Department of Biology

Chair: Dr. Steven N. Austad

The Department of Biology has experienced faculty dedicated to research and teaching with interests ranging from the molecular to the ecological level. The broad expertise of our faculty allows diverse emphasis in cellular, molecular, developmental, environmental, evolutionary, genetic, marine, and organismal biology. Our faculty have been recognized by the University and by national and international biological organizations for their excellence in research and teaching.

The curriculum in biology provides general and specific courses for non-majors and prepares the major for graduate study in biology; the professional schools of human and veterinary medicine, dentistry, optometry, and allied health sciences. Additionally, the curriculum prepares the non-major and major student with knowledge required for careers in secondary science education, environmental education, wildlife management in both the public and private sectors, and other careers dependent upon comprehension of biological sciences. The Department of Biology also has a well established Honors curriculum for those students who excel in academics and wish to participate in biological research. This program allows students to conduct research under the mentorship of faculty in the Department of Biology or the School of Medicine, and to graduate with departmental honors. The department offers the following B.S. degrees in biology as well as a minor in biology:

1. Major in Biology – Integrative Biology Concentration
2. Major in Biology – Marine Science Concentration
3. Major in Biology – Molecular Biology Concentration

Grade Point Average (Majors and Minors)

A student must have at least a 2.0 average in all biology courses attempted and a 2.0 average in all biology courses taken at UAB. The current UAB course repeat policy will be used in calculating the grade point average.

Transfer Credit

Biology courses in which a grade of D is earned at another institution cannot be applied toward requirements for the major or minor. Students will not be given more credit (semester hours) toward the major or minor than awarded for equivalent courses at UAB, nor more than 8 semester hours of credit in any introductory sequence or combination of courses. Excess hours in these courses may, however, be applied as electives toward the 120 semester hours necessary to satisfy the general degree requirements.

A minimum of 9 semester hours in the major and 6 semester hours in the minor in biology must be taken at UAB.

Graduate Programs

The Department of Biology offers graduate study leading to the degrees of Master of Science and Doctor of Philosophy. Further information may be found in the UAB Graduate School Catalog.

Accelerated Master of Science Programs

Fifth Year M.S. Program

The Department of Biology offers an opportunity to earn a B.S. and an M.S. degree in a total of five years. This program offers qualified students mentorship during undergraduate study and supplements professional degrees such as medicine, dentistry, and optometry. The student works closely with a faculty member in an area of intensive research which prepares the student for a Ph.D. degree program in the biological sciences or a future health professions career. It also builds teaching skills for academic careers. Admission to the program requires a minimum 3.25 grade point average; three letters of recommendation; an interview with the admissions committee; and a satisfactory score on the Graduate Record Examination by fall of the senior year. For additional information, please contact Dr. Stephen Watts, Graduate Program Director, at (205) 934-2045 or sawatts@uab.edu.

Bachelor of Science with a Major in Biology

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematics</strong></td>
<td></td>
</tr>
<tr>
<td>MA 125 Calculus I</td>
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<tr>
<td><strong>Chemistry</strong></td>
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</tr>
<tr>
<td>CH 115 General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CH 116 General Chemistry I Laboratory</td>
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<tr>
<td>or CH 114 General Chemistry I Laboratory (Honors)</td>
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</tr>
<tr>
<td>CH 117 General Chemistry II</td>
<td>3</td>
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<td>CH 118 General Chemistry II Laboratory</td>
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<td>CH 235 Organic Chemistry I</td>
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<td>CH 237 Organic Chemistry II</td>
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<td>CH 238 Organic Chemistry II Laboratory</td>
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<tr>
<td><strong>Physics</strong></td>
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</tr>
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<tr>
<td>PH 201 College Physics I &amp; PH 202 and College Physics II</td>
<td></td>
</tr>
<tr>
<td>PH 221 General Physics I &amp; PH 222 and General Physics II</td>
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<tr>
<td><strong>Biology Requirement</strong></td>
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<tr>
<td>Biology Majors must complete 40 hours of Biology courses approved for the major.</td>
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<tr>
<td><strong>Introductory Biology</strong></td>
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</tr>
<tr>
<td>BY 123 Introductory Biology I</td>
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</tr>
<tr>
<td>BY 124 Introductory Biology II</td>
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</tr>
<tr>
<td><strong>Genetics</strong></td>
<td></td>
</tr>
<tr>
<td>BY 210 Genetics</td>
<td>3</td>
</tr>
<tr>
<td><strong>Ecology &amp; Evolution</strong></td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>BY 429 Evolution</td>
<td></td>
</tr>
<tr>
<td>BY 435 Natural History of Vertebrates</td>
<td></td>
</tr>
<tr>
<td>BY 467 Population Ecology</td>
<td></td>
</tr>
<tr>
<td>BY 470 Ecology</td>
<td></td>
</tr>
<tr>
<td>BY 474 Chemical Ecology</td>
<td></td>
</tr>
<tr>
<td><strong>Organismal</strong></td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
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<tr>
<td>BY 255 Invertebrate Zoology</td>
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</table>
Graduating Seniors
Students must take a biology major fields test and a departmental survey.

Core Curriculum
Students must take a Philosophy course that meets the QEP Ethics and Civic Responsibility Requirement, either PHL 115 or PHL 116.

Bachelor of Science with a Major in Biology and a Marine Science Concentration
he marine science concentration and the molecular biology track prepare students for careers in marine science or research careers in the basic or medically-related sciences.

Requirements

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MA 125</td>
<td>Calculus I</td>
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Chemistry

<table>
<thead>
<tr>
<th>Course Numbers</th>
<th>Course Title</th>
<th>Hours</th>
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<td>Organic Chemistry II Laboratory</td>
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</tr>
<tr>
<td>CH 460</td>
<td>Fundamentals of Biochemistry</td>
<td>3</td>
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<tr>
<td>CH 461</td>
<td>Advanced Biochemistry</td>
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Physics

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<thead>
<tr>
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<th>Course Title</th>
<th>Hours</th>
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<td>PH 201 &amp; PH 202</td>
<td>College Physics I and College Physics II</td>
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</tr>
<tr>
<td>PH 221 &amp; PH 222</td>
<td>General Physics I and General Physics II</td>
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Marine Science Electives
Select at least five Marine Environmental Science (MESC) courses approved by the academic advisor.

<table>
<thead>
<tr>
<th>Biology Requirements</th>
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</thead>
<tbody>
<tr>
<td>Biology majors must complete 40 hours in Biology (BY) or Marine Environmental Science (MESC) courses approved for the major.</td>
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Introductory Biology

<table>
<thead>
<tr>
<th>Course Numbers</th>
<th>Course Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BY 123</td>
<td>Introductory Biology I</td>
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</tr>
<tr>
<td>BY 124</td>
<td>Introductory Biology II</td>
<td>4</td>
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Genetics

<table>
<thead>
<tr>
<th>Course Numbers</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BY 210</td>
<td>Genetics</td>
<td>3</td>
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</table>

Ecology & Evolution

<table>
<thead>
<tr>
<th>Course Numbers</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BY 470</td>
<td>Ecology</td>
<td></td>
</tr>
<tr>
<td>BY 429</td>
<td>Evolution</td>
<td></td>
</tr>
<tr>
<td>BY 474</td>
<td>Chemical Ecology</td>
<td></td>
</tr>
<tr>
<td>BY 435</td>
<td>Natural History of Vertebrates</td>
<td></td>
</tr>
<tr>
<td>BY 467</td>
<td>Population Ecology</td>
<td></td>
</tr>
<tr>
<td>MESC 411</td>
<td>Costal Wetlands Ecology</td>
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</table>

GPA Requirement & Residency
A student must have at least a 2.0 average in all biology courses attempted and a 2.0 average in all biology courses taken at UAB in order to graduate. The current UAB course repeat policy will be used in calculating the grade point average. A minimum of nine semester hours in the major must be taken at UAB. Transfer students should be aware of the Department of Biology’s policy regarding transfer credit.

