GENERAL EDUCATION:

Distribution Courses

Distribution courses emphasize ways of thinking and methods of inquiry within various disciplines. Students are required to take one course in each of the following seven areas:

• Arts—Visual and Performing

• History

• Literature

• Mathematics

• Natural Science (lab required)

• Social and Behavioral Sciences

• Advanced Quantitative/Scientific Reasoning

Courses

Advanced Quantitative/Scientific Reasoning (AQSR)

Courses in the AQSR category have Mathematics or Natural Science prerequisites and often additional prerequisites. For the full list of prerequisites, see the course description section of this catalog.

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| ANTH 235 | Bones and Stones: How Archaeologists Know | 4 | Annually |
| ANTH 306 | Primate Ecology and Social Behavior | 4 | F, Sp |
| ANTH 307 | Human Nature: Evolution, Ecology, and Behavior | 4 | F, Sp |
| BIOL 221 | Genetics | 4 | F |
| BIOL 335 | Human Physiology | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
| CHEM 106 | General, Organic, and Biological Chemistry II | 4 | F, Sp, Su |
| CSCI 423 | Analysis of Algorithms | 4 | Sp |
| GEOG 201 | Mapping Our Changing World | 4 | F, Sp |
| GEOG 205 | Earth's Physical Environments | 4 | F, Sp |
| HIST 207 | Quantitative History Through Applied Statistics | 4 | Sp (alternate years) |
| HSCI 232 | Human Genetics | 4 | F |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 239 | Contemporary Topics in Mathematics II | 4 | F, Sp, Su |
| MATH 241 | Statistical Methods II | 4 | F, Sp |
| MATH 248 | Business Statistics I | 4 | F, Sp, Su |
| MATH 324 | College Geometry | 4 | F, Sp |
| PHIL 220 | Logic and Probability in Scientific Reasoning | 4 | F, Sp |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |
| PHYS 120 | The Extraordinary Physics of Ordinary Things | 4 | Sp |
| PHYS 309 | Nanoscience and Nanotechnology | 4 | F (odd years) |
| POL 300 | Methodology in Political Science | 4 | F, Sp |
| PSCI 208 | Forensic Science | 4 | F, Sp |
| PSCI 214 | Introduction to Meteorology | 4 | F |
| SOC 302 | Social Research Methods | 4 | F, Sp, Su |
| SOC 404 | Social Data Analysis | 4 | F, Sp, Su |
| SWRK 303 | Social Work Research Methods II | 4 | F, Sp, Su |

Natural Science (NS)

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 100 | Fundamental Concepts of Biology | 4 | F, Sp, Su |
| BIOL 108 | Basic Principles of Biology | 4 | F, Sp, Su |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 105 | General, Organic and Biological Chemistry I | 4 | F, Sp, Su |
| PSCI 103 | Physical Science | 4 | F, Sp, Su |
| PSCI 211 | Introduction to Astronomy | 4 | F, Sp |
| PSCI 212 | Introduction to Geology | 4 | F, Su |
| PSCI 217 | Introduction to Oceanography | 4 | Sp |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 110 | Introductory Physics | 4 | Sp, F, Su |
|  |  |  |  |

**Faculty of Arts and Science:**

## Biology

Learning Goals (B.S.) (p. 350)

Learning Goals (M.A.) (p. 357)

Learning Goals (Minor) (p. 351)

Writing in the Discipline (p. 366)

**Department of Biology**

**Mission Statement:**

The mission of the Biology Department is to provide students with broad-based knowledge and experience in the investigative methods of life science. We support several curricula including general education, health sciences and undergraduate and graduate studies in biology. A faculty with diverse areas of expertise interacts closely with students in small classes, laboratories and field settings. We emphasize critical thinking skills and experiential learning while nurturing the intellectual development of our diverse student population. We foster scientific literacy such that our students make informed choices and act as responsible citizens.

**Department Chair:** Rebeka Merson

**Department Faculty: Professor** Merson; **Associate Professors** de Gouvenain, Govenar, Hall, Kinsey, Kolibachuk, Roberts, Sheridan, Spinette; **Assistant Professors** Britt, Conklin, Held, Hewins, Holmes, Montvilo, Patterson, Stilwell

Students **must** consult with their assigned advisor before they will be able to register for courses.

Biology B.S.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
| BIOL 112 | Introductory Biology II | 4 | F, Sp, Su |
| BIOL 213 | Introductory Physiology of Plants and Animals | 4 | Sp |
| BIOL 221 | Genetics | 4 | F |
| BIOL 241 | Biology Research Colloquium | 0.5 | F, Sp |
| BIOL 318 | Ecology | 4 | F |
| BIOL 320 | Cell and Molecular Biology | 4 | Sp |
| BIOL 460 | Biology Senior Seminar | 3 | F, Sp |

Note: BIOL 241: (take twice for 0.5 credits each)

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 300 | Developmental Biology of Animals | 4 | Sp |
| BIOL 321 | Invertebrate Zoology | 4 | As needed |
| BIOL 324 | Vertebrate Zoology | 4 | As needed |
| BIOL 329 | Comparative Vertebrate Anatomy | 4 | As needed |
| BIOL 353 | The Plant Kingdom | 4 | As needed |
| BIOL 354 | Plant Growth and Development | 4 | As needed |

TWO ADDITIONAL COURSES in biology at the 300-level or above (One of the two courses may consist of 3 or more credits in BIOL 491-494.)

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
| CHEM 205 | Organic Chemistry I | 4 | F, Su |
| CHEM 206 | Organic Chemistry II | 4 | Sp, Su |
|  |  |  |  |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
|  | -Or- |  |  |
| BIOL 240 | Biostatistics | 4 | Sp |
|  |  |  |  |
| MATH 209 | Precalculus Mathematics | 4 | F, Sp, Su |
|  | -Or- |  |  |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
|  |  |  |  |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp. Su |
|  | -And- |  |  |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |
|  |  |  |  |

Total Credit Hours: 70-72

## Chemistry

Learning Goals (p. 351)

Writing in the Discipline (p. 367)

**Department of Physical Sciences**

**Department Chair:** Sarah Knowlton

**Chemistry Program Faculty: Professors** Almeida, Cooley, Lamontagne, Knowlton, E. Magyar, J. Magyar, Williams Jr.; **Associate Professors** Leung; **Assistant Professor** Towle-Weicksel

Students **must** consult with their assigned advisor before they will be able to register for courses. This program also has specific retention requirements, which may be obtained from the advisor.

