

# Department of Chemistry

---

**Chair:** Dr. Richard Dluhy

The Department of Chemistry provides several undergraduate degree programs for chemistry majors and general course offerings for non-majors. All B.S. chemistry degrees are designed to comply with American Chemical Society (ACS) standards and provide a strong foundation in chemistry that prepares students to be highly qualified to work as professional chemists, pursue advanced studies leading to the Ph.D. degree in chemistry or biochemistry, or gain admission to professional schools in medicine, dentistry, optometry, pharmacy, work as forensic chemists in regional, state, and federal forensic laboratories, work as professional chemists in industrial or government laboratories, or pursue certification to be chemistry educators. Students should complete approximately 400 hours of pre-approved laboratory experiences beyond general chemistry in order for their degree to qualify for an ACS certificate. Undergraduate research can account for up to 180 of the required 400 laboratory hours.

The department offers the following ACS-approved B.S. degrees in chemistry as well as a minor in chemistry:

1. Major in Chemistry
2. Major in Chemistry with a Biochemistry Track
3. Major in Chemistry with a Chemical Education Track
4. Major in Chemistry with a Forensic Chemistry Track
5. Major in Chemistry with a Polymer Chemistry Track

The B.S. degree in chemistry with a biochemistry track, or a B.S. degree in chemistry, with biology as a minor, is recommended for students with career interests in medicine, dentistry, optometry, pharmacy, or other health-related fields. Students whose interests include careers in federal, state, or local forensic laboratories are encouraged to obtain a degree in chemistry with the forensic chemistry track.

The required curricula associated with the B.S. degree in chemistry with available options, and a suggested program of study, are available from the Department of Chemistry Advising Office and on the Department of Chemistry website ([www.uab.edu/chemistry](http://www.uab.edu/chemistry)).

An exciting feature of the Department of Chemistry's B.S. degree is the opportunities for undergraduate chemistry majors to participate in world-class research programs. Students are encouraged to become involved in research early in their undergraduate careers. Students are engaged in all aspects of meaningful and significant research programs that cover a variety of projects and encompass every area of chemistry, and biochemistry, and extend into interdisciplinary programs within the UAB biomedical research complex. Students demonstrating success in their research projects are encouraged to present their work at regional and national scientific meetings and are supported by departmental travel scholarships.

All students majoring in chemistry are required to meet with the Undergraduate Advisor (Mr. James Grimes) each term prior to registration. The advisor's contact information is [chemadvise@uab.edu](mailto:chemadvise@uab.edu) or 205-934-7529.

## Grade Point Average

At least a 2.0 average for all required chemistry courses and a 2.0 average for all required chemistry courses taken at UAB are compulsory for either a major or minor in chemistry. The current UAB course repeat policy and course forgiveness policy will be used in calculating the grade point average. Courses taken on a pass/fail basis do not count toward a CH minor.

## Transfer Credit / Residency

All chemistry minors must take at least two of the following courses (with laboratories) at UAB, and at least one of these courses with laboratory must be at the 200 level or higher: CH 235/CH 236, CH 245/CH236, CH 237/CH 238, CH247/CH238, CH 325, CH 345, CH 333, CH 355/CH 355L, CH 426, CH 440, CH 444, CH 450, CH 460, CH 480/CH 480L, or CH 481/CH 481L. Chemistry majors must also take CH 493 or CH 495 at UAB, and at least two of these courses at UAB (if not already satisfied by the residency requirement mentioned above): CH 333, CH 426, CH 440, CH 444, CH 450, CH 463 or CH 464, CH 480/CH 480L, CH 481/CH 481L, or CH 497 (which can only count once, for three credit hours, toward this requirement). Students will not be given more semester-hours credit toward the major or minor than awarded for equivalent courses at UAB. Chemistry credit from another institution cannot be applied toward requirements for a chemistry major or minor at UAB if the grade is W, WP, WF, D, or F. Courses taken through the Cooperative Exchange Program must be approved in advance and in writing by the chemistry department chair in order for courses to apply toward requirements for a chemistry major or minor.

## Core Curriculum for Chemistry

Refer to Core Curriculum

## Graduate Programs

The Department of Chemistry offers graduate study leading to the degrees of Doctor of Philosophy and Master of Science. Further information may be obtained from the Graduate Program Director of the Department of Chemistry, the UAB Graduate School Catalog, or the departmental web site (<http://www.uab.edu/chemistry>).

## 5<sup>th</sup> year master's degree in biochemistry

This is a research intensive degree program and to be eligible for admission in the senior year, students must start their undergraduate research experience as early as possible, preferably in their sophomore year.

Admission Requirements:

- achieved status of Senior chemistry major
- GPA of 3.0 or higher
- enrolled in CHEM 497 (Introduction to Undergraduate Research) by the Fall semester of the Junior year
- selection of faculty research mentor (in the Department of Chemistry or Department of Biochemistry & Molecular Genetics) by Spring semester of the Junior year and enroll in CHEM 497 (Undergraduate Research) by Spring semester of the Junior year

Admission to the 5<sup>th</sup>-year MS program will additionally require:

· satisfactory performance on Graduate Record Exam (GRE) taken in the Senior year (first term)

· strong letter of nomination for admission to the program from their undergraduate research mentor

The 5<sup>th</sup>-year M.S. Chemistry/Biochemistry Oversight Committee, composed of two faculty members from the Department of Chemistry (including the Department of Chemistry Graduate Program Director) and two faculty members from the Department of Biochemistry (GBS-BSSB theme including the GBS-BSSB Graduate Program Director) will review applicants and approve admission to the program.

## Bachelor of Science with a Major in Chemistry

### Required Courses in the UAB Blazer Core Curriculum

Students, in consultation with their academic advisor, must sequence requirements to meet any stated prerequisite requirements for specific courses in their curriculum, including UAB Blazer Core Curriculum requirements stated in this catalog. These courses are required for this major and can also fulfill Blazer core curriculum requirements:

Scientific Inquiry: CH 115, CH 116, CH 117, CH 118, or CH 125, CH 126, CH 127, CH 128

Quantitative Literacy: MA 125, or MA 225

Requirements	Hours
<b>Blazer Core Curriculum</b>	<b>41</b>
<b>General Electives</b>	<b>33</b>
<b>Mathematics Requirement</b>	<b>4</b>
MA 126/226 Calculus II	
<b>Physics</b>	
Select one of the following:	8
PH 201 College Physics I & PH 202 and College Physics II	
PH 221 General Physics I & PH 222 and General Physics II <sup>1</sup>	
<b>Chemistry Requirements</b>	
<b>Organic Chemistry</b>	<b>8</b>
CH 235/245 Organic Chemistry I	
CH 236/246 Organic Chemistry I Laboratory	
CH 237/247 Organic Chemistry II	
CH 238/248 Organic Chemistry II Laboratory	
<b>Analytical / Inorganic / Physical Chemistry</b>	<b>12</b>
CH 325 Physical Chemistry I with Calculus: Thermodynamics and Chemical Kinetics	
CH 333 Synthetic and Physical Laboratory Methods	
CH 345 Inorganic Chemistry: Principles and Applications of Chemical Periodicity	
CH 355 Quantitative Analysis & 355L and Quantitative Analysis Laboratory	
<b>Physical/Transition Metal/Instrumental Chemistry</b>	
Select upper division lab:	2
CH 444 Spectroscopic and Separations Laboratory Methods	
Select one of the following:	3
CH 426 Physical Chemistry II: Structure/Bonding and Molecular Spectroscopy <sup>2</sup>	
CH 440 Transition Metal Chemistry <sup>2</sup>	

CH 450 Instrumental Analysis <sup>2</sup>	
<b>Biochemistry</b>	<b>3</b>
CH 460 Fundamentals of Biochemistry	
<b>Chemistry Electives</b>	
Select one of the following:	3-6
CH 426 Physical Chemistry II: Structure/Bonding and Molecular Spectroscopy <sup>2</sup>	
CH 430 Physical Organic Chemistry	
CH 440 Transition Metal Chemistry <sup>2</sup>	
CH 450 Instrumental Analysis <sup>2</sup>	
CH 451 Chemometrics	
CH 461 Advanced Biochemistry	
CH 463 Biochemistry Laboratory	
CH 464 Physical Biochemistry Laboratory	
CH 471 Medicinal Chemistry and Drug Discovery	
CH 472 Chemistry of Natural Products	
CH 477 Radiochemistry for the Life Sciences	
CH 480 Polymer Chemistry I. Basic Principles	
CH 481 Polymer Chemistry II. Fundamental Properties	
CH 497 Undergraduate Research (two terms strongly recommended)	
<b>Capstone Requirement</b>	
Select one of the following:	3-4
CH 493 Chemistry in Culture & Ethics or CH 495 Ethics in Chemical Research and Undergraduate Research & CH 497	

**Total Hours** **120-124**

<sup>1</sup> The calculus-based PH 221 - PH 222 sequence is strongly recommended.

<sup>2</sup> Each of these courses can only count once toward the chemistry major.

## GPA Requirement

- At least a 2.0 average in all required chemistry courses and a 2.0 average in all required chemistry courses taken at UAB are mandatory for a major in chemistry.
- The current UAB course forgiveness policy will be used in calculating the grade point average.

