

Canisius College
Department of Chemistry & Biochemistry
Student Handbook
2016–2017



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A copy of this handbook can be downloaded from
<https://my.canisius.edu/group/student/collegepolicies> under the Student Handbooks folder **OR**
<https://my.canisius.edu/group/staff/collegepolicies> under the Student Handbooks folder.

AY 16/17

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Welcome to the Department of Chemistry & Biochemistry at Canisius College!

Inside these pages you will find information about:

- How to declare a major or minor
- Chemistry & Biochemistry Tracks including course requirements and recommended schedules
- Careers suitable for Chemistry & Biochemistry majors
- Extracurricular activities in the sciences
- Faculty and their research
- Important information for students interested in obtaining advanced degrees in Chemistry and Biochemistry (MS & PhD) after graduation
- Important information for students interested in attending medical or dental school after graduation
- Important information for students interested in attending pharmacy school after graduation

We hope that you find this information helpful and that you enjoy your studies here at Canisius. If you have any questions, please seek out a faculty member. We're excited that you are a member of our department and can't wait to watch you succeed!

The Chemistry & Biochemistry Department Faculty & Staff

Mariusz Kozik, Chair (Inorganic)	Allyson Backstrom (Organic)
Sarah Evans (Biochemistry)	Timothy Gregg (Organic)
Roberto Gregorius (Science Education)	Krit Marohn (General Chemistry Labs)
Jim Maul (Organic Labs)	Mary O'Sullivan (Organic)
Pete Schaber (Analytical)	Phil Sheridan (Physical)
Jeremy Steinbacher (Organic)	Tom Stabler (Lab Director)
Alice Steltermann (Administrative Assoc)	Steven Szczepankiewicz (Analytical)

Emeriti Faculty

Joe Bieron
Frank Dinan
James Van Verth
AY 16/17

Declaring a Major or Minor in Chemistry or Biochemistry

All freshmen are asked to declare a major when they matriculate at Canisius College. If you declared Chemistry or Biochemistry as a major, then additional paperwork is NOT required.

If you would like to change your major to Chemistry or Biochemistry from another major, to declare a double or triple major, or to declare one or more minors, download the Majors & Minors Declaration Form from the Student Advisement Center website:

<http://www.canisius.edu/dotAsset/1de8b9a9-9513-4263-aa4f-2924133df809.pdf> .

Please note the signature of the department chair is required. Completed forms are then submitted to the Student Records Office, Bagen 106.

Note that Chemistry Department offers five degree tracks, three in chemistry (CHM ACS, CHM, CHM HT) and two in biochemistry (BCH ACS, BCH). The differences between the tracks are summarized on the next page. While declaring the chemistry or biochemistry major you should indicate the track that you want to follow.

Side-by-side Comparison of Chemistry & Biochemistry Tracks

CHM ACS	CHM	CHM HT	BCH ACS	BCH
<i>Cognate Courses</i>				
BIO111 + L	BIO111 + L	BIO111 + L	BIO111 + L	BIO111 + L
		BIO112 + L	BIO112 + L	BIO112 + L
MAT111	MAT111	MAT111	MAT111	MAT111
MAT112	MAT112/141	MAT112/141	MAT112	MAT112/141
PHY223 (Calc based) + L	PHY201 + L	PHY201 + L	PHY223 + L	PHY201 + L
PHY224 (Calc based) + L	PHY202 + L	PHY202 + L	PHY224 + L	PHY202 + L
<i>Introductory Chemistry</i>				
CHM111 + L	CHM111 + L	CHM111 + L	CHM111 + L	CHM111 + L
CHM112 + L	CHM112 + L	CHM112 + L	CHM112 + L	CHM112 + L
<i>Fundamental Courses</i>				
Organic I CHM227 + L	CHM227 + L	CHM227 + L	CHM227 + L	CHM227 + L
Organic II CHM228 + L	CHM228 + L	CHM228 + L	CHM228 + L	CHM228 + L
Analytical CHM230 + L	CHM230 + L	CHM230 + L	CHM230 + L	
Inorganic CHM244	CHM244	CHM244	CHM244	CHM244
Classical Physical CHM301 + L	CHM301 + L	CHM301 (No L)	CHM301 + L	CHM301 (No L)
Intro to Bch BCH301 (No L)	BCH301 (No L)	BCH301 (No L)	BCH301 + L	BCH301 + L
<i>In-depth Courses</i>				
Modern Physical CHM302 + L			CHM302 + L	
		Cellular Bch BCH302	BCH302	BCH302
Spectroscopy CHM334 + L	CHM334 + L		(CHM334 or 430) + L	(CHM334 or 430) + L
Instrumental CHM430 + L	CHM430 + L			
			Mol. Bio BCH403 + L	BCH403 + L
Materials CHM 420 + L			Materials CHM 420	
CE	CE	CE + L		CE or BCE
CE	CE	SE + L		BCE
	CE	SE		
CHM 381,480,481	CHM 381,480,481	CHM 381,480,481	CHM 381,480,481	CHM 381,480,481
<i>Classes in Major and Laboratories</i>				
20, 13L, 75 CR	19, 11L, 70 CR	19, 11L, 70 CR	20, 14L, 76 CR	19, 11L, 70 CR

CE = Chemistry Elective

CE + L = Chemistry Elective + Lab

BCE = Biochemistry Elective

SE + L = Science Elective + Lab

SE = Science Elective; a 300 or 400 level course in CHM, BCH, BIO, PHY, or CSC

Chemistry ACS Certified: Suggested Schedule and Requirements

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	
MAT 111	MAT 112
	PHY 223 + L

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
CHM 244	CHM 230 + L
PHY 224 + L	

Junior Year	
Fall	Spring
CHM 301 + L	CHM 302 + L
CHM 420 + L*	CHM 430 + L
CHM 381	CHM 480

Senior Year	
Fall	Spring
CHM 334 + L	CE
BCH 301	CE
CHM 481	

“+ L” indicates that the corresponding laboratory is required.

*CHM 420 is offered every other year. If it is not offered in the junior year, take CHM 334 + L instead and move CHM 420 to the senior year

Chemistry: Suggested Schedule and Requirements

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	MAT 112/141
MAT 111	

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
PHY 201 + L	PHY 202 + L

Junior Year	
Fall	Spring
BCH 301	CHM 230 + L
CHM 244	CE
CHM 381	CHM 480

Senior Year	
Fall	Spring
CHM 301 + L	CHM 430 + L
CHM 334 + L	CE
CHM 481	CE

“+ L” indicates that the corresponding laboratory is required.

Chemistry Health Professions: Suggested Schedule and Requirements

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	BIO 112 + L
MAT 111	MAT 112/141

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
PHY 201 + L	PHY 202 + L

Junior Year	
Fall	Spring
CHM 244	CHM 230 + L
BCH 301	BCH 302
CHM 381	CHM 480

Senior Year	
Fall	Spring
CHM 301	CE + L or SE + L ¹
SE + L or CE + L ¹	SE
CHM 481	

“+ L” indicates that the corresponding laboratory is required.

¹ – Both SE + L and CE + L are required. If SE + L is taken in the fall, then CE + L is taken in the spring, and vice versa.

Chemistry ACS Certified with Business Minor:
Suggested Schedule and Requirements

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	PHY 223 + L
MAT 111	MAT 112

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
CHM 244	CHM 230 + L
PHY 224 + L	MAT 141 or ECO 255
ECO 101	ECO 102

Junior Year	
Fall	Spring
CHM 301 + L	CHM 302 + L
CHM 420 + L*	CHM 430 + L
CHM 381	CHM 480
MKT 201	MGT 101

Senior Year	
Fall	Spring
BCH 301	CE
CHM 334 + L	CE
CHM 481	FIN 201
ACC 201	

“+ L” indicates that the corresponding laboratory is required.