Chemistry B.A.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
|  | -Or- |  |  |
| CHEM 103H | Honors General Chemistry I | 4 | F |
|  |  |  |  |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
|  | -Or- |  |  |
| CHEM 104H | Honors General Chemistry II | 4 | Sp |
|  |  |  |  |
| CHEM 205 | Organic Chemistry I | 4 | F, Su |
| CHEM 206 | Organic Chemistry II | 4 | Sp, Su |
| CHEM 310 | Biochemistry | 4 | F |
| CHEM 403 | Inorganic Chemistry I | 3 | F |
|  |  |  |  |
| CHEM 404 | Analytical Chemistry | 4 | Sp (even years) |
|  | -Or- |  |  |
| CHEM 416 | Environmental Analytical Chemistry | 4 | Sp (odd years) |
|  |  |  |  |
| CHEM 405 | Physical Chemistry I | 3 | F |
| CHEM 407 | Physical Chemistry Laboratory I | 1 | F |

CHOOSE ONE OF THE OPTIONS below

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 406 | Physical Chemistry II | 3 | Sp |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 412 | Inorganic Chemistry II | 2 | Sp |
|  | -And- |  |  |
| CHEM 413 | Inorganic Chemistry Laboratory | 1 | Sp |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 414 | Instrumental Methods of Analysis | 4 | Sp (odd years) |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 418 | Marine Environmental Chemistry | 4 | Sp (even years) |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 420 | Biochemistry of Proteins and Nucleic Acids | 3 | F, Sp (odd years) |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 425 | Advanced Organic Chemistry | 4 | F (odd years) |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 435 | Pharmacology and Toxicology | 3 | As needed |

Note: MATH 314 Calculus III is a prerequisite for CHEM 406.

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F. Sp, Su |

Note: Prior to enrolling in any Chemistry course students must have completed the college mathematics competency.

**Total Credit Hours: 50-51**

Course Requirements — Concentration in Environmental Chemistry

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
| CHEM 205 | Organic Chemistry I | 4 | F, Su |
| CHEM 206 | Organic Chemistry II | 4 | Sp, Su |
| CHEM 310 | Biochemistry | 4 | F |
| CHEM 403 | Inorganic Chemistry I | 3 | F |
| CHEM 405 | Physical Chemistry I | 3 | F |
| CHEM 407 | Physical Chemistry Laboratory I | 1 | F |
| CHEM 416 | Environmental Analytical Chemistry | 4 | Sp (odd years) |
| CHEM 418 | Marine Environmental Chemistry | 4 | Sp (even years) |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp,,Su |
|  |  |  |  |
| PSCI 212 | Introduction to Geology | 4 | F, Su |
|  | -Or- |  |  |
| PSCI 217 | Introduction to Oceanography | 4 | Sp |

Total Credit Hours: 55

Chemistry B.S

Course Requirements — Concentration in Biochemistry

The B.S. degree program is approved by the American Chemical Society.

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
|  | -Or- |  |  |
| CHEM 103H | Honors General Chemistry I | 4 | F |
|  |  |  |  |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
|  | -Or- |  |  |
| CHEM 104H | Honors General Chemistry II | 4 | Sp |
|  |  |  |  |
| CHEM 205 | Organic Chemistry I | 4 | F, Su |
| CHEM 206 | Organic Chemistry II | 4 | Sp, Su |
| CHEM 310 | Biochemistry | 4 | F |
| CHEM 403 | Inorganic Chemistry I | 3 | F |
|  |  |  |  |
| CHEM 404 | Analytical Chemistry | 4 | Sp (even years) |
|  | -Or- |  |  |
| CHEM 416 | Environmental Analytical Chemistry | 4 | Sp (odd years) |
|  |  |  |  |
| CHEM 405 | Physical Chemistry I | 3 | F |
| CHEM 407 | Physical Chemistry Laboratory I | 1 | F |
| CHEM 419 | Biochemistry Mechanisms | 3 | Sp |
| CHEM 422 | Biochemistry Laboratory | 3 | Sp |
| CHEM 491-493 | Research in Chemistry | 1 | As needed |

Note: CHEM 491, CHEM 492, CHEM 493: Research in Chemistry can be fulfilled through any combination of these courses. It is strongly suggested that students take research credits in multiple semesters, beginning in their junior year for a total of 3 credit hours.

CHOOSE ONE OF THE OPTIONS below:

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 406 | Physical Chemistry II | 3 | Sp |
|  | -And- |  |  |
| CHEM 408 | Physical Chemistry Laboratory II | 1 | Sp |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 412 | Inorganic Chemistry II | 2 | Sp |
|  | -And- |  |  |
| CHEM 413 | Inorganic Chemistry Laboratory | 1 | Sp |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 414 | Instrumental Methods of Analysis | 4 | Sp (odd years) |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 418 | Marine Environmental Chemistry | 4 | Sp (even years) |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 425 | Advanced Organic Chemistry | 4 | F (odd years) |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
| BIOL 112 | Introductory Biology II | 4 | F, Sp, Su |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |

Note: Prior to enrolling in any Chemistry course students must have completed the college mathematics competency.

**Total Credit Hours: 67-68**

Course Requirements — Concentration in Environmental Chemistry

The B.S. degree program is approved by the American Chemical Society.