## Additional Requirements

Requirements	Hours
<b>General Electives</b>	<b>15-19</b>
Students must take general electives (and the FYE/FLC requirement, if applicable) to reach the 120 semester hour requirement.	
<b>Total Hours</b>	<b>15-19</b>

## Bachelor of Science with a Major in Chemistry and a Biochemistry Track

### Required Courses in Core Curriculum

Students, in consultation with their academic advisor, must sequence requirements to meet any stated prerequisite requirements for specific courses in their curriculum, including UAB Core Curriculum requirements

stated in this catalog. **These courses are required for this major and can also fulfill core curriculum requirements:**

Area III Sciences: CH 115, CH 116, CH 117, CH 118, or CH 125, CH 126, CH 127, CH 128

Area III Mathematics: MA 125, or MA 225

Requirements	Hours
<b>Mathematics Requirements</b>	<b>4</b>
MA 126/226 Calculus II	
<b>Biology</b>	<b>8</b>
BY 123 Introductory Biology I	
BY 124 Introductory Biology II	
<b>Biology</b>	
Select one of the following:	3-4
BY 210 Genetics	
or BY 211 Genetics for Honors-HON	
BY 271 Biology of Microorganisms	
BY 330 Cell Biology	
<b>Physics</b>	
Select one of the following:	8
PH 201 College Physics I & PH 202 and College Physics II	
PH 221 General Physics I & PH 222 and General Physics II <sup>1</sup>	
<b>Organic Chemistry</b>	<b>8</b>
CH 235/245 Organic Chemistry I	
CH 236/246 Organic Chemistry I Laboratory	
CH 237/247 Organic Chemistry II	
CH 238/248 Organic Chemistry II Laboratory	
<b>Analytical / Inorganic / Physical Chemistry</b>	<b>12</b>
CH 325 Physical Chemistry I with Calculus: Thermodynamics and Chemical Kinetics	
CH 345 Inorganic Chemistry: Principles and Applications of Chemical Periodicity	
CH 333 Synthetic and Physical Laboratory Methods	
CH 355 Quantitative Analysis & 355L and Quantitative Analysis Laboratory	
<b>Physical/Transition Metal/Instrumental Chemistry</b>	
Select upper division lab:	2
CH 444 Spectroscopic and Separations Laboratory Methods	
Select one of the following:	3
CH 426 Physical Chemistry II: Structure/Bonding and Molecular Spectroscopy	
CH 440 Transition Metal Chemistry	
CH 450 Instrumental Analysis	
<b>Biochemistry</b>	<b>3</b>
CH 460 Fundamentals of Biochemistry	
CH 461 Advanced Biochemistry	
<b>Biochemistry Elective</b>	
Select one of the following:	3
CH 463 Biochemistry Laboratory	
CH 464 Physical Biochemistry Laboratory	
<b>Capstone Requirement</b>	
Select one of the following:	3-4
CH 493 Chemistry in Culture & Ethics	

or CH 495 Ethics in Chemical Research and Undergraduate Research & CH 497

**Total Hours** **57-59**

<sup>1</sup> The calculus based PH 221 & PH 222 is strongly recommended.

## GPA Requirement

- At least a 2.0 average in all required chemistry courses and a 2.0 average in all required chemistry courses taken at UAB are mandatory for a major in chemistry.
- The current UAB course forgiveness policy will be used in calculating the grade point average.

## Additional Requirements

Requirements	Hours
General Electives	
Students must take general electives (and the FYE/FLC requirement, if applicable) to reach the 120 semester hour requirement.	15-19
<b>Total Hours</b>	<b>15-19</b>

## Bachelor of Science with a Major in Chemistry and a Forensic Chemistry Track

### Required Courses in the UAB Blazer Core Curriculum

Students, in consultation with their academic advisor, must sequence requirements to meet any stated prerequisite requirements for specific courses in their curriculum, including UAB Blazer Core Curriculum requirements stated in this catalog. **These courses are required for this major and can also fulfill Blazer core curriculum requirements:**

Communicating in the Modern World<sup>1</sup>: CMST 101

Scientific Inquiry: CH 115, CH 116, CH 117, CH 118, or CH 125, CH 126, CH 127, CH 128

Quantitative Literacy: MA 125, or MA 225

Requirements	Hours
<b>Blazer Core Curriculum</b>	<b>41</b>
<b>Mathematics Requirements</b>	<b>4</b>
MA 126/225 Calculus II	
<b>Biology</b> <sup>2</sup>	<b>17</b>
BY 123 Introductory Biology I	
BY 124 Introductory Biology II	
BY 210 Genetics	
or BY 211 Genetics for Honors-HON	
BY 311 Molecular Genetics	
BY 429 Evolution	
or BY 431 Principles of DNA Technology	
<b>Physics</b>	
Select one of the following:	8
PH 201 College Physics I & PH 202 and College Physics II	
PH 221 General Physics I & PH 222 and General Physics II <sup>3</sup>	
<b>Organic Chemistry</b>	<b>8</b>

CH 235/245	Organic Chemistry I	
CH 236/246	Organic Chemistry I Laboratory <sup>1</sup>	
CH 237/247	Organic Chemistry II	
CH 238/248	Organic Chemistry II Laboratory	
<b>Analytical/Inorganic/Physical Chemistry</b>		<b>20</b>
CH 325	Physical Chemistry I with Calculus: Thermodynamics and Chemical Kinetics	
CH 333	Synthetic and Physical Laboratory Methods	
CH 345	Inorganic Chemistry: Principles and Applications of Chemical Periodicity	
CH 355 & 355L	Quantitative Analysis and Quantitative Analysis Laboratory	
CH 426	Physical Chemistry II: Structure/Bonding and Molecular Spectroscopy	
CH 444	Spectroscopic and Separations Laboratory Methods	
CH 450	Instrumental Analysis	
<b>Biochemistry</b>		<b>6</b>
CH 460	Fundamentals of Biochemistry	
CH 463	Biochemistry Laboratory	
	or CH 464 Physical Biochemistry Laboratory	
<b>Justice Science</b>		<b>15</b>
CJ 110	Introduction to Forensic Science	
CJ 302	Introduction to Statistics	
CJ 250	Criminalistics: An Overview	
CJ 352	Forensic Science Lab	
FS 567	Forensic Toxicology	
<b>Research</b>		<b>2-3</b>
CH 497	Undergraduate Research	
<b>Capstone Requirement</b>		
Select one of the following:		1-3
CH 493	Chemistry in Culture & Ethics	
	or CH 495 Ethics in Chemical Research	
<b>Total Hours</b>		<b>122-125</b>

<sup>1</sup> Completion may satisfy three semester hours of UAB Blazer Core Curriculum credit (Academic Foundations/Communicating the Modern World). See GPS.

<sup>2</sup> These courses may constitute a biology minor; please see biology department advisor or GPS if interested in this minor.

<sup>3</sup> The calculus based sequence PH 221 & PH 222 is strongly recommended.

## GPA Requirement

- At least a 2.0 average in all required chemistry courses and a 2.0 average in all required chemistry courses taken at UAB are mandatory for a major in chemistry.
- The current UAB course forgiveness policy will be used in calculating the grade point average.

## Additional Requirements

### FYE/FLC Requirement

Students must also fulfill the FYC/FLC Requirement, if applicable.

## Bachelor of Science with a Major in Chemistry and a Chemical Education Track

### Required Courses in Blazer Core Curriculum

Students, in consultation with their academic advisor, must sequence requirements to meet any stated prerequisite requirements for specific courses in their curriculum, including UAB Blazer Core Curriculum requirements stated in this catalog. **These courses are required for this major and can also fulfill core curriculum requirements:**

Scientific Inquiry: CH 115, CH 116, CH 117, CH 118, or CH 125, CH 126, CH 127, CH 128

Quantitative Literacy: MA 125, or MA 225

Requirements	Hours
<b>Blazer Core Curriculum</b>	<b>41</b>
<b>General Electives</b>	<b>35</b>
<b>Mathematics Requirement</b>	<b>4</b>
MA 126/225 Calculus II	
<b>Physics</b>	
Select one of the following:	8
PH 201 College Physics I & PH 202 and College Physics II	
PH 221 General Physics I & PH 222 and General Physics II <sup>1</sup>	
<b>Organic Chemistry</b>	<b>8</b>
CH 235/245 Organic Chemistry I	
CH 236/246 Organic Chemistry I Laboratory	
CH 237/247 Organic Chemistry II	
CH 238/248 Organic Chemistry II Laboratory	
<b>Analytical/Inorganic Chemistry</b>	<b>7</b>
CH 345 Inorganic Chemistry: Principles and Applications of Chemical Periodicity	
CH 355 Quantitative Analysis & 355L and Quantitative Analysis Laboratory	
<b>Physical Chemistry</b>	
Select one of the following:	2
CH 333 Synthetic and Physical Laboratory Methods	
CH 444 Spectroscopic and Separations Laboratory Methods	
Select one of the following:	3
CH 325 Physical Chemistry I with Calculus: Thermodynamics and Chemical Kinetics <sup>2</sup>	
CH 426 Physical Chemistry II: Structure/Bonding and Molecular Spectroscopy <sup>2</sup>	
<b>Biochemistry</b>	<b>3</b>
CH 460 Fundamentals of Biochemistry	
<b>Chemistry Electives</b>	
Select one of the following:	3-6
CH 325 Physical Chemistry I with Calculus: Thermodynamics and Chemical Kinetics <sup>2</sup>	
CH 426 Physical Chemistry II: Structure/Bonding and Molecular Spectroscopy <sup>2</sup>	
CH 430 Physical Organic Chemistry	
CH 440 Transition Metal Chemistry <sup>2</sup>	
CH 450 Instrumental Analysis	
CH 451 Chemometrics	

CH 459	Special Topics in Analytical Chemistry	
CH 461	Advanced Biochemistry	
CH 463	Biochemistry Laboratory	
CH 464	Physical Biochemistry Laboratory	
CH 471	Medicinal Chemistry and Drug Discovery	
CH 472	Chemistry of Natural Products	
CH 477	Radiochemistry for the Life Sciences	
CH 480	Polymer Chemistry I. Basic Principles	
CH 481	Polymer Chemistry II. Fundamental Properties	
CH 497	Undergraduate Research (two terms strongly recommended)	
<b>Chemistry Teaching Methods</b>		<b>3</b>
CH 498	Chemistry Teaching Methods	
<b>Capstone Requirement</b>		
Select one of the following:		3-4
CH 493	Chemistry in Culture & Ethics	
	or CH 495 Ethics in Chemical Research and Undergraduate Research	
	& CH 497	
<b>Total Hours</b>		<b>120-124</b>

<sup>1</sup> The calculus based PH 221-PH 222 sequence is strongly recommended.