Additional Requirements

General Electives
Students must take general electives to reach the 120 semester hour requirement.
### Organismal
Select one of the following: 4
- BY 255 Invertebrate Zoology
- BY 256 Vertebrate Zoology
- BY 271 Biology of Microorganisms
- BY 442 Experimental Phycology
- MESC 402 Marine Vertebrate Zoology
- MESC 407 Marine Botany
- MESC 413 Marine Invertebrate Zoology

### Physiology and Development
Select one of the following: 3-4
- BY 314 Embryology
- BY 409 Principles of Human Physiology
- BY 410 Comparative Animal Physiology
- BY 420 General Endocrinology
- BY 440 Immunology
- BY 451 Plant Biology
- BY 475 Comparative Developmental Biology

### Cellular/Molecular
Select one of the following: 3
- BY 311 Molecular Genetics
- BY 330 Cell Biology
- BY 434 Functional Genomics and Systems Biology
- BY 437 Epigenetics

### Capstone Experience
Select one of the following (only one capstone course can count toward the major): 4
- BY 490 Bio Capstone: Human Physiology
- BY 491 Biology Capstone - Evolution
- BY 492 Biology Capstone - Undergraduate Research
- BY 493 Biology Capstone - Honors Research

### Electives
Electives in Biology to total 40 hours

### GPA Requirement & Residency
A student must have at least a 2.0 average in all biology courses attempted and a 2.0 average in all biology courses taken at UAB in order to graduate. The current UAB course repeat policy will be used in calculating the grade point average. A minimum of nine semester hours in the major must be taken at UAB. Transfer students should be aware of the Department of Biology’s policy regarding transfer credit.
BY 433  Advanced Molecular Genetics
BY 437  Epigenetics
BY 440  Immunology

Capstone Experience
Select one of the following (only one capstone course can count towards major):
BY 490  Bio Capstone: Human Physiology
BY 491  Biology Capstone - Evolution
BY 492  Biology Capstone - Undergraduate Research
BY 493  Biology Capstone - Honors Research

Elective Courses
Electives in Biology to total 40 hours.

Total Hours 71

1  Note: Completion of MA 125 automatically satisfies the Core Curriculum Area III: Math requirement and the Biology Major Requirement.

2  Including BY 123 and BY 124 with a C or better (fulfilling Core Curriculum Area III) and the courses taken to satisfy the requirements below. All of the courses listed below are approved for the major; consult your advisor for a list of additional courses. At least 9 hours must be 400-level or higher. No more than 6 total hours of BY 394, BY 397, BY 398, and BY 492 can be applied towards the 40 hours of Biology (BY) courses. Note: BY 101, BY 102, BY 108, BY 109, BY 111, BY 112, BY 116, and BY 261 cannot be applied toward the Biology major.

GPA Requirement & Residency
A student must have at least a 2.0 average in all biology courses attempted and a 2.0 average in all biology courses taken at UAB in order to graduate. The current UAB course repeat policy will be used in calculating the grade point average. A minimum of nine semester hours in the major must be taken at UAB. Transfer students should be aware of the Department of Biology’s policy regarding transfer credit.

Additional Requirements
General Electives
Students must take general electives to reach the 120 semester hour requirement.

Graduating Seniors
Students must take a biology major fields test and a departmental survey.

Core Curriculum
Students must take a Philosophy course that meets the QEP Ethics and Civic Responsibility Requirement, either PHL 115 or PHL 116.

Proposed Program of Study for a Major in Biology

<table>
<thead>
<tr>
<th>Freshman</th>
<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 106</td>
<td>3 MA 125</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CH 115</td>
<td>3 EH 102</td>
<td>3</td>
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<tr>
<td>&amp; 115R</td>
<td></td>
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</tr>
<tr>
<td>CH 116</td>
<td>1 BY 123</td>
<td>4</td>
<td>&amp; 123L</td>
<td></td>
</tr>
<tr>
<td>EH 101</td>
<td>3 CH 117</td>
<td>3</td>
<td>&amp; 117R</td>
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<table>
<thead>
<tr>
<th>Sophomore</th>
<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 235 &amp; 235R</td>
<td>3 CH 237</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH 236 &amp; 124L</td>
<td>1 CH 238</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>BY 124 &amp; 210</td>
<td>4 BY 210</td>
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<tr>
<td>PHL 115 or 116</td>
<td>3 Core Curriculum Area II or Area IV</td>
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<table>
<thead>
<tr>
<th>Junior</th>
<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Cellular or Molecular Biology</td>
<td>3 Organismal Biology</td>
<td>4</td>
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<td></td>
</tr>
<tr>
<td>&amp; 201R &amp; 201L</td>
<td>4 PH 202 &amp; 202R</td>
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<tr>
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<tr>
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<table>
<thead>
<tr>
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<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
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<tr>
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<tr>
<td>Ecology/Evolution</td>
<td>4 Biology Electives</td>
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<tr>
<td>Biology Elective</td>
<td>3 Electives</td>
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<td>Core Curriculum Area II or IV</td>
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<tr>
<td>Elective</td>
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</table>

Total credit hours: 122

1  Assumes student is placed in MA 106.
2  Assumes student has had one year of high school Chemistry with a grade of C or better.
3  Assumes no Advanced Placement (AP), Dual Enrollment, International Baccalaureate (IB), or College Level Examination Program (CLEP) credit.
4  Must complete either a two History Core IV or two Literature Core II sequence.
5  BY 101, BY 102, BY 111, BY 112, BY 116, and BY 261 do not count toward Biology Electives.
6  Must earn a Biology GPA of at least 2.0.
7  See your Biology Advisor once each term.

Proposed Program of Study for a Major in Biology with a Concentration in Marine Science

<table>
<thead>
<tr>
<th>Freshman</th>
<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
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<td>3 MA 125</td>
<td>4</td>
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<td></td>
</tr>
<tr>
<td>CH 115</td>
<td>3 EH 102</td>
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<td>&amp; 115R</td>
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<table>
<thead>
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<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CH 235 &amp; 235R</td>
<td>3 CH 237</td>
<td>3</td>
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<tr>
<td>CH 236 &amp; 124L</td>
<td>1 CH 238</td>
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<tr>
<td>BY 124 &amp; 210</td>
<td>4 BY 210</td>
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<td>PHL 115 or 116</td>
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<table>
<thead>
<tr>
<th>Junior</th>
<th>First Term</th>
<th>Hours</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>Cellular or Molecular Biology</td>
<td>3 Organismal Biology</td>
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<tr>
<td>&amp; 201R &amp; 201L</td>
<td>4 PH 202 &amp; 202R</td>
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<td>6 Core Curriculum Area II or IV</td>
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<tr>
<td>Biology Elective</td>
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<table>
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<tr>
<th>Senior</th>
<th>First Term</th>
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<th>Hours</th>
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<tr>
<td>Physiology/Development</td>
<td>4 Biology Elective</td>
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<td>Ecology/Evolution</td>
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<td>Core Curriculum Area II or IV</td>
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<tr>
<td>Elective</td>
<td>3</td>
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</table>

GPA Requirement & Residency
A student must have at least a 2.0 average in all biology courses attempted and a 2.0 average in all biology courses taken at UAB in order to graduate. The current UAB course repeat policy will be used in calculating the grade point average. A minimum of nine semester hours in the major must be taken at UAB. Transfer students should be aware of the Department of Biology’s policy regarding transfer credit.

Additional Requirements
General Electives
Students must take general electives to reach the 120 semester hour requirement.

Graduating Seniors
Students must take a biology major fields test and a departmental survey.

