

Fiscal Unit/Academic Org	Introductory Biology - D0326
Administering College/Academic Group	Biological Sciences
Co-administering College/Academic Group	Arts And Sciences
Semester Conversion Designation	Re-envisioned with significant changes to program goals and/or curricular requirements (e.g., degree/major name changes, changes in program goals, changes in core requirements, structural changes to tracks/options/courses)
Current Program/Plan Name	Biology
Proposed Program/Plan Name	Biology
Program/Plan Code Abbreviation	BIOLOGY-BA
Current Degree Title	Bachelor of Arts

Credit Hour Explanation

Program credit hour requirements		A) Number of credit hours in current program (Quarter credit hours)	B) Calculated result for 2/3rds of current (Semester credit hours)	C) Number of credit hours required for proposed program (Semester credit hours)	D) Change in credit hours
Total minimum credit hours required for completion of program		45	30.0	32	2.0
Required credit hours offered by the unit	Minimum	10	6.7	4	2.7
	Maximum	10	6.7	4	2.7
Required credit hours offered outside of the unit	Minimum	35	23.3	28	4.7
	Maximum	35	23.3	28	4.7
Required prerequisite credit hours not included above	Minimum	62	41.3	32	9.3
	Maximum	64	42.7	38	4.7

Explain any change in credit hours if the difference is more than 4 semester credit hours between the values listed in columns B and C for any row in the above table

Rationale for change in credit hours (Biology BS).

The number of credit hours offered outside the unit and required for the Biology major increased by 4.7 units. The 4.7 increase is the sum of the reduction of credit hours (2.7 units) in the Integrated Biology core courses and the increase in units required for the degree (an increase of 2 units compared with the calculations based on the quarter program). The reduction in courses offered by the unit has to be offset by an increase in courses taken outside the unit.

The number of credit hours in prerequisite courses (offered outside the unit) decreased by 9.3-10.7 units. This decrease is due to a reduction in the requirements for math, chemistry, and physics incorporated into the BA program.

Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

Program Learning Goals

- Goal #1: Explain major biological concepts and discuss how these are connected with various areas of the biological and physical sciences.
- 1.1 Describe the hierarchical relationship between structure and function at all levels: molecular, cellular, and organismic.
- 1.2 Diagram, explain, and contrast the major cellular processes in Archaea, bacteria, and eukaryotes.
- 1.3 Differentiate types of biological macromolecules and compare their contributions to cellular structure and function.
- 1.4 Apply the principles of genetics and describe the flow of genetic information.
- 1.5 Explain changes in organisms through time by applying the principles of evolutionary biology.
- 1.6 Demonstrate how relationships among living things are understood through taxonomy and phylogenetic analysis.
- 1.7 Describe ecological relationships between organisms and their environment.
- Goal #2: Demonstrate problem solving, analytical, and communication skills that will provide the foundation for lifelong learning and career development.
- 2.1 Apply the scientific process, including designing and conducting experiments and testing hypotheses.
- 2.2 Use laboratory equipment, employ safe laboratory practices, and adapt tools such as laboratory notebooks and spreadsheets to organize and analyze data associated with scientific processes.
- 2.3 Retrieve information from the life sciences literature; read, understand, and critically review scientific papers.
- 2.4 Prepare oral and written reports following a recognized scientific format.
- 2.5 Develop an awareness of the careers and professions that rely on knowledge of biological sciences.
- Goal #3: Value biology as an integral part of society and everyday life.
- 3.1 Integrate biological knowledge in discussions of society and everyday life

Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

Is this a degree program (undergraduate, graduate, or professional) or major proposal? Yes

Does the degree program or major have an assessment plan on file with the university Office of Academic Affairs? Yes

Summarize how the program's current quarter-based assessment practices will be modified, if necessary, to fit the semester calendar.

No modification will be necessary.

Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

Program Specialization/Sub-Plan Name	Pre-health Professions (Existing)
Program Specialization/Sub-Plan Goals	<ul style="list-style-type: none"> • This specialization provides a broad preparation in the biological sciences and ensures that graduates are prepared to enter doctoral programs at most professional schools.
Program Specialization/Sub-Plan Name	Forensic Biology (Existing)
Program Specialization/Sub-Plan Goals	<ul style="list-style-type: none"> • This specialization provides a diverse preparation in biological sciences with special attention to genetics, molecular biology, and human biology.
Program Specialization/Sub-Plan Name	Life Sciences Education (Existing)

Program Specialization/Sub-Plan Goals

- This specialization provides a broad exposure to biological sciences and coincides with the recommended coursework for students entering Ohio State's Masters in Education Program in science and technology.

Pre-Major

Does this Program have a Pre-Major? No

Attachments

- semester conversion directors letter_3.doc
(Letter from Program-offering Unit. Owner: Stetson, David Leete)
- BioBSBABingo_Quart.pdf
(Quarter Advising Sheet(s). Owner: Stetson, David Leete)
- Biology BA cover letter.doc: NMS Division of Arts and Sciences cover letter
(Letter from the College to OAA. Owner: Andereck, Claude David)
- 11BiologyReq_BA_Old&New_4.pdf
(List of Semester Courses. Owner: Stetson, David Leete)
- BioBABingo_Sem_4.pdf
(Semester Advising Sheet(s). Owner: Stetson, David Leete)
- 15BiologyBA curriculum map_4.pdf
(Curricular Map(s). Owner: Stetson, David Leete)
- ProgRationale_TransitionPol_BiologyBA_4.pdf
(Program Rationale Statement. Owner: Stetson, David Leete)
- FourYearPlanBA_4.pdf
(Other Supporting Documentation. Owner: Stetson, David Leete)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Stetson,David Leete	04/25/2011 04:47 PM	Submitted for Approval
Approved	Misicka,Matthew Alan	04/25/2011 05:04 PM	Unit Approval
Revision Requested	Andereck,Claude David	04/26/2011 01:54 PM	College Approval
Submitted	Stetson,David Leete	06/01/2011 03:32 PM	Submitted for Approval
Approved	Misicka,Matthew Alan	06/02/2011 08:46 AM	Unit Approval
Revision Requested	Andereck,Claude David	06/02/2011 01:30 PM	College Approval
Submitted	Stetson,David Leete	06/06/2011 08:43 AM	Submitted for Approval
Approved	Stetson,David Leete	06/06/2011 10:19 AM	Unit Approval
Approved	Andereck,Claude David	06/06/2011 01:21 PM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	06/23/2011 03:36 PM	ASCCAO Approval
Submitted	Stetson,David Leete	07/01/2011 10:18 AM	Submitted for Approval
Approved	Misicka,Matthew Alan	07/01/2011 10:40 AM	Unit Approval
Revision Requested	Andereck,Claude David	07/01/2011 11:31 AM	College Approval
Submitted	Stetson,David Leete	07/01/2011 11:55 AM	Submitted for Approval
Approved	Misicka,Matthew Alan	07/05/2011 08:38 AM	Unit Approval
Approved	Andereck,Claude David	07/05/2011 11:46 AM	College Approval
Pending Approval	Nolen,Dawn Jenkins,Mary Ellen Bigler Meyers,Catherine Anne Vankeerbergen,Bernadette Chantal Hanlin,Deborah Kay	07/05/2011 11:46 AM	ASCCAO Approval