<sup>2</sup> Each of these courses can only count once toward the chemistry major.

*This program alone DOES NOT lead to certification to teach chemistry. Advising in the School of Education is STRONGLY recommended.*

## GPA Requirement

- At least a 2.0 average in all required chemistry courses and a 2.0 average in all required chemistry courses taken at UAB are mandatory for a major in chemistry.
- The current UAB course forgiveness policy will be used in calculating the grade point average.

## Additional Requirements

Requirements	Hours
<b>General Electives</b>	
Students must take general electives (and the FYE/FLC requirement, if applicable) to reach the 120 semester hour requirement.	29-35
<b>Total Hours</b>	<b>29-35</b>

## Bachelor of Science with a Major in Chemistry and a Polymer Chemistry Track

### Required Courses in Core Curriculum

Students, in consultation with their academic advisor, must sequence requirements to meet any stated prerequisite requirements for specific courses in their curriculum, including UAB Core Curriculum requirements stated in this catalog. **These courses are required for this major and can also fulfill core curriculum requirements:**

Area III Sciences: CH 115, CH 116, CH 117, CH 118, or CH 125, CH 126, CH 127, CH 128

Area III Mathematics: MA 125, or MA 225

Requirements	Hours
<b>Mathematics Requirement</b>	<b>4</b>
MA 126/226	Calculus II
<b>Physics</b>	
Select one of the following: <sup>1</sup>	8
PH 201	College Physics I
& PH 202	and College Physics II
PH 221	General Physics I
& PH 222	and General Physics II
<b>Organic Chemistry</b>	<b>8</b>
CH 235/245	Organic Chemistry I
CH 236/246	Organic Chemistry I Laboratory
CH 237/247	Organic Chemistry II
CH 238	Organic Chemistry II Laboratory
	or CH 248 Organic Chemistry II Laboratory (Honors)
<b>Analytical/Inorganic/Physical Chemistry</b>	<b>12</b>
CH 325	Physical Chemistry I with Calculus: Thermodynamics and Chemical Kinetics
CH 333	Synthetic and Physical Laboratory Methods
CH 345	Inorganic Chemistry: Principles and Applications of Chemical Periodicity
CH 355	Quantitative Analysis
& 355L	and Quantitative Analysis Laboratory
<b>Physical/Transition Metal/Instrumental Chemistry</b>	
Select upper division lab:	2
CH 444	Spectroscopic and Separations Laboratory Methods
Select one of the following:	3
CH 426	Physical Chemistry II: Structure/Bonding and Molecular Spectroscopy
CH 440	Transition Metal Chemistry
CH 450	Instrumental Analysis
<b>Biochemistry</b>	<b>3</b>
CH 460	Fundamentals of Biochemistry
<b>Polymer</b>	<b>8</b>
CH 480	Polymer Chemistry I. Basic Principles
& 480L	and Polymer Chemistry I Laboratory
CH 481	Polymer Chemistry II. Fundamental Properties
& 481L	and Polymer Chemistry II Laboratory
<b>Materials Science and Engineering</b>	<b>6</b>
MSE 280	Engineering Materials
MSE 430	Polymeric Materials <sup>2</sup>
<b>Capstone Requirement</b>	
Select one of the following:	3-4
CH 493	Chemistry in Culture & Ethics
	or CH 495 Ethics in Chemical Research and Undergraduate Research
	& CH 497
<b>Total Hours</b>	<b>57-58</b>

<sup>1</sup> The calculus based PH 221-PH 222 sequence is strongly recommended.

<sup>2</sup> MSE 281 may be a required prerequisite. Check with the course instructor.

## GPA Requirement

- At least a 2.0 average in all required chemistry courses and a 2.0 average in all required chemistry courses taken at UAB are mandatory for a major in chemistry.
- The current UAB course forgiveness policy will be used in calculating the grade point average.
- Courses taken on a pass/fail basis do not count toward the CH major.

## Additional Requirements

Requirements	Hours
<b>General Electives</b>	
Students must take general electives (and the FYE/FLC requirement, if applicable) to reach the 120 semester hour requirement.	13-19
<b>Total Hours</b>	<b>13-19</b>

## Sample Program of Study for a Major in Chemistry

### ACS Approved

Freshman			
First Term	Hours	Second Term	Hours
CH 115 or 125		3 CH 117 or 127	3
CH 116 or 126		1 CH 118 or 128	1
EH 101		3 EH 102	3
MA 125 or 225		4 MA 126 or 226	4
Core Curriculum (e.g. HY 101) <sup>1</sup>		3 Core Curriculum (e.g. CMST 101) <sup>1</sup>	3
FYE (credit hours may vary)	1		
	<b>15</b>		<b>14</b>

Sophomore			
First Term	Hours	Second Term	Hours
CH 235 or 245		3 CH 237 or 247	3
CH 236 or 246		1 CH 238 or 248	1
PH 221 <sup>2</sup>		4 PH 222	4
PH 221L		PH 222L	
PH 221R		PH 222R	
Core Curriculum (e.g. EH 213) <sup>1</sup>		3 Core Curriculum (e.g. PY 101) <sup>1</sup>	3
Core Curriculum (e.g. SOC 100) <sup>1</sup>		3 Core Curriculum (e.g. HY 102) <sup>1</sup>	3
		Electives	2
	<b>14</b>		<b>16</b>

Junior			
First Term	Hours	Second Term	Hours
CH 345		3 CH 355 & 355L	4
CH Elective (400 level) <sup>1</sup>		3 Core Curriculum (e.g., PHL 116) <sup>1</sup>	3
Core Curriculum (e.g., THR 100) <sup>1</sup>		3 Electives	7
Electives	7		
	<b>16</b>		<b>14</b>

Senior			
First Term	Hours	Second Term	Hours
CH 325		3 CH 426 or 440 <sup>3</sup>	3
CH 333		2 CH 444	2
CH 460		3 CH 493	3

Electives	7 Electives	8
	<b>15</b>	<b>16</b>

**Total credit hours: 120**

- <sup>1</sup> See GPS for list of courses that can satisfy core and/or major requirements.
- <sup>2</sup> The calculus based physics sequence PH 221 & PH 222 is strongly recommended instead of the PH 201 & PH 202 sequence.
- <sup>3</sup> CH 450 can substitute for CH 426 or CH 440.

## Sample Program of Study for a Major in Chemistry with a Biochemistry Track

### ACS Approved

Freshman			
First Term	Hours	Second Term	Hours
FYE Course (hours may vary)		1 CH 117 or 127	3
CH 115 or 125		3 CH 118 or 128	1
CH 116 or 126		1 BY 123	4
MA 125 or 225		4 BY 123L	
EH 101		3 MA 126 or 226	4
Core Curriculum (e.g., PY 101) <sup>1</sup>		3 EH 102	3
	<b>15</b>		<b>15</b>

Sophomore			
First Term	Hours	Second Term	Hours
CH 235 or 245		3 CH 237 or 245	3
CH 236 or 246		1 CH 238 or 248	1
BY 124		4 PH 221 <sup>2</sup>	4
BY 124L		PH 221L	
Core Curriculum (e.g. EH 213) <sup>1</sup>		3 PH 221R	
Core Curriculum (e.g. THR 100) <sup>1</sup>		3 Core Curriculum (e.g. PHL 116) <sup>1</sup>	3
Core Curriculum (e.g., HY 101) <sup>1</sup>		3 Core Curriculum (e.g. HY 102) <sup>1</sup>	3
		Elective	1
	<b>17</b>		<b>15</b>

Junior			
First Term	Hours	Second Term	Hours
CH 345		3 CH 355 & 355L	4
CH 460		3 CH 461 <sup>5</sup>	3
PH 222 <sup>2</sup>		4 CH 464	3
PH 222L		BY 210 <sup>3</sup>	4
PH 222R		Core Curriculum (e.g. SOC 100) <sup>1</sup>	3
Electives	5		
	<b>15</b>		<b>17</b>

Senior			
First Term	Hours	Second Term	Hours
CH 325		3 CH 426 or 440 <sup>4</sup>	3
CH 333		2 CH 444	2
Core Curriculum (e.g. CMST 101) <sup>1</sup>		3 CH 493	3

Electives	7 Electives	4
	<b>15</b>	<b>12</b>

**Total credit hours: 121**

- <sup>1</sup> See GPS for list of courses that can satisfy core and/or major requirements.
- <sup>2</sup> The calculus-based physics sequence, PH 221 & PH 222, is strongly recommended, instead of the PH 201 & PH 202 sequence.
- <sup>3</sup> May also choose BY 330 or BY 271/BY 271L.
- <sup>4</sup> CH 450 may substitute for CH 426 or CH 440.
- <sup>5</sup> CH 463 may substitute for CH 464