*CHM 420 is offered every other year. If it is not offered in the junior year, take CHM 334 + L instead and move CHM 420 to the senior year .

Chemistry with Business Minor:
Suggested Schedule and Requirements

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	MAT 141 or ECO 255
MAT 111	

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
PHY 201 + L	PHY 202 + L
	ECO 102

Junior Year	
Fall	Spring
BCH 301	CHM 230 + L
CHM 244	CE
ECO 101	CHM 480
CHM 381	MGT 101

Senior Year	
Fall	Spring
CHM 301 + L	CHM430 + L
CHM 334 + L	CE
CHM 481	CE
MKT 201	FIN 201
ACC 201	

“+ L” indicates that the corresponding laboratory is required.

Chemistry Health Professions with Business Minor:
Suggested Schedule and Requirements

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	BIO 112 + L
MAT 111	MAT 141 or ECO 255

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
PHY 201 + L	PHY 202 + L
ECO 101	ECO 102

Junior Year	
Fall	Spring
CHM 244	CHM 230 + L
BCH 301	BCH 302
CHM 381	CHM 480
MKT 201	MGT 101

Senior Year	
Fall	Spring
CHM 301	CE + L
SE + L	SE
CHM 481	FIN 201
ACC 201	

“+ L” indicates that the corresponding laboratory is required.

Biochemistry ACS Certified: Suggested Schedule and Requirements

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	BIO 112 + L
MAT 111	MAT 112

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
CHM 244	PHY 223 + L

Junior Year	
Fall	Spring
BCH 301 + L	CHM 230 + L
PHY 224 + L	BCH 302
CHM 420*	CHM 480
CHM 381	

Senior Year	
Fall	Spring
CHM 301 + L	(CHM 430 + L)
(CHM 334 + L)	CHM 302 + L
CHM 481	BCH 403 + L

“+ L” indicates that the corresponding laboratory is required.

Biochemistry Track requires CHM 334 + L or CHM 430 + L.

* CHM 420 is offered every other year. If it is not offered in the junior year, take CHM 334 + L instead and move CHM 420 to the senior year .

Biochemistry: Suggested Schedule and Requirements

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	BIO 112 + L
MAT 111	MAT 112/141

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
PHY 201 + L	PHY 202 + L

Junior Year	
Fall	Spring
BCH 301 + L	BCH 302
CHM 244	BCE
CHM 381	CHM 480

Senior Year	
Fall	Spring
CHM 301	(CHM 430 + L)
(CHM 334 + L)	BCH 403 + L
CHM 481	CE or BCE

“+ L” indicates that the corresponding laboratory is required.

Biochemistry Track requires CHM 334 + L or CHM 430 + L.

Biochemistry ACS Certified with Business Minor:
Suggested Schedule and Requirements

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	BIO 112 + L
MAT 111	MAT 112

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
CHM 244	PHY 223 + L
ECO 101	MAT 141 or ECO 255
	ECO 102

Junior Year	
Fall	Spring
BCH 301 + L	BCH 302
CHM 420*	CHM 230 + L
PHY 224 + L	CHM 480
CHM 381	MGT 101

Senior Year	
Fall	Spring
CHM 301 + L	(CHM 430 + L)
(CHM 334 + L)	CHM 302 + L
CHM 481	BCH 403 + L
ACC 201	FIN 201
MKT 201	

“+ L” indicates that the corresponding laboratory is required.

Biochemistry Track requires CHM 334 + L or CHM 430 + L.

Students are required to take either ECO 255 or MAT 141 to satisfy minor requirements.

* CHM 420 is offered every other year. If it is not offered in the junior year, take CHM334 + L instead and move CHM 420 to the senior year .

**Biochemistry with Business Minor:
Suggested Schedule and Requirements**

Freshman Year	
Fall	Spring
CHM 111 + L	CHM 112 + L
BIO 111 + L	BIO 112 + L
MAT 111	MAT 141 or ECO 255

Sophomore Year	
Fall	Spring
CHM 227 + L	CHM 228 + L
PHY 201 + L	PHY 202 + L
ECO 101	ECO 102

Junior Year	
Fall	Spring
BCH 301 + L	BCH 302
CHM 244	BCE
CHM 381	CHM 480
	MGT 101

Senior Year	
Fall	Spring
CHM 301	BCH 403 + L
(CHM 334 + L)	(CHM 430 + L)
CHM 481	CE or BCE
ACC 201	FIN 201
MKT 201	

“+ L” indicates that the corresponding laboratory is required.

Biochemistry Track requires CHM 334 + L or CHM 430 + L.

CHEMISTRY MINOR

Students majoring in various disciplines such as biology, mathematics, physics, bioinformatics, computer science, psychology and business can benefit from pursuing a minor in chemistry. The chemistry minor requires a student to complete the following sequence of courses:

- Two semesters of General Chemistry with laboratory:
CHM 111 + L and CHM 112 + L (8 credits)
- Two semesters of Organic Chemistry with laboratory:
CHM 227 + L and CHM 228 + L (8 credits)
- One semester of Analytical Chemistry with laboratory:
CHM 230 + L or CHM 334 + L or CHM 430 + L (4 credits)
- One semester of Physical Chemistry or Inorganic Chemistry:
CHM 301 or CHM 244 (3 credits)
- Chemistry Elective:
one CHM 300 or 400 level course (3 credits)

SUGGESTED MINORS

- School of Business
 - Business
 - Marketing
 - Management

- College of Arts & Sciences
 - Modern Language (Spanish, French, etc.)
 - Math
 - Physics
 - Computer Science
 - Information Technology
 - Biology
 - Psychology

RECOMMENDED ELECTIVES

For students interested in studying physical chemistry in graduate school:

- Calculus III (MAT 211), Linear Algebra (MAT 219) and Differential Equations (MAT 222)
- General Physics III (PHY 225), Basic Electronics (PHY 226) Classical Mechanics (PHY 443) and Quantum Mechanics (PHY 447)

For students interested in studying biological chemistry in graduate school:

- Molecular Biology (BCH 403) and Biotechnology (BIO 408)

For students interested in pharmacy school:

- Microbiology (BIO 307) and Human Anatomy & Physiology (BIO 114 & 115 and BIO 340)
- In addition to MAT 111 and MAT 141, top pharmacy schools require MAT 112. Consider taking both MAT 112 and MAT 141.
- Economics (macro or micro) and Intro to Psychology or Sociology

For students interested in medical or dental school:

- Genetics (BIO 404), Medical Biochemistry (BIO 440) and Human Anatomy & Physiology (BIO 114 & 115)

OTHER IMPORTANT COURSES TO CONSIDER

BCH 450: Research in Biochemistry

3 credits

Independent research under the direction of the biochemistry faculty. Students are required to spend 9 hours per week conducting research. Research and consultation times to be arranged after approval of department chair. *Fall/Spring*. **This course counts as a chemistry elective (CE), biochemistry elective (BCE), or a science elective (SE).**

BCH 451: Research in Biochemistry

4 credits

Independent research under the direction of the biochemistry faculty. Students are required to spend 12 hours per week conducting research. Research and consultation times to be arranged after approval of department chair. *Fall/Spring*. **This course counts as a chemistry elective + lab (CE + L), biochemistry elective + lab (BCE + L), or a science elective + lab (SE + L).**

CHM 450: Research in Chemistry

3 credits

Independent research under the direction of a member of the chemistry faculty. Students are required to spend 9 hours per week conducting research. Research and consultation times to be arranged after approval of department chair. *Fall/Spring*. **This course counts as a chemistry elective (CE), biochemistry elective (BCE), or a science elective (SE).**

CHM 451: Research in Chemistry

4 credits

Independent research under the direction of a member of the chemistry faculty. Students are required to spend 12 hours per week conducting research. Research and consultation times to be arranged after approval of department chair. *Fall/Spring*. **This course counts as a chemistry elective + lab (CE + L), biochemistry elective + lab (BCE + L), or a science elective + lab (SE + L).**

CHM 490: Internships in Chemistry & Biochemistry

3 credits

Internships in chemical or biochemical industry under the direction of company and faculty supervisors. *Prerequisite:* Permission of the department chair. *Fall/Spring*
This course counts as a chemistry elective, biochemistry elective, or science elective.

