UNIVERSITY AT ALBANY
State University of New York

Office of the Provost and Senior Vice President for Academic Affairs

January 5, 2023

Shadi Shahedipour-Sandvik, Ph.D.
Senior Vice Chancellor for Research, Innovation and Economic Development
And Interim Provost
State University of New York
System Administration
State University Plaza
Albany, NY 12246

Dear Dr. Shahedipour-Sandvik,

On behalf of the faculty at the University at Albany and our College of Arts and Sciences, I am pleased to submit our proposal for an update to our Chemistry BA registration and the proposal for distance education approval for the same degree.

This proposal has been considered and approved through our campus governance system. Should there be a need for additional information or clarification to facilitate processing, please contact Kaitlyn Beachner at kbeachner@albany.edu.

Thank you for your consideration and assistance.

Sincerely,

Carol H. Kim
Provost and Senior Vice President for Academic Affairs

Attachment

c. Dean Jeanette Altarriba, College of Arts and Sciences
Vice Provost & Dean JoAnne Malatesta, Undergraduate Education

University Hall, Suite 308
1400 Washington Avenue, Albany, NY 12222
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Program Revision Proposal: Changes to an Existing Program

Form 3A

Version 2016-10-13

SUNY approval and SED registration are required for many changes to registered programs. To request a change to a registered program leading to an undergraduate degree, a graduate degree, or a certificate that does not involve the creation of a new program,[1] a Chief Executive or Chief Academic Officer must submit **a signed cover letter and this completed form** to the SUNY Provost at *program.review@suny.edu*.

Section 1. General Information		
a) Institutional Information	Institution's 6-digit SED Code:	**210500**
	Institution's Name:	University at Albany
	Address:	*1400 Washington Avenue, Albany, NY 12222*
b) Program Locations	List each campus where the entire program will be offered (with each institutional or branch campus 6-digit SED Code): 210500	
	List the name and address of off-campus locations (i.e., extension sites or extension centers) where courses will offered, **or check here [X] if not applicable**:	
c) Registered Program to be Changed	Program Title:	Chemistry
	SED Program Code	20581, 28860
	Award(s) (e.g., A.A., B.S.):	B.A.
	Number of Required Credits:	Minimum [120] If tracks or options, largest minimum [ ]
	HEGIS Code:	1905
	CIP 2010 Code:	40.0501
	Effective Date of Change:	Fall 2023
	Effective Date of Completion[2]	Spring 2027
d) Campus Contact	Name and title: Kaitlyn Beachner, Staff Associate for Undergraduate Academic Programs Telephone and email: 518 – 442 – 3941; kbeachner@albany.edu	
e) Chief Executive or Chief Academic Officer Approval	**Signature affirms that the proposal has met all applicable campus administrative and shared governance procedures for consultation, and the institution's commitment to support the proposed program. *E-signatures are acceptable.*** Name and title: Carol Kim, Ph.D., Senior Vice President for Academic Affairs & Provost Signature and date:  1/5/2023	
	If the program will be registered jointly[3] with one or more other institutions, provide the following information for <u>each</u> institution:	
	Partner institution's name and 6-digit SED Code: Name, title, and signature of partner institution's CEO (or **append** a signed letter indicating approval of this proposal):	

[1] To propose changes that would create a new program, Form 3B, Creating a New Program from Existing Program(s), is required.

[2] If the current program(s) must remain registered until enrolled students have graduated, the anticipated effective date by which continuing students will have completed the current version of the program(s).

[3] If the partner institution is non-degree-granting, see SED's CEO Memo 94-04.

Section 2. Program Information

Section 2.1. Changes in Program Content

[ ] No changes in program content. *Proceed to Section 2.2.*

a) Check all that apply. Describe each proposed change and why it is proposed.

[X] Cumulative change from SED's last approval of the registered program of one-third or more of the minimum credits required for the award (e.g., 20 credits for associate degree programs, 40 credits for bachelor's degree programs)
[ ] Changes in a program's focus or design
[ ] Adding or eliminating one or more options, concentrations or tracks
[ ] Eliminating a requirement for program completion (such as an internship, clinical placement, cooperative education, or other work or field-based experience). Adding such requirements must remain in compliance with SUNY credit cap limits.
[ ] Altering the liberal arts and science content in a way that changes the degree classification of an undergraduate program, as defined in Section 3.47(c)(1-4) of Regents Rules

Description:

We added some honors course options for students that were excelling in specific areas, as well as a few more options in a few required courses to allow for student choice. We also removed and added a few course options based on current faculty expertise.

b) Provide a side-by-side comparison of all the courses in the existing and proposed revised program that clearly indicates all new or significantly revised courses, and other changes.

1996 Chemistry B.A. Requirements:	**2022 Proposed Changes to Chemistry B.A. Requirements:**
Core of 51 credits to include:	***Combined major and minor sequence consisting of 56 or 57 credits:***
	Core Courses:
ACHM 120N – General Chemistry I (3)	*Select one*: ACHM 120 – General Chemistry I (3) / TCHM 130 – Honors Advanced General Chemistry I (3) / ACHM 115 – General Chemistry I Lecture and Lab (4 or 5 credits)
ACHM 121N – General Chemistry II (3)	*Select one*: ACHM 121 – General Chemistry II (3) / TCHM 131 – Honors Advanced General Chemistry II (3) / ACHM 116 – General Chemistry II Lecture and Lab (4)
ACHM 122A – General Chemistry Laboratory I (1)	*Select one*: ACHM 124 General Chemistry Laboratory I (1) / *Included in lab portion of ACHM 115*
ACHM 122B – General Chemistry Laboratory II (1)	*Select one*: ACHM 125 – General Chemistry Laboratory II (1) / *Included in lab portion of ACHM 116*
ACHM 216A – Organic Chemistry I (3)	ACHM 220 – Organic Chemistry I (3)
ACHM 216B – Organic Chemistry II (3)	ACHM 221 – Organic Chemistry II (3)
ACHM 217A – Organic Chemistry Laboratory I (1)	ACHM 222 – Organic Chemistry Laboratory I (1)
ACHM 217B – Organic Chemistry Laboratory II (1)	ACHM 223 – Organic Chemistry Laboratory II (1)
ACHM 225 – Quantitative Analysis (3)	ACHM 326 – Quantitative Analysis For Industry (3) / ACHM 327 – Quantitative Analysis For Industry Lab (2)
ACHM 320 – Introduction to Physical Chemistry (3)	ACHM 444 – Biophysical Chemistry I (3)
ACHM 321 – Introduction to Experimental Physical Chemistry (1)	*Removed option*
	ACHM 352Z – Physical Chemistry Lab (3)
	ACHM 417 – Advanced Synthesis Laboratory (3)
ACHM 420A – Inorganic Chemistry A (3)	ACHM 420 – Inorganic Chemistry A (3)
ACHM 430 – Instrumental Analysis (3)	ACHM 429 – Instrumental Analysis (3)
	ACHM 431 – Instrumental Analysis Lab (1)
Select one: AMAT 111 – Algebra and Calculus II (4) / AMAT 112 – Calculus I (4) / AMAT 118 – Honors Calculus I (4)	*Select one*: AMAT 111 – Algebra and Calculus II (4) / AMAT 112 – Calculus I (4) / AMAT 118 – Honors Calculus I (4) / TMAT 118 – Honors Calculus I Honors College (4)
Select one: AMAT 113 – Calculus iI (4) / AMAT 119 – Honors Calculus II (4)	*Select one*: AMAT 113 – Calculus II / AMAT 119 – Honors Calculus II (4) / TMAT 119 – Honors Calculus II Honor College (4)
APHY 105N – General Physics I (3)	*Removed requirement*
APHY 106 – General Physics Lab I (1)	*Removed requirement*
APHY 108N – General Physics II (3)	*Removed requirement*
APHY 109 – General Physics Lab II (1)	*Removed requirement*
	Select one: APHY 140 – Physics I: Mechanics (3) / APHY 142 – Physics I: Advanced Mechanics (3) / TPHY 141 – Honors Physics I: Mechanics (3)
	Select one: APHY 150 – Physics II: Electromagnetism (3) / APHY 152 – Physics II: Advanced Electromagnetism (3) / TPHY 151 – Honors Physics II: Electromagnetism (3)
	APHY 145 – Physics Lab I (1)
	APHY 155 – Physics Lab II (1)

