(3-0)<br>P: BCM 227, BCM 311, BCM 324. R: Open only to seniors and graduate students in Building Construction Management and Civil Engineering. | Contract procedures, bidding, changes, substitutions, insurance, bonding, claims, disputes, and payments. | BCM 215, BCM 417, BCM 418 |

### 427*. Construction Contract<br>Fall. | Fall, Spring, 3(3-0)<br>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. | BCM 216, BCM 317 |

### 429*. Construction Project Management<br>Fall, Spring. | Fall, Spring, 3(3-0)<br>P: BCM 227, BCM 311, BCM 324. R: Open only to seniors and graduate students in Building Construction Management and Civil Engineering. | Construction contracts; principles and practices. | BCM 216, BCM 317 |

### 452*. Commercial Utility Systems<br>Spring. | Spring, 3(3-0)<br>P: BCM 227, BCM 311, BCM 324. R: Open only to Building Construction Management, Mechanical Engineering, Civil Engineering, and Human Environment and Design majors. | Primary electrical, heating, ventilating, air conditioning, plumbing, elevator, and fire detection and suppression systems for commercial buildings. | BCM 217, BCM 412 |

### 490*. Independent Study<br>Fall, Spring, Summer. | 1 to 4 credits. | May enroll for a maximum of 8 credits. | BCM 217, BCM 418 |

Courses with an asterisk (*) have not been approved by the University Committee on Curriculum.
491*. Special Topics in Building Construction Management
Fall, Spring. 1 to 4 credits. May reenroll for a maximum of 8 credits.
P: BCM 257 or BCM 311. R: Open only to Building Construction Management majors. Approval of department.
Topics such as computer methods in building construction simulation, management technology, solar energy, special land use codes or new technology management.
QP: BCM 215 OR ATM 311 OR BCM 217 QA: BCM 490

823*. Advanced Topics in Construction Management
Spring of even-numbered years. 3(3-0) P: BCM 222 and BCM 423 or CE 373 and 471. R: Seniors and Graduate Students BCM, CHE Advanced construction management practices. Project management. Risk allocation. Case studies.
QP: BCM 257 QA: BCM 490

490*. Special Problems
Fall, Spring, Summer. 1 to 4 credits.
May reenroll for a maximum of 9 credits.
P: Approval of department R: Graduate students. Agriculture and Natural Resources Approval of department. Application required. Individual student research and study in land acquisition and development, design, construction, management, finance, marketing, and structural analysis.
QA: BCM 850

891*. Advanced Topics in Building Construction Management (MTC)
Fall, Spring, Summer. 1 to 4 credits.
May reenroll for a maximum of 12 credits.
P: Approval of department. R: Graduate students. Agriculture and Natural Resources.
Advanced topics in building construction management.
QA: BCM 850

892*. Construction Management Research Seminar
Fall. 1 1/2-0 R: Graduate Students
Current research topics and issues in construction management. Construction methods and materials and building design.

899*. Master’s Thesis Research
Fall, Spring, Summer. 1 to 4 credits.
May reenroll for a maximum of 15 credits.
P: Approval of department R: Graduate students.
QA: BCM 859

CHEMICAL ENGINEERING CHE

201. Material and Energy Balances
Fall, Spring. 3(4-0) P: MTH 133, CEM 142 or CEM 152, CPS 131 or CPS 150 or concurrently. Chemical engineering calculations. Synthesis of chemical process systems. Analysis of chemical processes using material and energy balances. Enthalpy calculations for changes in temperature, phase transitions, and chemical reactions.
QP: CPS 112 MTH 214 CEM 142 QA: CHE 200

311. Fluid Flow and Heat Transfer
Spring. 3(2-3) or concurrently. MTH 235 or concurrently. R: Open only to College of Engineering students. Not open to graduate with credit in BM 201 or MM 351.
QP: CHE 300 MTH 310 QA: CHE 340 CHE 341

312. Mass Transfer and Separations
Fall, 3(3-0) or concurrently. MTH 235 or concurrently. R: Open only to College of Engineering students.
QP: CHE 300 MTH 310 QA: CHE 342 CHE 343

316*. Unit Operations Laboratory
Spring. 3(01-06) P: CHE 311, CHE 312; CHE 231 or concurrently. R: Open only to Chemical Engineering majors.
QP: CHE 451 CHE 428 QA: CHE 423

321*. Thermodynamics for Chemical Engineering
QP: CHE 300 CEM 361 QA: CHE 311 CHEM 411

371*. Chemical Engineering Materials
Fall, 3(05-06) P: CEM 352; CEM 361 or concurrently. R: Open only to Chemical Engineering majors. Structure, properties, and performance of classes of materials emphasizing polymeric materials.
QP: CEM 353 QA: CHE 433 CHE 442

432*. Transport Phenomena
Spring, 3(00-00) P: CHE 311, CHE 312. R: Open only to Chemical Engineering majors. Mathematical and physical analogies among mass, energy and momentum transport processes. Dimensional analysis and solutions to multi-variable boundary value problems. Numerical solutions to nonlinear problems.
QP: MTH 310 CHE 343 QA: CHE 381 CHE 481

431. Chemical Reaction Engineering
Spring, 3(3-0) or concurrently. R: Open only to Chemical Engineering majors.
QP: CHE 343 CHEM 411 QA: CHE 428

433. Process Dynamics and Control
Fall, 3(03-00) P: CHE 431. R: Open only to Chemical Engineering majors.
Mathematical modeling of process dynamics. Control theory. Design of control systems and specification of control hardware. Integration of control theory with modern practice.
QP: CHE 438 QA: CHE 451

434*. Process Design and Optimization II
Spring, 3(00-00) P: CHE 453. R: Open only to Chemical Engineering majors.
Applications of process engineering principles to design calculations. Selection of optimum design. Influence of design on capital investment, operating cost, product loss and quality. Mathematical programming methods and applications.
QP: CHE 428 CHE 451 QA: CHE 461

452. Composite Materials Processing
Fall. 3(2-3) P: CHE 331 or MS 332 or CE 321. R: Open only to College of Engineering majors. Manufacturing processes for thermoset and thermoplastic matrix composites. Mechanical and thermal evaluation of composites. Rheology and molding of fiber-reinforced materials.
QP: CHE 341 QA: CHE 444

501. Biochemical Engineering
Fall, 4(04-00) P: CHE 431. R: Open only to College of Engineering majors. Applications of microbiology and biochemistry to biochemical engineering. Knowledge and thermodynamics of biochemical reactors. Transport phenomena in biological systems. Bioreactor design and scale-up.
QP: CHE 428

590*. Independent Study
Fall, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 6 credits. R: Open only to Chemical Engineering majors. Approval of department.
Theoretical or experimental studies of current research topics in chemical engineering. Individual interaction with faculty adviser.
QA: CHE 460

591*. Selected Topics in Chemical Engineering
Fall. 4(2-3) P: CHE 431 or concurrently.
Study of newly-developing or non-traditional chemical engineering topics in a classroom environment.
QA: CHE 460

801*. Advanced Chemical Engineering Calculations
Fall. 3(00-00) P: CHE 431 R: Senior or Graduate Student.
Formulation of differential equations modeling physical phenomena in chemical engineering. Application of analytical and numerical solution methods including spectral, finite difference and finite element methods.
QA: CHE 801 CHE 802

804*. Thermodynamics and Kinetics in Chemical Engineering
Fall. 4(2-2) P: CHE 431. R: Approval of department.
QA: CHE 806