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June 6, 2011

Larry Krissek
Chair, Arts and Sciences CCI

Dear Larry:

It is a pleasure to forward to you for consideration by the CCI and the Sciences Subcommittee the proposal for the Bachelor of Arts major in Biology under semesters. The program has been modified through the lowering of the mathematics level relative to the BS and the quarter version of the BA, a reduction in the sophomore level Integrated Biology to a single semester, removing the sophomore colloquium research topic survey course, and modestly increasing the total credit hours required for the major relative to a straight conversion. The lessening of the quantitative skills requirement for this program, while maintaining a high level of science content, is designed to make it an attractive major program for a wider audience of students than at present.

Beyond my own review of the documents, the proposal has been discussed by colleagues from other NMS units at meetings on April 26 and June 2, 2011. Feedback from these discussions has been incorporated in the proposal.

If you have any questions, I would be happy to address them.

Sincerely,



David Andereck
Professor of Physics
Associate Dean of Natural and Mathematical Sciences, College of Arts and Sciences



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May 31, 2011

Assoc. Dean Dave Andereck
Natural and Mathematical Sciences
College of Arts and Sciences

Dear Dean Andereck:

The Center for Life Sciences Education (CLSE) is pleased to present materials supporting our plans for converting our undergraduate degree programs from quarters to semesters.

The CLSE offers two degree programs:

- BS in Biology
- BA in Biology

In addition, we are proposing a new undergraduate minor in biology.

The biology major (BS and BA) were reviewed in 2007. The 2007 review incorporated student feedback and faculty input from the Columbus and regional campuses. This semester conversion proposal is based on that review, with the additional changes noted in the program rationale. The changes we propose and the addition of the new biology minor are in response to:

- Student feedback obtained in the course of outcomes assessment
- Advisor feedback solicited during regular meetings as well as one meeting focused on discussion of the biology major
- Biology 401 and 402 faculty feedback
- Recent reports that have proposed major changes in the way courses and curricula are structured in biology programs around the country

We are committed to protecting the academic progress of our students and ensuring that no biology student is penalized by the transition from quarters to semesters. Because of the flexibility built in to the biology major requirements, we rely heavily on the intentional and purposeful advising provided by our advising staff to ensure that this promise is kept.

The advisors for the biology major are housed in the CLSE. We currently have one full-time biology advisor, one part-time biology advisor (who also coordinates the Biological Sciences Scholars program), one faculty advisor (Dr. Glen Needham from EEOB and Entomology), and three faculty Honors advisors (Dr. Helen Chamberlin from Molecular Genetics, and Drs. W. Mitch Masters and David Stetson from EEOB). Together these six people, only one of whom is a full-time biology advisor, coordinate the advising services for nearly 2000 biology majors. We have approval to add one more staff advisor to meet the demand of the increasing numbers of biology majors and semester conversion, and we will fill that position this summer.

The CLSE draws on faculty from the core biological science departments: Biochemistry, EEOB, Microbiology, and Molecular Genetics. Dr. Stetson and I are the only tenure-track faculty associated with the CLSE, with our tenure residing in EEOB and Biochemistry, respectively. We do not have a defined faculty to whom we can turn for a vote on the proposed conversion. We asked the faculty members who reviewed and proposed revisions to the biology in 2007 to review the semester conversion plans. These faculty unanimously supported the conversion plans. We also are requesting concurrences from the core biological sciences departments in the College of Arts and Sciences (Biochemistry, Evolution, Ecology, and Organismal Biology, Microbiology, and Molecular Genetics) and from the College of Education and Human Ecology. Those concurrences will be attached to this proposal as they are received.

We recommend approval of the attached semester conversion plans.

Regards,



Caroline Breitenberger
Director, Center for Life Sciences Education



Dave Stetson
Associate Director, CLSE

Program Rationale (Biology BA).

The biology major was last reviewed and extensively revised in 2007. The key features of the revised biology major, an Integrated Biology core course followed by discrete specialization areas and student-selected electives, have been retained in the major as we transition to semesters. The changes in the re-envisioned BA program under semesters include reductions in math, organic chemistry, and physics prerequisites, a reduction in the length of the Integrated Biology course, and a small increase in the total number of hours required for the major.

Reduction in prerequisites for the BA. At the time of the last review of the biology major, the existing distinction between the BS and the BA was reaffirmed, namely one less Math prerequisite (Math 152 is not required in the current BA). Perhaps due to the relatively small difference in requirements between the BA and the BS, very few biology majors graduate with a BA. We would like to encourage more students to consider a BA in Biology, and it is likely that reducing the gauntlet of science and math prerequisites in the major will adequately prepare students for science-related careers without adversely affecting their progress through the major requirements. To this end, we have further reduced the math prerequisites for the major (Math 1148 & 1149 or 1150 will now be the minimum for the Biology BA). This level of math is sufficient to meet the Biology 3401 prerequisites and the requirements for many courses in the specialization areas. The organic chemistry lecture requirement has been reduced to the one-semester offering (Chem 2310), and we have eliminated the requirement for laboratories in organic chemistry. Finally, we have eliminated the requirement for a second semester of physics (thermodynamics are covered in the first semester of physics, and this will provide sufficient physics for students who do not plan to pursue significant further training in the health professions or in a graduate program in the sciences). This preparation would be suitable for careers in law, business, education, science journalism, scientific illustration, fields affiliated with health care, etc. Students will be advised that appropriate preparation for biological research careers and professional health degrees requires the BS-level math, organic chemistry, and physics prerequisites.