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
|  | -Or- |  |  |
| CHEM 103H | Honors General Chemistry I | 4 | F |
|  |  |  |  |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
|  | -Or- |  |  |
| CHEM 104H | Honors General Chemistry II | 4 | Sp |
|  |  |  |  |
| CHEM 205 | Organic Chemistry I | 4 | F, Su |
| CHEM 206 | Organic Chemistry II | 4 | Sp, Su |
| CHEM 310 | Biochemistry | 4 | F |
| CHEM 403 | Inorganic Chemistry I | 3 | F |
| CHEM 405 | Physical Chemistry I | 3 | F |
| CHEM 407 | Physical Chemistry Laboratory I | 1 | F |
| CHEM 414 | Instrumental Methods of Analysis | 4 | Sp (odd years) |
| CHEM 416 | Environmental Analytical Chemistry | 4 | Sp (odd years) |
| CHEM 418 | Marine Environmental Chemistry | 4 | Sp (even years) |
| CHEM 491-493 | Research in Chemistry | 1 | As needed |

Note: CHEM 491, CHEM 492, CHEM 493: Research in Chemistry can be fulfilled through any combination of these courses. It is strongly suggested that students take research credits in multiple semesters, beginning in their junior year, for a total of 3 credit hours.

CHOOSE one of the options below:

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 406 | Physical Chemistry II | 3 | Sp |
|  | -And- |  |  |
| CHEM 408 | Physical Chemistry Laboratory II | 1 | Sp |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 412 | Inorganic Chemistry II | 2 | Sp |
|  | -And- |  |  |
| CHEM 413 | Inorganic Chemistry Laboratory | 1 | Sp |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 420 | Biochemistry of Proteins and Nucleic Acids | 3 | F, Sp (odd years) |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 425 | Advanced Organic Chemistry | 4 | F (odd years) |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |
| PSCI 212 | Introduction to Geology | 4 | F, Su |

Note: Prior to enrolling in any Chemistry course students must have completed the college mathematics competency.

**Total Credit Hours: 69-70**

Course Requirements ­— Concentration in Professional Chemistry

The B.S. degree program is approved by the American Chemical Society.

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
|  | -Or- |  |  |
| CHEM 103H | Honors General Chemistry I | 4 | F |
|  |  |  |  |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
|  | -Or- |  |  |
| CHEM 104H | Honors General Chemistry II | 4 | Sp |
|  |  |  |  |
| CHEM 205 | Organic Chemistry I | 4 | F, Su |
| CHEM 206 | Organic Chemistry II | 4 | Sp, Su |
| CHEM 310 | Biochemistry | 4 | F |
| CHEM 403 | Inorganic Chemistry I | 3 | F |
|  |  |  |  |
| CHEM 404 | Analytical Chemistry | 4 | Sp (even years) |
|  | -Or- |  |  |
| CHEM 416 | Environmental Analytical Chemistry | 4 | Sp (odd years) |
|  |  |  |  |
| CHEM 405 | Physical Chemistry I | 3 | F |
| CHEM 406 | Physical Chemistry II | 3 | Sp |
| CHEM 407 | Physical Chemistry Laboratory I | 1 | F |
| CHEM 408 | Physical Chemistry Laboratory II | 1 | Sp |
| CHEM 414 | Instrumental Methods of Analysis | 4 | Sp (odd years) |
| CHEM 491-493 | Research in Chemistry | 1 | As needed |

Note: CHEM 491, CHEM 492, CHEM 493: Research in Chemistry can be fulfilled through any combination of these courses. It is strongly suggested that students take research credits in multiple semesters, beginning in their junior year for a total of 3 credit hours.

CHOOSE one of the options below:

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 412 | Inorganic Chemistry II | 2 | Sp |
|  | -And- |  |  |
| CHEM 413 | Inorganic Chemistry Laboratory | 1 | Sp |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 418 | Marine Environmental Chemistry | 4 | Sp (even years) |
|  |  |  |  |
|  | -Or- |  |  |
| CHEM 425 | Advanced Organic Chemistry | 4 | F (odd years) |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 314 | Calculus III | 4 | F, Sp |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |

Note: Prior to enrolling in any Chemistry course students must have completed the college mathematics competency.

**Total Credit Hours: 65-66**

Computer Science B.S.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
| CSCI 212 | Data Structures | 4 | F, Sp |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |
| CSCI 313 | Computer Organization and Architecture II | 3 | F, Sp |
| CSCI 325 | Organization of Programming Language | 3 | Sp |
| CSCI 401 | Software Engineering | 3 | Sp |
| CSCI 423 | Analysis of Algorithms | 4 | Sp |
| CSCI 435 | Operating Systems and Computer Architecture | 3 | F |

THREE COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 305 | Functional Programming | 4 | F |
| CSCI 415 | Software Testing | 4 | F (even years) |
| CSCI 416 | Human-Computer Interaction Design | 4 | As needed |
| CSCI 422 | Introduction to Computation Theory | 4 | Sp (As needed) |
| CSCI 427 | Introduction to Artificial Intelligence | 3 | As needed |
| CSCI 437 | Network Architectures and Programming | 4 | As needed |
| CSCI 455 | Introduction to Database Systems | 3 | F (odd years) |
| CSCI 467 | Computer Science Internship | 4 | As needed |
| CSCI 476 | Advanced Topics in Computer Science | 4 | Sp |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| ENGL 230 | Writing for Professional Settings | 4 | F, Sp, Su |
|  | -Or- |  |  |
| ENGL 231 | Writing for Digital and Multimedia Environments | 4 | As needed |
|  |  |  |  |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
|  |  |  |  |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
|  | -Or- |  |  |
| MATH 248 | Business Statistics I | 4 | F, Sp, Su |
|  |  |  |  |
| MATH 436 | Discrete Mathematics | 3 | Sp |
| PHIL 206 | Ethics | 3 | F, Sp, Su |
|  |  |  |  |

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 300 | Bridge to Advanced Mathematics | 4 | Sp |
| MATH 314 | Calculus III | 4 | F, Sp |
| MATH 324 | College Geometry | 4 | F, Sp |
| MATH 417 | Introduction to Numerical Analysis | 4 | Sp (as needed) |
| MATH 418 | Introduction to Operations Research | 3 | Sp (even years) |
| MATH 431 | Number Theory | 3 | F, Sp |
| MATH 445 | Advanced Statistical Methods | 3 | Sp |

ONE OF THE FOLLOWING TWO-COURSE SEQUENCES

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
|  | -And- |  |  |
| BIOL 112 | Introductory Biology II | 4 | F, Sp, Su |
|  |  |  |  |
|  | -Or- |  |  |
|  |  |  |  |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
|  | -And- |  |  |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
|  |  |  |  |
|  | -Or- |  |  |
|  |  |  |  |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
|  | -And- |  |  |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |

FOUR ADDITIONAL CREDIT HOURS in biology, chemistry, physical sciences, or physics at the 200-level or above.