6 credits in advanced chemistry including at least 3 credits in courses other than ACHM 424, 425, and 426 (options listed below):	*3 credits in advanced chemistry (options listed below):*
ACHM 317 – Advanced Synthesis Laboratory (2)	*Current course – **Core Requirement Above**, **No Longer option -** Course number and slight name changed to: ACHM 417 – Advanced Synthesis Lab*
ACHM 340A – Physical Chemistry A (3)	*Current course – **No longer option** Course number and slight name changed to: ACHM 350 – Physical Chemistry I*
ACHM 340B – Physical Chemistry B (3)	*Current course – **No longer option** – Course number and slight name changed to: ACHM 351 – Physical Chemistry II*
ACHM 341Z – Physical Chemistry Laboratory Z (3)	*Current course – **Core Requirement Above**, **No Longer option -** Course number and slight name changed to: ACHM 352Z – Physical Chemistry Lab*
ACHM 341B – Physical Chemistry Laboratory B (3)	*Course Removed*
ACHM 342 – Biological Chemistry (3)	ACHM 342 – Introduction to Biochemistry (3)
ACHM 343 – Introduction to Biochemistry Laboratory (1)	*Course Removed*
ACHM 408 – Survey of Polymer Chemistry (3)	ACHM 408 – Polymer Chemistry (3)
ACHM 411A – Computer Applications in Chemistry A (3)	ACHM 411 – Computational Chemistry I (3)
ACHM 411B – Computer Applications in Chemistry B (3)	ACHM 412 – Computational Chemistry II (3)
ACHM 420B – Inorganic Chemistry B (3)	ACHM 421 – Inorganic Chemistry II (3)
ACHM 424 – Retrieval and Presentation of Chemical Information (1)	ACHM 424 – Retrieval and Presentation of Chemical Information (1)
ACHM 425 – Introduction to Undergraduate Research in Chemistry (2)	ACHM 425 – Introduction to Undergraduate Research in Chemistry (2)
ACHM 426 – Undergraduate Research in Chemistry (3)	ACHM 426 – Undergraduate Research in Chemistry (3)
	ACHM 428 – Forensic Chemistry Research (3)
ACHM 436 – Advanced Organic Chemistry (3)	ACHM 436 – Advanced Organic Chemistry (3)
	ACHM 437 – Organic Synthesis (3)
ACHM 440A – Comprehensive Biochemistry A (3)	ACHM 442 – Comprehensive Biochemistry I (3)
ACHM 440B – Comprehensive Biochemistry B (3)	ACHM 443 – Comprehensive Biochemistry II (3)
	ACHM 445 – Biophysical Chemistry II (3)
	ACHM 446 – Chemical Biology Laboratory (3)
	ACHM 447 – Advanced Forensic Chemistry (3)
	ACHM 448 – Advanced Forensic Chemistry Lab I (2)
	ACHM 449 – Advanced Forensic Chemistry Lab II (2)
	ACHM 458 – Introduction to Medicinal Chemistry/Pharmacology (3)
	ACHM 470 – Crystallography (3)
	ACHM 471 – Theory and Techniques of Biophysics and Biophysical Chemistry (3)
	ACHM 472 – Experimental Methods of Organic Structure Determination (3)
	ACHM 473 – Chemical and Enzymatic Kinetics (3)
	ACHM 474 – Physical Organic Chemistry I (3)
	ACHM 475 – Physical Organic Chemistry II (3)

c) For each new or significantly revised course, **provide** a syllabus at the end of this form, and, on the ***SUNY Faculty***

Table provide the name, qualifications, and relevant experience of the faculty teaching each new or significantly revised course. NOTE: *Syllabi for all courses should be available upon request. Each syllabus should show that all work for credit is college level and of the appropriate rigor. Syllabi generally include a course description, prerequisites and corequisites, the number of lecture and/or other contact hours per week, credits allocated (consistent with SUNY policy on credit/contact hours), general course requirements, and expected student learning outcomes.*

TCHM 130 – Honors Advanced General Chemistry I (3)

TCHM 131 – Honors Advanced General Chemistry II (3)

ACHM 326 – Quantitative Analysis For Industry (3)

ACHM 327 – Quantitative Analysis For Industry Lab (2)

ACHM 352Z – Physical Chemistry Lab (3)

ACHM 408 – Polymer Chemistry (3)

ACHM 411 – Computational Chemistry I (3)

ACHM 412 – Computational Chemistry II (3)

ACHM 417 – Advanced Synthesis Laboratory (3)

ACHM 422 – Organometallic Chemistry (3)

ACHM 428 – Forensic Chemistry Research (3)

ACHM 429 – Instrumental Analysis (3)

ACHM 431 – Instrumental Analysis Lab (1)

ACHM 437 – Organic Synthesis (3)

ACHM 444 – Biophysical Chemistry I (3)

ACHM 445 – Biophysical Chemistry II (3)

ACHM 446 – Chemical Biology Laboratory (3)

ACHM 447 – Advanced Forensic Chemistry (3)

ACHM 448 – Advanced Forensic Chemistry Lab I (2)

ACHM 449 – Advanced Forensic Chemistry Lab II (2)

ACHM 458 – Introduction to Medicinal Chemistry/Pharmacology (3)

ACHM 470 – Crystallography (3)

ACHM 471 – Theory and Techniques of Biophysics and Biophysical Chemistry (3)

ACHM 472 – Experimental Methods of Organic Structure Determination (3)

ACHM 473 – Chemical and Enzymatic Kinetics (3)

ACHM 474 – Physical Organic Chemistry I (3)

ACHM 475 – Physical Organic Chemistry II (3)

APHY 140 – Physics I: Mechanics (3)

TPHY 141 – Honors Physics I: Mechanics (3)

APHY 145 – Physics Lab I (1)

APHY 150 – Physics II: Electromagnetism (3)

TPHY 151 – Honors Physics II: Electromagnetism (3)

APHY 155 – Physics Lab II (1)

d) What are the additional costs of the change, if any? If there are no anticipated costs, explain why.

None – Courses are being taught by current faculty.

Section 2.2. Other Changes

Check all that apply. Describe each proposed change and why it is proposed.

[ ] Program title
[ ] Program award
[X] Mode of delivery

NOTES: *(1) If the change in delivery enables students to complete 50% of more of the program via distance education, submit a Distance Education Format Proposal* as part of this proposal. *(2) If the change involves adding an accelerated version of the program that impacts financial aid eligibility or licensure qualification, SED may register the version as a separate program.*

[ ] Format change(s) (e.g., from full-time to part-time), based on SED definitions, for the **entire** program
1) State proposed format(s) and consider the consequences for financial aid
2) Describe availability of courses and any change in faculty, resources, or support services.

[ ] A change in the total number of credits in a certificate or advanced certificate program

[ ] Any change to a registered licensure-qualifying program, or the addition of licensure qualification to an existing program. **Exception:** Small changes in the required number of credits in a licensure-qualifying program that do not involve a course or courses that satisfy one of the required content areas in the profession.

Section 3. Program Schedule and Curriculum

a) For **undergraduate programs**, complete the ***SUNY Undergraduate Program Schedule*** to show the sequencing and scheduling of courses in the program. If the program has separate tracks or concentrations, complete a ***Program Schedule*** for each one.

NOTES: *The* ***Undergraduate Schedule*** *must show* ***all curricular requirements*** *and demonstrate that the program conforms to SUNY's and SED's policies.*

- *It must show how a student can complete all program requirements within SUNY credit limits, unless a longer period is selected as a format in Item 2.1(c): two years of full-time study (or the equivalent) and 64 credits for an associate degree, or four years of full-time study (or the equivalent) and 126 credits for a bachelor's degree. Bachelor's degree programs should have at least 45 credits of upper division study, with 24 in the major.*
- *It must show how students in A.A., A.S. and bachelor's programs can complete, within the first two years of full-time study (or 60 credits), no fewer than 30 credits in approved SUNY GER courses in the categories of Basic Communication and Mathematics, and in at least 5 of the following 8 categories: Natural Science, Social Science, American History, Western Civilization, Other World Civilizations, Humanities, the Arts and Foreign Languages*
- *It must show how students can complete Liberal Arts and Sciences (LAS) credits appropriate for the degree.*
- *When a SUNY Transfer Path applies to the program, it must show how students can complete the number of SUNY Transfer Path courses shown in the Transfer Path Requirement Summary within the first two years of full-time study (or 60 credits), consistent with SUNY's Student Seamless Transfer policy and MTP 2013-03.*
- *Requests for a program-level waiver of SUNY credit limits, SUNY GER and/or a SUNY Transfer Path require the campus to submit a Waiver Request –with compelling justification(s).*

EXAMPLE FOR ONE TERM: Undergraduate Program Schedule

Term 2: Fall 20xx	Credits per classification						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Prerequisite(s)**
ACC 101 Principles of Accounting	4			4	4		
MAT 111 College Mathematics	3	M	3	3			MAT 110
CMP 101 Introduction to Computers	3						
HUM 110 Speech	3	BC	3			X	
ENG 113 English 102	3	BC	3				
Term credit total:	16	6	9	7	4		

b) *For* ***graduate programs****, complete the* ***SUNY Graduate Program Schedule****. If the program has separate tracks or concentrations, complete a* ***Program Schedule*** *for each one.*