Reduction in length of Integrated Biology course. The Integrated Biology core courses in the biology major have been offered as a 2-course sequence (Biology 401 and 402) ever since the revised major was approved. Student assessment data indicate that students in this sequence feel that two courses are too much – they think they “get it” after the first course in the series. Faculty input and some assessment data suggest that a single quarter course is not enough, that students are just beginning to understand the interconnectedness between mathematics, chemistry, physics, and the overarching concepts in biology that are the focus of this sequence. A one-semester course might provide the happy middle. We will continue to monitor student attitudes and student learning outcomes to track the success of this slight reduction in the Integrated Biology core of the biology major.

The apparent reduction of credit hours is necessary because of the difference in credit hour definitions under quarters and semesters. In actuality, the semester course, Biology 3401 will be equivalent to Biology 401 plus half of Biology 402. Under quarters, Biology 401 and 402 were offered as two 5 credit courses because of the extensive out-of-class work that is required. Given the hours spent in class, the semester course meets the definition of a 4-unit course, and will be offered as such

Removed the requirement for “Sophomore Colloquium.” The 2007 biology major revision committee suggested a sophomore colloquium that would precede the Integrated Biology courses. This course was “designed to encourage students to learn to participate more fully in the process of discovery and to synthesize their learning more completely.” One of the primary reasons the Sophomore Colloquium requirement has not been enforced is staffing; however, it has become clear that the objectives of the

Sophomore Colloquium are being met through the Integrated Biology core courses, and thus the Sophomore Colloquium would be redundant. Implementation of the Integrated Biology courses resulted in courses that were more process-oriented and less content-oriented. Students receive instruction from faculty representing several different areas of biology in the 401-402 sequence; this will continue in the 3401 course under semesters. Many students are taking Biology 401-402 in their sophomore year, and thus getting the desired exposure to the breadth of biology early in their undergraduate career. One of the features of 401-402, which will be retained in 3401, is the invitation of a guest lecturer to class to talk about his/her research. The biology students write a paper about the guest lecture, integrating overarching themes of biology into their analysis of the research that was presented. Thus, the objective of learning about the process of discovery in the field of biology is being addressed as well. In essence, we are switching the credits required for this requirement to upper division hours, which better serve the individual student's specific needs.

Increase in number of hours required for the major. Biology majors are expected to acquire a breadth of experience in different areas of the life sciences (partly through the Integrated Biology core course and partly through their selection of elective courses), as well as depth in one particular area (through the specialization). In reviewing student course selections under the current Biology BS, it is clear that students who have exceeded the current 45 credit minimum often add experiences and breadth that are not evident in students who just reach the 45 hour minimum. To encourage this broader experience, we have added two more semester units to the minimum hours required for the major. The additional coursework would come exclusively from departments outside the Center for Life Sciences Education, where the biology major is housed.

Transition policy for the Biology BA semester conversion.

As indicated in the letter from the Director of the Center for Life Sciences Education, steps will be taken to ensure that the transition to semesters does not disrupt the academic progress of students who began their undergraduate studies under quarters. Special consideration will be given to appropriate and timely advising to ensure that Biology students can work with their advisor to develop efficient transition plans. In addition, the CLSE is developing a web site for biology major advising which will address semester conversion issues, notify students when bridge courses are offered, and address the most frequent "what course should I take next?" questions. For the most part, the reduction in major prerequisites will not affect the BA students' preparation for and ability to take the same specialization and elective courses as BS students. Special attention will be given to alerting students to course prerequisites that might preclude BA students from taking certain biology major courses.

Potential transition issues. The obvious concerns that need to be addressed in the transition from quarter to semesters are:

- Prerequisite course sequences that span the quarter-to-semester transition
- Changes in prerequisites (for BA students specifically: discontinuing the organic chemistry lab requirement, changing from two quarters to a one-term organic chemistry lecture, and lowering the math prerequisite)
- Reduction in the Biology major core from a 2-course sequence to a single semester course
- An increase in total hours required for the degree (32 semester hours instead of 45 quarter hours)
- A need for increased access to advising resources by students as they develop individualized transition plans

There are likely to be relatively few transition issues related to the specialization areas, since many of the specializations rely on single courses that are being directly converted to semester versions. For any transition concerns that do arise in the specializations, we will depend on units outside CLSE to develop appropriate transition solutions, including bridge courses. The flexibility of the biology major allows for appropriate substitutions even under normal circumstances; biology advisors will continue to evaluate student plans individually and identify and recommend appropriate substitutions when deemed necessary to ensure a student's progress to degree.

Prerequisite course sequences. Chemistry and Physics 3-quarter sequences are transitioning to 2-semester sequences. We will rely on those departments to establish transition plans and offer appropriate bridge courses to those students who might be affected. Students who transfer from other programs within Ohio State and have completed higher-level courses in math, chemistry, and physics essentially equivalent to the prerequisites specified for the biology program (for example, students transferring from engineering) will be considered to have completed the prerequisites for biology, as is current practice.

Changes in prerequisites. Effective Au2012, we will allow students planning a BA in Biology to opt out of the current organic laboratory requirement and the Math 151 requirement. BA students who have taken the first quarter of organic chemistry, Chem 251, will be encouraged to complete the second term before the start of semesters, otherwise they will be expected to complete the equivalent of at least Chem 252, following the bridge program established by the Chemistry Department. BA students who have taken the first quarter of organic chemistry, Chem 251, and who wish to switch to the one-semester organic chemistry course will be granted permission to do so if Chemistry approves.

Reduction in biology core. For students who have taken Biology 401 but not 402 under quarters, a 1-unit bridge course is being developed that will be required of those students and provide an experience comparable to the one-semester Biology 3401.

Hours required for the degree. Hours required for graduation with the BS or BA in Biology will be those in effect at the time the student declares the major. For students enrolled at Ohio State declaring the major at any point prior to SU 2012, 45 quarter hours/30 semester hours will be required. The 32 unit minimum will be enforced for students who declare the Biology during or after SU 2012.