Note: Connections courses cannot be used to satisfy these requirements.

Note: Eight credit hours from BIOL 111; CHEM 103; MATH 212, MATH 240; or PHYS 101 may be counted toward the Natural Science and Mathematics categories of General Education.

Total Credit Hours: 74-78

Health Sciences B.S.

D. Medical Laboratory Sciences

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 108 | Basic Principles of Biology | 4 | F, Sp, Su |
| BIOL 231 | Human Anatomy | 4 | F, Sp, Su |
| BIOL 335 | Human Physiology | 4 | F, Sp, Su |
| BIOL 348 | Microbiology | 4 | F, Sp, Su |
| BIOL 429 | Medical Microbiology | 4 | As needed |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
| CHEM 205 | Organic Chemistry I | 4 | F, Su |
| CHEM 206 | Organic Chemistry II | 4 | Sp, Su |
| CHEM 310 | Biochemistry | 4 | F |
| CSCI 101 | Introduction to Computers | 3 | F, Sp, Su |
| MATH 209 | Precalculus Mathematics | 4 | F, Sp, Su |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
| MEDT 301 | Clinical Microbiology | 8 | F |
| MEDT 302 | Clinical Chemistry | 8 | Sp |
| MEDT 303 | Immunohematology | 4 | F |
| MEDT 304 | Hematology | 6 | Sp |
| MEDT 305 | Pathophysiology | 2 | F |
| MEDT 306 | Clinical Immunology | 2 | Sp |
| MEDT 307 | Clinical Microscopy | 2 | F |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PSYC 110 | Introduction to Psychology | 4 | F, Sp, Su |
| SOC 200 | Society and Social Behavior | 4 | F, Sp |

Total Credit Hours: 95

Mathematics B.A.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 300 | Bridge to Advanced Mathematics | 4 | Sp |
| MATH 314 | Calculus III | 4 | F, Sp |
| MATH 315 | Linear Algebra | 4 | F |
| MATH 411 | Calculus IV | 4 | F (odd years) |
|  |  |  |  |
| MATH 416 | Ordinary Differential Equations | 4 | Sp (as needed) |
|  | -Or- |  |  |
| MATH 417 | Introduction to Numerical Analysis | 4 | Sp (as needed) |
|  |  |  |  |
| MATH 432 | Introduction to Abstract Algebra | 4 | Sp |
| MATH 441 | Introduction to Probability | 4 | F |
| MATH 461 | Seminar in Mathematics | 3 | Sp |

TWO COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 416 | Ordinary Differential Equations | 4 | Sp (as needed) |
|  | -Or- |  |  |
| MATH 417 | Introduction to Numerical Analysis | 4 | Sp (as needed) |
|  |  |  |  |
| MATH 418 | Introduction to Operations Research | 3 | Sp (even years) |
| MATH 431 | Number Theory | 3 | F, Sp |
| MATH 436 | Discrete Mathematics | 3 | Sp |
| MATH 445 | Advanced Statistical Methods | 3 | Sp |

Cognates

CHOOSE category A or B below

Category A

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 405 | Physical Chemistry I | 3 | F |
| CSCI 312 | Computer Organization and Architecture I | 4 | F, Sp |
| CSCI 422 | Introduction to Computation Theory | 4 | Sp (As needed) |
| CSCI 423 | Analysis of Algorithms | 4 | Sp |
| ECON 314 | Intermediate Microeconomic Theory and Applications | 4 | F |
| ECON 315 | Intermediate Macroeconomic Theory and Analysis | 4 | Sp |
| MGT 249 | Business Statistics II | 3 | F, Sp, Su |
| MKT 333 | Market Research | 3 | F, Sp |
| PHIL 305 | Intermediate Logic | 4 | Sp (even years) |

Category B

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |

and either

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 211 | Computer Programming and Design | 4 | F, Sp |
|  | -Or- |  |  |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |

Prior to enrolling in any mathematics course above 120, all students must have completed the College Mathematics Competency.

Total Credit Hours: 48-54

**PHILOSOPHY:**

Course Requirements for Minor in Principles of Knowledge and Reality

The minor in principles of knowledge and reality consists of a minimum of 18 credit hours, as follows:

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| PHIL 205 | Introduction to Logic | 4 | F, Sp, Su |
|  | -Or- |  |  |
| PHIL 220 | Logic and Probability in Scientific Reasoning | 4 | F, Sp |
|  | -Or- |  |  |
| PHIL 305 | Intermediate Logic | 4 | Sp (even years) |
|  |  |  |  |
| PHIL 311 | Knowledge and Truth | 3 | Sp (even years) |
|  | -Or- |  |  |
| PHIL 320 | Philosophy of Science | 3 | Sp (odd years) |
|  |  |  |  |
| PHIL 330 | Metaphysics | 3 | F (even years) |
|  | -Or- |  |  |
| PHIL 333 | Philosophy of Mind | 3 | F (odd years) |

REMAINING CREDIT HOURS are made up of additional choices from the seven courses above and/or from:

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
| CHEM 105 | General, Organic and Biological Chemistry I | 4 | F, Sp, Su |
| MATH 139 | Contemporary Topics in Mathematics | 4 | F, Sp, Su |
| PHIL 200 | Introduction to Philosophy | 3 | F, Sp, Su |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |
| PHYS 110 | Introductory Physics | 4 | Sp, F, Su |
| PSYC 110 | Introduction to Psychology | 4 | F, Sp, Su |
| PSYC 341 | Perception | 4 | Annually |
| PSYC 349 | Cognitive Psychology | 4 | Annually |

Notes: Connections courses cannot be used to satisfy these requirements. No minor in the Philosophy Department may be declared in combination with a Philosophy major or with any of the other minors in the Philosophy Department.