NOTE: *The* ***Graduate Schedule*** *must include all curriculum requirements and demonstrate that expectations from Part 52.2(c)(8) through (10) of the Regulations of the Commissioner of Education are met.*

SUNY Undergraduate Program Schedule (***OPTION: You can paste an Excel version of this schedule AFTER this line, and delete the rest of this page.)***

Program/Track Title and Award: Chemistry B.A.

a) Indicate **academic calendar type**: [ ] Semester [ ] Quarter [ ] Trimester [ ] Other (describe):

b) **Label each term in sequence**, consistent with the institution's academic calendar (e.g., Fall 1, Spring 1, Fall 2)

c) **Name of SUNY Transfer Path, if one exists: Chemistry** **See Transfer Path Requirement Summary for details**

d) Use the table to show **how a typical student may progress through the program**; copy/expand the table as needed. **Complete all columns that apply to a course.**

Term 1:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
ACHM 120 General Chemistry I and ACHM 124 General Chemistry Lab I or TCHM 130 Honors Advanced General Chemistry I and ACHM 124 General Chemistry Lab I ACHM 115 General Chemistry I Lecture and Lab	4 - 5	NS	4-5	4-5	X	130 and 115 New	
AMT 111 Algebra and Calculus II or AMAT 112 Calculus I or AMAT 118 Honors Calculus I or TMAT 118 Honors Calculus I Honors College	4	M	4	4	X	TMAT 118 New	
UUNI 101 Writing and Critical Inquiry	3	BC	3				
General Education: American History	3	AH	3				
Term credit totals:	14 - 15	14-15	14-15	8-9			

Term 2:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
ACHM 121 General Chemistry II and ACHM 125 General Chemistry Lab II OR TCHM 131 Honors Advanced General Chemistry II and ACHM 125 General Chemistry Lab II or ACHM 116 General Chemistry II Lecture and Lab	4-5	NS	4-5	4-5	X	131 and 116 New	ACHM 120 or TCHM 130 or ACHM 115
AMAT 113 Calculus II or AMAT 119 Honors Calculus II or TMAT 119 Honors Calculus II Honors College	4	M	4	4	X	119 New	AMAT 111 or 112 or 118 or TMAT 118
General Education: International Perspectives	3	IP	3				
General Education: Humanities	3	HU	3				
Local General Education: Challenges of the 21st Century	3		3				
Term credit totals:	17-18	14-15	17-18	8-9			

Term 3:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 140 Physics I: Mechanics or APHY 142 Physics I: Advanced Mechanics or TPHY 141 Honors Physics I: Mechanics	3	NS	3	3	X	X	AMAT 111 or 112 or 118 or TMAT 118
APHY 145 Physics Lab I	1	NS	1	1	X	X	APHY 140 or 141 or TPHY 141
ACHM 220 Organic Chemistry I	3		3	3	X		ACHM 120 or 131 and 121
ACHM 222 Organic Chemistry Lab I	1		1	1	X		ACHM 220
General Education: Social Science	3	SS	3				
General Education: Foreign Language	3	FL	3				

Term 4:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
ACHM 221 Organic Chemistry II	3		3	3	X		ACHM 220
ACHM 223 Organic Chemistry Lab II	1		1	1	X		ACHM 221
ACHM 326 Quantitative Analysis for Industry	3		3	3			ACHM 120 or 115
ACHM 327 Quantitative Analysis for Industry Lab	2		2	2			ACHM 326
ACHM 352Z Physical Chemistry Lab	3		3	3		X	ACHM 326 and 327
APHY 150 Physics II: Electromagnetism or APHY 152 Physics II: Advanced Electromagnetisms or	3	NS	3	3	X	X	APHYS 140 or 142 or TPHY 141

								TPHY 151 Honors Physics II: Electromagnetism								
General Education: Art	3	AR						APHY 155 Physics Lab II	1	NS	1	1	X	X	APHY 150 or 152 or TPHY 151
Term credit totals:	17	13	14	8				Term credit totals:	18	4	18	12			
Term 5:	See KEY.							**Term 6:**	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**	**Course Number & Title**	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
ACHM 417 Advanced Synthesis Laboratory	3		3	3		X	ACHM 221 and 223	ACHM 420 Inorganic Chemistry A	3		3	3			ACHM 350 or 444
ACHM 444 Biophysical Chemistry I	3		3	3			ACHM 221, AMAT 113 or 119, and APHY 150	LAS Elective	3		3				
LAS Elective	3		3					Upper Division Free Elective	3						
Upper Division Free Elective	3							Upper Division Free Elective	3						
Free Elective	3							Free Elective	3						
Term credit totals:	15		9	6				Term credit totals:	15		6	3			
Term 7:	See KEY.							**Term 8:**	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**	**Course Number & Title**	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
ACHM 429 Instrumental Analysis	3		3	3			ACHM 226 and 227	Upper Division Advanced Chemistry Elective	3		3	3			
ACHM 431 Instrument Analysis Lab I	1		1	1		X	ACHM 429	LAS Elective	3		3				
LAS Elective	3		3					Upper Division Free Elective	3						
Upper Division Free Elective	3							Upper Division Free Elective	3						
Upper Division Free Elective	3							Free Elective	3						
Term credit totals:	13		7	4				Term credit totals:	15		6	3			

Program Totals (in credits):	**Total Credits: 122-124**	**SUNY GER: 45 - 47**	**LAS: 92 - 94**	**Major: 56 - 58**	**Elective & Other: 45**	**Upper Division: 45**	**Upper Division Major: 24**	**Number of SUNY GER Categories:**
								9

KEY Cr: credits **GER:** SUNY General Education Requirement (Enter Category Abbreviation) **LAS:** Liberal Arts & Sciences (Enter credits) **Maj:** Major requirement (Enter credits) **TPath:** SUNY Transfer Path Courses (Enter credits) **New:** new course (Enter X) **Co/Prerequisite(s):** list co/prerequisite(s) for the noted courses **Upper Division:** Courses intended primarily for juniors and seniors **SUNY GER Category Abbreviations:** American History (AH), Basic Communication (BC), Foreign Language (FL), Humanities (H), Math (M), Natural Sciences (NS), Other World Civilizations (OW), Social Science (SS), The Arts (AR), Western Civilization (WC)

SUNY Graduate Program Schedule ***OPTION:*** ***You can insert an Excel version of this schedule AFTER this line, and delete the rest of this page.)***

Program/Track Title and Award:_____

a) Indicate **academic calendar** type: [ ] Semester [ ] Quarter [ ] Trimester [ ] Other (describe):

b) **Label each term in sequence**, consistent with the institution's academic calendar (e.g., Fall 1, Spring 1, Fall 2)

c) Use the table to show **how a typical student may progress through the program**; copy/expand the table as needed.

d) Complete the last row to show program totals and comprehensive, culminating elements. **Complete all columns that apply to a course.**

Term 1:				**Term 2:**			
Course Number & Title	**Credits**	**New**	**Co/Prerequisites**	**Course Number & Title**	**Credits**	**New**	**Co/Prerequisites**
Term credit total:				Term credit total:			
Term 3:				**Term 4:**			
Course Number & Title	**Credits**	**New**	**Co/Prerequisites**	**Course Number & Title**	**Credits**	**New**	**Co/Prerequisites**
Term credit total:				Term credit total:			
Term 5:				**Term 6:**			
Course Number & Title	**Credits**	**New**	**Co/Prerequisites**	**Course Number & Title**	**Credits**	**New**	**Co/Prerequisites**
Term credit total:				Term credit total:			
Term 7:				**Term 8:**			
Course Number & Title	**Credits**	**New**	**Co/Prerequisites**	**Course Number & Title**	**Credits**	**New**	**Co/Prerequisites)**
Term credit total:				Term credit total:			

Program Total:	**Total Credits:**	**Identify the required comprehensive, culminating element(s), such as a thesis or examination, including course number(s), if applicable:**

New: X if new course **Prerequisite(s)**: list prerequisite(s) for the listed courses

Section 4. SUNY Faculty Table

a) If applicable, provide information on faculty members who will be teaching new or significantly revised courses in the program. Expand the table as needed.

b) **Append** at the end of this document position descriptions or announcements for each to-be-hired faculty member