Core Curriculum
Students must take a Philosophy course that meets the QEP Ethics and Civic Responsibility Requirement, either PHL 115 or PHL 116.
CH 116 1 BY 123 4
& 123L
EH 101 3 CH 117 3
& 117R
CAS Freshman Year Experience 1 CH 118 1
Core Curriculum Area II or Area IV 3

Sophomore
First Term Hours Second Term Hours
CH 235 3 CH 237 3 Dauphin Island Sea Lab 6-12
& 235R & 237R (MESC credit)
CH 236 1 CH 238 1
BY 124 4 BY 210 3
& 124L
PHL 115 or 116 3 Core Curriculum Area II or Area IV 6
Elective 3

Junior
First Term Hours Second Term Hours
BY 330 3 Organismal Biology (if not previously covered) 6-12
PH 201 4 PH 202 4
& 201R & 202R
& 201L & 202L
Biological Elective 3 Core Curriculum Area II or Area IV 6
Core Curriculum Area II or Area IV 6

Senior
First Term Hours
Physiology 3-4
Biological Elective 3
Ecology (if not covered with MESC) 3
Core Curriculum Area II or Area IV 3
Elective 3

Total credit hours: 113-126

1 Assumes student is placed in MA 106.
2 Assumes student has had one year of high school Chemistry with a grade of C or better.
3 Assumes no Advanced Placement (AP), Dual Enrollment, International Baccalaureate (IB), or College Level Examination Program (CLEP) credit.
4 Must complete at least one Literature Core II and two History Core IV or two Literature Core II and one History Core IV.
5 BY 101, BY 102, BY 111, BY 112, BY 116, and BY 261 do not count toward Biology Electives.
6 Must earn Biology GPA of at least 2.0
7 See Biology Advisor once each term.
8 Some Biology (BY) courses rotate every other year or once a year, see advisor.
9 18 hours Marine Science (MESC) courses (taken summers at sea lab) contribute to 40 hours in Biology.

Proposed Program of Study for a Major in Biology with a Concentration in Molecular Biology

Freshman

<table>
<thead>
<tr>
<th>Term</th>
<th>First Term Hours</th>
<th>Second Term Hours</th>
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<td>MA 106</td>
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Sophomore

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Junior

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<tr>
<td>BY 311</td>
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<td>&amp; 271L</td>
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Senior

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<td>BY 433 or 416</td>
<td>3 BY 431</td>
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<tr>
<td>BY 440</td>
<td>3 BY 245</td>
<td>3</td>
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<tr>
<td>CH 460 or 461</td>
<td>3 Biology Elective (see note below) 3-4</td>
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<tr>
<td>Biology Elective</td>
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<tr>
<td>Elective</td>
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</table>

Total credit hours: 122-124

1 Assumes student is placed in MA 106
2 Assumes student has had one year of High School Chemistry with a grade of C or better.
3 Assumes no Advanced Placement (AP), Dual Enrollment, International Baccalaureate (IB), or College Level Examination Program (CLEP) credit.
To be accepted into the Biology Honors Program, a student must:

1. Must complete at least one Literature Core II and two History Core IV or two Literature Core II and one History Core IV.
2. BY 101, BY 102, BY 111, BY 112, BY 116 and BY 261 do not count toward Biology electives.
3. Must earn a Biology GPA of at least 2.0
4. See Biology Advisor once each term.
5. Some Biology (BY) courses rotate every other year (BY 245) see advisor.
6. Biochemistry - CH 460 is taught summer and fall. CH 461 is only offered in the fall.

**Minor in Biology**

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Required Biology Courses (must earn a grade of C or better)</td>
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<tr>
<td>BY 123 Introductory Biology I</td>
<td>4</td>
</tr>
<tr>
<td>BY 124 Introductory Biology II</td>
<td>4</td>
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<tr>
<td>BY 210 Genetics</td>
<td>3</td>
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<tr>
<td>Biology Electives</td>
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<tr>
<td>Select 6 hours from 200-level or higher Biology (BY) courses.</td>
<td>6</td>
</tr>
<tr>
<td>Total Hours</td>
<td>17</td>
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</table>

1. Note: BY 123 and BY 124 may also satisfy the Core Curriculum Area III: Natural Sciences requirement; check the Core Curriculum for your particular major.
2. Not more than a total of three hours in BY 397, BY 398, and BY 498 may be counted toward the minor.
3. Note: BY 101, BY 102, BY 108, BY 109, BY 111, BY 112, BY 116, and BY 261 cannot be applied toward the Biology minor.

**GPA Requirement & Residency**

A student must have at least a 2.0 average in all biology courses attempted and a 2.0 average in all biology courses taken at UAB in order to graduate. The current UAB course repeat policy will be used in calculating the grade point average. A minimum of six semester hours in the minor must be taken at UAB. Transfer students should be aware of the Department of Biology’s policy regarding transfer credit.

**Honors Program in Biology**

**Purpose**

The Biology Honors Program offers motivated students the opportunity to develop research and communication skills in preparation for a graduate or professional career.

**Eligibility**

To be accepted into the Biology Honors Program, a student must:

- Have earned a 3.5 GPA in biology courses attempted.
- Have earned a 3.0 GPA overall.
- Have completed 18 semester hours in biology courses.
- Have enrolled in BY 398 (Undergraduate Research) for at least one semester hour.
- Have arranged with a faculty sponsor in biology to do a research project.

**Requirements**

Students in the Biology Honors Program will be required to have the following:

- Six semester hours in BY 498 (Honors Research), with each semester hour per term requiring a minimum of four hours of laboratory work per week.
- A formal research proposal, submitted by the end of the first semester of Honors Research, including an introduction, proposed methods, and relevant literature citation.
- A formal written report in the form of a scientific paper.
- An oral or poster presentation at Biology Research Day or the UAB Expo.

In some instances, it will be recommended that biology honors students give a formal presentation of their work at a scientific meeting. Funds may be provided to support participation at such a meeting.

**Benefits**

In addition to the educational and career benefits of participation in the Biology Honors Program, students who complete the program will be honored at the annual Biology Honors Research Day and will graduate “With Honors in Biology.”

**Contact**

For more information and/or admission to the Biology Honors Program, contact Dr. Thane Wibbels, Campbell Hall, Room 255A, Birmingham, AL 35294-1170; Telephone (205) 934-4419 or E-mail twibbels@uab.edu

**BY-Biology Courses**

**BY 101. Topics in Contemporary Biology. 3 Hours.**

Selected topics in the current understanding of biological systems, ranging from humans to ecosystems. Particular focus on scientific issues such as human diseases, genetic engineering, emerging infectious diseases, environmental causes of disease, and climate change, as well as analysis of these issues as presented in print and electronic media. 

**BY 102. Topics Contemporary Biology Laboratory. 1 Hour.**

Experiments and demonstrations in contemporary biology with strong emphasis is placed on understanding the systems of the human body. Drawing and writing assignments will focus on the structure and function of the important systems of the human body. Quantitative Literacy is a significant component of this course.

**BY 108. Human Population and the Earth’s Environment. 3 Hours.**

Influence of human population on Earth's environment. Specific attention will be paid to environmental issues such as population growth, climate change, water and energy resources, pollution, waste disposal, plant and animal extinctions, and food resources. Strong emphasis will be placed on determining solution to the variety of environmental problems facing the earth. Lecture and film. Ethics and Civic Responsibility are significant components of this course.
BY 109. Laboratory in Environmental Science. 1 Hour.
Experiments on topics essential to study of environment and which reveal complexity of solving environmental problems. Writing, Ethics and Civic Responsibility are significant components of this course.
Prerequisites: BY 108 [Min Grade: C] (Can be taken Concurrently) or ENV 108 [Min Grade: C] (Can be taken Concurrently)

BY 111. Extended Topics in Contemporary Biology. 3 Hours.
Selected topics in contemporary biology of interest to students with minimal background in biology. Topics presented in interactive lecture/discussion format. This course, when taken with its corresponding laboratory, meets the Core Curriculum requirements for Area III: Natural Sciences. NOTE: Only general elective credit for biology major or minor.
Prerequisites: BY 101 [Min Grade: D]

BY 112. Ext Topics Contemporary Biology Laboratory. 1 Hour.
Further examination, interpretation, and discussion of topics in BY 111. Independent and group projects. NOTE: Only general elective credit for biology major or minor.
Prerequisites: BY 111 [Min Grade: D] (Can be taken Concurrently)

BY 115. Human Anatomy. 4 Hours.
Principles of vertebrate structure with emphasis on gross and microscopic human anatomy. Survey of human embryology and evolution. Lecture and laboratory.

BY 115L. Human Anatomy Laboratory. 0 Hours.
Human Anatomy Lab required with BY 115 lecture.

