## Chemistry

Learning Goals (p. 343)

Writing in the Discipline (p. 358)

**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 200 | Mechanics | 4 | F |
| PHYS 201 | Electricity and Magnetism | 4 | Sp |

Note: PHYS 200, PHYS 201: in unusual circumstances, PHYS 101 and PHYS 102 may be substituted for PHYS 200 and PHYS 201, with consent of department chair.

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 200 | Mechanics | 4 | F |
| PHYS 201 | Electricity and Magnetism | 4 | Sp |
|  |   |  |  |
| 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 200 | Mechanics | 4 | F |
| PHYS 201 | Electricity and Magnetism | 4 | Sp |

Note: PHYS 200, PHYS 201: In unusual circumstances, PHYS 101 and PHYS 102 may be substituted for PHYS 200 and PHYS 201, with consent of department chair.

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 200 | Mechanics | 4 | F |
| PHYS 201 | Electricity and Magnetism | 4 | Sp |
| PSCI 212 | Introduction to Geology | 4 | F, Su |

Note: PHYS 200, PHYS 201: In unusual circumstances, PHYS 101 and PHYS 102 may be substituted for PHYS 200 and PHYS 201, with consent of department chair.

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 200 | Mechanics | 4 | F |
| PHYS 201 | Electricity and Magnetism | 4 | Sp |

Note: PHYS 200, PHYS 201: In unusual circumstances, PHYS 101 and PHYS 102 may be substituted for PHYS 200 and PHYS 201, with consent of department chair.

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

**Total Credit Hours: 65-66**

Chemistry Minor

Course Requirements

The minor in chemistry consists of a minimum of 19 credit hours (five courses), as follows:

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 |

and one chemistry course at the 400-level (3-4 credits).

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

Total Credit Hours: 19-20

## Health Sciences

Learning Goals (p. 345)

**Director**: Rebeka Merson

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

Health Sciences B.S.

Course Requirements

Choose concentration A, B, C, D, or E below

A. Dental Hygiene Completion

Note: Prior dental hygienist licensure required for admission.

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 231 | Human Anatomy | 4 | F, Sp, Su |
| BIOL 335 | Human Physiology | 4 | F, Sp, Su |
| CHEM 105 | General, Organic and Biological Chemistry I | 4 | F, Sp, Su |
| CSCI 101 | Introduction to Computers | 3 | F, Sp, Su |
| HPE 233 | Social and Global Perspectives on Health | 3 | F, Sp, Su |
| HPE 307 | Dynamics and Determinants of Disease | 3 | F, Sp |
| HSCI 402 | Current Topics in Dental Hygiene | 4 | As needed |
| HSCI 466 | Evidence-Based Decision Making for Dental Hygiene | 4 | As needed |
| HSCI 494 | Independent Study in Health Sciences | 4 | As needed |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
| PSYC 110 | Introduction to Psychology | 4 | F, Sp, Su |
| SOC 200 | Society and Social Behavior | 4 | F, Sp |
|  | Dental Hygiene Licensure Transfer Credits | 48 |  |

Total Credit Hours: 93

B. Food Safety

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |
| 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 |
| HPE 221 | Nutrition | 3 | F, Sp |
| HSCI 100 | Introduction to Food Safety | 3 | F |
| HSCI 102 | Food Plant Sanitation | 3 | Sp |
| HSCI 202 | Fundamentals of Food Processing | 3 | Sp |
| HSCI 300 | Food Chemistry | 3 | F |
| HSCI 302 | Hazard Analysis and Critical Control Points | 3 | Sp |
| HSCI 400 | Quality Assurance of Food Products | 3 | F |
| HSCI 403 | Food Borne Disease | 3 | F |
| HSCI 404 | Food Microbiology | 3 | Sp |
| HSCI 405 | Food Safety Case Study | 1 | Sp |
| HSCI 494 | Independent Study in Health Sciences | 4 | As needed |
| MATH 212 | Calculus I | 4 | F, Sp, Su |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
| PHYS 110 | Introductory Physics | 4 | Sp, F, Su |
| **Total Credit Hours: 80** |