Biology major advising. Currently there are about 2000 students majoring in Biology, nearly a third of whom are Honors students. Biology majors are advised in the CLSE by 1 full-time staff advisor, one staff advisor who also coordinates the Biological Sciences Scholars program, and 4 faculty advisors, most of whom focus on Honors student advising. A new staff advisor has been requested to help with the increased advising demand during the transition to semesters.

Biology Major - Bachelor of Arts

	Courses required under quarters	Hours	Courses required under semesters	Units
Required supportive courses (do not count towards hours in the major)				
Introductory Biology	Biology 113 & 114, or 115H & 116H	10	Bio 1113 & 1114	8
Mathematics	Math 150 & 151	10	Math 1148 & 1149, or 1150	7 or 5
General Chemistry	Chem 121-123	15	Chem 1210 & 1220	10
Organic Chemistry	Chem 251 & 252	8	Chem 2310, or 2510 & 2520	4 or 8
Organic Chemistry Lab	Chem 245 & 246, or 254 & 255	4 or 6	<i>will no longer be required</i>	0
Physics	Physics 112-113	15	Physics 1200 or 1250	5
Total Prereqs for BA:		62 - 64		32 - 38
Courses in the major				
Core Course				
Integrated Biology	Biology 401 and 402	10	Biology 3401	4
Specializations				
Education in Life Sciences				
Required Courses				
Biochemistry	Biochem 511, or 613 & 614	5 or 8	Biochem 4511, or 5613 & 5614	4 or 6
General Genetics	MolGen 500, or 605 & 606	5 or 6	MolGen 4500 or 5606	3 or 4
Evolution	EEOB 400	5	EEOB 3310	4
Microbiology	Micro 509, or 520 & 521	5 or 10	Micro 4000 or 4100	4 or 5
Plant Biology	PCMB 300	5	MolGen 3300	3
Additional Coursework (any 2)				
General Entomology	Entomol 500	5	Entomology 3000	3
Introduction to Ornithology	EEOB 322	5	EEOB 2220	2
Diversity and Systematics	EEOB 405.01	5	EEOB 3320	3
Ichthyology	EEOB 621	5	EEOB 5430 or 5930	1.5 or 3
Vertebrate Biology	Not listed	0	EEOB 4210	2 or 4
Mammalogy	EEOB 625	5	EEOB 4220	2 or 4
Invertebrates	Not offered	0	EEOB 4230	1 or 2
DNA Fingerprinting Workshop in CPS	MolGen 591	2	MolGen 4591S	1
Forensic Biology				
Recommended Additional Prerequisite				
Intro Physical Anthropology	Anthro 200	5	Anthro 2200	4
Required Courses				
Biochemistry	Biochem 511, or 613 & 614	5 or 8	Biochem 4511, or 5613 & 5614	4 or 6
Genetics	MolGen 500, or 605 & 606	5 or 6	MolGen 4500 or 5606	3 or 4
Additional Coursework (any 3)				
	Anthropology 603.01	5	Anthropology 5607	3
Biological Anthropology of the Human Skeleton	Anthropology 603.02	5	Anthropology 5608	3
	Anthropology 603.03	5	Anthropology 5609	3
	Anthropology 603.04	5	Anthropology 5610	3
Forensic Anthropology	Anthropology 640.04	5	Anthropology 5644	3
Biochemistry	Biochem 615	4	Biochem 5615	3
Molecular Lab	MolGen 601	5	MolGen 5601	4
Cellular Biology	MolGen 607	3	MolGen 5607	3
Molecular Biology	MolGen 701	3	MolGen 6701	4
Microbiology	Micro 509, or 520 & 521	5 or 10	Micro 4000 or 4100	4 or 5
DNA Fingerprinting	MolGen 591	2	MolGen 4591S	1
Pre-Health Professions				
Recommended Additional Prerequisite				
Organic Chemistry	Chem 253	4		0
Required Course(s)				
Genetics	MolGen 500, or 605 & 606	5 or 6	MolGen 4500 or 5606	3 or 4
Additional Coursework (any 4)				
Biochemistry	Biochem 511, or 613 & 614	5 or 8	Biochem 4511, or 5613 & 5614	4 or 6
Evolution	EEOB 400	5	EEOB 3310	4
Microbiology	Micro 509, or 520 & 521	5 or 10	Micro 4000 or 4100	4 or 5
Cellular Biology	EEOB 415	4	EEOB 3510 or MolGen 5607	3
Vertebrate Histology	EEOB 630	5	EEOB 3520	1.5
Human Anatomy	Anat 200	6	Anat 2199, or 200, or EEOB 2510	3
Comparative Anatomy	EEOB 512	2	EEOB 4510	3
Physiology	PhysioCB 311 & 312, or 601 & 602, or EEOB 410	10	PhysioCB 311 & 312, or 601 & 602, or EEOB 2520, or 4520	3
Elective Courses				
	Core, specialization, and elective courses must total 45		Core, specialization, and elective courses must total 32 semester	
Minimum total hours/units in major				
	45		32	
	Honors versions of courses may be substituted in all		Honors versions of courses may be substituted in all cases; no	

**Biology Major Program
Bachelor of Arts
Pre-Health Professions**

Name _____
Semester of Graduation _____

Required Supporting Courses

Biology (2 courses)

- Biology 1113 (4)
- Biology 1114 (4)
- _____ Substitution
- Waived

Chemistry (2 courses)

- Chemistry 1210 or 1610 or 1910H (5)
- Chemistry 1220 or 1620 or 1920H (5)
- _____ Substitution
- Waived

Mathematics

- Math 1148 and 1149 (7), or 1150 (5)
- _____ Substitution
- Waived

Organic Chemistry

- Chemistry 2310 (4), or 2510 and 2520 (8)
- _____ Substitution
- Waived

Physics (1 course)

- Physics 1200 or 1250‡ (5)
- _____ Substitution
- Waived

Core Course

- Biology 3401 (4)

Pre-Health Professions Specialization

Required

- MolGen 4500 (3) or 5606 (4)

Additional Coursework (at least 4)

- Biochem 4511 (4), or 5613 and 5614 (6)
- EEOB 3310 (4)
- Micro 4000† (4) or 4100† (5)
- EEOB 3510 or MolGen 5607 (3)
- EEOB 3520† (1.5)
- Anatomy 2300.01† (4) or 3300† (5),
or EEOB 2510† (3)
- EEOB 4510† (3)
- PhysioCB 3101 and 3102 (6), or EEOB 2520 (3),
or EEOB 4520 (3)

Electives

Total Semester Units

Core, specialization, and elective courses must total 32 semester units, and must include three laboratory courses. Honors versions of courses substitute freely. Electives must be at the 2000 level or above. Up to 3 credit hours of research, individual study, or internship may be counted toward the major and, with approval of a major advisor, may be counted as a laboratory course. *Note: At least 25 of the 32 semester units must be courses in Biochemistry, Biology, EEOB, Microbiology, or Molecular Genetics, and courses outside these departments must be pre-approved by a Biology advisor.