## Sample Program of Study for a Major in Chemistry with a Chemical Education Track

### ACS Approved

#### Freshman

First Term	Hours	Second Term	Hours
CH 115 or 125		3 CH 117 or 127	3
CH 116 or 126		1 CH 118 or 128	1
MA 125 or 225		4 MA 126 or 226	4
EH 101		3 EH 102	3
FYE (Credit hours may vary)		1 Core Curriculum (e.g. PHL 115) <sup>1</sup>	3
Core Curriculum (e.g. HY 101) <sup>1</sup>	3		
	<b>15</b>		<b>14</b>

#### Sophomore

First Term	Hours	Second Term	Hours
CH 235 or 245		3 CH 237 or 247	3
CH 236 or 246		1 CH 238 or 248	1
PH 221 & 221R & 221L <sup>2</sup>		4 PH 222 & 222R & 222L <sup>2</sup>	4
Core Curriculum (e.g. EH 213) <sup>1</sup>		3 Core Curriculum (e.g. CMST 101) <sup>1</sup>	3
Core Curriculum (e.g. THR 100) <sup>1</sup>		3 Elective	4
Elective	3		
	<b>17</b>		<b>15</b>

#### Junior

First Term	Hours	Second Term	Hours
CH 345		3 CH 355 & 355L	4
CH 460		3 Chemistry Elective (400 level) <sup>1</sup>	3
Core Curriculum (e.g. HY 102) <sup>1</sup>		3 Core Curriculum (e.g. PY 101) <sup>1</sup>	3
Core Curriculum (e.g. ANTH 101) <sup>1</sup>		3 Electives	4
Elective	2		
	<b>14</b>		<b>14</b>

#### Senior

First Term	Hours	Second Term	Hours
CH 325 <sup>3</sup>		3 CH 498	3
CH 333		2 CH 493	3

Electives	11 Electives	9
	<b>16</b>	<b>15</b>

**Total credit hours: 120**

**This program alone DOES NOT lead to certification to teach chemistry. Advising in the School of Education is STRONGLY recommended.**

- <sup>1</sup> See GPS for list of courses that can satisfy core and/or major requirements.
- <sup>2</sup> The calculus-based physics sequence, PH 221 and PH 222, is strongly recommended, instead of the PH 201 and PH 202 sequence.
- <sup>3</sup> CH 426/440 can substitute for CH 325/333

## Sample Program of Study for a Major in Chemistry with a Forensic Chemistry Track

### ACS Approved

#### Freshman

First Term	Hours	Second Term	Hours
CH 115 or 125		3 CH 117 or 127	3
CH 116 or 126		1 CH 118 or 128	1
MA 125 or 225		4 MA 126 or 226	4
EH 101		3 EH 102	3
CJ 110		3 BY 123	4
FYE (Credit hours may vary)		1 BY 123L	
	<b>15</b>		<b>15</b>

#### Sophomore

First Term	Hours	Second Term	Hours
CH 235 or 245		3 CH 237 or 247	3
CH 236 or 246		1 CH 238 or 248	1
CJ 302		3 BY 210	4
BY 124		4 CJ 250 or 350	3
BY 124L		Core Curriculum (e.g. PHL 116) <sup>1</sup>	3
Core Curriculum (e.g. EH 213) <sup>1</sup>		3 Core Curriculum (e.g. HY 101) <sup>1</sup>	3
Core Curriculum (e.g. SOC 100) <sup>1</sup>	3		
	<b>17</b>		<b>17</b>

#### Junior

First Term	Hours	Second Term	Hours
CH 345		3 CH 355 & 355L	4
CH 460		3 CJ 352	3
BY 311		3 CH 464 <sup>3</sup>	3
PH 221 & 221R & 221L <sup>2</sup>		4 BY 429 or 431	3
Core Curriculum (e.g. HY 102) <sup>1</sup>		3 PH 222 & 222R & 222L <sup>2</sup>	4
	<b>16</b>		<b>17</b>

#### Senior

First Term	Hours	Second Term	Hours
CH 325		3 CH 426 or 440	3
CH 333		2 CH 444	2

CH 450	3 CH 495	1
CH 497	2-3 Core Curriculum (e.g. CMST 101) <sup>1</sup>	3
FS 567 or 677	3 Core Curriculum (e.g., THR 100) <sup>1</sup>	3
	Core Curriculum (e.g. PY 101) <sup>1</sup>	3
<b>13-14</b>		<b>15</b>

**Total credit hours: 125-126**

<sup>1</sup> See GPS for list of courses that can satisfy core and/or major requirements.

<sup>2</sup> The calculus-based physics sequence, PH 221 and PH 222, is strongly recommended, instead of the PH 201 and PH 202 sequence.

<sup>3</sup> CH 463 can substitute for CH 464.

## Sample Program of Study for a Major in Chemistry with a Polymer Chemistry Track

### ACS Approved

#### Freshman

First Term	Hours	Second Term	Hours
CH 115 or 125		3 CH 117 or 127	3
CH 116 or 126		1 CH 118 or 128	1
MA 125 or 225		4 MA 126 or 226	4
EH 101		3 EH 102	3
FYE (Credit hours vary.)		1 Core Curriculum (e.g. HY 101) <sup>1</sup>	3
Elective		2 Elective	1
<b>14</b>		<b>15</b>	

#### Sophomore

First Term	Hours	Second Term	Hours
CH 235 or 245		3 CH 237 or 247	3
CH 236 or 246		1 CH 238 or 248	1
MSE 280		3 Core Curriculum (e.g. CMST 101) <sup>1</sup>	3
Core Curriculum (e.g. EH 213) <sup>1</sup>		3 Core Curriculum (e.g. HY 102) <sup>1</sup>	3
Core Curriculum (e.g. PHL 115) <sup>1</sup>		3 Core Curriculum (e.g. ANTH 101) <sup>1</sup>	3
Core Curriculum (e.g. THR 100) <sup>1</sup>		3 Elective (MSE 281)	3
<b>16</b>		<b>16</b>	

#### Junior

First Term	Hours	Second Term	Hours
CH 345		3 CH 355 & 355L	4
PH 221 & 221R & 221L <sup>2</sup>		4 PH 222 & 222R & 222L <sup>2</sup>	4
Core Curriculum (e.g. PY 101) <sup>1</sup>		3 MSE 430	3
Elective		4 Electives	3
<b>14</b>		<b>14</b>	

#### Senior

First Term	Hours	Second Term	Hours
CH 325		3 CH 426 or 440 <sup>3</sup>	3

CH 333	2 CH 444 <sup>3</sup>	2
CH 460	3 CH 481 & 481L	4
CH 480 & 480L	4 CH 493	3
Elective	3 Elective	4
<b>15</b>		<b>16</b>

**Total credit hours: 120**

<sup>1</sup> See GPS for list of courses that can satisfy core and/or major requirements.

<sup>2</sup> The calculus-based physics sequence, PH 221 & PH 222, is strongly recommended, instead of the PH 201 & PH 202 sequence.

<sup>3</sup> CH 450 can substitute for CH 426 or 440.

## Minor in Chemistry

Requirements	Hours
<b>Required Chemistry Courses</b>	
CH 115 General Chemistry I <sup>1</sup> or CH 125 General Chemistry I HONORS	3
CH 116 General Chemistry I Laboratory or CH 126 General Chemistry I HONORS Laboratory	1
CH 117 General Chemistry II <sup>1</sup> or CH 127 General Chemistry II HONORS	3
CH 118 General Chemistry II Laboratory <sup>1</sup> or CH 128 General Chemistry II HONORS Laboratory	1
CH 235 Organic Chemistry I or CH 245 Organic Chemistry I Honors	3
CH 236 Organic Chemistry I Laboratory	1
CH 237 Organic Chemistry II or CH 247 Organic Chemistry II Honors	3
CH 238 Organic Chemistry II Laboratory	1
<b>Chemistry Elective</b>	
Select one of the following:	3-4
CH 325 Physical Chemistry I with Calculus: Thermodynamics and Chemical Kinetics	
CH 345 Inorganic Chemistry: Principles and Applications of Chemical Periodicity	
CH 355 Quantitative Analysis	
CH 426 Physical Chemistry II: Structure/Bonding and Molecular Spectroscopy	
CH 430 Physical Organic Chemistry	
CH 440 Transition Metal Chemistry	
CH 450 Instrumental Analysis	
CH 451 Chemometrics	
CH 459 Special Topics in Analytical Chemistry	
CH 460 Fundamentals of Biochemistry	
CH 461 Advanced Biochemistry	
CH 463 Biochemistry Laboratory	
CH 464 Physical Biochemistry Laboratory	
CH 471 Medicinal Chemistry and Drug Discovery	
CH 472 Chemistry of Natural Products	
CH 477 Radiochemistry for the Life Sciences	
CH 480 Polymer Chemistry I. Basic Principles	
CH 481 Polymer Chemistry II. Fundamental Properties	
<b>Total Hours</b>	<b>19-20</b>



<sup>1</sup> May also satisfy the Blazer Core curriculum Thinking Broadly/Scientific Inquiry requirement.