## Physics

Learning Goals (p. 355)  
**Department of Physical Sciences**

**Department Chair:** Sarah Knowlton

**Physics Program Faculty: Professors** Rivers, Snowman; **Associate Professor** Del Vecchio; **Assistant Professors** Padmanabhan, Young

Students **must** consult with their assigned advisor before they will be able to register for courses.

Physics B.S.

Course Requirements

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |
| PHYS 307 | Quantum Mechanics I | 4 | F (even years) |
| PHYS 311 | Thermodynamics | 4 | F (odd years) |
| PHYS 312 | Mathematical Methods in Physics | 3 | Sp |
| PHYS 313 | Junior Laboratory | 3 | Sp |
| PHYS 401 | Advanced Electricity and Magnetism I | 4 | F (odd years) |
| PHYS 403 | Classical Mechanics | 4 | F (even years) |
| PHYS 413 | Senior Laboratory | 3 | Sp |

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 315 | Optics | 4 | F (odd years) |
| PHYS 320 | Analog Electronics | 4 | F (even years) |
| PHYS 321 | Digital Electronics | 4 | Sp (odd years) |

TWO COURSES from

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 309 | Nanoscience and Nanotechnology | 4 | F (odd years) |
| PHYS 402 | Advanced Electricity and Magnetism II | 3 | Sp (even years) |
| PHYS 407 | Quantum Mechanics II | 3 | Sp (odd years) |
| PHYS 409 | Solid State Physics | 3 | F (even years) |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 314 | Calculus III | 4 | F, Sp |
| MATH 416 | Ordinary Differential Equations | 4 | Sp (as needed) |

Total Credit Hours: 67-68

## School of Education:

**ELEMENTARY EDUCATION**

C. Content Major in General Science

In addition to completing required courses in elementary education, students electing a content major in general science must complete the following courses, with a minimum grade point average of 2.50 in the major. Students may not proceed to student teaching without the required GPA.

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| ART 210 | Nurturing Artistic and Musical Development | 4 | F, Sp |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
| MATH 143 | Mathematics for Elementary School Teachers I | 4 | F, Sp, Su |
| MATH 144 | Mathematics for Elementary School Teachers II | 4 | F, Sp, Su |
| POL 201 | Development of American Democracy | 4 | F, Sp, Su |
| PHYS 102 | General Physics II | 4 | Sp, Su |

Note: ART 210, BIOL 111, MATH 144, POL 201, PHYS 102: These courses may also apply to General Education requirement.

Total Credit Hours: 24

Content major courses in General Science

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 112 | Introductory Biology II | 4 | F, Sp, Su |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |

ONE CHEMISTRY SEQUENCE from

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
|  | -And- |  |  |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
|  |  |  |  |
|  | -Or- |  |  |
|  |  |  |  |
| CHEM 105 | General, Organic and Biological Chemistry I | 4 | F, Sp, Su |
|  | -And- |  |  |
| CHEM 106 | General, Organic, and Biological Chemistry II | 4 | F, Sp, Su |

## **Secondary Education**

Biology Major

Students electing a major in Biology apply to the Feinstein School of Education and Human Development and meet admission requirements that include a 2.50 in their content grade point average (GPA) and a minimum grade of C. Students must maintain the content GPA of 2.50 for retention and, along with satisfactorily completing required courses in secondary education (minimum grade B-), complete the following courses to obtain Biology certification:

Requirements

Biology

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
| BIOL 112 | Introductory Biology II | 4 | F, Sp, Su |
| BIOL 213 | Introductory Physiology of Plants and Animals | 4 | Sp |
| BIOL 221 | Genetics | 4 | F |
| BIOL 318 | Ecology | 4 | F |
| BIOL 320 | Cell and Molecular Biology | 4 | Sp |
| BIOL 348 | Microbiology | 4 | F, Sp, Su |
| BIOL 491-494 | Research in Biology | 1-4 | F, Sp, Su |

Chemistry

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
| CHEM 205 | Organic Chemistry I | 4 | F, Su |
| CHEM 206 | Organic Chemistry II | 4 | Sp, Su |

Mathematics

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 209 | Precalculus Mathematics | 4 | F, Sp, Su |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |

Physical Science

|  |  |  |  |
| --- | --- | --- | --- |
| PSCI 212 | Introduction to Geology | 4 | F, Su |
| PSCI 357 | Historical and Contemporary Contexts of Science | 3 | As needed |

Physics

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
|  |  |  |  |

ONE COURSE from:

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 300 | Developmental Biology of Animals | 4 | Sp |
| BIOL 321 | Invertebrate Zoology | 4 | As needed |
| BIOL 324 | Vertebrate Zoology | 4 | As needed |
| BIOL 329 | Comparative Vertebrate Anatomy | 4 | As needed |
| BIOL 353 | The Plant Kingdom | 4 | As needed |
| BIOL 354 | Plant Growth and Development | 4 | As needed |

Note: To enroll in SED 411 and SED 412, students must have completed at least 55 credit hours of required and cognate courses in the major or have the consent of the program advisor. Prior to enrolling in SED 421, students must have completed all requirements in the biology major.