EXTRACURRICULAR ACTIVITIES IN THE SCIENCES

Student Chapter of the American Chemical Society (ACS).

Find us on Collegiate Link and the web:

<http://www.canisius.edu/chemistry/learn/chemistry-club/>

Advisor: Dr. Sheridan

Chem for Kids (Chemistry demonstrations at local schools by ACS)

Physics Club

Colleges Against Cancer

Pre-Health Professions Club

INFORMATION FOR STUDENTS INTERESTED IN ATTENDING GRADUATE SCHOOL

FRESHMAN YEAR

- Keep your text books, quizzes, and exams (good resources for upper level courses, studying for the GRE, etc.).
- In early November, ask faculty about conducting summer research. In mid/late November complete the “application for research” form (available in Chemistry Dept. Office, also look for an e-mail announcement from the Chair of the Chem. Dept.).
- Get involved in 2-3 clubs or extracurricular activities. (But don’t over-commit!)

SOPHOMORE YEAR

- Keep your text books, quizzes, and exams.
- Complete summer research at Canisius College, another university, or a company such as Merck, Wyeth, or Glaxo. For a list of available internships, consult the department webpage <http://www.canisius.edu/chemistry/learn/research/off-campus-research>.
- Consider applying for Research Experience for Undergraduates (REU) programs (http://www.nsf.gov/crssprgm/reu/reu_search.cfm), summer research at Roswell Park Cancer Institute, etc. These applications are often due early in the Spring semester so apply in January. Consider also an international Research Internship in Science and Engineering (RISE) (<http://www.daad.de/rise/en/>).
- Consider taking CHM 450 or BCH 450 in junior year.

JUNIOR YEAR

- Keep your text books, quizzes, and exams.
- Consider taking CHM 450 or BCH 450.
- Complete summer research at Canisius College, another university, or a company such as Merck, Wyeth, or Glaxo (see above “Sophomore year”).

- Consider applying for Research Experience for Undergraduates (REU) programs (http://www.nsf.gov/crssprgm/reu/reu_search.cfm), summer research at Roswell Park Cancer Institute, etc. (see above “Sophomore year”).
- In the summer, start researching graduate programs:
 Grad Schools.com: <http://www.gradschools.com/Subject/Chemistry/64.html>
 PhDs.org: <http://graduate-school.phds.org/rankings/chemistry>
 American Chemical Society: <http://www.chemistry.org>
- In the summer, start preparing for your general GRE (required) and subject test GRE in chemistry or biochemistry (some graduate schools recommend this) and look at dates/places where they will be offered. (<http://www.ets.org/gre/>)

SENIOR YEAR

- Keep your text books, quizzes, and exams.
- Consider taking CHM 450/451 or BCH 450/451.
- **In September, sign up to take the general GRE and the subject test GRE in chemistry or biochemistry in October or November (<http://www.ets.org/gre/>)**
- Apply to graduate programs (many are online) early, by **December or January**. Remember these are rolling admissions, so you need to apply near start of application period!!

INFORMATION FOR STUDENTS INTERESTED IN ATTENDING MEDICAL OR DENTAL SCHOOL

FRESHMAN YEAR

- Keep your text books, quizzes, and exams (good resources for upper level courses, studying for the MCAT or the DAT, etc.).
- Get involved in 2-3 clubs or extracurricular activities. (But don't over-commit!)
- **In the summer, you should be either conducting research or shadowing health professionals. Start arranging EARLY, around November, by talking to faculty in the Chemistry & Biochemistry Department or to the Director of Pre-Health Programs.**

SOPHOMORE YEAR

- Keep your text books, quizzes, and exams.
- During the school year, shadow health professionals or arrange to volunteer at Sisters of Charity, etc.
- In November, talk to faculty about conducting summer research at Canisius.
- **When registering for courses for Fall semester of your Junior Year, talk with your advisor about arranging your course load so that it is lighter in the Fall. You'll need to be studying for your MCAT or DAT.**

SUMMER BETWEEN SOPHOMORE AND JUNIOR YEAR

- Consider taking an MCAT/DAT prep. course (**plan on taking MCAT/DAT in January of your junior year**).
- **Start studying for your MCAT/DAT**
- **Register to take your MCAT/DAT in January**
- **Shadow a health care professional**
- **Conduct summer research or work in a health-care related job.**
- **Ensure that you understand/research the Medical/Dental School application process. Begin to research Med/Dental School programs.**

JUNIOR YEAR

- **Plan on taking the MCAT or DAT in January** (so that, if necessary, you can retake it later in the spring). **Sign up during summer or start of Fall semester.**

To sign up for the MCAT, go to: <http://www.aamc.org/students/applying/mcat>

To sign up for the DAT, go to: <http://www.ada.org/dat.aspx>

- Spend the Fall semester and Christmas vacation studying for the MCAT/DAT so you are prepared to take it in January.
- If you have not taken a MCAT/DAT prep. course during the summer, take one during the Fall semester.
- During the Spring semester (after taking the MCAT/DAT), shadow health professionals or arrange to volunteer at Sisters of Charity, etc. (get some health-care related experience).
- **In late October / beginning of November, ask faculty if they can submit a letter of recommendation on your behalf to HSARC.** Provide them with a copy of your resume. A request for letters at the last minute reflects poorly on you!
- **In November, start preparing your HSARC application.** It reflects poorly on you to submit your application package late.
- In November, talk to faculty about conducting summer research at Canisius.
- In May, determine to which medical or dental schools you would like to apply.

Descriptions of MD (allopathic) programs can be found at:
<http://www.aamc.org/medicalschoools>

Descriptions of DO (osteopathic) programs can be found at:
<http://www.aacom.org/resources/bookstore/cib/Pages/default.aspx>

Descriptions of DDS programs can be found at:
<http://www.ada.org/267.aspx>

- **By the beginning of May, start completing your medical or dental school applications.** Ask faculty if they will review your personal statement and activities list and descriptions. **Warning:** it takes longer than you think to prepare a good quality application (set aside 2 to 3 weeks).

- **By the end of May, complete your medical school or dental school applications.** You will want to submit your applications the first day you are able (usually June 2nd or 3rd).

To apply to medical schools granting MD's use the American Medical College Application Service (AMCAS): <http://www.aamc.org/students/amcas/start.htm>

To apply to medical schools granting DO's use the American Association of Colleges of Osteopathic Medicine (AACOM): <http://www.aacom.org/InfoFor/applicants/Pages/default.aspx>

However, some schools require you send an application package directly to them.

