BIOLOGY-CHEMISTRY DOUBLE MAJOR

Total Minimum Credits: 136

All biology, chemistry, and cognate courses require grades of C or better.

YEAR 1

Fall Semester		Cr.	Spring Semester		Cr.
BIOL 200	Concepts in Biology	4	R120:201/202	Foundations of Cell/Molec	4
Chem 125	General Chemistry I	3	Chem 124	General Chem. Lab	1
Math 111	Calculus I	4	Chem 126	General Chemistry II	3
HUM 101	English I	3	Math 112	Calculus II	4
BNFO 135	Bioinformatics I	3	HUM 102	English II	3
Frsh Sem	Freshman Seminar	0	GUR Elective	Physical Education	1
		17			16

YEAR 2

Fall Semester		Cr.	Spring Semester		Cr.
Chem 221	Analytical Chemical Methods	2	BIOL 205/206	Foundation of Ecol/Evol	4
Chem 222	Analytical Chemistry	3	Chem 244	Organic Chemistry II	3
Chem 243	Organic Chemistry I	3	Chem 244A	Organic Chemistry Laboratory	2
Phys 111	Physics I	3	Phys 121	Physics II	3
Phys 111A	Physics I Lab	1	Phys 121A	Physics II Lab	1
Math 211	Calculus IIIA	3	EPS 202	Society Technology & Environ	3
GUR Elective	Cultural History GUR	3	GUR Elective	Physical Education	1
		18			17

YEAR 3

Fall Semester		Cr.	Spring Semester		Cr.
Chem 231	Physical Chemistry I	3	Chem 235	Physical Chemistry II	3
Chem 473	Biochemistry I	3	Chem 474	Biochemistry II	3
Math Cognate	Math Cognate[1] *(3 or 4 credit)*	3	SS 201	Economics	3
Biology Elective	Cluster Elective - Functional Org	4	MGMT 390	Principles of Management	3
Biology Elective	Cluster Elective - Ecol/Evol	3	Biology Elective	BIO Laboratory Elective[2]	3
			GUR Elective	Lit/Hist/Phil/STS - GUR	3
		16			18

YEAR 4

Fall Semester		Cr.	Spring Semester		Cr.
Chem 235A	Physical Chemistry II Laboratory	2	Chem 336	Physical Chemistry III	3
Chem 475	Biochemistry Laboratory	2	Chem 412	Inorganic Chemistry	3
Chem 480	Instrumental Analysis	2	Elective	Biology Elective	3
Math 333	Probability and Statistics	3	Elective	Chemistry Elective	3
Biology Elective	Cluster Elective - Molec/Cell	3	Elective	GUR Open Elective	3
Biology Elective	BIO Laboratory Elective[2]	4	GUR Elective	HSS Capstone Seminar	3
		16			18

Total Credits: 136

Biology Credits: 35 ~ Chemistry Credits: 47

[1] Math Cognate: Choice of Differential Equations [Math 222], Mathematical Modeling [Math 227], Linear Algebra [Math 337], or Numerical Methods [Math 340].

[2] BIO Laboratory Electives: *7 credits minimum:* Choice of *one* 4 credit laboratory *and one* 3 *or* 4 credit laboratory .

BIOLOGY-CHEMISTRY DOUBLE MAJOR

Total Minimum Credits: 136

All biology, chemistry, and cognate courses require grades of C or better.

REQUIRED CORE BIOLOGY COURSES ~ 15 Credits * REQUIRED CORE CHEMISTRY COURSES ~ 44 Credits

- ❑ R120/BIOL 200 Concepts in Biology* (4cr) **Effective from Fall 2011*
- ❑ R120:201 Foundations of Cell & Molecular Biology Lecture (3cr)
- ❑ R120:202 Foundations of Cell & Molecular Biology Lab (1cr)
- ❑ BIOL 205 Foundations of Ecology & Evolution Lecture (3cr)
- ❑ BIOL 206 Foundations of Ecology & Evolution Lab (1cr)
- ❑ MATH Cognate Course: Math 222, 227, 337 or 340 (3-4cr)