Advisor (Printed) _____

Advisor (Signature) _____

Date _____

†Courses within the major with a laboratory component.

‡Physics 1250 requires Math 1152 or 1156.

Biology Major Program
Bachelor of Arts
Forensic Biology

Name _____
Semester of Graduation _____

Required Supporting Courses

Biology (2 courses)

- Biology 1113 (4)
- Biology 1114 (4)
- _____ Substitution
- Waived

Chemistry (2 courses)

- Chemistry 1210 or 1610 or 1910H (5)
- Chemistry 1220 or 1620 or 1920H (5)
- _____ Substitution
- Waived

Mathematics

- Math 1148 and 1149 (7), or 1150 (5)
- _____ Substitution
- Waived

Organic Chemistry

- Chemistry 2310 (4), or 2510 and 2520 (8)
- _____ Substitution
- Waived

Physics (1 course)

- Physics 1200 or 1250‡ (5)
- _____ Substitution
- Waived

Additional Prerequisite (1 course)

- Anthropology 2200 (4) (for higher level Anthropology courses if taken in the specialization)

Core Course

- Biology 3401 (4)

Forensic Biology Specialization

Required

- MolGen 4500 (3) or 5606 (4)
- Biochem 4511 (4),
or 5613 and 5614 (6)

Additional Coursework (at least 3)

- Anthropology 5607 (3)
- Anthropology 5608 (3)
- Anthropology 5609 (3)
- Anthropology 5610 (3)
- Anthropology 5644 (3)
- Biochem 5615 (3)
- MolGen 5601† (4)
- MolGen 5607 (3)
- MolGen 6701 (4)
- Micro 4000† (4) or 4100† (5)
- MolGen 4591S or equivalent (1)

* See note below -
at most 7 units from
Anthropology may
be counted towards
the Biology major

Electives (At least one elective course must include a laboratory component.)

Total Semester Units

Core, specialization, and elective courses must total 32 semester units, and must include three laboratory courses. Honors versions of courses substitute freely. Electives must be at the 2000 level or above. Up to 3 credit hours of research, individual study, or internship may be counted toward the major and, with approval of a major advisor, may be counted as a laboratory course. *Note: At least 25 of the 32 semester units must be courses in Biochemistry, Biology, EEOB, Microbiology, or Molecular Genetics, and courses outside these departments must be pre-approved by a Biology advisor.

Advisor (Printed) _____

Advisor (Signature) _____

Date _____

†Courses within the major with a laboratory component.
‡Physics 1250 requires Math 1152 or 1156.

Biology Major Program
Bachelor of Arts
Education in Life Sciences

Name _____

Semester of Graduation _____

Required Supporting Courses

Biology (2 courses)

- Biology 1113 (4)
- Biology 1114 (4)
- _____ Substitution
- Waived

Chemistry (2 courses)

- Chemistry 1210 or 1610 or 1910H (5)
- Chemistry 1220 or 1620 or 1920H (5)
- _____ Substitution
- Waived

Mathematics

- Math 1148 and 1149 (7), or 1150 (5)
- _____ Substitution
- Waived

Organic Chemistry

- Chemistry 2310 (4), or 2510 and 2520 (8)
- _____ Substitution
- Waived

Physics (1 course)

- Physics 1200 or 1250† (5)
- _____ Substitution
- Waived

Core Course

- Biology 3401 (4)

Education in Life Sciences Specialization

Required (5 courses)

- Biochem 4511 (4),
or 5613 and 5614 (6)
- MolGen 4500 (3) or 5606 (4)
- EEOB 3310 (4)
- Micro 4000† (4) or 4100† (5)
- MolGen 3300† (3)

Additional Coursework (at least 2)

- EEOB 2220 (2)
- EEOB 3320 (*strongly recommended*)† (3)
- EEOB 4210 (2 or 4)
- EEOB 4220 (2 or 4)
- EEOB 4230 (2 or 4)
- EEOB 5430† or 5930† (1.5 or 3)
- Entomology 3000† (3)
- MolGen 4591S or equiv. (1)

Electives

Total Semester Units

Core, specialization, and elective courses must total 32 semester units, and must include three laboratory courses. Honors versions of courses substitute freely. Electives must be at the 2000 level or above. Up to 3 credit hours of research, individual study, or internship may be counted toward the major and, with approval of a major advisor, may be counted as a laboratory course. *Note: At least 25 of the 32 semester units must be courses in Biochemistry, Biology, EEOB, Microbiology, or Molecular Genetics, and courses outside these departments must be pre-approved by a Biology advisor.

Advisor (Printed) _____

Advisor (Signature) _____

Date _____

†Courses within the major with a laboratory component.

‡Physics 1250 requires Math 1152 or 1156.

**BIOLOGY MAJOR PROGRAM APPROVAL FORM
PRE-HEALTH SPECIALIZATION**

Name _____ BS _____ BA _____

Quarter to Graduate _____

REQUIRED PREREQUISITES

BIOLOGY - ONE SEQUENCE

- Biology 113 & 114
- Biology H115 & H116
- Substitution _____
- Waived

CHEMISTRY - TAKE ALL 3 COURSES

- Chem 121 & 122 & 123
- Chem H201 & H202 & H203
- Substitution _____
- Waived

MATHEMATICS

- Math 152
- Substitution _____
- Waived

ADVANCED CHEMISTRY - COMPLETE 4 COURSES

- Chem 251
- Chem 252
- Chem 245 OR 254
- Chem 246 OR 255
- Substitution _____
- Waived

PHYSICS - COMPLETE 1 SEQUENCE

- Physics 111 & 112 & 113
- Physics 131 & 132 & 133
- Substitution _____
- Waived

Suggested prerequisite (not required).