(a)	(b)	(c)	(d)	(e)	(f)
Faculty Member Name and Title and/or Rank at the Institution (Include and identify Program Director.)	**% of Time Dedicated to This Program**	**Program Courses Which May Be Taught (Number and Title)**	**Highest and Other Applicable Earned Degrees (include College or University)**	**Discipline(s) of Highest and Other Applicable Earned Degrees**	**Additional Qualifications: List related certifications and licenses and professional experience in field.**
PART 1. Full-Time Faculty					
Paul Toscano, Associate Professor of Chemistry, Director of Undergraduate Studies	100	ACHM 120 General Chemistry 1 ACHM 121 General Chemistry 2 ACHM 220 Organic Chemistry 1 ACHM 222 Organic Chemistry 2 ACHM 426 Undergraduate Research in Chemistry	Ph.D., Johns Hopkins University	Chemistry	
Halimah Sayahi, Chemistry Lecturer	100	ACHM 115 General Chemistry I and Lab ACHM 116 General Chemistry II and Lab ACHM 120 General Chemistry 1 ACHM 121 General Chemistry 2 ACHM 220 Organic Chemistry 1 ACHM 222 Organic Chemistry 2	Ph.D., University at Albany, SUNY	Chemistry	
Igor Lednev, Professor of Chemistry	100	ACHM 250 Introduction to Forensic Chemistry ACHM 251 Introduction to Forensic Chemistry Lab ACHM 326 – Quantitative Analysis for Industry ACHM 327 – Quantitative Analysis for Industry Lab ACHM 428 Forensic Chemistry Research ACHM 429 Instrumental Analysis ACHM 431 Instrumental Analysis Lab	Ph.D., Moscow Institute of Physics and Technology	Physical Chemistry	

(a)	(b)	(c)	(d)	(e)	(f)
Faculty Member Name and Title and/or Rank at the Institution (Include and identify Program Director.)	**% of Time Dedicated to This Program**	**Program Courses Which May Be Taught (Number and Title)**	**Highest and Other Applicable Earned Degrees (include College or University)**	**Discipline(s) of Highest and Other Applicable Earned Degrees**	**Additional Qualifications: List related certifications and licenses and professional experience in field.**
Jeremy Feldblyum, Assistant Professor of Chemistry	100	ACHM 350 Physical Chemistry 1 ACHM 408 Polymer Chemistry	Ph.D., University of Michigan, Ann Arbor	Chemistry	
Alan Chen, Associate Professor of Chemistry	100	ACHM 411 Computational Chemistry 1 ACHM 412 Computational Chemistry 2	Ph.D., Washington University in St. Louis	Molecular Biophysics	
Evgeny Dikarev, Professor of Chemistry	100	ACHM 422 Organometallic Chemistry ACHM 470 Crystallography	Ph.D., Moscow State University	Chemistry	
Maksim Royzen, Associate Professor of Chemistry	100	ACHM 437 Organic Synthesis	Ph.D., New York University	Chemistry	
Mehmet Yigit, Associate Professor of Chemistry	100	ACHM 444 Biophysical Chemistry 1 ACHM 445 Biophysical Chemistry 2	Ph.D., University of Illinois, Urbana-Champaign	Biophysics	
Micheal Yeung, Assistant Professor of Chemistry	100	ACHM 352Z Physical Chemistry Lab	Ph.D., University of California, Los Angeles	Chemistry	
Li Niu, Professor of Chemistry	100	ACHM 446 Chemical Biology Lab ACHM 473 Chemical and Enzymatic Kinetics	Ph.D., University of Wisconsin, Milwaukee	Chemistry	
Rabi Musah, Professor of Chemistry	100	ACHM 447 Advanced Forensic Chemistry ACHM 448 Advanced Forensic Chemistry Lab 1 ACHM 449 Advanced Forensic Chemistry Lab 2 ACHM 458 Introduction to Medicinal Chemistry/Pharmacology	Ph.D., University of Arkansas	Chemistry	

(a)	(b)	(c)	(d)	(e)	(f)
Faculty Member Name and Title and/or Rank at the Institution (Include and identify Program Director.)	**% of Time Dedicated to This Program**	**Program Courses Which May Be Taught (Number and Title)**	**Highest and Other Applicable Earned Degrees (include College or University)**	**Discipline(s) of Highest and Other Applicable Earned Degrees**	**Additional Qualifications: List related certifications and licenses and professional experience in field.**
		ACHM 472 Experimental Methods of Organic Structure Determination			
Alexander Shekhtman, Professor and Chair of Chemistry	100	ACHM 458 Introduction to Medical Chemistry and Pharmacology ACHM 471 – Theory and Techniques of Biophysics and Biophysical Chemistry	Ph.D., University at Albany, SUNY	Physics	
Zhwng Wei, Director of the X-Ray Facility Core	100%	ACHM 470 X-ray Crystallography	Ph.D., University at Albany. SUNY	Chemistry	
John Welch, Professor of Chemistry	100	ACHM 474 Physical Organic Chemistry 1 ACHM 475 Physical Organic Chemistry 2	Ph.D., Case Western Reserve University	Chemistry	
Qiang Zhang, Associate Professor of Chemistry	100	ACHM 417 Advanced Synthesis Laboratory	Ph.D., Boston University	Chemistry	
James Sidoli, Lecturer in Mathematics & Statistics	100	AMAT 111 Algebra and Calculus 2 AMAT 112 Calculus 1	Ph.D., University at Albany, SUNY	Mathematics	
John Tambroni, Lecturer in Mathematics & Statistics	66	TMAT 118 Honors Calculus 1	M.A., University at Buffalo , SUNY	Mathematics	Masters of Science in Teaching, SUNY Potsdam
Steven Plotnick, Associate Professor of Mathematics and Statistics	25	TMAT 119 Honors Calculus 2	Ph.D., University of Michigan	Mathematics	
William Lanford, Professor of Physics	10%	APHY 140 Physics 1: Mechanics	Ph.D., University of Rochester	Physics	

(a)	(b)	(c)	(d)	(e)	(f)
Faculty Member Name and Title and/or Rank at the Institution (Include and identify Program Director.)	**% of Time Dedicated to This Program**	**Program Courses Which May Be Taught (Number and Title)**	**Highest and Other Applicable Earned Degrees (include College or University)**	**Discipline(s) of Highest and Other Applicable Earned Degrees**	**Additional Qualifications: List related certifications and licenses and professional experience in field.**
Anna Sharikova, Visiting Assistant Professor in Physics	25	APHY 145 Physics Lab 1	Ph.D., University of South Florida	Applied Physics	
Jesse Ernst, Associate Professor of Physics	25	APHY 150 Physics 2: Electromagnetism	Ph.D., University of Rochester	Physics	
Keith Earle, Associate Professor of Physics and Chair	100	APHY 155 Physics Lab 2	Ph.D., Cornell University	Physics	
Alexander Khmaladze, Associate Professor of Physics	50	APHY 142 Physics I: Advanced Mechanics APHY 152 Physics II: Advanced Electromagnetism	Ph.D., University of South Florida	Applied Physics	
Matthew Szydagis, Associate Professor of Physics	25	TPHY 141 Honors Physics 1: Mechanics	Ph.D., University of Chicago	Physics	
Oleg Lunin, Associate Professor of Physics	25	TPHY 151 Honors Physics 2: Electromagnetism	Ph.D., Ohio State University	Physics	
Part 2. Part-Time Faculty					
Priyantha Sugathapa, Lecturer, Honors College	100	TCHM 130 Honors Advanced General Chemistry 1 TCHM 131 Honors Advanced General Chemistry 2	Ph.D., Wayne State University	Chemistry	
Part 3. To-Be-Hired Faculty (List as TBH1, TBH2, etc., and provide expected hiring date instead of name.)					

Distance Education Format Proposal
For A Proposed or Registered Program

Form 4

Version 2014-11-17

When a new or existing program is designed for a distance education format, a campus Chief Executive Officer or Chief Academic Officer should submit a signed cover letter and this completed form to the SUNY Provost at *program.review@suny.edu*. According to MSCHE, the 50% standard includes only courses offered in their entirety via distance education, not courses utilizing mixed delivery methods. Also, MSCHE requires that the first two programs for which 50% or more is offered through distance education be submitted for Commission review and prior approval of a substantive change.

- All campuses must complete the following sections: Sections 1 - 3, and Part B: Program Specific Issues.
- Part A must be completed if the proposing campus has not previously submitted this form with a completed Part A: Institution-wide Issues, or has made significant changes to its institution-wide distance education operations since last completing Part A. This applies even if the institution has programs registered to be delivered at a distance.

Section 1. General Information		
a) Institutional Information	Institution's 6-digit SED Code:	210500
	Institution's Name:	University at Albany
	Address:	*1400 Washington Avenue, Albany, NY 12222*
b) Registered or Proposed Program	Program Title:	Chemistry
	SED Program Code	20581
	Award(s) (e.g., A.A., B.S.):	B.A.
	Number of Required Credits:	Minimum [120] If tracks or options, largest minimum [120]
	HEGIS Code:	1905
	CIP 2010 Code:	40.0501
c) Distance Education Contact	Name and title: Billie Bennett Franchini, Ph.D., Director of the Institute for Teaching, Learning and Academic Leadership and Interim Director for Online Teaching and Learning Telephone: (518) 442-4850 E-mail: bfranchini@albany.edu	
d) Chief Executive or Chief Academic Officer Approval	**Signature affirms that the proposal has met all applicable campus administrative and shared governance procedures for consultation, and the institution's commitment to support the proposed program. *E-signatures are acceptable.*** Name and title: Carol Kim, Ph.D., Senior Vice Provost for Academic Affairs & Provost Signature and date:  1/5/2023	
	If the program will be registered jointly[1] with one or more other institutions, provide the following information for <u>each</u> institution:	

[1] If the partner institution is non-degree-granting, see SED's CEO Memo 94-04.