## GPA and Residency Requirement

- At least a 2.0 average in required chemistry courses and a 2.0 average in required chemistry courses taken at UAB are mandatory for a minor in chemistry.
- The current UAB course forgiveness policy will be used in calculating the grade point average.
- Chemistry courses in which a grade of W, WP, WF, D or F is earned at another institution cannot be applied toward requirements for the chemistry major or minor.**
- Students will not be given more semester-hours credit toward the major or minor than awarded for equivalent courses at UAB.
- All chemistry minors must take at least two of the following courses (at least one with its accompanying laboratory) at UAB: CH 235 /CH 236 , CH 237/CH 238, CH 325 /[CH 333], CH 345/[CH 333], CH 355/CH 355L, CH 426/[CH 444] or CH 440, CH 450/[CH 444], CH 460, CH 480 CH 480 CH 480/CH 480L, or CH 481 /CH 481L.**
- Courses taken on a pass/fail basis do not count toward a CH minor.

## Honors Program in Chemistry

### Purpose

The Chemistry Honors Program is aimed toward outstanding chemistry majors and is designed to enhance the students' problem solving, critical thinking, and communication skills. The program provides an excellent preparation for graduate school or professional careers.

### Eligibility

Acceptance into the Chemistry Honors Program requires the student to:

- Have earned a 3.25 GPA in required chemistry courses attempted;
- Have earned a 3.0 GPA overall;
- Have completed the following courses:

Requirements	Hours
CH 115 General Chemistry I or CH 125 General Chemistry I HONORS	3
CH 116 General Chemistry I Laboratory or CH 126 General Chemistry I HONORS Laboratory	1
CH 117 General Chemistry II or CH 127 General Chemistry II HONORS	3
CH 118 General Chemistry II Laboratory or CH 128 General Chemistry II HONORS Laboratory	1
CH 235 Organic Chemistry I or CH 245 Organic Chemistry I Honors	3
CH 236 Organic Chemistry I Laboratory or CH 246 Organic Chemistry I Laboratory (Honors)	1
CH 237 Organic Chemistry II or CH 247 Organic Chemistry II Honors	3
CH 238 Organic Chemistry II Laboratory or CH 248 Organic Chemistry II Laboratory (Honors)	1

- Have arranged with a faculty mentor to do a research project in chemistry; and

- Have submitted the honors program application form and a one-page honors research proposal to the Chemistry Honors Director.

## Requirements

- Prior approval of the Chemistry Honors Director.
- Prior completion of 6 semester hours of undergraduate research CH 497.
- Enrollment in Honors Thesis, CH 499, requiring a senior thesis written in ACS format for a scientific paper.
- An oral presentation and defense of the thesis before the student's Honors Research Committee.

Where appropriate, the Honors Committee may recommend that chemistry honors students make a formal presentation of their work at the annual meeting of the Alabama Academy of Science or a regional or national meeting of the American Chemical Society.

## Benefits

In addition to the benefits associated with a mentoring program that fosters a spirit of inquiry, independence, and initiative and integrates the student's prior course work into a working knowledge of chemistry in the laboratory, the student who completes the program will graduate "With Honors in Chemistry."

## Contact

For more information and/or admission to the Chemistry Honors Program, contact

Dr. Mitzy Erdmann

Director of the Department of Chemistry Honors Program

Chemistry Building

Birmingham, AL 35294-1240

## CH-Chemistry Courses

### CH 100. Chemical Problem Solving. 3 Hours.

Development of quantitative skills and introduction to basic chemical concepts to prepare students for CH 115. Successful completion of MA 098 or more advanced math, or placement in a more advanced math, is strongly recommended prior to taking this course.

**Prerequisites:** MAAD 15 or MA 098 [Min Grade: P] or MA 098 [Min Grade: C] or MA 102 [Min Grade: D](Can be taken Concurrently) or MA 105 [Min Grade: D](Can be taken Concurrently) or MA 106 [Min Grade: D](Can be taken Concurrently) or MA 107 [Min Grade: D] (Can be taken Concurrently) or MA 110 [Min Grade: D](Can be taken Concurrently) or MA 125 [Min Grade: D](Can be taken Concurrently) or MA 225 [Min Grade: D](Can be taken Concurrently) or MTH1 75 or MTH2 75 or MTH3 75 or MTH4 75 or MTH5 75 or MA1 75 or MA2 75 or MA3 75 or MA4 75 or MA5 75 or MPL 30

**CH 105. Introductory Chemistry I. 3 Hours.**

CH 105 introduces students to the fundamental facts, principles, and theories of general chemistry, and is geared towards allied health professions and non-majors. Topics covered include the following: matter, measurements in chemistry, atomic structure and the periodic table, chemical bonding, chemical reactions and calculations, solutions, and acid/base chemistry. This course meets Blazer Core Curriculum Scientific Inquiry. Concurrent enrollment in CH 105R Introductory Chemistry I Recitation required.

**Prerequisites:** MA 098 [Min Grade: P] or MA 098 [Min Grade: C] or MA 102 [Min Grade: D](Can be taken Concurrently) or MA 105 [Min Grade: D](Can be taken Concurrently) or MA 106 [Min Grade: D] (Can be taken Concurrently) or MA 107 [Min Grade: D](Can be taken Concurrently) or MA 110 [Min Grade: D](Can be taken Concurrently) or MA 125 [Min Grade: D](Can be taken Concurrently) or MA 225 [Min Grade: D](Can be taken Concurrently) or MAAD 15 or MTH1 75 or MTH2 75 or MTH3 75 or MTH4 75 or MTH5 75 or MA1 75 or MA2 75 or MA3 75 or MA4 75 or MA5 75 or MPL 30 or EMA E

**CH 105R. Introductory Chemistry I Recitation. 0 Hours.**

Introductory Chemistry I recitation is used to build problem-solving skills in a study-group environment. Included in these sections are homework, quizzes, lecture related problems, and exams. Concurrent enrollment in CH 105 Introductory Chemistry I required.

**CH 106. Introductory Chemistry I Laboratory. 1 Hour.**

Emphasizes development of lab skills and demonstration of chemical principles covered in CH 105. Writing assignments structured to build on scientific reasoning. Not applicable to a major or minor in chemistry. Quantitative Literacy is a significant component of this course. Concurrent enrollment in or prior completion of CH 105 strongly recommended. This course meets Blazer Core Curriculum Scientific Inquiry.

**CH 107. Introductory Chemistry II. 3 Hours.**

CH 107 will introduce students to the fundamental facts, principles, and theories of organic chemistry and biochemistry, and is geared towards allied health professions and non-majors. Topics covered include the following: hydrocarbons, alcohols, esters, aldehydes and ketones, carboxylic acids, amines and amides, carbohydrates, lipids, proteins, enzymes, and nucleic acids. This course meets Blazer Core Curriculum Scientific Inquiry. Concurrent enrollment in CH 107R Introductory Chemistry II Recitation is required.

**Prerequisites:** CH 105 [Min Grade: C] or CH 115 [Min Grade: C]

**CH 107R. Introductory Chemistry II Recitation. 0 Hours.**

Introductory Chemistry II recitation is used to build problem-solving skills in a study-group environment. Included in these sections are homework, quizzes, lecture related problems, and exams. Concurrent enrollment in CH 107 Introductory Chemistry II required.

**CH 108. Introductory Chemistry II Laboratory. 1 Hour.**

Emphasizes development of lab skills and demonstration of phenomena covered in CH 107. Not applicable to a major or minor in chemistry. Writing assignments structured to build on scientific reasoning. Quantitative Literacy is a significant component of this course. Concurrent enrollment in or prior completion of CH 107 strongly recommended. This course meets Blazer Core Curriculum Scientific Inquiry.

**CH 115. General Chemistry I. 3 Hours.**

Introduces the principles of chemical thought through atomic theory, quantum theory, chemical bonding, reaction types, solution concentration, stoichiometry, chemical structures, intermolecular forces, kinetic molecular theory, and gas laws. The structure of the course emphasizes problem solving and the relationship of these ideas to each other. Quantitative literacy is a significant component of this course. This course meets Blazer Core Curriculum Scientific Inquiry. Concurrent enrollment in CH 115R General Chemistry I Recitation required.

**Prerequisites:** MA 102 [Min Grade: B] or (MA 105 [Min Grade: C] or MA 105 [Min Grade: P]) or MA 106 [Min Grade: C](Can be taken Concurrently) or MA 107 [Min Grade: C](Can be taken Concurrently) or MA 109 [Min Grade: C](Can be taken Concurrently) or MA 225 [Min Grade: C](Can be taken Concurrently) or MA 125 [Min Grade: C](Can be taken Concurrently) or MA 125 [Min Grade: P]) or MAC1 17 or MAAD 21 or MTH2 75 or MTH3 75 or MTH4 75 or MTH5 75 or (A02 23 and HSCG 3.50) or (A02 24 and HSCG 3.00) or (A02 25 and HSCG 2.50) or A02 26 or (S02 540 and HSCG 3.50) or (S02 560 and HSCG 3.00) or (S02 580 and HSCG 2.50) or (SAT2 580 and HSCG 3.50) or (SAT2 600 and HSCG 3.00) or (SAT2 620 and HSCG 2.50) or SAT2 640 or S02 600 or MPL 61

**CH 115R. General Chemistry I Recitation. 0 Hours.**

General Chemistry I recitation is used to build problem-solving skills in a study-group environment. Included in these sections are homework, quizzes, lecture related problems, and exams. Concurrent enrollment in CH 115 General Chemistry I required.

**CH 116. General Chemistry I Laboratory. 1 Hour.**

Emphasizes development of laboratory skills and quantitative analyses related to CH 115. Writing assignments structured to build on scientific reasoning. Concurrent enrollment or prior completion of CH 115 General Chemistry I recommended. Quantitative Literacy is a significant component of this course. This course meets Blazer Core Curriculum Scientific Inquiry.