BY 116. Introductory Human Physiology. 4 Hours.
Integrated functions of human cells, tissues, and organ systems. NOTE: Only general elective credit for biology majors or minors. Lecture and laboratory.
Prerequisites: BY 115 [Min Grade: C] and (CH 105 [Min Grade: C] and CH 106 [Min Grade: C]) or (CH 115 [Min Grade: C] and CH 116 [Min Grade: C]) or (CH 114 [Min Grade: C]) or (CH 117 [Min Grade: C]) and CH 118 [Min Grade: C] or CH 119 [Min Grade: C]) and BY 116L [Min Grade: C] (Can be taken Concurrently)

BY 116L. Introductory Human Physiology Laboratory. 0 Hours.
Human Physiology Lab required with BY 116 lecture.
Prerequisites: BY 116 [Min Grade: C] (Can be taken Concurrently)

BY 123. Introductory Biology I. 4 Hours.
Basic chemistry, cell structure and function, metabolism, genetics, evolution, bacteria, and protists. For major in biology and related fields. Quantitative Literacy and Writing are significant components of this course. Lecture and laboratory. Eligible for, enrolled in, or have completed MA 106, MA 107, MA 125, or MA 126. This course meets the Core Curriculum requirements for Area III: Natural Sciences.
Prerequisites: MA 106 [Min Grade: C] (Can be taken Concurrently) or MA 107 [Min Grade: C] (Can be taken Concurrently) or MA 125 [Min Grade: C] (Can be taken Concurrently) or MA 226 [Min Grade: C] (Can be taken Concurrently) or MAC 17 or MAAD 24 or MTH 75 or MTH 74 75 or MTH 75 75 or MPL 61

BY 123L. Introductory Biology I Laboratory. 0 Hours.
Introductory Biology I Lab required with BY 123 lecture.

BY 124. Introductory Biology II. 4 Hours.
The course emphasizes the transition from cell, to tissue, to organs in multicellular systems. Specific attention in the course will be paid to a survey of the various groups of plants, fungi, invertebrates and vertebrates. Strong emphasis will be placed on comparing the anatomy and physiology of the major organ systems in humans with those of other organisms. The course is designed to expand the students understanding of the process of scientific writing. Quantitative Literacy and Writing are significant components of this course. This course meets the Core Curriculum requirements for Area III: Natural Sciences.
Prerequisites: BY 123 [Min Grade: C]

BY 124L. Introductory Biology II Laboratory. 0 Hours.
Introductory Biology II Lab required with BY 124 lecture.

BY 201. Climate Change and the Environment. 3 Hours.
This introductory course will introduce the science of climate change and is designed for science and non-science majors. We will discuss the empirically driven principles of anthropogenic climate change and why we have high certainty that humans have caused this rapid global change. Next, we will address the ecological consequences of a changing climate. We will cover examples from various environments including polar, terrestrial, and ocean ecosystems and study microbial, plant, and animal interactions. Finally, we will discuss potential solutions to reduce the impact of humans on climate change. This will include local, regional and worldwide strategies. Lecture. 3 credit hours.

BY 203. Aging: From Cells to Society. 3 Hours.
BY 203 is designed to provide students with an opportunity to gain basic knowledge of the aging process and its implications for the aging population. Upon successful completion of the course, students will learn to appreciate the complexities associated with the aging process and also understand it is a natural process. Students should be able to distinguish a normal process that is changing with age and be able to classify whether it is a simple time dependent change or a disease associated change from a true aging change.
Prerequisites: BY 101

BY 210. Genetics. 3 Hours.
Principles and mechanisms of inheritance; structure, action, and regulation of genes; molecular genetic technology and application to human health and agriculture. Preparation for advanced courses in biology.
Prerequisites: BY 123 [Min Grade: C] and BY 124 [Min Grade: C]

BY 211. Genetics for Honors-HON. 3 Hours.
Genetics, a study of heredity, refers to the understanding of how DNA and its products participate in diverse biological processes, molecular pathways and signaling cascades in both prokaryotes and eukaryotes. This CURE-based course is designed to increase student engagement and therefore student learning in this complex but very important discipline of biology hands-on training on a variety of topics. Lecture/lab. 3 credit hours.
Prerequisites: BY 123 [Min Grade: C] and BY 124 [Min Grade: C]

BY 213. Phage Genomics I. 4 Hours.
Phage Genomics I is the first semester of a year-long lecture, laboratory, and web-enhanced course designed to provide an authentic research experience for undergraduate students. The course will address themes and techniques from across biology including microbiology, phage genetics, molecular biology, bioinformatics, and electron microscopy.
Preqs: completed application (contact biology advisor) and permission of instructor. Freshmen and sophomores only.
BY 214. Phage Genomics II. 4 Hours.
This course is the second semester of a year-long lecture, laboratory, and web-enhanced class designed to provide an authentic research experience for undergraduate students. Students will learn the concepts and procedures for: annotating segments of a unique mycobacteriophage genome to indently open reading frames, genes, and regulatory sequences; compare this bacteriophage genome to other sequenced bacteriophage genomes; compare and analyze amino acid sequences to reveal relationships between species; writing and presentation of scientific results. Freshmen and sophomores only.
Prerequisites: BY 213 [Min Grade: C]

BY 215. Introduction to Genomics. 3 Hours.
This course will feature basic and introductory concepts in –omics, sequencing technologies, applications in prokaryotes and eukaryotes, particularly human genome. Moreover, we will also discuss how the next generation sequencing information can be applicable to human health, agriculture and ecology. Key concepts of computing and data science will also be introduced. This will also include basic bioinformatics and bioinformatics tools in handling and management of genomic data.
Prerequisites: BY 123 [Min Grade: C] and BY 124 [Min Grade: C] and (BY 210 [Min Grade: C] or BY 211 [Min Grade: C])

BY 216. Pathophysiology. 3 Hours.
A course about human diseases emphasizing mechanisms of injury, altered physiology, disease development and progress, clinical assessments, and treatment strategies. Specific topics include diseases on genetic defects, infections, cancers, stress, altered immune actions, nutritional problems, fluid imbalances, hormone control issues, altered blood flow, and pulmonary inadequacies. The course incorporates historical and current case load relevancy and case study analysis.
Prerequisites: BY 116 [Min Grade: C] or BY 409 [Min Grade: C] or BY 124 [Min Grade: C]

BY 220. CLOne: Chromatin Laboratory 1. 0-4 Hours.
Students will learn laboratory skills in molecular genetics, with a focus on generating CRISPR guide RNAs and testing their efficiency in Drosophila cells. The students will be introduced to the scope of the project, read relevant literature, and will conclude their research experience by writing a journal-style report on their results.
Prerequisites: BY 123 [Min Grade: C]

BY 245. Fundamentals of Scientific Investigation. 3 Hours.
The course covers the basics of scientific investigation with an emphasis on understanding methods of the scientific process, experimental design, data interpretation and presentation and scientific writing. Special emphasis will be placed on the use of data management and statistical packages to address the most common types of data analysis used to investigate specific applications in biology. Quantitative Literacy is a significant component of this course. Recommend course is taken before junior year.
Prerequisites: BY 124 [Min Grade: C]

BY 255. Invertebrate Zoology. 4 Hours.
Invertebrate phyla, emphasizing evolutionary relationships, biological principles demonstrated by invertebrates, and significance of invertebrates in total ecology. Lecture and laboratory.
Prerequisites: BY 124 [Min Grade: C]

BY 255L. Invertebrate Zoology Laboratory. 0 Hours.
Invertebrate Zoology Lab required with BY 255 lecture.

BY 256. Vertebrate Zoology. 4 Hours.
Comparative approach to the structure, function, ecology, life history, and conservation of vertebrates. Lecture and laboratory.
Prerequisites: BY 124 [Min Grade: C] and CH 115 [Min Grade: C] and (CH 116 [Min Grade: C] or CH 114 [Min Grade: C])

BY 256L. Vertebrate Zoology Laboratory. 0 Hours.
Vertebrate Zoology Lab required with BY 256 lecture.

BY 260. Botany. 4 Hours.
Development, structure, physiology, and diversity of plants, emphasizing vascular plants. Lecture and laboratory.
Prerequisites: BY 124 [Min Grade: C]

BY 260L. Botany Laboratory. 0 Hours.
Botany Lab required with BY 260 lecture.