	Partner institution's name and 6-digit SED Code: Name, title, and signature of partner institution's CEO (or **append** a signed letter indicating approval of this proposal):

Section 2: Enrollment

Year	Anticipated Headcount Enrollment			Estimated FTE
	Full-time	Part-time	Total	
1	6	0	6	6
2	7	0	7	7
3	8	0	8	8
4	9	2	11	10
5	10	4	14	12

Section 3: Program Information

a) ***Term length*** (in weeks) for the distance program: 15

b) Is this the same as term length for classroom program? [ ] No [X] Yes

c) How much "***instructional time***" is required per week per credit for a distance course in this program? (Do not include time spent on activities that would be done outside "class time," such as research, writing assignments, or chat rooms.) ***NOTE:*** *See SUNY policy on credit/contact hours and SED guidance.*

50 minutes instructional time per week per credit-hour – same as in-person determination

d) What proportion or percentage of the program will be offered in Distance Education format? Will students be able to complete 100 percent of the program online? If not, what proportion will be able to be completed online?

Chemistry is inherently a laboratory science-oriented major which must include hands-on instruction in chemistry lab methods. In order to maintain accreditation of our BS degree programs with the American Chemical Society, all lab -courses must be offered in-person with appropriate equipment. The BA is a subset of the BS degree track with fewer upper-level advanced chemistry courses, allowing flexibility for dual-majors and pre-health students, but with identical core-chemistry requirements. Therefore, to maintain ACS compliance of our BS programs, only non-lab instruction can be offered via distance learning, including general education courses and lecture-only courses. Students will NOT be able to complete 100% of the program online, as the B.A. in Chemistry requires 12 credits of lab courses which can only be taken in-person. Therefore, almost 80% of the program will be offered online.

e) What is the maximum number of students who would be enrolled in an online course section?

For online lecture courses, a maximum of 30 students will be able to be enrolled at once.

Part A: Institution-wide Issues: Submit Part A only for the **first** Distance Education program proposed by your institution using this form. SUNY and the State Education Department will keep this in a master file so that your institution will not need to resubmit it for each new proposed online program, **unless there are significant changes, such as a new platform**.

Part A.1. Organizational Commitment

a) Describe your institution's planning process for Distance Education, including how the need for distance access was identified, the nature and size of the intended audiences, and the provisions for serving those audiences, including how each student's identity will be verified.

b) Describe your institution's resources for distance learning programs and its student and technical support services to ensure their effectiveness. What course management system does your institution use?

c) Describe how the institution trains faculty and supports them in developing and teaching online courses, including the pedagogical and communication strategies to function effectively. Describe the qualifications of those who train and/or assist faculty, or are otherwise responsible for online education.

d) If your institution uses courses or academic support services from ***another provider***, describe the process used (with faculty participation) to evaluate their quality, academic rigor, and suitability for the award of college credit and a degree or certificate.

e) Does your institution have a clear ***policy on ownership of course materials*** developed for its distance education courses? How is this policy shared with faculty and staff? ***NOTE:*** *You may refer to SUNY's statement on copyright and faculty ownership of instructional content, and/or faculty contract provisions.*

Part A.2. Learner Support

a) Describe how your institution provides distance students with ***clear information*** on:

- Program completion requirements
- The nature of the learning experience
- Any specific student background, knowledge, or technical skills needed
- Expectations of student participation and learning
- The nature of interactions among faculty and students in the courses.
- Any technical equipment or software required or recommended.

b) Describe how your institution provides distance learners with adequate ***academic and administrative support***, including academic advisement, technical support, library and information services, and other student support services normally available on campus. Do program materials clearly define how students can access these support services?

c) Describe how ***administrative processes*** such as admissions and registration are made available to distance students, and how program materials inform students how to access these services.

d) What ***orientation*** opportunities and resources are available for students of distance learning?

Part B: Program-Specific Issues: Submit Part B for each new request to add Distance Education Format to a proposed or registered program.

Part B.1. Learning Design

a) How does your institution ensure that the ***same academic standards and requirements*** are applied to the program on campus and through distance learning? If the curriculum in the Distance Education program differs from that of the on-ground program, please identify the differences.

Any distance learning courses offered will fulfill the same curriculum as their in-person equivalents; syllabi will have the same learning outcomes and goals. Standards and requirements help set the learning outcomes and goals for

Online learning platforms provided by the University (currently Blackboard and Zoom) will be utilized as a way for students in the online versions of the courses to interact with each other and faculty. At the end of each academic year, a committee within the department will review every course taught that year's syllabus, outcomes from students, and student surveys. If the committee sees that any learning outcomes are not being met or need to be adjusted, the committee will work with the faculty teaching the course to ensure this is fixed for the upcoming academic year.

b) Are the courses that make up the distance learning program offered in a sequence or configuration that allows ***timely completion of requirements***?

Yes – required lecture courses within the program that are not labs will be offered the same as in-person lectures.

c) How do faculty and others ensure that ***the technological tools*** used in the program are appropriate for the content and intended learning outcomes?

At the end of each academic year, a committee within the department will review every course taught that year's syllabus, outcomes from students, and student surveys. If the committee sees that any learning outcomes are not being met or need to be adjusted, the committee will work with the faculty teaching the course to ensure this is fixed for the upcoming academic year. With online courses, the committee will review the technology used throughout the course of the semester. They will look at activities completed online through Blackboard and Zoom and ensure that these tools were used in ways to ensure leaning outcomes were meet. If the technology is not meeting the learning outcomes set, the committee will discuss that with the faculty and suggest better ways of using the technology to meet the learning outcomes.

d) How does the program provide for appropriate and flexible interaction between faculty and students, and among students?

Using a classroom management system (Blackboard) and Zoom, students and faculty are able to interact with ease. Instructors will offer lectures via zoom, allowing students to hear directly from the professor and asking questions. Instructors of distance-learning courses will also offer office hours via zoom, in-class discussions will utilize Zoom break-out rooms for student collaboration, and Blackboard message boards can be used discussion board posting. Students will be able to submit work via the management system or via email with time stamps as to when things were submitted.

e) How do faculty teaching online courses verify that the student who registers in a distance education course or program is the same student who participates in and completes the course or program and receives the academic credit?

Zoom attendance and Blackboard usage both require UAlbany single-sign-on credentials (with two-factor authentication) to verify student identity. Students will still have significant coursework that must be completed in-person (e.g., all lab courses), and assessments such as exams will occur under controlled conditions (see B.2.a below) to verify the identity of the student taking the course.

Part B.2. Outcomes and Assessment

a) Distance learning programs are expected to produce the ***same learning outcomes*** as comparable classroom-based programs. How are these learning outcomes identified – in terms of knowledge, skills, or credentials – in course and program materials?

Distance learning courses will only be offered if assessments directly equivalent to classroom-based offerings can be ensured. For example, courses requiring term papers or student presentations as graded assignments are equivalent whether submitted online or in-person. Similarly, homework problem sets can be submitted electronically or via hard-copy to the instructor for grading. Exams, however, would require the distance learning student to arrange to take all exams under appropriately controlled conditions – for example, proctored in-person during instructor office-hours, joining the same exam period as for in-person students, or utilizing a professionally proctored testing center (such as

the UAlbany Disability Resource Center) even if the student otherwise participates in the course entirely online. Per American Chemistry Society requirements, lab courses will only be offered in-person, ensuring all chemistry degree students receive the equivalent hands-on training regardless of the modality in which they attend lectures.

b) Describe how the ***means chosen for assessing student learning*** in this program are appropriate to the content, learning design, technologies, and characteristics of the learners.

All BA Chemistry courses are a subset of the BS Chemistry courses, which are certified by the American Chemical Society, which set the curriculum, technology, and skills our students must be exposed to. This is regularly assessed by the ACS via external review of syllabi, sample exams, and site visits. Distance learning courses will only be offered if identical assessments as the classroom-based course can be implemented.

Part B.3. Program Evaluation

a) What process is in place to monitor and ***evaluate the effectiveness*** of this particular distance education program on a regular basis?