To apply to dental schools use the American Dental Education Association (ADEA): <http://www.adea.org>. However, some schools require you send an application package directly to them.

- **Most medical schools and dental schools use rolling admissions. Therefore, applicants are reviewed and accepted continuously. If you apply late, fewer slots will be available than if you apply early.**
- **During the summer, after you have completed your application, you should be: conducting research or shadowing health professionals. Start arranging EARLY, around November, by talking to faculty in the Chemistry & Biochemistry Department or to the Director of Pre-Health Programs.**

SENIOR YEAR

- Keep your text books, quizzes, and exams.
- During the school year, shadow health professionals or arrange to volunteer at Sisters of Charity, etc.
- In early September, arrange for mock interviews with the Director of Pre-Health Programs.

INFORMATION FOR STUDENTS INTERESTED IN ATTENDING PHARMACY SCHOOL

A very useful web site for pre-pharmacy students with a lot of valuable information is <http://www.aacp.org/resources/Pages/default.aspx>

See page 18 of this handbook for the list of prerequisite courses required by pharmacy schools.

FRESHMAN YEAR

- Keep your text books, quizzes, and exams (good resource for upper level courses, studying for the PCAT, etc.).
- Get involved in 2-3 clubs or extracurricular activities. (But don't over-commit!)
- **In the summer, you should be either working as a pharmacy technician, shadowing pharmacists, or conducting research. Start arranging EARLY, around November, by talking to faculty in the Chemistry & Biochemistry Department or to the Director of Pre-Health Programs.**
- *Pharmacy Schools realize that there are limited numbers of pharm tech positions. They are looking for a commitment to patient care. Therefore any relevant health care experience builds your resume.

SOPHOMORE YEAR

- Keep your text books, quizzes, and exams.
- During the school year, shadow pharmacists or arrange to volunteer at Sisters of Charity, etc.
- In November, talk to faculty about conducting summer research at Canisius.
- **When registering for courses for Fall semester of your Junior Year, talk with your advisor about:**
 1. **arranging your course load so that it is lighter in the Spring. You'll need to be studying for your PCAT.**
 2. **what electives or upper level biology courses you should be taking in order to meet requirements for pharmacy school.**
 3. **3+4 program with UB Pharmacy School.**
- **Consider taking the PCAT during the summer.**

- **During the summer, you should be: conducting research or shadowing health professionals. Start arranging EARLY, around November, by talking to faculty in the Chemistry & Biochemistry Department or to the Director of Pre-Health Programs.**

JUNIOR YEAR

- Keep your text books, quizzes, and exams.
- During the school year, shadow pharmacists or arrange to volunteer at Sisters of Charity, etc.
- **In October or November, sign-up to take the PCAT.** Consider taking a review course (\$\$\$). To sign up or for information go to: <http://tpc-etesting.com/pcat/>
- In November, talk to faculty about conducting summer research at Canisius.
- **In March, ask faculty or pharmacists if they could submit a letter of recommendation on your behalf.** Provide them with a copy of your resume. It reflects poorly on you if you ask for letters at the last minute.
- In May, determine which pharmacy schools to which you will apply. Description of PharmD programs are available from Pharmacy College Application Service (PharmCAS) at: <http://www.pharmcas.org>
- **In the middle of May, start completing your pharmacy school applications.** Ask faculty if they will review your personal statement and activities list and descriptions.
- **By the middle of June, complete your pharmacy school applications.** You will want to submit your applications the first day you are able (usually around July 1st). Most pharmacy schools use PharmCAS: <http://www.pharmcas.org/>
- **Most pharmacy schools use rolling admissions. Therefore, applicants are reviewed and accepted continuously. If you apply late, fewer slots will be available than if you apply early.**
- **During the summer, you should be: conducting research or shadowing health professionals. Start arranging EARLY, around November, by talking to faculty in the Chemistry & Biochemistry Department or to the Director of Pre-Health Programs.**

SENIOR YEAR

- Keep your text books, quizzes, and exams.
- During the school year, shadow pharmacists or arrange to volunteer at Sisters of Charity, etc.
- In September, arrange for mock interviews with the Pre-Health Programs Director.

MEET THE FACULTY & STAFF

Mariusz Kozik

Department Chair / Professor of Inorganic Chemistry
PhD, Georgetown University

kozik@canisius.edu / HO 206 / (716) 888-2337

Teaching areas include general chemistry, inorganic, organometallic and bioinorganic chemistry. Research interests are in the structures of polyoxometallates and their practical applications, most recently on carbon dioxide activation. Dr. Kozik is the 2008 recipient of the College of Arts and Sciences Faculty Service Award, and the 2010 recipient of the Kenneth Koessler Distinguished Faculty Award.

Allyson Backstrom

Director, George E. Schreiner, M.D. '43 Pre-Medical Center
PhD, Cornell University

backstra@canisius.edu / SH 1026A / (716) 888-2539

Primary teaching area: organic chemistry. As Director of the Pre-Med Center, Dr. Backstrom works with students to prepare them for entry into medical school and the full range of health professional schools.

Sarah Evans

Assistant Professor of Biochemistry
PhD, University of Maryland Baltimore County

sarah.evans@canisius.edu / HO 101 / (716) 888-2342

Teaching areas include biochemistry and molecular biology. Research interests include the characterization of bacterial metal binding transcription factors and determining the properties of DNA-protein cross-links.

Timothy Gregg

Associate Professor of Organic Chemistry
PhD, University of Arizona

greggt@canisius.edu / HO 210A / (716) 888-2259

Teaching areas include organic chemistry and spectroscopy. Research interests are in organic synthesis, reaction mechanisms and the medicinal chemistry of neurotransmitter modulators.

Roberto Ma. Gregorius

Associate Professor of Education
Director, Chemical Education Leadership Program
PhD, University of Massachusetts at Amherst (Polymer Science & Engineering)

gregorir@canisius.edu / CT 805 / (716) 888-3701

Teaching areas include general chemistry and science education. Research interests include Chemical Education: student-centered teaching and learning protocols suitable for both high school and first year college chemistry.

Mary O'Sullivan

Professor of Organic Chemistry
PhD, University of Newcastle upon Tyne, U.K.

osulliv1@canisius.edu / HO 205 / (716) 888-2352

Teaching areas include organic chemistry, biological organic chemistry and spectroscopy. Research interests are in enzyme inhibition and the development of novel anti-parasitic agents, specifically new compounds designed to combat diseases caused by trypanosomes. Dr. O'Sullivan is the 2009 recipient of the College of Arts and Sciences Faculty Teaching Award.

Peter Schaber

Professor of Analytical Chemistry
PhD, SUNY at Buffalo

schaber@canisius.edu / HO 302 / (716) 888-2351

Teaching areas include general and analytical chemistry. Research interests are in the synthesis, characterization and reactivity of transition metal complexes in "unusual" coordination spheres and the analysis of heavy metals in water and food.

Phillip Sheridan

Professor of Physical Chemistry
PhD, University of Arizona

phillip.sheridan@canisius.edu / HO 310A / (716) 888-2347

Teaching areas include general and physical chemistry. Research interests are in the electronic, bonding and geometric properties of small metal-containing radicals, which are studied in the gas-phase using high-resolution laser spectroscopy.

Jeremy Steinbacher

Assistant Professor of Chemistry
PhD, Cornell University

steinbaj@canisius.edu / HO 306 / (716) 888-2343

Teaching areas include organic chemistry, materials/biomaterials chemistry, and scientific literature and seminars. Research interests are particle-based drug-delivery and contrast agents focusing on cancer and magnetic resonance imaging, bionanoscience in general, and functional polymers.