- Chem 253

CORE COURSES:

INTEGRATED BIOLOGY

- | | Hours | _____ |
|--------------------------|-----------------|-------|
| <input type="checkbox"/> | Biology 401 and | |
| <input type="checkbox"/> | Biology 402 | |
| <input type="checkbox"/> | Substitution | _____ |
| <input type="checkbox"/> | Waived | |

SOPHOMORE COLLOQUIUM

- | | Hours | _____ |
|--------------------------|-----------------|-------|
| <input type="checkbox"/> | Biology 320 or | |
| <input type="checkbox"/> | Biochem H200 or | |
| <input type="checkbox"/> | Mol Gen H220 | |
| <input type="checkbox"/> | Substitution | _____ |
| <input type="checkbox"/> | Waived | |

PRE-HEALTH PROFESSIONS SPECIALIZATION

REQUIRED:

- Mol Gen 500 or
- Mol Gen 605 and 606.

ELECTIVES: Complete at least 4 courses from the following list:

- | | | | |
|--------------------------|------------------------------|--------------------------|--------------------------------|
| <input type="checkbox"/> | Biochem 511 or Biochem 613 | <input type="checkbox"/> | EEOB 630 |
| <input type="checkbox"/> | Biochem 614 | <input type="checkbox"/> | EEOB 410 or Anatomy 200 |
| <input type="checkbox"/> | EEOB 400 | <input type="checkbox"/> | Physiocrb 311 or Physiocrb 601 |
| <input type="checkbox"/> | Micrbiol 509 or Micrbiol 520 | <input type="checkbox"/> | Physiocrb 312 or Physiocrb 602 |
| <input type="checkbox"/> | Micrbiol 521 | | |
| <input type="checkbox"/> | EEOB 415 | | |

A minimum of 45 hours or upper division (300 level or above, not including 591 or 597) biological sciences are required for the major, with at least 35 hrs from the following areas:

Biology
Biochemistry
EEOB
Microbiology
Molecular Genetics
Plant Biology

Independent Study, e.g. Biol 699 or H783, can be included to a maximum of 5 hours, and may be counted towards the laboratory/data analysis component.

Five courses in the major must have a laboratory or data analysis component (circle).

ANATOMY 200
BIOCHEM 521, 693, 699, 706, 708, 710, H783
BIOLOGY 693, 699, H783
CHEM 245, 246, 254, 255
EEOB 322, 405.02, 413.03, 440, 470, 503.02, 505, 510, 512, 611, 620,
621, 622, 625, 626, 630, 647, 651, 652, 653, 655, 657,
661, 671, 672, 674, 693, 699, 713, 714.02, 720, 730, 741.02, H783
ENTOMOL H444, 460, 462, 500, 611, 612, 621, 623, 631, 641, 650,
660, 661, 662, 670, 693, 699, H783
MICRBIOL 509, 520, 521, 522, 524.02, 581, 610, 629 (AU90-WI08),
636.02, 655, 693, 699, 723.02, 750, H783
MOL GEN H500, 601, 602, 650, 693, 699, H783
PLNT BIO 300, 402, 604, 608.02, 643, 693, 699, H783
Substitution _____
Waived

Comments:

Major GPA _____

Total Major Hours _____

ADVISOR APPROVAL

FOR EXCEPTIONS FROM MAJOR:

Signature

CLSE Director or Assoc. Director

Date

Date

Last updated 4/1/2009

**BIOLOGY MAJOR PROGRAM APPROVAL FORM
FORENSIC BIOLOGY SPECIALIZATION**

Name _____ BS _____ BA _____

Quarter to Graduate _____

REQUIRED PREREQUISITES

BIOLOGY - ONE SEQUENCE

- Biology 113 & 114
- Biology H115 & H116
- Substitution _____
- Waived

CHEMISTRY - TAKE ALL 3 COURSES

- Chem 121 & 122 & 123
- Chem H201 & H202 & H203
- Substitution _____
- Waived

MATHEMATICS

- Math 152
- Substitution _____
- Waived

ADVANCED CHEMISTRY - COMPLETE 4 COURSES

- Chem 251
- Chem 252
- Chem 245 OR 254
- Chem 246 OR 255
- Substitution _____
- Waived

PHYSICS - COMPLETE 1 SEQUENCE

- Physics 111 & 112 & 113
- Physics 131 & 132 & 133
- Substitution _____
- Waived

Suggested prerequisite (not required).

- Anthrop 200

CORE COURSES:

INTEGRATED BIOLOGY

- | | Hours | _____ |
|--------------------------|-----------------|-------|
| <input type="checkbox"/> | Biology 401 and | |
| <input type="checkbox"/> | Biology 402 | |
| <input type="checkbox"/> | Substitution | _____ |
| <input type="checkbox"/> | Waived | |

SOPHOMORE COLLOQUIUM

- | | Hours | _____ |
|--------------------------|-----------------|-------|
| <input type="checkbox"/> | Biology 320 or | |
| <input type="checkbox"/> | Biochem H200 or | |
| <input type="checkbox"/> | Mol Gen H220 | |
| <input type="checkbox"/> | Substitution | _____ |
| <input type="checkbox"/> | Waived | |

FORENSIC BIOLOGY SPECIALIZATION

Required:

- Biochem 511 or 613 & 614
- Mol Gen 500, or 605 & 606

Electives: Complete at least three additional courses from the following list:

- | | | |
|--------------------------|--|---|
| <input type="checkbox"/> | Anthrop 603.01 or 603.02 or 603.03 or 603.04 | |
| <input type="checkbox"/> | Anthrop 640.04 | <input type="checkbox"/> Mol Gen 607 |
| <input type="checkbox"/> | Biochem 615 | <input type="checkbox"/> Mol Gen 701 |
| <input type="checkbox"/> | Micrbiol 509 or 520 & 521 | <input type="checkbox"/> Biochem 591 or Micrbiol 591 or |
| <input type="checkbox"/> | Mol Gen 601 | <input type="checkbox"/> Mol Gen 591 |

A minimum of 45 hours or upper division (300 level or above, not including 591 or 597) biological sciences are required for the major, with at least 35 hrs from the following areas:

Biology
Biochemistry
EEOB
Microbiology
Molecular Genetics
Plant Biology

Independent Study, e.g. Biol 699 or H783, can be included to a maximum of 5 hours, and may be counted towards the laboratory/data analysis component.