All students are asked to provide feedback on each course via the Student Instructional Rating Form (SIRF), a secure, online portal where students rate the effectively of the specific course, instructor, and can also leave confidential comments and feedback. Distance-learning offering SIRFS scores will be compared to their in-person equivalents to assess program effectiveness. A departmental committee will review the SIRF scores for each course, in conjunction with syllabi and student grades. If the committee feels as if something needs to be adjusted to ensure the effectiveness of a course or section within a course, the committee will address this with the teaching faculty and suggest changes to meet the learning outcome.

b) How will the evaluation results will be used for ***continuous program improvement***?

Significant deviations in SIRF scores and learning outcomes (i.e. final grade distributions) for distance-learning courses compared to their classroom-equivalents will trigger departmental review of the suitability of the distance-learning course offering. Our goal is not to replace any classroom-based offerings with distance learning, but rather to improve learning outcomes for non-traditional student populations via enhanced accessibility options (for example, if they cannot attend in-person lectures due to job or child-care obligations).

c) How will the evaluation process assure that the ***program results in learning outcomes appropriate to the rigor and breadth*** of the college degree or certificate awarded?

Rigor and breadth of all BS Chemistry programs are already set by American Chemical Society standards. The BA chemistry track, although not ACS certified, is comprised of a subset of core Chemistry courses also required for the BS degree, and therefore set to the same standards. By only offering distance-learning courses where learning assessments can be ensured to be directly equivalent to their classroom-based equivalents (see section B.2.a), the same learning outcomes for distance learning vs. in-person students is ensured.

Part B.4. Students Residing Outside New York State

SUNY programs must comply with all "authorization to operate" regulations that are in place in other U.S. states where the institution has enrolled students or is otherwise active, based on each state's definitions.

a) What processes are in place to monitor the U.S. state of residency of students enrolled in any distance education course in this program while residing in their home state?

The integrated administrative system identifies and keeps track of any out of state students who are participating in courses from their home state. The University at Albany is affiliated with the National Council for State Authorization Reciprocity Agreement (NC-SARA). The NC-SARA, a voluntary agreement among affiliated states and U.S. territories, ensures a national set of educational standards for interstate postsecondary distance-education courses and programs. As an affiliate, the University at Albany is permitted to offer students outside of New York access to distance education courses.

b) Federal regulations require institutions delivering courses by distance education to provide students or prospective students with contact information for filing complaints with the state approval or licensing entity in the student's state of residency and any other relevant state official or agency that would appropriately handle a student's complaint. What is the URL on your institution's website where contact information for filing complaints for students in this program is posted?

https://www.albany.edu/online/non-nys-residents.php

Chemistry BA Syllabi:

TCHM 130 – Honors Advanced General Chemistry I
TCHM 131 – Honors Advanced General Chemistry II
ACHM 115 – General Chemistry I Lecture and Lab
ACHM 116 – General Chemistry II Lecture and Lab
ACHM 326 – Quantitative Analysis For Industry
ACHM 327 – Quantitative Analysis For Industry Lab
ACHM 352Z – Physical Chemistry Lab
ACHM 408 – Polymer Chemistry
ACHM 411 – Computational Chemistry I
ACHM 412 – Computational Chemistry II
ACHM 417 – Advanced Synthesis Laboratory
ACHM 422 – Organometallic Chemistry
ACHM 426 – Undergraduate Research in Chemistry
ACHM 428 – Forensic Chemistry Research
ACHM 429 – Instrumental Analysis
ACHM 431 – Instrumental Analysis Lab
ACHM 437 – Organic Synthesis
ACHM 444 – Biophysical Chemistry I
ACHM 445 – Biophysical Chemistry II
ACHM 446 – Chemical Biology Laboratory
ACHM 447 – Advanced Forensic Chemistry
ACHM 448 – Advanced Forensic Chemistry Lab I
ACHM 449 – Advanced Forensic Chemistry Lab II
ACHM 458 – Introduction to Medicinal Chemistry/Pharmacology
ACHM 470 – Crystallography
ACHM 471 – Theory and Techniques of Biophysics and Biophysical Chemistry
ACHM 472 – Experimental Methods of Organic Structure Determination
ACHM 473 – Chemical and Enzymatic Kinetics
ACHM 474 – Physical Organic Chemistry I
ACHM 475 – Physical Organic Chemistry II
APHY 140 – Physics I: Mechanics
APHY 142 – Physics I: Advanced Mechanics
TPHY 141 – Honors Physics I: Mechanics
APHY 145 – Physics Lab I
APHY 150 – Physics II: Electromagnetism
TPHY 151 – Honors Physics II: Electromagnetism
APHY 152 – Physics II: Advanced Electromagnetism
APHY 155 – Physics Lab II
TMAT 118 – Honors Calculus I Honors College
TMAT 119 – Honors Calculus II Honor College

TCHM 130 – HONORS ADVANCED GENERAL CHEMISTRY I
(3 credits), Fall 2019 MWF 9:20 A.M. – 10:15 A.M. Class No. 4721
Chemistry Building, Room 151 (CH 151)

Instructor: Priyantha Sugathapala, Ph.D.
Office: Chemistry 337
Email address: psugathapala@albany.edu
Office Hours: MWF 10:30 A.M. – 11:30 A.M., and by appointment.

Course Description: Energy, enthalpy, thermochemistry, quantum mechanics and atomic theory, general concepts of bonding, covalent bonding and orbitals, gases, liquids, and solids. Students will be introduced to faculty research within the Department of Chemistry, as well as interdisciplinary areas. Honors College students only.

This course consists of three lecture periods per week. A tentative lecture schedule is given at the end of this syllabus. The laboratory program for General Chemistry is a separate course, CHM 124. While it will be coordinated to the greatest practicable extent with TCHM 130, it is taught and graded separately.

Prerequisites: None

Course Objectives: Students will learn foundational concepts and problem solving techniques in Chemistry, including: energy, enthalpy, thermochemistry, quantum mechanics and atomic theory, general concepts of bonding, covalent bonding and orbitals, gases, liquids, and solids. Students will be introduced to faculty research within the Department of Chemistry, as well as interdisciplinary areas.

Sapling Plus (required): Buy **only** **Sapling Plus** (use the following link or the bookstore)

https://store.macmillanlearning.com/us/product/Chemical-Principles/p/1464183953

Note: Sapling plus comes with online home work and the e-book: ***Chemical Principles: The Quest for Insight 7th edition*, by Peter Atkins and Loretta Jones**. A hard copy of the text book is **not required**. However, the textbook is available if necessary.

Lectures: Students are expected to attend lectures. Lectures will focus student's attention on the most important topics. The PowerPoint lecture slides will be posted on the Blackboard Learning System.

It is essential for success in this course that the homework be accomplished in a conscientious, routine and timely manner. There is much material to be covered, and while lectures can hopefully provide an overview, insight and flavor to the subject matter, each student is expected to master the content of the assigned chapter sections through his/her personal study.

Quizzes: There will be a quiz each week (**no quiz on 8/26/19**). It will be graded and returned by the instructor. Your ten highest quiz scores will be used to construct a quiz average with a maximum possible of 100.

Examinations: Examinations may include questions related to anything presented during lectures, whether that information is in the text or not. This includes problems discussed during the class, problems from quizzes, and assigned homework problems. The format of examinations is variable. You should be prepared for multiple choice, fill in the blank, short answer and work out the answer questions. Some examinations may consist of only one of these types. For all examinations you are expected to have mastered all chapters studied back to and including FUNDAMENTALS.

No make-up examinations will be given except for the Final Examination. If you miss an examination and have an excused absence, your score for that examination is determined by your

scheduled varsity athletic competition, or other exceptional circumstances approved by the instructor". In so far as possible, you must contact the instructor prior to the exam to receive an excused absence. A score of (0) will be assigned for an unexcused absence.
Calculators during exams: You may use a handheld scientific calculator. You are not allowed to use a device with the capacity to communicate with other students in the room, or with any source of information outside the examination room. If you are observed to have or to be using such a device, you will be asked to remove it from your desk and place it in your bag. Two such infractions will be considered cheating and we will give you a score of zero on the examination of the second infraction. You are responsible for bringing an acceptable and working calculator. Borrowed or replacement calculators will not be available. If you have questions about your calculator see your instructor **BEFORE** the day of the exam. There is no sharing of calculators during exams.

Grading: Letter grades will be assigned by the instructor, based on the overall average, on the equivalent of 600 points (**Exams 60%, Quizzes 20%, Final 20%**). Each of the four hour exams is counted as 100 points and the final is 100 points. The quiz grade will contribute 100 points and the homework will contribute 100 points. Of these 600 points, the lowest exam equivalent (100 points) is dropped in the computation of your average score and grade. If a student has taken the four hour exams and completed the quizzes, he/she will be given a grade based on those exams and quizzes on the last day of classes and need not take the final if that grade is acceptable.