Total Credit Hours: 68

Chemistry Major

Students electing a major in Chemistry apply to the Feinstein School of Education and Human Development and meet admission requirements that include a 2.50 in their content grade point average (GPA) and a minimum grade of C. Students must maintain the content GPA of 2.75 for retention and, along with satisfactorily completing required courses in secondary education (minimum grade B-), complete the following courses to obtain Chemistry certification:

Requirements

Biology

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |

Chemistry

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |
| CHEM 205 | Organic Chemistry I | 4 | F, Su |
| CHEM 206 | Organic Chemistry II | 4 | Sp, Su |
| CHEM 310 | Biochemistry | 4 | F |
| CHEM 403 | Inorganic Chemistry I | 3 | F |
| CHEM 404 | Analytical Chemistry | 4 | Sp (even years) |
| CHEM 405 | Physical Chemistry I | 3 | F |
| CHEM 407 | Physical Chemistry Laboratory I | 1 | F |
| CHEM 491-493 | Research in Chemistry | 1 | As needed |

Mathematics

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |

Physical Science

|  |  |  |  |
| --- | --- | --- | --- |
| PSCI 212 | Introduction to Geology | 4 | F, Su |
| PSCI 357 | Historical and Contemporary Contexts of Science | 3 | As needed |

Physics

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |

ONE COURSE from:

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 406 | Physical Chemistry II | 3 | Sp |
|  |  |  |  |
| CHEM 412 | Inorganic Chemistry II | 2 | Sp |
|  | -And- |  |  |
| CHEM 413 | Inorganic Chemistry Laboratory | 1 | Sp |
|  |  |  |  |
| CHEM 414 | Instrumental Methods of Analysis | 4 | Sp (odd years) |
| CHEM 420 | Biochemistry of Proteins and Nucleic Acids | 3 | F, Sp (odd years) |
| CHEM 422 | Biochemistry Laboratory | 3 | Sp |
| CHEM 425 | Advanced Organic Chemistry | 4 | F (odd years) |
| CHEM 435 | Pharmacology and Toxicology | 3 | As needed |

Note: To enroll in SED 411 and SED 412, students must have completed at least 55 credit hours of required and cognate courses in the major or have the consent of the program advisor. Prior to enrolling in SED 421, students must have completed all requirements in the chemistry major.

Total Credit Hours: 61-62

General Science Major

Students electing a major in General Science apply to the Feinstein School of Education and Human Development and meet admission requirements that include a 2.50 in their content grade point average (GPA) and a minimum grade of C. Students must maintain the content GPA of 2.50 for retention and, along with satisfactorily completing required courses in secondary education (minimum grade B-), complete the following courses to obtain General Science certification:

Requirements

Biology

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |
| BIOL 112 | Introductory Biology II | 4 | F, Sp, Su |

Chemistry

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |

Mathematics

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 209 | Precalculus Mathematics | 4 | F, Sp, Su |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |

Physical Science

|  |  |  |  |
| --- | --- | --- | --- |
| PSCI 212 | Introduction to Geology | 4 | F, Su |
| PSCI 217 | Introduction to Oceanography | 4 | Sp |
| PSCI 357 | Historical and Contemporary Contexts of Science | 3 | As needed |

Physics

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
|  | -And- |  |  |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

ONE RESEARCH COURSE from:

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 491-494 | Research in Biology | 1-4 | F, Sp, Su |
| CHEM 491-493 | Research in Chemistry | 1 | As needed |
| PHYS 491-493 | Research in Physics | 1 | As needed |
| PSCI 491-493 | Research in Physical Science | 1 | As needed |

THREE COURSES at the 300-level or above from the following areas: biology, chemistry, physical science, and physics (two courses must be in the same area).

Note: To enroll in SED 411 and SED 412, students must have completed at least 55 credit hours of required and cognate courses in the major or have the consent of the program advisor. Prior to SED 421, students must have completed all requirements in the general science major.

Total Credit Hours: 57

Mathematics Major

Students electing a major in Mathematics apply to the Feinstein School of Education and Human Development and meet admission requirements that include a 2.75 in their content grade point average (GPA). Students must maintain the content GPA of 2.75 for retention and, along with satisfactorily completing required courses in secondary education (minimum grade B-), complete the following courses to obtain Mathematics certification:

Requirements

Computer Science

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 157 | Introduction to Algorithmic Thinking in Python | 4 | F, Sp |

Mathematics

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
| MATH 300 | Bridge to Advanced Mathematics | 4 | Sp |
| MATH 314 | Calculus III | 4 | F, Sp |
| MATH 315 | Linear Algebra | 4 | F |
| MATH 324 | College Geometry | 4 | F, Sp |
| MATH 431 | Number Theory | 3 | F, Sp |
| MATH 432 | Introduction to Abstract Algebra | 4 | Sp |
| MATH 441 | Introduction to Probability | 4 | F |
| MATH 458 | History of Mathematics | 4 | F |

Physics

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |

Note: To enroll in SED 411 and SED 412, students must have completed the calculus sequence: MATH 212, 213, 314; in addition to MATH 240, MATH 300, MATH 315, MATH 324; and at least concurrent enrollment in MATH 432. Prior to enrollment in SED 421 and SED 422, students must have completed all requirements in the mathematics major.

Total Credit Hours: 51

Physics Major

Students electing a major in Physics apply to the Feinstein School of Education and Human Development and meet admission requirements that include a 2.50 in their content grade point average (GPA). Students must maintain the content GPA of 2.50 for retention and, along with satisfactorily completing required courses in secondary education (minimum grade B-), complete the following courses to obtain Physics certification:

Requirements

Biology

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 111 | Introductory Biology I | 4 | F, Sp, Su |

Chemistry

|  |  |  |  |
| --- | --- | --- | --- |
| CHEM 103 | General Chemistry I | 4 | F, Sp, Su |
| CHEM 104 | General Chemistry II | 4 | F, Sp, Su |

Mathematics

|  |  |  |  |
| --- | --- | --- | --- |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 213 | Calculus II | 4 | F, Sp, Su |
| MATH 314 | Calculus III | 4 | F, Sp |

Physical Science

|  |  |  |  |
| --- | --- | --- | --- |
| PSCI 212 | Introduction to Geology | 4 | F, Su |
| PSCI 357 | Historical and Contemporary Contexts of Science | 3 | As needed |