C. Human Services

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |

Either

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |
|  |   |  |  |
| COMM 338 | Communication for Health Professionals | 4 | Sp |
| CSCI 101 | Introduction to Computers | 3 | F, Sp, Su |
| HCA 201 | Introduction to Health Care Systems | 3 | F, Sp |
| HCA 303 | Health Policy and Contemporary Issues | 3 | Sp |
| HCA 402 | Health Care Informatics | 3 | As needed |
| HPE 102 | Personal Health | 3 | F, Sp, Su |
| HPE 233 | Social and Global Perspectives on Health | 3 | F, Sp, Su |
| HPE 307 | Dynamics and Determinants of Disease | 3 | F, Sp |
| HSCI 105 | Medical Terminology | 2 | F, Sp |
| HSCI 232 | Human Genetics | 4 | F |
| HSCI 494 | Independent Study in Health Sciences | 4 | As needed |
| MGT 201 | Foundations of Management | 3 | F, Sp, Su |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
| PHIL 206 | Ethics | 3 | F, Sp, Su |
| PSYC 110 | Introduction to Psychology | 4 | F, Sp, Su |
| PSYC 221 | Research Methods I: Foundations | 4 | F, Sp, Su |
| PSYC 230 | Human Development | 4 | F, Sp, Su |
| SOC 217 | Aging and Society | 4 | F, Sp, Su |
| SOC 314 | The Sociology of Health and Illness | 4 | Annually |

ONE COURSE from:

|  |  |  |  |
| --- | --- | --- | --- |
| PSYC 335 | Family Psychology | 4 | Annually |
| PSYC 339 | Psychology of Aging | 4 | Annually |
| PSYC 345 | Physiological Psychology | 4 | Annually |
| PSYC 424 | Health Psychology | 4 | Annually |

Total Credit Hours: 88

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 | General Physics I | 4 | F, Su |
| PSYC 110 | Introduction to Psychology | 4 | F, Sp, Su |
| SOC 200 | Society and Social Behavior | 4 | F, Sp |

Total Credit Hours: 95

E. Respiratory Therapy Completion

Note: Prior respiratory therapist licensure required for admission.

|  |  |  |  |
| --- | --- | --- | --- |
| BIOL 231 | Human Anatomy | 4 | F, Sp, Su |
| BIOL 335 | Human Physiology | 4 | F, Sp, Su |
| CHEM 105 | General, Organic and Biological Chemistry I | 4 | F, Sp, Su |
| CSCI 101 | Introduction to Computers | 3 | F, Sp, Su |
| HPE 233 | Social and Global Perspectives on Health | 3 | F, Sp, Su |
| HPE 307 | Dynamics and Determinants of Disease | 3 | F, Sp |
| HSCI 232 | Human Genetics | 4 | F |
| HSCI 402 | Current Topics in Dental Hygiene | 4 | As needed |
| HSCI 466 | Evidence-Based Decision Making for Dental Hygiene | 4 | As needed |
| HSCI 494 | Independent Study in Health Sciences | 4 | As needed |
| MATH 240 | Statistical Methods I | 4 | F, Sp, Su |
| PSYC 110 | Introduction to Psychology | 4 | F, Sp, Su |
| SOC 200 | Society and Social Behavior | 4 | F, Sp |
|  | Respiratory Therapist Licensure Transfer Credits | 42 |  |

Total Credit Hours: 91

CHEM 310 - Biochemistry (4)

Topics include biological macromolecule structure, function and interactions, catalysis and kinetics of biochemistry, acid-base equilibrium in biological systems, and thermodynamics of binding and recognition. Lecture.

Prerequisite: CHEM 206.

Offered: Fall.