**CH 117. General Chemistry II. 3 Hours.**

Solutions, chemical kinetics, chemical thermodynamics, chemical equilibria, and special topics, e.g. organic, biochemistry, descriptive chemistry. Writing assignments are structured to build on scientific reasoning. Quantitative literacy is a significant component of this course. This course meets Blazer Core Curriculum Scientific Inquiry. Concurrent enrollment in CH 117R General Chemistry II Recitation required.

**Prerequisites:** CH 115 [Min Grade: C] or CH 125 [Min Grade: C]

**CH 117R. General Chemistry II Recitation. 0 Hours.**

General Chemistry II Recitation is used to build problem-solving skills in a study-group environment. Included in these sections are homework, quizzes, lecture related problems, and exams. Concurrent enrollment in CH 117 General Chemistry II required.

**CH 118. General Chemistry II Laboratory. 1 Hour.**

Emphasizes development of laboratory skills and quantitative analyses related to CH 117. Writing assignments structured to build on scientific reasoning. Concurrent enrollment or prior completion of CH 117 General Chemistry II recommended. Quantitative Literacy is a significant component of this course. This course meets Blazer Core Curriculum Scientific Inquiry.

**CH 125. General Chemistry I HONORS. 3 Hours.**

Stoichiometry, quantum theory, atomic structure, chemical bonding, acids-bases, colligative properties, periodicity, and gas laws. Writing assignments are structured to build on scientific reasoning. This course emphasizes oral and writing communication skills. This Honors course provides less classroom discussion of basic concepts to allow time to cover additional concepts not discussed in CH 115. Thus, prior experience with basic chemical concepts is highly recommended. The class size is limited to 60 students. Quantitative literacy is a significant component of this course. This course, when taken with its corresponding laboratory, meets the Blazer Core Curriculum requirements for Scientific Inquiry. Concurrent enrollment in CH 125R General Chemistry I Recitation required.

**Prerequisites:** MA 102 [Min Grade: B] or MA 105 [Min Grade: C] or MA 105 [Min Grade: P] or MA 106 [Min Grade: C](Can be taken Concurrently) or MA 107 [Min Grade: C](Can be taken Concurrently) or MA 109 [Min Grade: C](Can be taken Concurrently) or MA 125 [Min Grade: C](Can be taken Concurrently) or MA 225 [Min Grade: C](Can be taken Concurrently) or MA 125 [Min Grade: P] or MAC1 17 or MAAD 21 or MTH2 75 or MTH3 75 or MTH4 75 or MTH5 75 or MPL 61 or (A02 23 and HSCG 3.5) or (A02 24 and HSCG 3.0) or (A02 25 and HSCG 2.5) or (S02 540 and HSCG 3.5) or (S02 560 and HSCG 3.0) or (S02 580 and HSCG 2.5) or (SAT2 580 and HSCG 3.5) or (SAT2 600 and HSCG 3.0) or (SAT2 620 and HSCG 2.5) or SAT2 640 or S02 600

**CH 125R. General Chemistry I HONORS Recitation. 0 Hours.**

General Chemistry I recitation is used to build problem-solving skills in a study-group environment. Included in these sections are homework, quizzes, lecture related problems, and exams. Concurrent enrollment in CH 125 General Chemistry I required.

**CH 126. General Chemistry I HONORS Laboratory. 1 Hour.**

Emphasizes development of laboratory skills and quantitative analyses related to CH 125. Writing assignments structured to build on scientific reasoning. (Core Area III) Quantitative Literacy is a significant Component of this course. Permission of instructor or enrollment in Honors College or Chemistry Scholars program required. Concurrent enrollment or prior completion of CH 125 strongly recommended. This course meets the Blazer Core Curriculum Scientific Inquiry with its lecture.

**CH 127. General Chemistry II HONORS. 3 Hours.**

Solutions, kinetics, thermodynamics, equilibria, electrochemistry, nuclear, and special topics, e.g. organic, biochemistry, and descriptive chemistry. Writing assignments are structured to build on scientific reasoning. This course emphasizes oral and written communication skills. This Honors course provides less classroom discussion of basic material to allow time to cover additional concepts not discussed in CH 117. The class size is limited to 60 students. Quantitative literacy is a significant component of this course. This course, when taken with its corresponding laboratory, meets the Blazer Core Curriculum requirements for Scientific inquiry. Concurrent enrollment in CH 127R General Chemistry II Recitation is required.

**Prerequisites:** (CH 115 [Min Grade: A] or CH 115 [Min Grade: P]) or CH 125 [Min Grade: B]

**CH 127R. General Chemistry II HONORS Recitation. 0 Hours.**

General Chemistry II Recitation is used to build problem-solving skills in a study-group environment. Included in these sections are homework, quizzes, lecture related problems, and exams. Concurrent enrollment in CH 127 General Chemistry II required.

**CH 128. General Chemistry II HONORS Laboratory. 1 Hour.**

Emphasizes development of laboratory skills and quantitative analyses related to CH 127. Writing assignments structured to build on scientific reasoning. (Core Area III) Quantitative Literacy is a significant component of this course. Permission of instructor or enrollment in Honors College or Chemistry Scholars program required. Concurrent enrollment or prior completion of CH 127 strongly recommended. This course meets the Blazer Core Curriculum Scientific Inquiry with its lecture.

**Prerequisites:** CH 115 [Min Grade: A] or CH 125 [Min Grade: B] and CH 116 [Min Grade: A] or CH 126 [Min Grade: B]

**CH 199. Bridge Between General and Organic Chemistry. 1 Hour.**

This is a one credit hour, pass-fail, 6-week, on-line class designed to prepare general chemistry students for success in the organic chemistry sequence. The course will reinforce topics from general chemistry and introduce basic concepts that will be encountered in organic chemistry. Recommended for transfer students or for students who earned a grade of C in General Chemistry II.

**Prerequisites:** CH 117 [Min Grade: C] or CH 127 [Min Grade: C]

**CH 201. Research Methods in Chemistry. 3 Hours.**

Comprehensive approach for developing research skills used in chemistry and biochemistry research laboratories. Permission of instructor required.

**Prerequisites:** CH 115 [Min Grade: C](Can be taken Concurrently) or CH 125 [Min Grade: C](Can be taken Concurrently)

**CH 235. Organic Chemistry I. 3 Hours.**

Structure, nomenclature, properties, and reactivity of compounds with various organic functional groups: alkanes, alkenes, alkynes, alkyl halides and alcohols. Emphasis on the mechanisms of organic reactions and problem solving. Concurrent enrollment in CH 235R Organic I Recitation required.

**Prerequisites:** CH 117 [Min Grade: C] or CH 127 [Min Grade: C]

**CH 235R. Organic Chemistry I Recitation. 0 Hours.**

Organic Chemistry I recitation is used to build problem-solving skills in study-group environments. Concurrent enrollment in CH 235 Organic I required.

**CH 236. Organic Chemistry I Laboratory. 1 Hour.**

Techniques of organic chemistry. Synthesis, purification, and characterization of organic compounds. Concurrent enrollment or prior completion of CH 235 strongly recommended.

**Prerequisites:** (CH 117 [Min Grade: C] or CH 127 [Min Grade: C]) and (CH 118 [Min Grade: C] or CH 119 [Min Grade: C] or CH 128 [Min Grade: C])

**CH 237. Organic Chemistry II. 3 Hours.**

Reactions of aromatic compounds and carbonyl containing functional groups: aldehydes, ketones, acids, esters and amides. Molecules of biological interest, such as proteins and carbohydrates. Concurrent enrollment in CH 237R Organic II Recitation required.

**Prerequisites:** CH 235 [Min Grade: C] or CH 245 [Min Grade: C]

**CH 237R. Organic Chemistry II Recitation. 0 Hours.**

Organic Chemistry II recitation is used to build problem-solving skills in study-group environments. Concurrent enrollment in CH 237 Organic Chemistry II required.

**CH 238. Organic Chemistry II Laboratory. 1 Hour.**

Synthesis, purification, and characterization of organic compounds using instrumental analysis and identification of unknowns. Concurrent enrollment or prior completion of CH 237 strongly recommended.

**Prerequisites:** (CH 235 [Min Grade: C] or CH 245 [Min Grade: C]) and (CH 234 [Min Grade: C] or CH 236 [Min Grade: C] or CH 246 [Min Grade: C])

**CH 245. Organic Chemistry I Honors. 3 Hours.**

Structure, nomenclature, properties, and reactivity of compounds with various organic functional groups: alkanes, alkenes, alkynes, alkyl halides and alcohols. Emphasis on the mechanisms of organic reactions and problem solving. This honors course moves at a slightly faster pace than CH 235, and is taught in a slightly nontraditional way. There is less lecture, more class discussion, and more problem-solving. Concurrent enrollment in CH 245R Organic I HONORS Recitation required. Open to Honors College students, Chemistry Scholars, or Permission of Instructor.

**Prerequisites:** CH 117 [Min Grade: C] or CH 127 [Min Grade: C]

**CH 245R. Organic Chemistry I Honors Recitation. 0 Hours.**

Organic Chemistry I recitation is used to build problem-solving skills in study-group environments. Concurrent enrollment in CH 245 Organic Chemistry I HONORS required.

**CH 246. Organic Chemistry I Laboratory (Honors). 1 Hour.**

Emphasis placed on development of techniques used in organic research laboratories and scientific writing. Permission of instructor or enrollment in Honors College or Chemistry Scholars program required.