Required Physics Courses

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |
| PHYS 307 | Quantum Mechanics I | 4 | F (even years) |
| PHYS 311 | Thermodynamics | 4 | F (odd years) |
| PHYS 312 | Mathematical Methods in Physics | 3 | Sp |
| PHYS 313 | Junior Laboratory | 3 | Sp |
| PHYS 413 | Senior Laboratory | 3 | Sp |
| PHYS 491-493 | Research in Physics | 1 | As needed |

PHYS 491: (for 1 credit)

Elective Physics Courses

ONE COURSE from

|  |  |  |  |
| --- | --- | --- | --- |
| PHYS 309 | Nanoscience and Nanotechnology | 4 | F (odd years) |
| PHYS 315 | Optics | 4 | F (odd years) |
| PHYS 320 | Analog Electronics | 4 | F (even years) |
| PHYS 321 | Digital Electronics | 4 | Sp (odd years) |

Note: To enroll in SED 411 and SED 412, students must have completed at least 55 credit hours of required and cognate courses in the major or have the consent of the program advisor. Prior to enrollment in SED 421, students must have completed all requirements in the physics major.

Total Credit Hours: 61

**TECHNOLOGY EDUCATION**

Course Requirements for Concentration in Applied Technology

Note: This program does not lead to RIDE teaching certification.

Courses

|  |  |  |  |
| --- | --- | --- | --- |
| TECH 200 | Introduction to Technological Systems and Processes | 3 | F, Sp |
| TECH 202 | Design Processes | 3 | F |
| TECH 204 | Energy and Control Systems | 3 | Annually |
| TECH 216 | Computer-Aided Design | 3 | As needed |
| TECH 306 | Automation and Control Processes | 3 | F |
| TECH 326 | Communication Systems | 3 | F |
| TECH 327 | Construction Systems | 3 | Sp |
| TECH 328 | Manufacturing Systems | 3 | Sp |
| TECH 329 | Transportation Systems | 3 | Annually |
| TECH 430 | Internship in Applied Technology | 6 | As needed |
| TECH 431 | Capstone Design Project | 4 | F, Sp |

Cognates

|  |  |  |  |
| --- | --- | --- | --- |
| CSCI 157 | Introduction to Algorithmic Thinking in Python | 4 | F, Sp |
| CSCI 201 | Computer Programming and Design | 4 | F, Sp |
| MGT 201 | Foundations of Management | 3 | F, Sp, Su |
| MGT 331 | Occupational and Environmental Safety Management | 3 | F |
| MATH 209 | Precalculus Mathematics | 4 | F, Sp, Su |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| PHYS 101 | Physics for Science and Mathematics I | 4 | F, Sp, Su |
| PHYS 102 | Physics for Science and Mathematics II | 4 | F, Sp, Su |

Total Credit Hours: 67

**COURSE DESCRIPTIONS:**

## CHEM - Chemistry

CHEM 404 - Analytical Chemistry (4)

Topics include the principles and applications of volumetric, gravimetric, and selected instrumental methods of analysis, including potentiometric and spectroscopic methods. Lecture and laboratory. 6 contact hours.

Prerequisite: CHEM 104.

Offered: Spring (even years).

CHEM 405 - Physical Chemistry I (3)

Through rigorous quantitative approaches, properties of gases, kinetic molecular theory, thermodynamics, statistical mechanics, and chemical and phase equilibrium are presented. Differential and integral calculus are used extensively. Lecture.

Prerequisite: CHEM 104, MATH 213, and PHYS 102.

Offered: Fall.

CHEM 406 - Physical Chemistry II (3)

Through rigorous quantitative approaches, quantum mechanics, atomic structure, atomic spectra, chemical bonding, molecular spectra, and chemical kinetics are presented. Differential and integral calculus are used extensively. Lecture.

Prerequisite: CHEM 104, MATH 314, and PHYS 102.

Offered: Spring.

CHEM 407 - Physical Chemistry Laboratory I (1)

Experiments involving topics covered in CHEM 405 are performed. The experimental methods of physical chemistry are developed. Error analysis, statistical methods, and computer applications are emphasized. 3 contact hours.

Prerequisite: Prerequisite or corequisite: CHEM 405.

Offered: Fall.

## PHYS - Physics

PHYS 101 - Physics for Science and Mathematics I (4)

This mathematically intensive course includes vectors, statics, kinematics, Newton's laws, energy, momentum, thermodynamics, and wave motion. Lecture and laboratory. 6 contact hours.

General Education Category: Natural Science.

Prerequisite: Completed MATH 120 or appropriate score on the mathematics placement exam.

Offered: Fall, Summer.

PHYS 102 - Physics for Science and Mathematics II(4)

This mathematically intensive course includes electrostatics, DC and AC circuits, magnetism, electromagnetic waves, optics and an introduction to atomic and nuclear physics. Lecture and laboratory. 6 contact hours.

General Education Category: Advanced Quantitative/Scientific Reasoning.

Prerequisite: PHYS 101.

Offered: Spring, Summer.

PHYS 103 - **Calculus Applications in Mechanics (1)**

Students explore calculus-based topics in mechanics including kinematics, work and potential energy, momentum, rotational motion and simple harmonic motion.

Prerequisite: PHYS 101, MATH 212.

Offered: Fall.

PHYS 104 - **Calculus Applications in Electricity and Magnetism**

Students explore calculus-based topics in electricity and magnetism including force from extended charge distributions, calculation of electric potential, Gauss’s Law, Ampere’s Law, Faraday’s Law and electromagnetic waves.

Prerequisite: PHYS 102, MATH 212.

Offered: Spring.

PHYS 110 - Introductory Physics (4)

This algebra-based course includes vectors, statics, Newton’s Laws, work and energy, electrostatics, DC circuits, magnetism, electromagnetic waves, nuclear radiation, and topics in modern physics. Lecture and Laboratory. 7 contact hours.

General Education Category: Natural Science.

Offered: Spring, Fall, Summer.