The policies, penalties, procedures & standards on Academic Integrity outlined in the *Undergraduate Bulletin* & in the University code of conduct *Community Rights & Responsibilities* are followed.

Sapling registration instructions

1. Go to www.saplinglearning.com/login to create an account. If you already have a Macmillan Learning account you can log in with your existing credentials and skip to step 3.
    a. Create your password and set all three security questions.
    b Start typing in your institution to select from the options that appears in the Primary Institution or School name field. If you institution does not appear you can add it by typing in the full name.
    c. Accept the terms of use and click "Sign Up".
    d. Check your email for the confirmation link to complete your registration and return to the login page.
2. Set your institution by searching using your institution's full name and selecting the appropriate option from the menu that appears.
3. Under Enroll in a new course, you should see Courses at [Your College]. Click to expand this list and see courses arranged by subject. Click on a subject to see the terms that courses are available.
4. Click on the term to expand the menu further (note that Semester 1 refers to the first course in a sequence and not necessarily the first term of the school year).
5. Once the menus are fully expanded, you'll see a link to a specific course. If this is indeed the course you'd like to register for, click the link.
6. *If applicable,* to access your e-book click on the image of the cover on the right sidebar of your course site. Create an account or log in with an existing Macmillan Learning eBook account.
7. **Need Help?** Our technical support team can be reached by phone, chat, or by email via the Student Support Community. To contact support please open a service request by filling out the web form: https://macmillan.force.com/macmillanlearning/s/
8. The following link includes more detailed instructions on how to register for your course: https://macmillan.force.com/macmillanlearning/s/article/Sapling-Learning-Registering-for-courses

Grading Scale

A = 93-100%; A- = 90-<93%; B+ = 87-<90%; B = 83-<87%; B- = 80-<83%; C+ = 77-<80%; C = 73-<77%; C- = 70-<73%; D+ = 67-<70%; D = 63-<67%; D- = 60-<63%; E = <60%.

Lecture/Quiz/Test Schedule

DATE			TOPIC	FOCUS/Sections
August	26	M	Introduction/syllabus/Fundamental review	A, B
	28	W	Fundamental review	C, D
	30	F	**Quiz-1**; Fundamental review	E, F
September	***2***	***M***	***No class***	
	4	W	Fundamental review	G, H
	6	F	**Quiz-2;**Fundamental review	I, J
	9	M	Fundamental review	K, L
	11	W	Fundamental review	M
	13	F	**Quiz-3;** Fundamental review	
	16	**M**	**Exam-1**	
	18	W	Systems, states and energy (*Thermodynamics-First Law*)	4A, 4B
	20	F	**Quiz-4;** Enthalpy	4C
	23	M	Enthalpy of Chemical Reactions	4D
	25	W	Enthalpy of the environment	4E
	27	F	**Quiz-5**; Investigating atoms (*Atoms-Quantum World*)	1A
	30	M	Quantum Theory	1B
October	2	W	Models of Atoms	1C
	4	F	**Quiz-6**; The Structures of Many-Electron Atoms	1D, 1E
	7	M	The Periodicity of Atomic Properties	1F
	9	W	**Review**	
	11	**F**	**Exam-2**	
	14	***M***	***No class***	
	16	W	Ionic Bonds (*Chemical Bonds*)	2A
	18	F	**Quiz-7**; Covalent Bonds	2B
	21	M	Exceptions to the Octet Rule	2C
	23	W	Ionic versus covalent bonds	
	25	F	**Quiz-8**; Strengths and length of covalent bonds	2D
	28	M	Infrared Spectroscopy	
	30	W	The VSEPR Model (*Molecular Shape and Structure*)	2E
November	1	F	**Quiz-9**; Molecular Orbital Theory	2G
	4	M	**Exam-3**	
	6	**W**	Ultraviolet and Visible Spectroscopy	
	8	F	Intermolecular Forces (*Liquids and Solids*)	3F
	11	M	Liquid Structure	3G
	13	W	Solid Structure	3H
	15	F	**Quiz-10**; The Impact of Materials	3I
	18	M	The Nature of Gases (*The Properties of Gases*)	3A
	20	**W**	The Gas Law, Molecular Motion	3B-3D
	22	F	**Quiz-11**; Real Gases	3E
	25	**M**	**Exam-4**	
	27	W	***No class***	
	29	F	***No class***	
December	2	M	Phases and Phase Transitions (Physical Equilibria)	5A-5B
	4	W	Solubility	5D
	6	F	**Quiz 12**; Colligative Properties	5F
	9	**M**	**Last class**	
	14	**S**	**Saturday 3:30pm – 5:30pm**	**FINAL EXAM**

TCHM 131–HONORS ADVANCED GENERAL CHEMISTRY II
(3 credits), SPRING 2019 MWF 10:25 A.M. – 11:20 A.M. Class No.7265
Chemistry Building (CH 151)

Instructor: Dr. Priyantha Sugathapala
Office: Chemistry 337
Email address: psugathapala@albany.edu
Office Hours: MWF 9:00 A.M. – 10:00 A.M., and by appointment.

Course Description: Chemical kinetics, chemical equilibrium, spontaneity, entropy, free energy, electrochemistry, transition metals, coordination chemistry, organic and biochemical molecules. Honors College students only. Only one of A CHM 121 and T CHM 131 may be taken for credit.

This course consists of three lecture periods per week. A tentative lecture schedule is given at the end of this syllabus. The laboratory program for General Chemistry is a separate course, CHM 125. While it will be coordinated to the greatest practicable extent with CHM 131, it is taught and graded separately. Colin Henck supervises CHM 125.

Prerequisites: TCHM 130

Course Objectives: Students will learn foundational concepts and problem-solving in Chemistry including kinetics, chemical equilibrium, spontaneity, entropy, free energy, electrochemistry, transition metals, coordination chemistry, organic and biochemical molecules.

Text: The required text for TCHM 131 is Chemical Principles: The Quest for Insight 7th edition, by Peter Atkins and Loretta Jones. The text is available in the University Bookstore.

Lectures: Students are expected to attend the lectures. Lectures will focus student's attention on the most important topics. The PowerPoint lecture slides will be posted on the Blackboard Learning System.

Homework (online): Require access to **Sapling (URL:** http://saplinglearning.com**). See page 4 for login instructions.****
The text and sapling access is available in the University Bookstore along with the Student Study Guide/Solutions Manual

It is essential for success in this course that the **homework be accomplished in a conscientious, routine and timely manner**. There is much material to be covered, and while lectures can hopefully provide an overview, insight and flavor to the subject matter, each student is expected to master the content of the assigned chapter sections through his/her personal study.

Quizzes: There will be a ten minute quiz each week. It will be graded and returned. Your ten highest quiz scores will be used to construct a quiz average with a maximum possible of 100.

Examinations: Examinations may include questions related to anything presented during lectures, whether that information is in the text or not. This includes problems discussed during the class, problems from quizzes, and assigned homework problems. The format of examinations is variable. You should be prepared for multiple choice, fill in the blank, short answer and work out the answer questions. Some examinations may consist of only one of these types. For all examinations you are expected to have mastered all chapters studied.

To have a make-up exam. An excused absence is a "documented serious medical condition, or a

exceptional circumstances approved by the instructor". A score of (0) will be assigned for an unexcused absence.

Calculators during exams: You may use a handheld scientific calculator. You are not allowed to use a device with the capacity to communicate with other students in the room, or with any source of information outside the examination room. If you are observed to have or to be using such a device, you will be asked to remove it from your desk and place it in your bag. Two such infractions will be considered cheating and we will give you a score of zero on the examination of the second infraction. **You** are responsible for bringing an acceptable and working calculator. Borrowed or replacement calculators will not be available. If you have questions about your calculator see your instructor **BEFORE** the day of the exam. There is no sharing of calculators allowed during exams.

Grading: Letter grades will be assigned by the instructor, based on the overall average, on the equivalent of 600 points (Exams 60%, Quizzes 20%, Final 20%). Each of the four hour exams is counted as 100 points and the final is 100 points. The quiz grade will contribute 100 points and the homework will contribute 100 points. Of these 600 points, the lowest exam equivalent (100 points) is dropped in the computation of your average score and grade. If a student has taken the four hour exams and completed the quizzes, he/she will be given a grade based on those exams and quizzes on the last day of classes and need not take the final if that grade is acceptable.

The policies, penalties, procedures & standards on Academic Integrity outlined in the *Undergraduate Bulletin* & in the University code of conduct *Community Rights & Responsibilities* are followed.