BY 261. Introduction to Microbiology. 4 Hours.
Cell structure and function, microbial genetics, viruses, and epidemiology and infectious disease. NOTE: Cannot be applied toward requirements for a biology major. Lecture and laboratory.
Prerequisites: BY 123 [Min Grade: C] or (CH 107 [Min Grade: C] and CH 108 [Min Grade: C] or (CH 237 [Min Grade: C] and CH 238 [Min Grade: C]) or (CH 237 [Min Grade: C] and CH 239 [Min Grade: C]) and BY 116 [Min Grade: C]

BY 261L. Introduction to Microbiology Laboratory. 0 Hours.
Introduction to Microbiology Lab required with BY 261 lecture.

BY 267. Tropical Ecology. 3 Hours.
Major tropical ecotypes; ecology of terrestrial, aquatic, and marine tropical organisms. Major portion conducted at tropical field station in the Caribbean. Lecture and field trips (May session, alternate years). Permission of instructor required.
Prerequisites: BY 124 [Min Grade: C]

BY 268. Galapagos Ecology. 3 Hours.
An overview of the ecology of the Galapagos Island, with an emphasis on the ecology of terrestrial and marine organisms. Major portion of course conducted on the Galapagos Islands. Lecture & field trips. Permission of instructor required.
Prerequisites: BY 124 [Min Grade: C]

BY 269. Rain Forest Ecology. 3 Hours.
Physical and environmental factors that structure rain forest, biodiversity of life, and interactions of its organisms. Prominent biota. Major portion of course taught at tropical field station in Costa Rica. Lecture and field trips (May session, alternate years). Permission of instructor required.
Prerequisites: BY 124 [Min Grade: C]

BY 271. Biology of Microorganisms. 4 Hours.
Microbiology with emphasis on molecular aspects of microbial cell structure, function, and diversity. Host defense mechanisms, infectious disease, and microbial ecology. Preparation for advanced courses in biology. Lecture and laboratory.
Prerequisites: (BY 210 [Min Grade: C] or BY 211 [Min Grade: C]) and (CH 117 [Min Grade: C] or CH 118 [Min Grade: C] or CH 119 [Min Grade: C])

BY 271L. Biology of Microorganisms Laboratory. 0 Hours.
Microbiology of Microorganisms Lab required with BY 271 lecture.

BY 280. Biology of Aging. 3 Hours.
Current understanding of aging, measurement of aging changes, theories of aging, and aging changes in various human systems.
Prerequisites: BY 123 [Min Grade: C]
BY 311. Molecular Genetics. 3 Hours.
Prokaryotic and eukaryotic gene structure and function.
**Prerequisites:** BY 210 [Min Grade: C] or BY 211 [Min Grade: C]

BY 314. Embryology. 3 Hours.
Descriptive and experimental studies of vertebrate development at the molecular, cellular and tissue levels.
**Prerequisites:** CH 117 [Min Grade: C] and CH 118 [Min Grade: C]

BY 327. Histology. 4 Hours.
Microscopic anatomy of cells, tissues, and organs of animals; correlation of structure and function. Techniques and methodology. Lecture and laboratory.
**Prerequisites:** BY 115 [Min Grade: C] or BY 124 [Min Grade: C]

BY 327L. Histology Laboratory. 0 Hours.
Histology Lab required with BY 327 lecture.

BY 330. Cell Biology. 3 Hours.
Structure and function of the cell, cellular components and major cellular processes. Topics include biological molecules and metabolism, energetics, synthesis and regulation of macromolecules, mechanisms for transcription and translation, membranes and organelles, small molecule transport and intracellular trafficking, cytoskeleton and cell movement, cell signaling, cell cycle, and cancer cell biology.
**Prerequisites:** BY 123 [Min Grade: C] and BY 214 [Min Grade: C] and CH 235 [Min Grade: C](Can be taken Concurrently) and CH 234 [Min Grade: C](Can be taken Concurrently) or CH 236 [Min Grade: C](Can be taken Concurrently)

BY 351. Plant Biology. 3 Hours.
This course introduces the student to the basic concepts of plant biology including plant diversity, structure, physiology, metabolism, reproduction, genetics, molecular biology, evolution and ecology. It is targeted to Biology Majors. This class brings together knowledge and methodologies from a number of different disciplines to provide students with an intensive and comprehensive plant curriculum from the molecular to the organismal level. In this course, students will be introduced not only to plant biology, but also to plant-specific concepts and techniques in molecular biology and genetics. Lecture. 3 credit hours.
**Prerequisites:** BY 123 [Min Grade: C] and BY 124 [Min Grade: C] and (BY 210 [Min Grade: C] or BY 211 [Min Grade: C])

BY 362. Neurobiology. 3 Hours.
This course teaches the biological basis of nervous system function, i.e., how the central nervous system is organized, and how neurons, synapses and neuronal circuits function in order to produce behavior. The course also provides the student with basic concepts in mammalian neuroendocrinology and age-related changes in nervous system structure and function.
**Prerequisites:** BY 123 [Min Grade: C] and BY 124 [Min Grade: C]

BY 394. Biology Laboratory Teaching. 1-3 Hour.
Student will assist in instruction of a biology laboratory. Student is required to attend scheduled preparatory sessions each week, assist in teach assigned laboratory section, help develop student assignments such as examinations and/or practicals and assist the laboratory coordinator in other capacities as assigned. Students work under the direction of the course instructor and/or the laboratory coordinator. Student must have completed the course in which the student is assisting with a grade of B or higher. Permission of the instructor is required. May be repeated for credit to a maximum of three semester hours.

BY 395. Special Topics in Biology. 1-4 Hour.
This course will consider topics from the various disciplines in the biological sciences and the topic will differ each term. Course requirements may include lecture, laboratory, readings, discussion, reporting, and internships or fieldwork, which may be conducted on- or off-campus. May be taken more than once for credit.
**Prerequisites:** BY 123 [Min Grade: C] and BY 124 [Min Grade: C] and (BY 210 [Min Grade: C] or BY 211 [Min Grade: C])

BY 397. Advanced Directed Readings. 1-3 Hour.
Reading and independent study in selected areas under supervision of faculty sponsor. May be repeated for total of three semester hours credit. 12 semester hours of BY with BY GPA of 3.0 and permission of instructor required.

BY 398. Undergraduate Research. 1-3 Hour.
Research project under supervision of faculty sponsor. May be repeated for a total of 3 semester hours credit. 12 semester hours of BY with GPA of 3.0 and permission of instructor required.

BY 405. Microbial Physiology. 3 Hours.
Microbial structure and function, growth, metabolism, and regulation of cellular activity.
**Prerequisites:** BY 271 [Min Grade: C]

BY 407. Microbial Ecology. 3 Hours.
This course examines microorganisms in their natural habitats, with a focus on soil and aquatic ecosystems as well as symbiotic interactions between microbes and animals and plants. Students will learn both theory and practical techniques for studying microbial ecology, including hands-on exposure to modern bioinformatic analysis methods for microbial communities. 3 credit hours.
**Prerequisites:** BY 271 [Min Grade: C]

BY 409. Principles of Human Physiology. 4 Hours.
The lecture and laboratory course uses humans as a model system to investigate physiological processes occurring at cell, tissue, organ, and system levels. Additionally the use of experimental examples and laboratory experiments and the interpretation of data will be used to understand all aspects of productivity. The class is designed to improve scientific writing skills related to research experiment. Writing and Quantitative Literacy are significant components of this course. Foundation in anatomy recommended (BY 115 or BY 256).
**Prerequisites:** (BY 210 [Min Grade: C] or BY 211 [Min Grade: C]) and CH 237 [Min Grade: C] and (CH 238 [Min Grade: C] or CH 239 [Min Grade: C] or CH 239 [Min Grade: C])

BY 409L. Principles of Human Physiology Laboratory. 0 Hours.
Human Physiology Lab required with BY 408 and BY 409 lecture.