Steven Szczepankiewicz

Associate Professor of Analytical Chemistry
PhD, California Institute of Technology

szczepas@canisius.edu / HO 308 / (716) 888-2355

Teaching areas include general, analytical and environmental chemistry. Research interests are in the study of surface interactions with applications towards the development of new sensor technologies and photochemistry. Dr. Szczepankiewicz is also the Director of the Middle School Summer Science Camp.

Kristina (Krit) Marohn

General Chemistry Laboratory Coordinator
MS, SUNY Fredonia

marohnk@canisius.edu / HO 211A / (716) 888-2348

Teaching areas include general chemistry laboratory classes. Professional experience includes a position as an Associate Engineer at AVOX Systems.

James Maul

Adjunct Professor of Organic Chemistry
PhD, Wayne State University

maulj@canisius.edu / HO 105 / (716) 888-2356

Teaching areas include organic chemistry laboratory classes. Professional experience includes a position as Senior Scientist at Occidental Chemical Corporation Technology Center.

Joseph Bieron

Professor *Emeritus* of Organic Chemistry
PhD, SUNY at Buffalo

bieron@canisius.edu / HO 401 / (716) 888-2357

Canisius College Kenneth Koessler Distinguished Professor, 1983. WNY-ACS Schoellkopf Medal recipient, 1993. Research interests are in organic synthesis, NMR spectroscopy, and innovative teaching strategies.

Frank Dinan

Professor *Emeritus* of Organic Chemistry
PhD, SUNY at Buffalo

dinan@canisius.edu / HO 207A / (716) 888-2399

Canisius College Kenneth Koessler Distinguished Faculty Award, 1981. Canisius College of Arts and Sciences Full-time Faculty Teaching Award, 2008. Research interests are in organic synthesis, polymer structure studies and innovative teaching strategies.

Thomas Stabler

Director of Chemistry Laboratories
MS in Chemistry, Canisius College

stabler@canisius.edu / HO 209 / (716) 888-2344

Alice Steltermann

Administrative Associate

steltermann@canisius.edu / HO 206 / (716) 888-2340

COURSE DESCRIPTIONS

CHEMISTRY CURRICULUM

CHM 104 Energy, Environment, and Society 3 credits

Designed to provide a better understanding of energy and our environment, including man's interaction with his environment and the consequences facing society today.

Field 6. *Fall*

CHM 109 (fall) followed by CHM 110 (spring): General Chemistry with Review I

General Chemistry I with review for science majors. **7 credits**

CHM 109, three lectures and one recitation per week. CHM 109 reviews some mathematical concepts, emphasizes dimensional analysis, nomenclature, stoichiometry, solutions, basic chemical reactions, and thermochemistry. *Fall*

CHM 110, three lectures, one recitation, as well as 3-hr laboratory co-requisite.

CHM 110 emphasizes atomic and molecular structure, periodic properties, gas laws, and states of matter. *Spring*

The CHM 109/110 sequence is equivalent to CHM 111 and a Free Elective. Students completing the CHM 109/110 sequence are eligible to take CHM 112 in the fall of their sophomore year or during the summer. A minimum grade of C- in CHM 109 is a prerequisite for CHM 110 and a minimum grade of C- in CHM 110 is a prerequisite for both CHM 112 (General Chemistry II) and CHM 227 (Organic Chemistry I).

CHM 111: General Chemistry I 4 credits

General Chemistry I for science majors, three lectures and one recitation per week, as well as 3-hr laboratory co-requisite. This course is recommended for students with a very good background in mathematics and significant exposure to high school chemistry. The course emphasizes dimensional analysis, nomenclature, stoichiometry, solutions, basic chemical reactions, thermochemistry, atomic and molecular structure, periodic properties, gas laws, and states of matter. Prerequisite: a minimum score of 580 in MSAT or instructor's approval. Co-requisite: CHM 111 laboratory. Minimum C- in CHM 111 is a prerequisite for both CHM 112 (General Chemistry II) and CHM 227 (Organic Chemistry I). *Fall*

CHM 112: General Chemistry II 4 credits

General Chemistry II for science majors, three lectures and one recitation per week, as well as 3-hr laboratory co-requisite. The course emphasizes properties of solutions (including colligative properties), kinetics, chemical equilibrium concept, calculations involving acid/base and precipitation equilibria, thermodynamics (second and third law), electrochemistry, nuclear chemistry, chemistry of the environment, metals, and nonmetals, and basic coordination chemistry. Prerequisite: Minimum C- in CHM 111 or in CHM 110. Co-requisite: CHM 112 laboratory. Minimum C in CHM 112 is required for all chemistry and biochemistry majors. *Fall/Spring*

CHM 227-228 Organic Chemistry 8 credits

Fundamental treatment of organic chemistry. Mechanisms, structure and synthetic methods. Laboratory covers techniques of separation, purification, analysis and organic synthesis. Three lectures, one laboratory and one recitation per week. *Prerequisites:* a minimum of C- in CHM 110 or 111-; a minimum grade of C- in CHM 227 is required to enroll in CHM 228. *Fall and Spring*

CHM 230 Analytical Chemistry I 4 credits

Principles and methodology of modern analytical chemistry presented with particular emphasis on chromatographic, spectrophotometric and electroanalytical techniques. Three lectures, one laboratory and one recitation per week. *Prerequisite:* CHM 112 with a minimum grade of C. *Spring*

CHM 232 Analytical Environmental Chemistry 4 credits

First-level analytical course. Environmental applications. Sampling techniques and statistical analysis of data. Soil chemistry, aquatic chemistry and atmospheric chemistry. Trace analysis with electroanalytical, liquid and gas chromatography, atomic absorption spectroscopy and ion selective electrodes. *Prerequisites:* CHM 111-112. *Spring 2017.*

CHM 244 Inorganic Chemistry 3 credits

Periodic classification of the elements, electronic configuration of atoms, nature of chemical bonding, symmetry and group theory, structures and thermodynamics of solids, acid/base concepts, isomerism, bonding, reactions and spectroscopy of coordination compounds and other aspects of modern inorganic chemistry. *Prerequisites:* CHM 112 with a minimum grade of C. *Fall*

CHM 301 Classical Physical Chemistry 3 credits

Principles of thermodynamics with applications to phase and chemical equilibria. Kinetic theory of gases and chemical kinetics. Three lectures and one recitation per week. *Prerequisites:* CHM 112 with a minimum grade of C, MAT 111, PHY 201-202 or 223-224, or equivalent courses. *Fall*

CHM 301L Classical Physical Chemistry Laboratory 1 credit

Selected experiments demonstrating principles of thermodynamics and chemical kinetics. One four-hour lab per week. *Prerequisites:* CHM 230 Lab and CHM 301 or concurrent registration in CHM 301. *Fall*

CHM 302 Modern Physical Chemistry 3 credits

Introduction to quantum chemistry with applications to the structure of atoms and molecules. Molecular spectroscopy. Three lectures and one recitation per week. *Prerequisites:* CHM 112 with a minimum grade of C, CHM 244, MAT 111-112, PHY 201-202 or 223-224, or equivalent courses. *Spring*

CHM 302L Modern Physical Chemistry Laboratory 1 credit

Selected spectroscopic experiments with applications to molecular structure. One four-hour lab per week. *Prerequisites:* CHM 334 Lab or CHM 430 Lab with a minimum grade of C- and CHM 302 or concurrent registration in CHM 302. *Spring*