PHYS 118 - Fundamentals of Physics I (4)

This noncalculus-based course includes vectors, statics, kinematics, Newton’s laws, energy, momentum, fluids, thermodynamics and wave motion. Lecture and laboratory.

Offered: As needed.

PHYS 119 - Fundamentals of Physics II (4)

This noncalculus-based course  includes electrostatics, DC and AC circuits, magnetism, electromagnetic waves, optics, and an introduction to atomic and nuclear physics. Lecture and laboratory.

Prerequisite: PHYS 118.

Offered: As needed.

PHYS 120 - The Extraordinary Physics of Ordinary Things (4)

Students will learn about physical principles governing everyday applications and phenomena such as sports, musical instruments, computers, etc. Students will see how various physical principles work together in these technologies.

General Education Category: Advanced Quantitative/Scientific Reasoning (AQSR)

Prerequisite: Completion of any mathematics general education distribution.

Offered: Spring.

PHYS 307 - Quantum Mechanics I (4)

Topics include relativistic mechanics, the failures of classical physics, the structure of the atom, and the wave description of matter, including the Schrödinger Equation, the hydrogen atom, angular momentum and spin. Lecture

Prerequisite: PHYS 102.

Offered: Fall (even years).

PHYS 309 - Nanoscience and Nanotechnology (4)

This course will introduce the basic physics of nanoscience, describe how properties change at the nanoscale and relate this basic science to new nanotechnologies**.**

General Education Category: Advanced Quantitative/Scientific Reasoning

Prerequisite: Any Natural Science General Education course.

Offered: Fall (odd years).

PHYS 311 - Thermodynamics (4)

This is an introduction to the laws of thermodynamics and its application to equilibrium systems, such as ideal gases, phase transformations, solutions and chemical reactions, and elementary statistical mechanics. Lecture.

Prerequisite: PHYS 1 and successful completion of or concurrent enrollment in MATH 213, or consent of department chair.

Offered: Fall (odd years).

PHYS 312 - Mathematical Methods in Physics (3)

Topics include curvilinear coordinates, complex variables, integral transforms, vectors and matrices, special functions, differential equations, and numerical methods as applied to physics. Lecture.

Prerequisite: MATH 314.

Offered: Spring.

PHYS 313 - Junior Laboratory (3)

Intermediate-level experiments are performed in all areas of physics. Students also learn research skills, such as data analysis, literature review, and communication skills. Laboratory. 6 contact hours.

Prerequisite: PHYS 102 and PHYS 307.

Offered: Spring.

PHYS 315 - Optics (4)

This course covers electromagnetic waves, geometric optics, and physical optics. Topics include: mirrors, lenses, optical systems, thick lenses, aberrations, interference, diffraction, polarization, coherence, and lasers. Laboratory. 6 contact hours.

Prerequisite: PHYS 102 or consent of department chair.

Offered: Fall (odd years).

PHYS 320 - Analog Electronics (4)

Students examine discrete components, including resistors, capacitors, diodes, and transistors, and their applications. Oscilloscopes and other standard laboratory test equipment are used extensively. Integrated circuits are also introduced. 6 contact hours.

Prerequisite: PHYS 102 or consent of department chair.

Offered: Fall (even years).

PHYS 321 - Digital Electronics (4)

Students explore basic logic chips and combine them to build digital devices including a microcomputer. Devices include multiplexers, counters, adders, flip-flops, and memory buses. Laboratory. 6 contact hours.

Prerequisite: PHYS 102 or consent of department chair.

Offered: Spring (odd years).

PHYS 401 - Advanced Electricity and Magnetism I (4)

This is an examination of the theory and application of electrostatic fields, charge, potential, magnetic fields, steady currents, magnetic flux, inductance, transient current, radiation, magnetic energy and Maxwell's Equations. Lecture.

Prerequisite: MATH 314 and PHYS 102.

Offered: Fall (odd years).

PHYS 402 - Advanced Electricity and Magnetism II (3)

This course covers the principles of electrodynamics, conservation laws, electromagnetic radiation, and the application of Special Relativity to electrodynamics. Lecture.

Prerequisite: PHYS 401.

Offered: Spring (even years).

PHYS 403 - Classical Mechanics (4)

This course covers, at an advanced level, the classical theory of linear and rotational dynamics of particles and continuous media. An introduction to Lagrangian mechanics and special relativity is included. Lecture.

Prerequisite: MATH 314, PHYS 102.

Offered: Fall (even years).

PHYS 407 - Quantum Mechanics II (3)

Topics include the structure of solids, approximation techniques, nuclear physics, and particle physics. Lecture.

Prerequisite: PHYS 102 and PHYS 307.

Offered: Spring (odd years).

PHYS 409 - Solid State Physics (3)

Topics include crystallography, common crystal structures, the reciprocal lattice, band theory, phonons, metals, and semiconductors. Lecture.

Prerequisite: PHYS 307.

Offered: Fall (even years).

PHYS 413 - Senior Laboratory (3)

Advanced experiments in mechanics, waves, thermodynamics, optics, electromagnetism, and other topics are conducted. Laboratory. 6 contact hours.

Prerequisite: PHYS 102 and PHYS 313.

Offered: Spring.

PHYS 467 - Honors Colloquium in Physics ()

Current topics in science at an advanced level are presented through department colloquia with outside speakers and through a series of seminars led by resident experts. This course may be repeated for credit with a change in content. 1 contact hour. Graded S, U.

Prerequisite: PHYS 102 and consent of department chair.

Offered: Fall, Spring.

PHYS 490 - Directed Study in Physics (3)

Designed to be a substitute for a traditional course under the instruction of a faculty member. An area of physics is studied on the basis of the interest of the student and the instructor.

Prerequisite: Consent of instructor, department chair and dean.

Offered: As needed.

PHYS 491-493 - Research in Physics (1)

The student conducts original research in an area selected after consulting with the instructor and prepares a report on the work. A maximum of 6 credit hours may be earned in these courses.

Prerequisite: Consent of instructor, department chair and dean.

Offered: As needed.