BY 410. Comparative Animal Physiology. 3 Hours.
Comparative examples to illustrate general principles of physiology; study of how animals function in their environment.
**Prerequisites:** BY 256 [Min Grade: C]

BY 411. Advanced Human Anatomy. 4 Hours.
Regional study of human gross anatomy by dissection of human donor bodies.
**Prerequisites:** BY 115 [Min Grade: C]
BY 414. Advanced Cell Biology. 3 Hours.
This course will focus on understanding cell signaling, function, and dynamics, which is the core of modern cell biology topics. This course is targeted for senior undergraduate students who are interested in current topics of Cell Biology and have successfully completed undergraduate courses in genetics and cell biology. Topics include the cellular organization and function, cell cycle, autophagy, apoptosis, stem cell and cellular signaling pathways. This course also includes reading of primary literature and writing a research proposal.
Prerequisites: BY 210 [Min Grade: C] and BY 330 [Min Grade: C]

BY 416. Cellular Physiology. 3 Hours.
Biochemical and thermodynamic aspects of cellular energy metabolism. Foundation in physiology recommended (BY 124, BY 116, BY 409 or BY 410).
Prerequisites: BY 330 [Min Grade: C] and CH 237 [Min Grade: C] (Can be taken Concurrently) and CH 238 [Min Grade: C] (Can be taken Concurrently) or CH 239 [Min Grade: C]

BY 419. Reproductive Physiology. 3 Hours.
Comparative reproductive physiology in mammals, with emphasis on humans.
Prerequisites: BY 256 [Min Grade: C] and CH 235 [Min Grade: C] and (BY 210 [Min Grade: C] or BY 211 [Min Grade: C]) and (BY 330 [Min Grade: C] and CH 237 [Min Grade: C])

BY 420. General Endocrinology. 3 Hours.
The central theme of this course is the role of hormone chemical messengers in the regulation of physiological processes. Topics include structure of endocrine cells and glands, hormone synthesis and chemistry, physiological effects of hormones, and mechanisms of hormone action. Emphasis is placed on vertebrate systems, but instructive invertebrate systems are also considered.
Prerequisites: BY 256 [Min Grade: C]

BY 426. Evolutionary Medicine. 3 Hours.
An evolutionary approach to issues relating to human health and disease.
Prerequisites: BY 264 [Min Grade: C] or BY 409 [Min Grade: C] and BY 330 [Min Grade: C]

BY 429. Evolution. 3 Hours.
The course includes the history of evolutionary thought and modern evolutionary theory. Discussions cover (but are not limited to) the history of life, mechanisms of evolutionary change, sexual selection, adaptation, speciation, and molecular evolution. Students will also be introduced to historical and contemporary studies of evolution on a wide variety of topics and organisms.
Prerequisites: BY 210 [Min Grade: C] or BY 211 [Min Grade: C]

BY 431. Principles of DNA Technology. 3 Hours.
Manipulation of genes and their regulation; techniques used in recombinant DNA technology. Lecture.
Prerequisites: BY 210 [Min Grade: C] or BY 211 [Min Grade: C] and BY 311 [Min Grade: C]

BY 432. Biological Information Resources. 3 Hours.
The National Center for Biological Information (NCBI) website is a treasure house of information and tools for researchers in all areas of modern Biology. The goal of this course is to provide guidance for students who wish to become familiar with the NCBI website through an online learning experience. They will learn many of the features available at this site and will gain experience using some of the tools. The course will be taught online consisting of 1) Guidelines for navigating through NCBI, 2) NCBI tutorials with sample questions to be answered online wherever appropriate, and 3) assignments and exams to be answered online.
Prerequisites: BY 123 [Min Grade: C] and BY 124 [Min Grade: C] and BY 210 [Min Grade: C] or BY 211 [Min Grade: C] or BY 311 [Min Grade: C]

BY 433. Advanced Molecular Genetics. 3 Hours.
Molecular genetics of eukaryotic organisms, including analysis of the features and nature of eukaryotic genomes, genes, nucleosomes, and chromosomes; processes involved, such as transcription, splicing, transposition, and signal transduction. The role of molecular biology in cell growth and cancer. Lecture.
Prerequisites: BY 311 [Min Grade: C]

BY 434. Functional Genomics and Systems Biology. 3 Hours.
Systems biology is an inter-disciplinary study underlying complex biological processes as integrated systems of many interacting components. This course will give students a foundation in understanding complex biological interactions at the molecular, network and genomic level. This course will cover state-of-the-art high throughput established and novel approaches used in genome sequencing, transcriptomics, proteomics and metabolomics to obtain, integrate and analyze complex data. The students will also get familiar with knowledge on experimental perturbation of genomes, gene regulatory networks, comparative genomics and evolution, basic bioinformatics. This course will be a combination of text based lectures and discussions of the current literature relevant to Functional Genomics and Systems Biology.
Prerequisites: BY 210 [Min Grade: C] or BY 211 [Min Grade: C]

BY 435. Natural History of Vertebrates. 4 Hours.
Lecture and field study of adaptations of vertebrate classes for survival in particular environments. Survey and classification of local vertebrates. Lecture and laboratory.
Prerequisites: BY 256 [Min Grade: C]

BY 435L. Natural History of Vertebrates Laboratory. 0 Hours.
Natural History of the Vertebrates Lab required with BY 435 lecture.

BY 436. Biological Processes in Aging. 3 Hours.
The #1 threat to human health – far greater than cancer, heart disease, and Alzheimer’s disease combined – is aging. Aging is also a fascinating biological puzzle. Why do we, and virtually every other species, age in the first place? Why can’t nature simply maintain the body it built? This course will introduce you to the fascinating process of biological aging, its impact on human and animal life, how it evolved, and the manner in which its biology is investigated, the cellular and molecular process that underlie aging, and how efforts to slow human aging are progressing. We will cover the history of exceptionally long human and animal lives and also delve into current and historical approaches to alter the rate of aging in humans with an emphasis on current promising research areas. In covering this material we will also encounter some of the many colorful scientists who have worked on the problem of aging as well as the past and current frauds and charlatans who are just trying to make a buck off of people’s fear of death and disability.
Prerequisites: BY 123 [Min Grade: C] and BY 210 [Min Grade: C]
BY 437. Epigenetics. 3 Hours.
This course provides a survey of the field of epigenetics, introducing the student to the diverse areas of epigenetic research in a variety of eukaryotic systems. The course combines lectures with discussion of primary literature and research talks from invited faculty speakers working in epigenetics. In addition to providing an overview of the field of epigenetics, this course emphasizes working with primary scientific literature and the development of critical reading skills. Recommended that Molecular Genetics be completed prior to enrollment.
**Prerequisites:** BY 123 [Min Grade: C] and BY 124 [Min Grade: C] and (BY 210 [Min Grade: C] or BY 211 [Min Grade: C])

BY 440. Immunology, 3 Hours.
Immune system and functions of host humoral and cellular immune responses. Mechanisms of antigen and antibody reactions and basic immunological methods.
**Prerequisites:** BY 271 [Min Grade: C] and BY 330 [Min Grade: C]

BY 442. Experimental Phycology, 4 Hours.
The course uses Algae as a model system to investigate various experimental approaches to assessing productivity with specific emphasis placed on classification, respiration, photosynthesis, growth and nutrient limitation. Additionally the use of experimental examples and laboratory experiments and the interpretation of data will be used to understand all aspects of productivity. Designed to improve scientific writing skills related to research experiments. Quantitative Literacy is a significant component of this course.
**Prerequisites:** BY 124 [Min Grade: C] and CH 117 [Min Grade: C] and (CH 118 [Min Grade: C] or CH 119 [Min Grade: C])

BY 442L. Experimental Phycology Laboratory, 0 Hours.
Experimental Phycology Lab required with BY 442 lecture.
**Prerequisites:** BY 124 [Min Grade: C] and CH 117 [Min Grade: C] and (CH 118 [Min Grade: C] or CH 119 [Min Grade: C])

BY 448. Psychoneuroimmunology, 3 Hours.
How neuroendocrine and immune systems communicate with each other. Regulatory processes mediated by interactions between these systems and application to diseases.
**Prerequisites:** BY 440 [Min Grade: C]

BY 450. Plant Physiology, 3 Hours.
Metabolic activities and growth processes of plants, with emphasis on photosynthesis, respiration, germination, dormancy, and hormones; physiological phenomena associated with phases of development. Lecture.
**Prerequisites:** CH 210 [Min Grade: C]