CHM 334 Spectrometric Analysis 4 credits

Spectrometric methods for the elucidation of chemical structures. Includes nuclear magnetic resonance, infrared, ultraviolet and mass spectrometry. Emphasis on organic compounds. Three lectures and one laboratory per week. *Prerequisites:* CHM 227-228. *Fall*

CHM 338 Intermediate Organic Chemistry 3 credits

Important basic concepts in organic chemistry are reviewed at a higher level than is possible in an introductory course. New concepts are presented in the area of reaction mechanisms, physical organic chemistry, and in the use of retrosynthetic analysis to plan multi-step organic syntheses. *Prerequisites:* CHM 227-228. *Fall 2017*

CHM 344 Metal Ions in Biological Systems 3 credits

Chemical processes in biological systems, which include participation of metal ions, are covered. The course begins with the principles of coordination chemistry and structural biochemistry. The rest of the course is organized according to the functions performed by the metal centers: gene expression and signal transduction, digestion, bioenergetics and electron transfer, oxygen transport, liver functions and anticancer drugs. *Prerequisites:* BIO 111 and CHM 227-228. *Offered occasionally.*

CHM 381-480-481 Chemistry and Biochemistry Seminar 1 credit each

381 Scientific Literature and Communication, 480 Communicating Concepts in Chemistry, 481 Communicating Research Literature. Student-faculty seminar for majors. To be taken for three semesters. *Prerequisites:* CHM 244, CHM 228 and Junior standing. *Spring - Fall - Spring*

CHM 401 Modern Synthetic Methods 3 credits

Structure-reactivity relationships in organometallic chemistry and the application of organometallic compounds in organic synthesis, including industrial catalysis. *Prerequisites:* CHM 244, CHM 228. *Offered occasionally.*

CHM 401L Modern Synthetic Methods Laboratory 1 credit

Designed to illustrate some of the most important synthetic and physical techniques used by modern synthetic chemists. *Prerequisite:* CHM 401 or concurrent registration in CHM 401. *Offered occasionally.*

CHM 402 Advanced Physical Chemistry 3 credits

Introduction to statistical thermodynamics. Applications of group theory to chemical bonding and molecular spectroscopy. Angular momentum coupling in atomic and molecular spectroscopy. Three lectures per week. *Prerequisites:* MAT 111-112, PHY 201-202 or 223-224, CHM 244 and CHM 302 (or co-requisite). *Offered occasionally.*

CHM 420 Materials Chemistry 3 credits

A survey of topics and applications in modern materials chemistry including solid state materials, semiconductors, polymers, nanomaterials, and introductions to mechanical properties, device fabrication, and structure-activity relationships. Three lectures and one laboratory per week. *Prerequisites:* CHM 228 and CHM 244. *Fall 2016, Fall 2018.*

CHM 430 Instrumental Analytical Chemistry II 4 credits

Advanced instrumental methods of analysis including spectroscopy, chromatography and various electrochemical techniques. *Prerequisite:* CHM 112. *Spring*

CHM 450 Research in Chemistry 3 credits

Independent research under the direction of a member of the chemistry faculty. Students are required to spend 9 hours per week conducting research. Research and consultation times to be arranged after approval of department chair. *Fall/Spring*

CHM 451 Research in Chemistry 4 credits

Independent research under the direction of a member of the chemistry faculty. Students are required to spend 12 hours per week conducting research. Research and consultation times to be arranged after approval of department chair. *Fall/Spring*

CHM 455 Medicinal Chemistry 3 credits

Chemical principles are used to explain the interaction of drugs with biological targets. Strategies used in the design and development of medicines are discussed. *Prerequisites:* CHM 227-228 and BCH 301. *Spring 2017*

CHM 490 Internships in Chemistry & Biochemistry 3 credits

Internships in chemical or biochemical industry under the direction of company and faculty supervisors. *Prerequisite:* Permission of the department chair. *Fall/Spring*

CHM 498-499 Independent Study 3 credits

Independent study under the direction of the chemistry staff. *Prerequisite:* Permission of the department chair. *Fall/Spring*

BIOCHEMISTRY CURRICULUM

BCH 301 Introduction to Biochemistry 3 credits

Structure and function of biological molecules. Topics include proteins, carbohydrates, nucleic acids, lipids, enzyme kinetics, ligand binding, recombinant DNA technology, and cell membrane structure and transport. *Prerequisites:* CHM 228 with a minimum grade of C-. *Fall*

BCH 301L Introduction to Biochemistry Lab 1 credit

One four-hour lab per week. *Prerequisite:* BCH 301 or concurrent registration in BCH 301. *Fall*

BCH 302 Cellular Biochemistry 3 credits

The more biological aspects of biochemistry. Topics include signal transduction, bioenergetics, metabolism of carbohydrates, lipids, proteins, and metabolic control, emphasizing hormones. *Prerequisite:* BCH 301 with a minimum grade of C-. *Spring*

BCH 403 Molecular Biology 3 credits

Biochemical processes at the cellular and molecular level. Topics include DNA structure in chromosomes, replication, repair, and recombination, DNA transcription, RNA structure and function, protein translation and regulation of these processes. *Prerequisite:* BCH 301 with a minimum grade of C-. *Spring*

BCH 403L Molecular Biology Lab 1 credit

One four-hour lab per week. *Prerequisites:* BCH 301L and BCH 403 (or concurrent registration in BCH 403). *Spring*

BCH 450 Research in Biochemistry 3 credits

Independent research under the direction of the biochemistry faculty. Students are required to spend 9 hours per week conducting research. Research and consultation times to be arranged after approval of department chair. *Fall/Spring*

BCH 451 Research in Biochemistry 4 credits

Independent research under the direction of the biochemistry faculty. Students are required to spend 12 hours per week conducting research. Research and consultation times to be arranged after approval of department chair. *Fall/Spring*

Chemistry ACS Track: Course Completion Checklist
MAJOR REQUIREMENTS

- | | |
|--|--|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 112 _____ |
| <input type="checkbox"/> PHY 223 + L _____ | <input type="checkbox"/> PHY 224 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 230 + L _____ |
| <input type="checkbox"/> CHM 301 + L _____ | <input type="checkbox"/> CHM 302 + L _____ |
| <input type="checkbox"/> CHM 334 + L _____ | <input type="checkbox"/> CHM 430 + L _____ |
| <input type="checkbox"/> BCH 301 _____ | <input type="checkbox"/> CHM 420 + L _____ |
| <input type="checkbox"/> CE _____ | <input type="checkbox"/> CE _____ |
| <input type="checkbox"/> CHM 381 _____ | <input type="checkbox"/> CHM 480 _____ |
| <input type="checkbox"/> CHM 481 _____ | |

CORE REQUIREMENTS

- | | |
|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input type="checkbox"/> Field 5 Social Sciences | Course Name: _____ |
| <input type="checkbox"/> CORE CAPSTONE | Course Name: _____ |
| <input type="checkbox"/> Diversity | Course Name: _____ |
| <input type="checkbox"/> Ethics | Course Name: _____ |
| <input type="checkbox"/> Global Awareness | Course Name: _____ |
| <input type="checkbox"/> Justice | Course Name: _____ |
| <input type="checkbox"/> Advanced Writing-intensive | Course Name: _____ |
| <input type="checkbox"/> Oral Communication | Course Name: _____ |