Five courses in the major must have a laboratory or data analysis component (circle).

ANATOMY 200
BIOCHEM 521, 693, 699, 706, 708, 710, H783
BIOLOGY 693, 699, H783
CHEM 245, 246, 254, 255
EEOB 322, 405.02, 413.03, 440, 470, 503.02, 505, 510, 512, 611, 620,
621, 622, 625, 626, 630, 647, 651, 652, 653, 655, 657,
661, 671, 672, 674, 693, 699, 713, 714.02, 720, 730, 741.02, H783
ENTOMOL H444, 460, 462, 500, 611, 612, 621, 623, 631, 641, 650,
660, 661, 662, 670, 693, 699, H783
MICRBIOL 509, 520, 521, 522, 524.02, 581, 610, 629 (AU90-WI08),
636.02, 655, 693, 699, 723.02, 750, H783
MOL GEN H500, 601, 602, 650, 693, 699, H783
PLNT BIO 300, 402, 604, 608.02, 643, 693, 699, H783
Substitution _____
Waived

Comments:

Major GPA _____

Total Major Hours _____

ADVISOR APPROVAL

FOR EXCEPTIONS FROM MAJOR:

Signature

CLSE Director or Assoc. Director

Date

Date

Last updated 4/1/2009

**BIOLOGY MAJOR PROGRAM APPROVAL FORM
LIFE SCIENCES EDUCATION SPECIALIZATION**

Name _____ BS _____ BA _____

Quarter to Graduate _____

REQUIRED PREREQUISITES

BIOLOGY - ONE SEQUENCE

- Biology 113 & 114
- Biology H115 & H116
- Substitution _____
- Waived

CHEMISTRY - TAKE ALL 3 COURSES

- Chem 121 & 122 & 123
- Chem H201 & H202 & H203
- Substitution _____
- Waived

MATHEMATICS

- Math 152
- Substitution _____
- Waived

ADVANCED CHEMISTRY - COMPLETE 4 COURSES

- Chem 251
- Chem 252
- Chem 245 OR 254
- Chem 246 OR 255
- Substitution _____
- Waived

PHYSICS - COMPLETE 1 SEQUENCE

- Physics 111 & 112 & 113
- Physics 131 & 132 & 133
- Substitution _____
- Waived

CORE COURSES:

INTEGRATED BIOLOGY

- Hours _____
- Biology 401 and
- Biology 402
- Substitution _____
- Waived

SOPHOMORE COLLOQUIUM

- Hours _____
- Biology 320 or
- Biochem H200 or
- Mol Gen H220
- Substitution _____
- Waived

LIFE SCIENCES EDUCATION SPECIALIZATION

Required:

- BIOCHEM 511
- EEOB 400
- MICRBIOL 509
- MOL GEN 500
- PLNT BIO 300

Electives: Complete at least two courses from the following list:

- EEOB 322
- EEOB 405.01
- EEOB 621
- EEOB 625
- ENTOMOL 500
- BIOCHEM 591
- MICRBIOL 591
- MOL GEN 591

A minimum of 45 hours or upper division (300 level or above, not including 591 or 597) biological sciences are required for the major, with at least 35 hrs from the following areas:

- Biology
- Biochemistry
- EEOB
- Microbiology
- Molecular Genetics
- Plant Biology

Independent Study, e.g. Biol 699 or H783, can be included to a maximum of 5 hours, and may be counted towards the laboratory/data analysis component.

Five courses in the major must have a laboratory or data analysis component (circle).

- ANATOMY 200
- BIOCHEM 521, 693, 699, 706, 708, 710, H783
- BIOLOGY 693, 699, H783
- CHEM 245, 246, 254, 255
- EEOB 322, 405.02, 413.03, 440, 470, 503.02, 505, 510, 512, 611, 620, 621, 622, 625, 626, 630, 647, 651, 652, 653, 655, 657, 661, 671, 672, 674, 693, 699, 713, 714.02, 720, 730, 741.02, H783
- ENTOMOL H444, 460, 462, 500, 611, 612, 621, 623, 631, 641, 650, 660, 661, 662, 670, 693, 699, H783
- MICRBIOL 509, 520, 521, 522, 524.02, 581, 610, 629 (AU90-WI08), 636.02, 655, 693, 699, 723.02, 750, H783
- MOL GEN H500, 601, 602, 650, 693, 699, H783
- PLNT BIO 300, 402, 604, 608.02, 643, 693, 699, H783
- Substitution _____
- Waived

Comments:

Major GPA _____

Total Major Hours _____

ADVISOR APPROVAL

FOR EXCEPTIONS FROM MAJOR:

Signature

CLSE Director or Assoc. Director

Date

Date

Last updated 4/1/2009

	BA Biology	Pre-Health Professions			
Autumn I	ASC 1000	1			
	Math 1148	4		Total Credits	123.5
	GE Course	4			
	GE Course	3		Major Credits	33.5
	GE Course	3			
		15		†Major course with lab	
Spring I	Chem 1210	5			
	Biology 1113	4			
	Math 1149	4			
	GE Course	4			
		17			
Autumn II	Chem 1220	5			
	Biology 1114	4			
	GE Course	4			
	GE Course	3			
		16			
Spring II	Chem 2310	4			
	Biology 3401	4			
	GE Course	3			
	GE Course	3			
		14			
Autumn III	EEOB 3310	4			
	Molgen 4500	3			
	Physics 1200	5			
	Elective	3			
		15			
Spring III	Microbiol 4000†	4			
	EEOB 3510	3			
	EEOB 3520†	1.5			
	Elective	3			
	GE Course	3			
		14.5			
Autumn IV	Biochem 4511	4			
	EEOB 4510†	3			
	Elective	3			
	Elective	3			
	GE Course	3			
		16			
Spring IV	EEOB 3320	3			
	Major Elective	4			
	Elective	3			
	Elective	3			
	GE Course	3			
		16			