**Prerequisites:** CH 245 [Min Grade: C](Can be taken Concurrently)

**CH 247. Organic Chemistry II Honors. 3 Hours.**

Reactions of aromatic compounds and carbonyl containing functional groups: aldehydes, ketones, acids, esters and amides. Molecules of biological interest, such as proteins and carbohydrates. This Honors course moves at a slightly faster pace than CH 237, and is taught in a slightly nontraditional way with a greater focus on organic synthesis. There is less lecture, more class discussion, and more problem-solving. Concurrent enrollment in CH 247R Organic II HONORS Recitation required.

**Prerequisites:** CH 235 [Min Grade: A] or CH 245 [Min Grade: C]

**CH 247R. Organic Chemistry II Honors Recitation. 0 Hours.**

Organic Chemistry II recitation is used to build problem-solving skills in study-group environments. Concurrent enrollment in CH 247 Organic Chemistry II HONORS required.

**CH 248. Organic Chemistry II Laboratory (Honors). 1 Hour.**

Synthesis, purification, and characterization of organic compounds using instrumental analysis, molecular modeling, scientific writing, and oral presentation. Permission of instructor, or enrollment in Honors College or Chemistry Scholars program required.

**Prerequisites:** CH 247 [Min Grade: C](Can be taken Concurrently)

**CH 325. Physical Chemistry I with Calculus: Thermodynamics and Chemical Kinetics. 3 Hours.**

Thermodynamics, chemical equilibria, and chemical kinetics. Lecture and laboratory. Prior completion of PH 221 and CH 355 strongly recommended. Prior completion of, or concurrent enrollment in, MA 227 strongly recommended.

**Prerequisites:** (CH 117 [Min Grade: C] or CH 117 [Min Grade: P] or CH 127 [Min Grade: C]) and (MA 126 [Min Grade: C] or MA 226 [Min Grade: C] or MA 126 [Min Grade: P]) and (PH 201 [Min Grade: C] or PH 201 [Min Grade: P] or PH 221 [Min Grade: C] or PH 221 [Min Grade: P])

**CH 333. Synthetic and Physical Laboratory Methods. 2 Hours.**

Fundamental concepts including chemical equilibrium, kinetics, and electronic interactions are explored through synthetic design, advanced spectroscopic methods, and data analysis. Techniques from organic chemistry are further developed and scientific writing is emphasized.

**Prerequisites:** (CH 237 [Min Grade: C] or CH 247 [Min Grade: C]) and (CH 238 [Min Grade: C] or CH 239 [Min Grade: C]) and CH 355 [Min Grade: C](Can be taken Concurrently) and CH 355L [Min Grade: C](Can be taken Concurrently)

**CH 345. Inorganic Chemistry: Principles and Applications of Chemical Periodicity. 3 Hours.**

Systematic coverage of descriptive chemistry. Chemical reactivity using structural and electronic parameters. Development of chemical understanding and intuition of elements and their compounds, as well as industrial and environmental applications.

**Prerequisites:** (CH 237 [Min Grade: C] or CH 247 [Min Grade: C])

**CH 355. Quantitative Analysis. 3 Hours.**

Principles of analytical measurements, statistical and volumetric techniques, spectrophotometric analysis, and chromatography, with emphasis on equilibrium and applications.

**Prerequisites:** CH 117 [Min Grade: C] or CH 127 [Min Grade: C]

**CH 355L. Quantitative Analysis Laboratory. 1 Hour.**

Quantitative analysis laboratory. Concurrent enrollment or prior completion of CH 355 Quantitative Analysis required.

**Prerequisites:** CH 355 [Min Grade: C](Can be taken Concurrently)

**CH 391. Cooperative Education in Chemistry. 2-3 Hours.**

Analysis of the concepts and models of chemistry with emphasis on computational skills for chemistry and science teachers. Appropriate for students seeking certification as chemistry or science teachers. Junior or senior standing and minimum GPA of 2.5 or above required. Requires permission of and evaluation by appropriate faculty advisor.

**CH 416. Chemical Demonstrations I. 3 Hours.**

Demonstration and analysis of safe, practical and effective experiments suitable for middle/high school students. At least 50 demonstrations will be performed. Not applicable to a major or minor in chemistry. Requires permission of instructor.

**CH 417. Chemical Demonstrations II. 3 Hours.**

Demonstration and analysis of safe, practical and effective experiments suitable for middle/high school students. At least 50 demonstrations will be performed. Not applicable to a major or minor in chemistry. Requires permission of instructor.

**CH 426. Physical Chemistry II: Structure/Bonding and Molecular Spectroscopy. 3 Hours.**

Quantum mechanics, chemical bonding, and molecular spectroscopy. Prior completion of CH 325 and MA 227 strongly recommended.

**Prerequisites:** (CH 117 [Min Grade: C] or CH 127 [Min Grade: C] or CH 117 [Min Grade: P]) and (MA 126 [Min Grade: C] or MA 126 [Min Grade: P] or MA 226 [Min Grade: C]) and (PH 202 [Min Grade: C] or PH 202 [Min Grade: P] or PH 222 [Min Grade: C] or PH 222 [Min Grade: P])

**CH 429. Special Topics in Physical Chemistry. 1-3 Hour.**

Special Topics in selected areas of physical chemistry under the supervision of faculty sponsor. Requires permission of instructor.

**CH 430. Physical Organic Chemistry. 3 Hours.**

The course will focus on basic concepts, molecular orbital theory, and organic reaction mechanisms, built on the foundation of organic chemistry I and II. The goal is to provide students a deeper understanding of the general principles, especially structure, mechanism, and their relationships.

**Prerequisites:** CH 237 [Min Grade: C] or CH 247 [Min Grade: C]

**CH 439. Special Topics in Organic Chemistry. 1-3 Hour.**

Special Topics in selected areas of organic chemistry under the supervision of faculty sponsor. Requires permission of instructor.

**CH 440. Transition Metal Chemistry. 3 Hours.**

Relationship between bonding, structure, and properties of compounds including reactions, mechanisms, and catalysis of organometallic and bioinorganic chemistry.

**Prerequisites:** CH 345 [Min Grade: C]

**CH 444. Spectroscopic and Separations Laboratory Methods. 2 Hours.**

Fundamental concepts including electronic and vibrational transitions, nuclear magnetic resonance, and molecular orbital theory are explored through the use of commonly-accessible laboratory instruments. Chromatographic theory and quantitative analysis are applied to the identification and quantitation of analytical standards and unknowns using industry-standard instrumentation. The second half of the course reinforces quantitative methods with hands-on practical training. Concurrent enrollment in, or prior completion of, CH 355 Quantitative Analysis and CH 355L Quantitative Analysis Lab required. CH 355/355L are strongly recommended prior to CH 444.

**Prerequisites:** (CH 237 [Min Grade: C] or CH 247 [Min Grade: C]) and (CH 238 [Min Grade: C] or CH 239 [Min Grade: C]) and CH 355 [Min Grade: C](Can be taken Concurrently) and CH 355L [Min Grade: C](Can be taken Concurrently)

**CH 449. Special Topics in Inorganic Chemistry. 1-3 Hour.**

Special Topics in selected areas of inorganic chemistry under the supervision of faculty sponsor. Requires permission of instructor.

**CH 450. Instrumental Analysis. 3 Hours.**

Focus on modern analytical chemistry instrumentation including chemical separations, spectroscopies (atomic absorption, infrared, UV-visible, fluorescence), mass spectroscopy, and thermal analysis.

**Prerequisites:** (CH 117 [Min Grade: C] or CH 127 [Min Grade: C])

**CH 451. Chemometrics. 3 Hours.**

Introduction to basic data analysis techniques that include testing hypotheses, establishing tendencies and correlations, experimental design, etc. The course is designed to provide a support to a research chemist in effectively solving everyday problems associated with production and interpretation of experimental data.

**CH 459. Special Topics in Analytical Chemistry. 1-3 Hour.**

Special Topics in selected areas of analytical chemistry under the supervision of faculty sponsor. Requires permission of instructor.

**Prerequisites:** (CH 235 [Min Grade: C] and CH 236 [Min Grade: C]) and (CH 237 [Min Grade: C] and CH 238 [Min Grade: C]) and CH 355 [Min Grade: C]

**CH 460. Fundamentals of Biochemistry. 3 Hours.**

Overview of biochemical principles; chemistry of aqueous solutions, biochemical building blocks including amino acids, carbohydrates, lipids, and nucleotides; examination of metabolic pathways and enzymes that mediate catabolic and anabolic metabolism of carbohydrates, lipids, amino acids, and nucleic acids. Application of clinical correlations of metabolism to human nutrition and disease. This course is designed for Chemistry majors as well as students interested in medicine, dentistry, optometry, or pharmacy.

**Prerequisites:** CH 237 [Min Grade: C] or CH 247 [Min Grade: C]

**CH 461. Advanced Biochemistry. 3 Hours.**

Protein structure and function, enzymology, DNA structure, prokaryotic replication, transcription, and protein synthesis. Membrane structure and function, carbohydrate structure and function. Methods for isolating and characterizing macromolecule structure and function including chromatography, gel electrophoresis, CD, UV, and fluorescence spectroscopy, mass spectroscopy, X-ray crystallography and nuclear magnetic resonance spectroscopy.

**Prerequisites:** CH 460 [Min Grade: C]

**CH 463. Biochemistry Laboratory. 3 Hours.**

Introduction to modern bioanalytical techniques used for the expression, isolation, and characterization of proteins and other biological macromolecules. Space is limited. Students with a Chemistry Major with either the Biochemistry or Forensic Tracks have priority.