Chemistry Track: Course Completion Checklist
MAJOR REQUIREMENTS

- | | |
|--|--|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 112/141 _____ |
| <input type="checkbox"/> PHY 201 + L _____ | <input type="checkbox"/> PHY 202 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 230 + L _____ |
| <input type="checkbox"/> CHM 301 + L _____ | <input type="checkbox"/> CHM 334 + L _____ |
| <input type="checkbox"/> CHM 430 + L _____ | <input type="checkbox"/> BCH 301 _____ |
| <input type="checkbox"/> CE _____ | <input type="checkbox"/> CE _____ |
| <input type="checkbox"/> CE _____ | <input type="checkbox"/> CHM 381 _____ |
| <input type="checkbox"/> CHM 480 _____ | <input type="checkbox"/> CHM 481 _____ |

CORE REQUIREMENTS

- | | |
|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input type="checkbox"/> Field 5 Social Sciences | Course Name: _____ |
| <input type="checkbox"/> CORE CAPSTONE | Course Name: _____ |
| <input type="checkbox"/> Diversity | Course Name: _____ |
| <input type="checkbox"/> Ethics | Course Name: _____ |
| <input type="checkbox"/> Global Awareness | Course Name: _____ |
| <input type="checkbox"/> Justice | Course Name: _____ |
| <input type="checkbox"/> Advanced Writing-intensive | Course Name: _____ |
| <input type="checkbox"/> Oral Communication | Course Name: _____ |

Chemistry Health Professions Track: Course Completion Checklist

MAJOR REQUIREMENTS

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|--|--|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | <input type="checkbox"/> BIO 112 + L _____ |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 112 / 141 _____ |
| <input type="checkbox"/> PHY 201 + L _____ | <input type="checkbox"/> PHY 202 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 230 + L _____ |
| <input type="checkbox"/> CHM 301 _____ | |
| <input type="checkbox"/> BCH 301 _____ | <input type="checkbox"/> BCH 302 _____ |
| <input type="checkbox"/> CE + L _____ | <input type="checkbox"/> SE + L _____ |
| <input type="checkbox"/> SE _____ | <input type="checkbox"/> CHM 381 _____ |
| <input type="checkbox"/> CHM 480 _____ | <input type="checkbox"/> CHM 481 _____ |

CORE REQUIREMENTS

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|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input type="checkbox"/> Field 5 Social Sciences | Course Name: _____ |
| <input type="checkbox"/> CORE CAPSTONE | Course Name: _____ |
| <input type="checkbox"/> Diversity | Course Name: _____ |
| <input type="checkbox"/> Ethics | Course Name: _____ |
| <input type="checkbox"/> Global Awareness | Course Name: _____ |
| <input type="checkbox"/> Justice | Course Name: _____ |
| <input type="checkbox"/> Advanced Writing-intensive | Course Name: _____ |
| <input type="checkbox"/> Oral Communication | Course Name: _____ |

Chemistry ACS Certified Track with Business Minor: Course Completion Checklist

MAJOR REQUIREMENTS

- | | |
|--|---|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | <input type="checkbox"/> MAT 141 or ECO 255 _____ |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 112 _____ |
| <input type="checkbox"/> PHY 223 + L _____ | <input type="checkbox"/> PHY 224 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 230 + L _____ |
| <input type="checkbox"/> CHM 301 + L _____ | <input type="checkbox"/> CHM 302 + L _____ |
| <input type="checkbox"/> CHM 334 + L _____ | <input type="checkbox"/> CHM 430 + L _____ |
| <input type="checkbox"/> BCH 301 _____ | <input type="checkbox"/> CHM 420 + L _____ |
| <input type="checkbox"/> CE _____ | <input type="checkbox"/> CE _____ |
| <input type="checkbox"/> CHM 381 _____ | <input type="checkbox"/> CHM 480 _____ |
| <input type="checkbox"/> CHM 481 _____ | |

MINOR REQUIREMENTS

- | | |
|--|--|
| <input type="checkbox"/> ECO 101 _____ | <input type="checkbox"/> ECO 102 _____ |
| <input type="checkbox"/> MGT 101 _____ | <input type="checkbox"/> MKT 201 _____ |
| <input type="checkbox"/> ACC 201 _____ | <input type="checkbox"/> FIN 201 _____ |

CORE REQUIREMENTS

- | | |
|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input checked="" type="checkbox"/> Field 5 Social Sciences | Course Name: <u>ECO 101</u> |

- CORE CAPSTONE
- Diversity
- Ethics
- Global Awareness
- Justice
- Advanced Writing-intensive
- Oral Communication

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Chemistry Track with Business Minor: Course Completion Checklist

MAJOR REQUIREMENTS

- | | |
|--|---|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 141 or ECO 255 _____ |
| <input type="checkbox"/> PHY 201 + L _____ | <input type="checkbox"/> PHY 202 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 230 + L _____ |
| <input type="checkbox"/> CHM 301 + L _____ | <input type="checkbox"/> CHM 334 + L _____ |
| <input type="checkbox"/> CHM 430 + L _____ | <input type="checkbox"/> BCH 301 _____ |
| <input type="checkbox"/> CE _____ | <input type="checkbox"/> CE _____ |
| <input type="checkbox"/> CE _____ | <input type="checkbox"/> CHM 381 _____ |
| <input type="checkbox"/> CHM 480 _____ | <input type="checkbox"/> CHM 481 _____ |

MINOR REQUIREMENTS

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|--|--|
| <input type="checkbox"/> ECO 101 _____ | <input type="checkbox"/> ECO 102 _____ |
| <input type="checkbox"/> MGT 101 _____ | <input type="checkbox"/> MKT 201 _____ |
| <input type="checkbox"/> ACC 201 _____ | <input type="checkbox"/> FIN 201 _____ |

CORE REQUIREMENTS

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|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input checked="" type="checkbox"/> Field 5 Social Sciences | Course Name: <u>ECO 101</u> |
| <input type="checkbox"/> CORE CAPSTONE | Course Name: _____ |

- Diversity
- Ethics
- Global Awareness
- Justice
- Advanced Writing-intensive
- Oral Communication

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Chemistry Health Professions Track with Business Minor: Course Completion Checklist

MAJOR REQUIREMENTS

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|--|---|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | <input type="checkbox"/> BIO 112 + L _____ |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 141 or ECO 255 _____ |
| <input type="checkbox"/> PHY 201 + L _____ | <input type="checkbox"/> PHY 202 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 230 + L _____ |
| <input type="checkbox"/> CHM 301 _____ | |
| <input type="checkbox"/> BCH 301 _____ | <input type="checkbox"/> BCH 302 _____ |
| <input type="checkbox"/> CE + L _____ | <input type="checkbox"/> SE + L _____ |
| <input type="checkbox"/> SE _____ | <input type="checkbox"/> CHM 381 _____ |
| <input type="checkbox"/> CHM 480 _____ | <input type="checkbox"/> CHM 481 _____ |

MINOR REQUIREMENTS

- | | |
|--|--|
| <input type="checkbox"/> ECO 101 _____ | <input type="checkbox"/> ECO 102 _____ |
| <input type="checkbox"/> MGT 101 _____ | <input type="checkbox"/> MKT 201 _____ |
| <input type="checkbox"/> ACC 201 _____ | <input type="checkbox"/> FIN 201 _____ |

CORE REQUIREMENTS

- | | |
|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input checked="" type="checkbox"/> Field 5 Social Sciences | Course Name: <u>ECO 101</u> |
| <input type="checkbox"/> CORE CAPSTONE | Course Name: _____ |

- Diversity
- Ethics
- Global Awareness
- Justice
- Advanced Writing-intensive
- Oral Communication