BY 451. Principles of Botany, 3 Hours.
This course introduces the student to the basic concepts of plant biology including plant diversity, structure, physiology, metabolism, reproduction, genetics, molecular biology, evolution and ecology. It is targeted to Biology Majors and Biology Graduate Students. This class brings together knowledge and methodologies from a number of different disciplines to provide students with an intensive and comprehensive plant curriculum from the molecular to the organismal level.
**Prerequisites:** BY 123 [Min Grade: C] and BY 124 [Min Grade: C] and BY 210 [Min Grade: C]

BY 456. Comparative Vertebrate Anatomy, 4 Hours.
Study of the anatomical systems of vertebrates in an evolutionary and functional context. Covers form, function, development and phylogeny of vertebrates, with overviews of organ systems, and the major adaptive events of vertebrate evolution. Labs complement lectures with dissections of representative species, and surveys of specializations in other forms. Lecture and laboratory.
**Prerequisites:** BY 124 [Min Grade: C]

BY 456L. Comparative Vertebrate Anatomy Lab, 0 Hours.
Comparative Vertebrate Anatomy Lab required with BY 456 lecture.
**Prerequisites:** BY 124 [Min Grade: C]

BY 460. Advanced Invertebrate Zoology, 3 Hours.
This course takes an in-depth look at aspects of the biology of the Echinodermata and Crustacea. The course format includes lectures, guest lectures, and student critiques of papers from the scientific literature. There is a field trip to Blunt Springs to search for echinoderm fossils. Lecture and student projects.
**Prerequisites:** BY 255 [Min Grade: C]

BY 467. Population Ecology, 3 Hours.
The course covers the structure and dynamics of populations with an emphasis on understanding how reproduction, mortality and dispersal interact to control fluctuations in population size and structure. Special emphasis will be placed on the use of computer models and interpretation of data to address specific applications in conservation biology and natural resource management. Quantitative Literacy is a significant component of this course.
**Prerequisites:** BY 124 [Min Grade: C]

BY 468. Conservation Genetics, 3 Hours.
This intensive course will introduce students to the genetic tools of modern population biology – which ones are available, practical, and useful for particular questions – and how these genetic analyses have been applied to a wide variety of ecological topics, including: dispersal, life histories, recruitment, habitat and mate choice, local selection, genetic differentiation, the conservation of biodiversity, and speciation. Importantly, this course is an opportunity to become proficient at applying molecular tools to bolster ecological studies. Time will be spent in lectures and learning practical coding and data analyses.

BY 470. Ecology, 3 Hours.
The study of interactions between organisms and their environment. An introduction to ecological processes at individual, population, community, and ecosystem levels and their relevance to current environmental problems. Lecture.
**Prerequisites:** BY 255 [Min Grade: C] or BY 256 [Min Grade: C] or BY 260 [Min Grade: C] or BY 271 [Min Grade: C]

BY 474. Chemical Ecology, 3 Hours.
Study of chemical interactions between organisms or between organisms and their environment. Topics include chemical signaling between organisms, sensing of the chemical environment, and chemical defenses against predators, pathogens, biofoulers, or competitors. Students will be introduced to these topics in a wide variety of terrestrial and aquatic habitats, with a special emphasis on marine organisms.
**Prerequisites:** BY 124 [Min Grade: C] and CH 235 [Min Grade: C]

BY 475. Comparative Developmental Biology, 3 Hours.
Mechanisms of development with emphasis on comparative biology.
**Prerequisites:** BY 210 [Min Grade: C] or BY 211 [Min Grade: C]
BY 480. Emergency Medicine Internship. 3 Hours.
This semester-long internship is designed to provide undergraduate students with an authentic hands-on medical research experience. The course will allow students the opportunity to assist faculty members and residents of the UAB Department of Emergency Medicine in their clinical research studies. Specifically, students will be involved in patient recruitment for the study, determine patient eligibility, reading information about the studies to patients, and collecting data regarding patient history. Students will also have the methodology associated with clinical research. Junior or senior standing, minimum GPA of 3.5, completed application and acceptance into the internship program required.

BY 485. Special Topics in Biology. 0-4 Hours.
This course will consider topics from the various disciplines in the biological sciences and the topic will differ each term. Course requirements may include lecture, laboratory, readings, discussion, reporting, and internships or fieldwork, which may be conducted on- or off-campus. May be taken more than once for credit.

Prerequisites: BY 123 [Min Grade: C] and BY 124 [Min Grade: C] and (BY 210 [Min Grade: C] or BY 211 [Min Grade: C])

BY 488. Instructional Teaching Practicum. 1 Hour.
This course is specially designed to introduce students to the learning and teaching of biology in the college classroom. We will begin our discussions with exploring current issues in biology education and the need for a reform in the light of different teaching methodologies. It will then be followed upon by easily implementable strategies for your respective weekly group discussions. These sessions will be in the form of a series of four/five workshops followed by monthly check-in dates.

Prerequisites: BY 123 [Min Grade: C] and BY 124 [Min Grade: C]

BY 489. Chromatin Biology Research Lab. 0-3 Hours.
This Classroom Undergraduate Research experience is designed for students transferring to UAB and introduces them to original research in a classroom setting. The students will learn laboratory skills in molecular genetics by producing the reagents such as plasmid constructs or recombinant proteins. The students will be introduced to the scope of the project, read relevant literature, and will conclude their research experience by writing a journal-style report on their results. Thus, this course promotes proficiency in laboratory skills, writing of laboratory reports, and scientific literacy.

BY 490. Bio Capstone: Human Physiology. 4 Hours.
Physiological processes occurring at cell, tissue, organ, and system levels in mammals with emphasis on humans. Students that enroll in this capstone experience will be expected to do additional work to fulfill their biology capstone requirement. Lecture and Laboratory. Foundation in anatomy recommended (Human Anatomy or Vertebrate Zoology).

Prerequisites: (BY 210 [Min Grade: C] or BY 211 [Min Grade: C]) and CH 237 [Min Grade: C] and (CH 238 [Min Grade: C] or CH 239 [Min Grade: C])

BY 491. Biology Capstone - Evolution. 4 Hours.
The course introduces the history of evolutionary thought and modern evolutionary theory. Discussions cover (but are not limited to) the history of life, mechanisms of evolutionary change, sexual selection, adaptation, speciation, and molecular evolution. Students will be introduced to historical and contemporary studies of evolution on a wide variety of topics and organisms. Students that enroll in this class as their capstone experience are expected to do writing and ethics assignments to fulfill their capstone requirement.

BY 492. Biology Capstone - Undergraduate Research. 4 Hours.
Research project under supervision of faculty sponsor. Student must enroll for 4 credit hours and must have senior standing. Students who enroll in this course as their capstone experience will be required to do additional work to fulfill their biology capstone requirement.

BY 493. Biology Capstone - Honors Research. 4 Hours.
Research project under supervision of faculty sponsor. You must enroll in 4 credit hours and you must have senior standing. Students that identify this course as their capstone experience will be required to do additional work to fulfill their biology capstone requirement.

BY 495. Special Topics in Biology. 0-4 Hours.
This course will consider topics from the various disciplines in the biological sciences and the topic will differ each term. Course requirements may include lecture, laboratory, readings, discussion, reporting, and internships or fieldwork, which may be conducted on- or off-campus. May be taken more than once for credit.

Prerequisites: BY 123 [Min Grade: C] and BY 124 [Min Grade: C] and (BY 210 [Min Grade: C] or BY 211 [Min Grade: C])

BY 496. Fundamentals of Clinical Research. 3 Hours.
Issues relevant to the conduct of clinical research: ethics, hypothesis testing, study design, and data collection and management. Lecture and clinical interaction with patients. Prerequisites: Junior or Senior level biology majors; 15 hours of biology credit with a 3.5 GPA in biology courses, and permission of instructor.

BY 498. Honors Research. 1-6 Hour.
Research project for students admitted to Honors Research Program. Two or three terms required during which minimum of 6 semester hours must be earned. Grade assigned at completion of program. 18 hours of biology with minimum GPA of 3.5 in biology classes and admission to Honors Research Program required.

BY 499. Biology Seminar. 1 Hour.
Student presentations and discussions. Subject matter varies by term. See current class schedule for topic. Senior standing and permission of instructor required.