	BA Biology	Forensic Biology			
Autumn I	ASC 1000	1			
	Math 1148	4		Total Credits	122
	GE Course	4			
	GE Course	3		Major Credits	34
	GE Course	3			
		15		†Major course with lab	
Spring I	Chem 1210	5			
	Biology 1113	4			
	Math 1149	3			
	GE Course	4			
			16		
Autumn II	Chem 1220	5			
	Biology 1114	4			
	GE Course	4			
	GE Course	3			
			16		
Spring II	Chem 2310	4			
	Biology 3401	4			
	Elective	4			
	GE Course	3			
			15		
Autumn III	Anthro 2200	4			
	Physics 1200	5			
	Elective	3			
	GE Course	3			
			15		
Spring III	Molgen 4500	3			
	Microbiol 4000†	4			
	Anthro 5607	3			
	Elective	3			
	GE Course	3			
			16		
Autumn IV	Biochem 4511	4			
	Molgen 5601†	4			
	Molgen 5607	3			
	GE Course	3			
			14		
Spring IV	Molgen 6701	4			
	Molgen 4591S	1			
	Major Elective†	4			
	Elective	3			
	GE Course	3			
			15		

	BA Biology	Life Sciences Education		
Autumn I	ASC 1000	1		
	Math 1148	4		Total Credits 127
	GE Course	4		
	GE Course	3		Major Credits 32
	GE Course	3		
		15		†Major course with lab
Spring I	Chem 1210	5		
	Biology 1113	4		
	Math 1149	4		
	GE Course	4		
			17	
Autumn II	Chem 1220	5		
	Biology 1114	4		
	Elective	4		
	GE Course	4		
			17	
Spring II	Chem 2310	4		
	Biology 3401	4		
	Entomol 3000†	3		
	Elective	3		
	GE Course	3		
			17	
Autumn III	EEOB 3310	4		
	Physics 1200	5		
	Elective	3		
	GE Course	3		
			15	
Spring III	Molgen 4500	3		
	Microbiol 4000†	4		
	Elective	4		
	GE Course	3		
			14	
Autumn IV	Biochem 4511	4		
	Molgen 3300†	3		
	Elective	3		
	GE Course	3		
	GE Course	3		
			16	
Spring IV	EEOB 3320	3		
	Major Elective	4		
	Elective	3		
	Elective	3		
	GE Course	3		
			16	

Biology B.A. Major Requirements

Program Learning Goals*

	S	Course	S cr hr	Course Title	Comments	1.1 Structure and function	1.2 Cellular processes	1.3 Biomolecules	1.4 Genetics	1.5 Evolution	1.6 Taxonomy	1.7 Ecology	2.1 Scientific process	2.2 Lab skills	2.3 Life sciences literature	2.4 Oral and written reports	2.5 Life sci careers	3.1 Integrate
Required Prereq Courses (offered by the unit)		Biol 1113	4	Biological Sciences: Energy Transfer and Development	Prerequisite; some additional content	B	B	B	B	B			B	B	B	B	B	B
		Biol 1114	4	Biological Sciences: Form, Function, Diversity, and Ecology	Prerequisite; some additional content		B			B	B	B	B	B	B	B	B	B
Required Prerequisite Courses (offered outside the unit)		Chem 1210	5	General Chemistry		B		B					B	B		B		
		Chem 1220	5	General Chemistry		B		B					B	B		B		
		Chem 2310	4	Organic Chemistry		B		I									B	
		Math 1149 or 1150	5	Pre-Calculus										B			B	B
		Physics 1200	5	Introductory Physics		B		B					B	B		B		
Required Core Course (offered by the unit)		Biol 3401	4	Integrated Biology	Core course; because of additional coverage in prerequisites, 2 Q courses combined into one S	I	I	I	I	I	I	I	I	B	I	I	I	A
Education in Life Sciences Specialization																		
		Biochem 4511	4	General Biochemistry		A	I	A		I						I		I
		MolGen 4500	3	General Genetics		A	I	A	A	I	I				I		I	I

Courses comprising specializations (offered outside the unit)

EEOB 3000	4	Evolution		A	I		I	A	I	I			I		I	I
Micro 4090	4	Basic and Practical Microbiology		A	I	I	I	I	I	I	A	A	I	A	I	I
MolGen 3300	4	General Plant Biology		A	I	I	I	I	I	I	A	A	I	A	I	I
Additional coursework, including lab requirement	9			A	A	A	A	A	A	A	A	A	A	A	A	A
Forensic Biology Specialization																
Anthro 2200	4	Physical	Additional prerequisite				B	B	B	B	B	B		B	B	B
Biochem 4511	4	General Biochemistry		I	I	A		I					I		I	I
MolGen 4500	3	General Genetics		A	I	A	A	I	I				I		I	I
Additional coursework, including lab requirement	17			A	A	A	A	A	A	A	A	A	A	A	A	A
Pre-Health Professions Specialization																
MolGen 4500	3	General Genetics		A	I	A	A	I	I				I		I	I
Additional coursework, including lab requirement	25			A	A	A	A	A	A	A	A	A	A	A	A	A

B = beginning, I = intermediate, A = advanced

*** Full text of program learning goals:**

- 1.1 Describe the hierarchical relationship between structure and function at all levels: molecular, cellular, and organismic.
- 1.2 Diagram, explain, and contrast the major cellular processes in Archaea, bacteria, and eukaryotes.
- 1.3 Differentiate types of biological macromolecules and compare their contributions to cellular structure and function.
- 1.4 Apply the principles of genetics and describe the flow of genetic information.
- 1.5 Explain changes in organisms through time by applying the principles of evolutionary biology.
- 1.6 Demonstrate how relationships among living things are understood through taxonomy and phylogenetic analysis.
- 1.7 Describe ecological relationships between organisms and their environment.
- 2.1 Apply the scientific process, including designing and conducting experiments and testing hypotheses.

- Use laboratory equipment, employ safe laboratory practices, and adapt tools such as laboratory notebooks and spreadsheets to organize and
- 2.2** analyze data associated with scientific processes.
 - 2.3** Retrieve information from the life sciences literature; read, understand, and critically review scientific papers.
 - 2.4** Prepare oral and written reports following a recognized scientific format.
 - 2.5** Develop an awareness of the careers and professions that rely on knowledge of biological sciences.
 - 3.1** Integrate biological knowledge in discussions of society and everyday life