**Prerequisites:** CH 355 [Min Grade: C] and CH 460 [Min Grade: C]

**CH 464. Physical Biochemistry Laboratory. 3 Hours.**

Physical/analytical approaches (including mass spectroscopy and NMR) toward determination of macromolecular structures, ligand binding, and enzymology. Space is limited. Students with the Chemistry Major with the Biochemistry Track have priority. Concurrent or prior enrollment in CH 461 is recommended.

**Prerequisites:** CH 450 [Min Grade: C] or CH 460 [Min Grade: C] or CH 461 [Min Grade: C]

**CH 469. Special Topics in Biochemistry. 1-3 Hour.**

Special topics in selected areas of biochemistry, biophysical chemistry, or structural biochemistry under supervision of faculty sponsor. Requires permission of instructor.

**Prerequisites:** CH 462 [Min Grade: C]

**CH 471. Medicinal Chemistry and Drug Discovery. 3 Hours.**

Emphasis on structure-based design strategies for small organic molecule drugs using common macromolecular drug targets. Examples of successful design for experimental and clinically used drugs will be presented.

**Prerequisites:** CH 237 [Min Grade: C] and CH 460 [Min Grade: C]

**CH 472. Chemistry of Natural Products. 3 Hours.**

The principal focus of this course will be the introduction of synthesis and medicinal chemistry of natural products. Drug discovery using natural products, with specific examples in the areas of antibacterial, anticancer, and analgesic drugs will be introduced. An overview of structural classes, biosynthetic pathways and application of asymmetric synthesis in the synthesis of specific examples from each class will be discussed. This course is intended for undergraduate students at the senior level. Prior completion of prerequisite courses with a grade of B or better strongly recommended.

**Prerequisites:** (CH 235 [Min Grade: C] or CH 245 [Min Grade: C]) and CH 236 [Min Grade: C] and (CH 237 [Min Grade: C] or CH 247 [Min Grade: C]) and CH 238 [Min Grade: C]

**CH 477. Radiochemistry for the Life Sciences. 3 Hours.**

This course is intended to act as an introduction to radiochemistry. It will cover production, instrumentation, and radiochemistry techniques to make use of radiotracers in the life sciences from basic biological and environmental applications to medical imaging and therapy. Prior completion of CH 355 Quantitative Analysis and CH 355L Quantitative Analysis Lab strongly recommended.

**Prerequisites:** CH 237 [Min Grade: C] or CH 247 [Min Grade: C]

**CH 480. Polymer Chemistry I. Basic Principles. 3 Hours.**

Basic chemical principles of polymers with the focus on synthesis, characterization, and applications of synthetic and biological macromolecules. Prior completion of CH 237, CH 325, and CH 355 (and MSE 350 for MSE students) recommended. Concurrent enrollment in, or prior completion of, CH 480L Polymer Chemistry I Lab is recommended.

**Prerequisites:** (CH 117 [Min Grade: C] or CH 127 [Min Grade: C])

**CH 480L. Polymer Chemistry I Laboratory. 1 Hour.**

Polymer Chemistry I Laboratory. Concurrent enrollment in CH 480 Polymer Chemistry I required.

**CH 481. Polymer Chemistry II. Fundamental Properties. 3 Hours.**

Fundamentals of chemical, physical and molecular properties of polymers in bulk and solution. Concurrent enrollment in CH 481L Polymer Chemistry II Laboratory required. Prior completion of CH 237, CH 325, and CH 355 (and MSE 350 for MSE students) recommended. Concurrent enrollment in, or prior completion of, CH 481L Polymer Chemistry II Laboratory is recommended.

**Prerequisites:** (CH 117 [Min Grade: C] or CH 127 [Min Grade: C])

**CH 481L. Polymer Chemistry II Laboratory. 1 Hour.**

Polymer Chemistry II Laboratory. Concurrent enrollment in CH 481 Polymer Chemistry II required.

**CH 489. Special Topics in Polymer Chemistry. 1-3 Hour.**

Special topics in selected areas of polymer chemistry under supervision of faculty sponsor. Requires permission of instructor.

**CH 492. Research Methods. 1-3 Hour.**

This course is required in the UABTEACH program and is specially designed to meet the needs of future teachers. Students meet two hours per week for non-traditional, interactive lectures and two hours per week for lab. The course is cross-listed (Physics, Chemistry, and Biology). It provides students with the tools that scientists use to solve scientific problems; gives students the opportunity to use these tools in a laboratory setting; makes students aware of how scientists communicate with each other through peer-reviewed scientific literature; and enables students to understand how scientists develop new knowledge and insights. The course requires a substantial amount of writing.

**CH 493. Chemistry in Culture & Ethics. 3 Hours.**

Designed to explore the impact of chemical innovations on society; challenges students to consider ethical use of chemical innovations and broader impacts of chemistry in society. Writing assignments are structured to build on scientific reasoning. Capstone course intended for graduating senior Chemistry majors.

**Prerequisites:** (CH 237 [Min Grade: C] or CH 247 [Min Grade: C]) and CH 325 [Min Grade: D]

**CH 495. Ethics in Chemical Research. 1 Hour.**

Designed to explore the impact of chemical innovations on society; challenges students to consider ethical use of chemical innovations and broader impacts of chemistry in society. Writing assignments are structured to build on scientific reasoning. Capstone course intended for graduating senior Chemistry majors.

**Prerequisites:** (CH 237 [Min Grade: C] or CH 247 [Min Grade: C]) and CH 497 [Min Grade: C](Can be taken Concurrently) and CH 325 [Min Grade: C]

**CH 497. Undergraduate Research. 2-3 Hours.**

Research project conducted under the supervision of a faculty mentor. Two semesters are highly recommended for minimum accumulation of 6 semester hours. A progress report is required each semester and a comprehensive written report in ACS format is required at the completion of the project. Permission of faculty mentor and instructor required; GPA 2.5 or greater overall; GPA 3.0 or greater in required chemistry courses.

**CH 498. Chemistry Teaching Methods. 3 Hours.**

This course provides chemistry majors who will be future chemistry teachers with insights into the fundamental principles of chemistry in a way that can be transported to the classroom. The course will cover all aspects of teaching, measurements of effectiveness, and outcomes. Permission of instructor required.

**Prerequisites:** CH 235 [Min Grade: C] or CH 245 [Min Grade: C]

**CH 499. Honors Research and Thesis. 0-3 Hours.**

Research project conducted under the supervision of faculty mentor. Admission to the Chemistry Honors Program is required; a research proposal must be on file with and approved by Chemistry Honors Director. The course concludes with a written honors thesis and oral presentation and defense. Chemistry GPA 3.25 or greater; overall GPA 3.0 or greater required.

**Prerequisites:** CH 497 [Min Grade: C]

**ES-Earth Science Courses****ES 101. Physical Geology. 3 Hours.**

Earth-the third rock from the Sun. Mankind's only home with resources necessary for life. Learn about our uses and dependence on water, minerals, rocks, fossils and fossil fuels. Critical mineral resources that bind us to foreign countries. Dangers of earthquakes and volcanic eruptions. Our warming world in an energy transition for sustainability and reducing climate change. Active lectures with group discussions. This course, when taken with its corresponding laboratory ES102, meets the Blazer Core Curriculum Scientific Inquiry.

**ES 102. Physical Geology Laboratory. 1 Hour.**

Got gold? Probably not. Learn how to identify common rocks and minerals, and their uses in everyday materials. Lost your way? Learn how to read maps and the landscape. Feeling old? Learn about the geologic time scale, age of fossils, Earth and Moon. Wonder what powers your world? Learn about fossil fuels, electricity, and your future world of global climate change. One laboratory session per week. This course when taken with its corresponding lecture ES101 meets Blazer Core Curriculum Scientific Inquiry.

**Prerequisites:** ES 101 [Min Grade: D](Can be taken Concurrently)

**ES 103. History of the Earth. 3 Hours.**

Interpretation of Earth's history through geologic time. Study of life on Earth through the fossil record. Lecture. This course, when taken with its corresponding laboratory, meets the Core Curriculum requirements for Area III: Natural Sciences.

**ES 104. History of the Earth Laboratory. 1 Hour.**

Sedimentary materials and environments of formation. Fossil identification. Geologic time and principles of age-dating. One laboratory session per week.

**ES 105. Physical Geography. 3 Hours.**

Atmosphere, weather, climate and climatic regions, and soils.

**ES 107. Directed Readings in Earth Science. 1-3 Hour.****ES 108. Urban Geology. 3 Hours.**

Urban lives are dominated by concrete and steel, as well as daily movements from home to campus or work. Every manufactured object is derived from earth's resources, and the planet's dynamic activity drives and constrains movements. This course will introduce students to the resources of the material world, e.g. minerals, rock, water, and the processes that impact the urban environment, e.g. flooding, weathering, etc. Students will learn, practice, and employ scientific thinking skills to better understand and analyze connections between geologic resources and economics, environment, and social justice. This course meets Blazer Core Curriculum City as a Classroom with flags in Collaborative Assignments and Sustainability.

**ES 109. Planet Earth. 3 Hours.**

Major topics and problems in modern earth science. Nature of solid Earth and its atmosphere, climatic change, Earth's resources, interaction of Earth with sun, and planetary geology. Selected readings and videotapes.

**ES 110. The Geography of Alabama. 3 Hours.**

The physical geography of Alabama: geologic setting, landscape, climate and weather, soils and vegetation, natural resources.

**ES 120. Geology for Engineers. 3 Hours.**

The solid earth, the nature of the earth's crust, surficial processes.

**ES 191. Co-op Work Program. 2-3 Hours.**