MESC-Marine Environmental Sci Courses
MESC 106. Introduction to Oceanography. 4 Hours.
General introduction to the physics, chemistry, geology, and biology of the ocean. Lecture, laboratory, and field trips. Course is taught at Dauphin Island Sea Lab.

MESC 128. Ocean Science. 4 Hours.
Marine environment and relation of ocean to man. Lecture, laboratory, and field work. For non-science majors. Does not count towards the biology major or minor. General elective credit only. Course is taught at Dauphin Island Sea Lab.

MESC 201. Oceanology of the Gulf of Mexico. 2 Hours.
Descriptive study of the oceanology of the Gulf of Mexico and adjacent waters, including coastal zone, continental shelf, and deep ocean. Course is taught at Dauphin Island Sea Lab.

MESC 204. Coastal Geomorphology. 2 Hours.
Shape and land forms along coast; factors determining formation. Lecture and lab. Course is taught at Dauphin Island Sea Lab.

MESC 206. Marine Biology. 4 Hours.
Invertebrates, vertebrates, and marine plants. Lecture, laboratory, and field work. Permission of instructor required. Course is taught at Dauphin Island Sea Lab.

Prerequisites: BY 124 [Min Grade: D]
MESC 207. Commercial Marine Fisheries of Alabama. 2 Hours.
Biology, harvest techniques, processing, and economic value of local commercial species. Course is taught at Dauphin Island Sea Lab.

MESC 208. Biology and Conservation of Marine Turtles. 2 Hours.
Overview of the biology and conservation of marine turtles. Lecture and laboratory. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 124 [Min Grade: D]

MESC 209. Hurricanes of the Gulf of Mexico. 2 Hours.
Survey of hurricane formation and impacts with emphasis on hurricanes in the Gulf of Mexico. Does not count towards the biology major or minor. General elective credit only. Course is taught at Dauphin Island Sea Lab.

MESC 213. Shark & Ray Biology. 2 Hours.
Introduction to the biology of sharks and rays, with emphasis on regional shark and ray fauna. Lecture and laboratory. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 124 [Min Grade: C]

MESC 216. Shark and Ray Biology. 2 Hours.
Introduction to the biology of sharks and rays, with emphasis on regional shark and ray fauna. Lecture and laboratory. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 124 [Min Grade: C]

MESC 220. Marine Aquaculture. 2 Hours.
This course will introduce students to techniques in marine shellfish aquaculture (both commercial and research production) with an emphasis on production techniques, water quality, nutrition, reproduction, and economics of commercially important species. This course is also designed to assist students with problem solving and communication skills.

MESC 230. The Ecology of Florida Everglades. 2 Hours.
This course will examine the natural history and ecology of one of the world's rarest and most endangered wilderness areas. The Everglades is the only area of our planet to be designated as a National Park, an International Biosphere Reserve, and a World Heritage Park. This two-week course will consist of a week of intensive lectures and discussions, focusing on the natural history, geology, hydrology, and biota of this system, and then a week of intense field time to examine the Everglades and associated systems. The field portion of the course will consist of day-long excursions and hikes, as well as tent camping in several of Florida's state parks. As such, participants should bring appropriate gear and be prepared to actively and cheerfully participate. Special fees apply and will be determined by the number of participants in the course.
Prerequisites: (BY 123 [Min Grade: C] and BY 124 [Min Grade: C]) or BY 260 [Min Grade: C] or BY 256 [Min Grade: C] or BY 255 [Min Grade: C]

MESC 302. Coastal Zone Management. 2 Hours.
Ecological features and set of physical management policies for coastal communities, with description of relevant federal and state programs. Course is taught at Dauphin Island Sea Lab.

MESC 303. Coastal Climatology. 2 Hours.
Physical factors resulting in climatic conditions of coastal regions, with emphasis on northern Gulf of Mexico. Does not count towards the biology major or minor. General elective credit only. Course is taught at Dauphin Island Sea Lab.

MESC 304. Marine Geology. 4 Hours.
Geology of ocean basins, with emphasis on continental shelves, sediments, and sedimentary processes. Course is taught at Dauphin Island Sea Lab.
Prerequisites: ES 101 [Min Grade: D] and ES 102 [Min Grade: D]

MESC 305. Dolphins and Whales. 2 Hours.
Classification, anatomy, and ecology of cetaceans. Lecture and laboratory. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 124 [Min Grade: D]

MESC 330. Marine Conservation Biology. 4 Hours.
This course will explore the major threats to marine biodiversity as well as the pros and cons of the potential solutions to these threats. In addition, students will participate in field trips that support topics covered in lecture, and will demonstrate the application of current principles in marine conservation.

MESC 402. Marine Vertebrate Zoology. 4 Hours.
Marine fishes, reptiles, and mammals (systematics, zoogeography, and ecology). Lecture, laboratory, and field work. 12 semester hours in biology required. Course is taught at Dauphin Island Sea Lab.

MESC 407. Marine Botany. 4 Hours.
Marine algae and vascular and non-vascular plants (distribution, identification, structure, ecology, and reproduction). Lecture, laboratory, and field work. 12 semester hours in biology required. Course is taught at Dauphin Island Sea Lab.

MESC 411. Costal Wetlands Ecology. 4 Hours.
Habitat analysis, natural history studies, and population dynamics of selected organisms. Lecture, laboratory, and field work. Course is taught at Dauphin Island Sea Lab.
Prerequisites: MESC 412 [Min Grade: D] or BY 470 [Min Grade: D]

MESC 412. Marine Ecology. 4 Hours.
Bioenergetics, community structure, population dynamics, predation, competition, and speciation in marine ecosystems. Lecture, laboratory and field work. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 255 [Min Grade: D] or BY 256 [Min Grade: D]

MESC 413. Marine Invertebrate Zoology. 4 Hours.
Natural history, systematics, and morphology of marine invertebrates. Lecture, laboratory and field work. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 124 [Min Grade: D]

MESC 415. Coastal Ornithology. 2 Hours.
Coastal and pelagic birds, with emphasis on ecology, taxonomy, and distribution. Lecture, laboratory, and field work. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 124 [Min Grade: D]

MESC 417. Marine Technical Methods. 2 Hours.
Hardware of marine science, sampling procedures, processing station location, and field equipment maintenance and operation. Prerequisite: 12 semester hours in a science discipline. Course is taught at Dauphin Island Sea Lab.

MESC 428. Oceanography. 4 Hours.
Physics, chemistry, biology, and geology of oceans. Course is taught at Dauphin Island Sea Lab.
Prerequisites: CH 117 [Min Grade: D] and CH 118 [Min Grade: D] and PH 202 [Min Grade: D] and MA 106 [Min Grade: D]

MESC 472. Marine Aquaculture. 2 Hours.
Science, techniques, and economics of marine aquaculture. Lecture and laboratory. BY 255 is a recommended prerequisite. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 256 [Min Grade: D] or BY 435 [Min Grade: D]
MESC 473. Marine Fish Diseases. 4 Hours.
Introduction to aquatic animal diseases, specifically for fish and shellfish. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 271 [Min Grade: D] and (BY 255 [Min Grade: D] or BY 256 [Min Grade: D])

MESC 475. Marine Behavioral Ecology. 4 Hours.
Behavior of marine organisms as it relates to survival in their environment. Lecture, laboratory and field trips. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 255 [Min Grade: D] or BY 256 [Min Grade: D]

MESC 478. Advanced Anatomy and Evolution of Marine Fishes. 3 Hours.
Anatomical studies of marine fishes with emphasis on function and structure; evolutionary and taxonomic relationships. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 256 [Min Grade: D]

MESC 479. Marine Toxicology. 4 Hours.
Selected topics of toxicology as related to the coastal environment and marine organisms. Course is taught at Dauphin Island Sea Lab.
Prerequisites: BY 330 [Min Grade: D] and (CH 235 [Min Grade: D] or CH 237 [Min Grade: D])

MESC 491. Research on Special Topics. 1-6 Hour.
Enrollment by special arrangement in any subject listed. Permission of MESC representative, Department of Biology required. Course is taught at Dauphin Island Sea Lab.

MESC 492. Special Topics: Lecture. 2-4 Hours.
Lectures on selected marine-related topics. Course content varies. Course is taught at Dauphin Island Sea Lab.