- ❑ Chem 124, 125, 126: General Chemistry I, II, Lab (7cr)
- ❑ Chem 221, 222: Analy Chem Mth, Analy Chemistry (5 cr)
- ❑ Chem 243, 244, 244A: Organic Chemistry I, II, Lab (8 cr)
- ❑ Chem 231, 235: Physical Chemistry I, II (6 cr)
- ❑ Chem 235A, 336: Physical Chemistry Lab, III (5 cr)
- ❑ Chem 473, 474, 475: Biochemistry I, II, Lab (8 cr)
- ❑ Chem 412: Inorganic Chemistry (3 cr)
- ❑ Chem 480: Instrumental Analysis (2 cr)

CONCEPT CLUSTER COURSES ~ 10 Credits

*Double Majors must complete **one course from each** of the following **three** concept cluster elective categories:*

❑ **Ecological and Evolutionary Framework** (3cr)
- Evolution (BIOL 222)
- Ecology (R120:280)
- Animal Behavior (R120:282)
- Plant Ecology (R120:370)

❑ **Molecular and Cellular Mechanisms** (3cr)
- Genetics (R120:352)
- Cell Biology (R120:355)
- Molecular Biology (R120:356)
- Biochemistry (R120:360)

❑ **The Functional Organism** (4cr)
- Plant Kingdom (R120:211)
- Biology of Seed Plants (R120:230)
- Plant Physiology (R120:330)
- General Microbiology (R120:335)
- Mammalian Physiology (R120:340)
- Developmental Biology & Lab (R120:342/343)

LABORATORY/FIELD EXPERIENCE ~ 7 Credits

*Double Majors must complete **at least one 4-credit lab** in this category:*

❑ **Four Credit Laboratories** (4cr)
- Plant Kingdom (R120:211)
- Biology of Invertebrates (R120:227)
- Biology of Seed Plants (R120:230)
- Comparative Vertebrate Anatomy (R120:285)
- Taxonomy of Vascular Plants (R120:311)
- Mycology (R120:313)
- Animal Parasites & Parasitology Lab (R120:325/326)

Four Credit Laboratories (cont.)
- Plant Physiology (R120:330)
- General Microbiology (R120:335)
- Mammalian Physiology (R120:340)
- Developmental Biology & Lab (R120:342/343)
- Microanatomy of Tissues (R120:405)
- Plant Growth and Development (R120:430)
- Cell Physiology and Imaging (BIOL 451)

❑ **Three Credit Laboratories** (3cr)
- Ecology of Birds (R120:328)
- Field Plant Ecology (R120:371)
- Field Ecology (R120:380)

Three Credit Laboratories (cont.)
- Field Animal Ecology (R120:381)
- Analytical Field Ecology (BIOL 475)
- Tropical Field Ecology (R120:485) - [2cr]

BIOLOGY-CHEMISTRY ELECTIVES ~ 6 Credits [3 Biology & 3 Chemistry Elective Credits]

The courses listed below may be used to complete the 35 credits of biology course work , once approved by the Advisor:

- Insects and Human Society (BIOL 225)
- Neurobiology (BIOL/R120:346)
- Human Ecology (R120:365)
- Physiology and Medicine (Math 371)
- Population Biology (Math 372)
- Introduction to Math Biology (Math 373)
- Conservation Biology (BIOL 375)
- Biological Ultrastructure (R120:403)
- Light & Elect Microscope (R120:404)
- Biological Invasions (R120:422)
- Comp Neuroscience (Math 430)
- Immunology (R120:443)
- Endocrinology (R120:445)
- Cell & Systems Neurosci (Biol 447)
- Neuropathophysiology (BIOL 448)
- Cell Physiology & Imaging (Biol 451)
- Cellular Biophysics-*4cr* (R120:451)
- Molecular Biotechnology-*4cr* (R120:452)
- Molecular Cell Biology (R120:455)
- Ecological Physiology (R120:471)
- Systems Ecology (R120:487)
- Problems in Biology-*6cr* (BIOL 491/492)