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Biochemistry ACS Certified Track: Course Completion Checklist
MAJOR REQUIREMENTS

- | | |
|---|--|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | <input type="checkbox"/> BIO 112 + L _____ |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 112 _____ |
| <input type="checkbox"/> PHY 223 + L _____ | <input type="checkbox"/> PHY 224 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 230 + L _____ |
| <input type="checkbox"/> CHM 301 + L _____ | <input type="checkbox"/> CHM 302 + L _____ |
| <input type="checkbox"/> BCH 301 + L _____ | <input type="checkbox"/> BCH 302 _____ |
| <input type="checkbox"/> CHM 334 + L or 430 + L _____ | <input type="checkbox"/> CHM 420 _____ |
| <input type="checkbox"/> BCH 403 + L _____ | <input type="checkbox"/> CHM 381 _____ |
| <input type="checkbox"/> CHM 480 _____ | <input type="checkbox"/> CHM 481 _____ |

CORE REQUIREMENTS

- | | |
|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input type="checkbox"/> Field 5 Social Sciences | Course Name: _____ |
| <input type="checkbox"/> CORE CAPSTONE | Course Name: _____ |
| <input type="checkbox"/> Diversity | Course Name: _____ |
| <input type="checkbox"/> Ethics | Course Name: _____ |
| <input type="checkbox"/> Global Awareness | Course Name: _____ |
| <input type="checkbox"/> Justice | Course Name: _____ |
| <input type="checkbox"/> Advanced Writing-intensive | Course Name: _____ |
| <input type="checkbox"/> Oral Communication | Course Name: _____ |

Biochemistry Track: Course Completion Checklist
MAJOR REQUIREMENTS

- | | |
|---|--|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | <input type="checkbox"/> BIO 112 + L _____ |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 112 / 141 _____ |
| <input type="checkbox"/> PHY 201 + L _____ | <input type="checkbox"/> PHY 202 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 301 _____ |
| <input type="checkbox"/> CHM 334 + L or 430 + L _____ | |
| <input type="checkbox"/> BCH 301 + L _____ | <input type="checkbox"/> BCH 302 _____ |
| <input type="checkbox"/> BCE _____ | <input type="checkbox"/> CE or BCE _____ |
| <input type="checkbox"/> BCH 403 + L _____ | <input type="checkbox"/> CHM 381 _____ |
| <input type="checkbox"/> CHM 480 _____ | <input type="checkbox"/> CHM 481 _____ |

CORE REQUIREMENTS

- | | |
|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input type="checkbox"/> Field 5 Social Sciences | Course Name: _____ |
| <input type="checkbox"/> CORE CAPSTONE | Course Name: _____ |
| <input type="checkbox"/> Diversity | Course Name: _____ |
| <input type="checkbox"/> Ethics | Course Name: _____ |
| <input type="checkbox"/> Global Awareness | Course Name: _____ |
| <input type="checkbox"/> Justice | Course Name: _____ |
| <input type="checkbox"/> Advanced Writing-intensive | Course Name: _____ |
| <input type="checkbox"/> Oral Communication | Course Name: _____ |

Biochemistry ACS Certified Track with Business Minor: Course Completion Checklist

MAJOR REQUIREMENTS

- | | |
|---|--|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | <input type="checkbox"/> BIO 112 + L _____ |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 112 _____ |
| <input type="checkbox"/> PHY 223 + L _____ | <input type="checkbox"/> PHY 224 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 230 + L _____ |
| <input type="checkbox"/> CHM 301 + L _____ | <input type="checkbox"/> CHM 302 + L _____ |
| <input type="checkbox"/> BCH 301 + L _____ | <input type="checkbox"/> BCH 302 _____ |
| <input type="checkbox"/> CHM 334 + L or 430 + L _____ | <input type="checkbox"/> CHM 420 _____ |
| <input type="checkbox"/> BCH 403 + L _____ | <input type="checkbox"/> CHM 381 _____ |
| <input type="checkbox"/> CHM 480 _____ | <input type="checkbox"/> CHM 481 _____ |

MINOR REQUIREMENTS

- | | |
|--|--|
| <input type="checkbox"/> ECO 101 _____ | <input type="checkbox"/> ECO 102 _____ |
| <input type="checkbox"/> MGT 101 _____ | <input type="checkbox"/> MKT 201 _____ |
| <input type="checkbox"/> ACC 201 _____ | <input type="checkbox"/> FIN 201 _____ |
| <input type="checkbox"/> MAT 141 or ECO255 _____ | |

CORE REQUIREMENTS

- | | |
|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input checked="" type="checkbox"/> Field 5 Social Sciences | Course Name: <u>ECO 101</u> |
| <input type="checkbox"/> CORE CAPSTONE | Course Name: _____ |

- Diversity
- Ethics
- Global Awareness
- Justice
- Advanced Writing-intensive
- Oral Communication

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Biochemistry Track with Business Minor: Course Completion Checklist

MAJOR REQUIREMENTS

- | | |
|---|---|
| <input type="checkbox"/> CHM 111 + L _____ | <input type="checkbox"/> CHM 112 + L _____ |
| <input type="checkbox"/> BIO 111 + L _____ | <input type="checkbox"/> BIO 112 + L _____ |
| <input type="checkbox"/> MAT 111 _____ | <input type="checkbox"/> MAT 141 or ECO 255 _____ |
| <input type="checkbox"/> PHY 201 + L _____ | <input type="checkbox"/> PHY 202 + L _____ |
| <input type="checkbox"/> CHM 227 + L _____ | <input type="checkbox"/> CHM 228 + L _____ |
| <input type="checkbox"/> CHM 244 _____ | <input type="checkbox"/> CHM 301 _____ |
| <input type="checkbox"/> BCH 301 + L _____ | <input type="checkbox"/> BCH 302 _____ |
| <input type="checkbox"/> CHM 334 + L or 430 + L _____ | <input type="checkbox"/> BCE _____ |
| <input type="checkbox"/> BCH 403 + L _____ | <input type="checkbox"/> CE or BCE _____ |
| <input type="checkbox"/> CHM 381 _____ | <input type="checkbox"/> CHM 480 _____ |
| <input type="checkbox"/> CHM 481 _____ | |

MINOR REQUIREMENTS

- | | |
|--|--|
| <input type="checkbox"/> ECO 101 _____ | <input type="checkbox"/> ECO 102 _____ |
| <input type="checkbox"/> MGT 101 _____ | <input type="checkbox"/> MKT 201 _____ |
| <input type="checkbox"/> ACC 201 _____ | <input type="checkbox"/> FIN 201 _____ |

CORE REQUIREMENTS

- | | |
|---|----------------------------------|
| <input type="checkbox"/> FYS 101 | <input type="checkbox"/> ENG 101 |
| <input type="checkbox"/> PHI 101 | <input type="checkbox"/> RST 101 |
| <input type="checkbox"/> Field 1 Religious Studies and Theology | Course Name: _____ |
| <input type="checkbox"/> Field 2 Philosophy | Course Name: _____ |
| <input type="checkbox"/> Field 3 Arts | Course Name: _____ |
| <input type="checkbox"/> Field 4 History | Course Name: _____ |
| <input checked="" type="checkbox"/> Field 5 Social Sciences | Course Name: <u>ECO 101</u> |
| <input type="checkbox"/> CORE CAPSTONE | Course Name: _____ |

- Diversity
- Ethics
- Global Awareness
- Justice
- Advanced Writing-intensive
- Oral Communication

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____

Course Name: _____