Test Dates:

Exam	1	2	3	4	Final
Date	2-11-19	3-4-19	3-29-19	4-24-19	**5-15-19**
Time	10:25 -11:20 a.m.	10:25 -11:20 a.m.	10:25 -11:20 a.m.	10:25 -11:20 a.m.	**3:30 - 5:30 p.m.**
Place	CH-151	CH-151	CH-151	CH-151	**CH-151**

Grading Scale

A = 93-100%; A- = 90-<93%; B+ = 87-<90%; B = 83-<87%; B- = 80-<83%; C+ = 77-<80%; C = 73-<77%; C- = 70-<73%; D+ = 67-<70%; D = 63-<67%; D- = 60-<63%; E = <60%.

Lecture/Quiz/Test Schedule

DATES			TOPICS	Focus
January	23	*W*	Entropy (macroscopic and microscopic) Global Changes in Entropy Gibbs Free Energy	4 (F-J)
	25	*F*		
	28	*M*		
	30	*W*		
February	1	***F(q-1)***	Reaction rates, Integrated Rate Laws and Reaction Mechanisms Models of Reactions Catalysis	7 (A-E)
	4	*M*		
	6	*W*		
	8	***F(q-2)***		
	Monday 11: TEST-1			
	13	*W*	Chemical Equilibrium, Equilibrium Constant, Equilibrium calculations, The Response of Equilibria to changes in reaction conditions The Nature of Acids and Bases, pH scale Weak Acids and Bases	5 (G-J) 6 (A-C)
	15	***F(q-3)***		
	18	*M*		
	20	*W*		
	22	***F(q-4)***		
	25	*M*		
	27	*W*		
March	1	*F(q-5)*	Review	
	Monday 4: TEST-2			
	6	*W*	Polyprotic Acids and Bases Mixed Solutions and Buffers Titrations Solubility Equilibria Precipitation	6 (E-J)
	8	***F(q-6)***		
	11	M		
	13	*W*		
	15	***F(q-7)***		
	SPRING BREAK (16-24)			
	25	*M*	Redox Reactions	6 K
	27	***W***		
	Friday 29: TEST-3			
April	1	*M*	Galvanic Cells Standard potential Electrolytic Cells Group 2 and Group 13/III Group 14/IV: The Carbon Family The *d*-Block Elements and their Compounds	6 (L-O) 8 (D-F) 9A
	3	*W*		
	5	***F(q-8)***		
	8	*M*		
	10	*W*		
	12	***F(q-9)***		
	15	*M*		
	17	*W*		
	19	***F(q-10)***		
	Wednesday 24: TEST-4			
	26	*W*	Selected *d*-Block Elements	9B
	29	***F(q-11)***		
May	1	*W*	Coordination Compounds The Electronic Structures of Complexes	9 (C-D)
	3	***F(q-12)***		
	6	*M*		
	8	***W***		

Sapling Instructions for Students:

1. Go to http://saplinglearning.com and click "US Higher Ed" at the top right
2a. If you already have a Sapling Learning account, log in then skip to step 3.
2b. If you have Facebook account, you can use it to quickly create a SaplingLearning account. Click the blue button with the Facebook symbol on it (just to the left of the username field). The form will auto-fill with information from your Facebook account (you may need to log into Facebook in the popup window first). Choose a password and time zone, accept the site policy agreement, and click "Create my new account". You can then skip to step 3.
2c. Otherwise, click "create account". Supply the requested information and click "Create my new account". Check your email (and spam filter) for a message from Sapling Learning and click on the link provided in that email.
3. Find your course (TCHM-131) in the list (you may need to expand the subject and term categories) and click the link.
4. Select a payment option and follow the remaining instructions.

Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up - and throughout the term - if you have any technical problems or grading issues, send an email to support@saplinglearning.com explaining the issue. The Sapling support team is almost always more able (and faster) to resolve issues than your instructor.

Syllabus

ACHM 115 General Chemistry 1 and Lab (4 credits)
M, W, F - 9:30am - 10:25am

INSTRUCTOR: Halimah Sayahi
Email: hsayahi@albany.edu
OFFICE HOURS: By Appointment

GENERAL INFORMATION FOR STUDENTS

Course Description: Atomic theory, quantitative relationships in chemical change, electronic structure of atoms and chemical periodicity, chemical bonding, and states of matter. This is a combined lecture and lab. The lab includes laboratory techniques and experiments demonstrating chemical principles. Experiments including stoichiometry, calibration curves, titrations, empirical formula, solubility and chemical synthesis.

Prerequisites: None
Learning Objectives. Students should acquire general knowledge of the scientific facts and laws which have been developed from chemists' observations of the natural world, and should gain understanding of the theories and models that chemists employ to explain these natural phenomena. Students should gain an appreciation of the quantitative nature of chemistry and should develop the ability to apply principles they have learned to the mathematical solution of chemical problems. Students should also learn how to conduct lab experiments, use scientific equipment, interpret data and generate lab reports. **THIS COURSE yields credit for Nat Sci Gen Ed.**

Meetings. The course consists of 3 lecture periods each week and one lab period each week.

Text. The required text for this course is OpenStax General Chemistry available for free as a pdf on Blackboard. If you desire a paper copy it can be purchased on Amazon.

Lab Requirements. All lab requirements can be purchased at the College of Arts and Sciences (C.A.S.) Laboratory Sciences window (CH-B44):

1) General Chemistry 1 Laboratory Manual: Henck, Huynh, Saxton, Carozza, Muzio. 2016
2) Splash-Resistant Goggles, Lab Coat and Heavy Duty Nitrile Gloves

Attendance and Decorum. Regular class attendance is **expected**, and daily attendance may be taken. **NOTE**: Examinations will emphasize material covered in class. Since some material will not be covered in the same manner or depth as in the textbook, you will find that **daily attendance will be most helpful for successful results**.

Students may get my attention during class at any time to ask questions, but otherwise, talking and other distracting activities will not be tolerated. Cell phone usage is not allowed in class and

laptops must be used to type notes and follow the lecture only. Students who use their cell phones in class will be dismissed from class.

Lab attendance is mandatory. Detailed information about what to do if you missed a lab is available on Blackboard. If you miss a lab, you have options; please see Blackboard as soon as you can.

Homework. Weekly homework sets are available on Blackboard. Homework sets include links to YouTube where you can find video explanations and solution manuals from some problems.

Online homework is due each week . Please complete your online homework on Blackboard.

Quizzes: Each week you will receive a quiz during lab based on the homework for that week. Quizzes will be multiple choice. It is essential to complete the homework before coming to lab. If you miss a quiz, it will be during a lab. If you miss a lab, you have options; please see Blackboard as soon as you can.

Examinations. There will be **four** 55-minute examinations spread throughout the semester. During the finals exams period, there will be a **fifth cumulative final exam** that **every student must take**. This final exam will be scheduled during what is called a Departmental Exam period. The date and time of the final exam will be announced later.

Note: ***Some*** examinations *might* include some extra points.

Exams will be of the multiple-choice variety. Each student must bring a supply of soft lead #2 pencils with good erasers and a calculator for use in all examinations. A scientific calculator having logarithmic and exponential functions will do. PHONE CALCULATORS OR CALCULATORS THAT ARE PART OF OTHER ELECTRONIC DEVICES ARE NOT PERMITTED. Calculators will NOT be provided to you if you forget one or if your batteries run out.
Borrowing calculators from other students at the examination is not allowed. NOTE: Use of calculators with substantial memory or those capable of input of alphabetical characters or formulae is discouraged. They may be used for calculations, but use of the memory to store
information such as mathematical formulae is considered a breach of University policy on academic honesty.

Examinations will emphasize material covered in class or that which you are told in class to read on your own. The examinations may and likely will include some problems that are similar to those of the homework assignments or examples done in class. You can expect that examinations will include both mathematical calculations, as well as questions on theory.

Examination questions and answer sheets will be collected and **not returned**. If you wish to know exactly what went wrong, you may come to see me to go over your examination (most preferably during office hours); this **MUST** be done before the next examination.

Students must attend all examinations. Absence from an examination will result in a grade of zero on that examination. A make-up exam will be given **only** after the student has presented acceptable **WRITTEN** documentation that the absence was caused by **serious** illness or other exceptional circumstance such as a personal emergency, death in the immediate family or a previously scheduled varsity athletic competition. The acceptability of the excuse is at my discretion. Students are advised to notify me in advance of absence from an examination, if possible. The form of the make-up exam may be different from that of the scheduled exam.

If you have special needs for taking examinations, you should clear it through Disability Resource Center as soon as possible. You must then show me written documentation from that office.

IMPORTANT: the date of the final exam EXAM is FIRM--do not plan on leaving campus EARLY--do not buy airplane/bus/train tickets for a date earlier than the date of these exams!!

Course Grade.

Weekly Graded Homework	10%
Weekly Quizzes	15%
Lab	25%
Hour Exams	40%
Cumulative Final Exam	10%

Percent	Letter Grade	Percent	Letter Grade
95-100	A	74-76	C
90-94	A-	70-73	C-
87-89	B+	67-69	D+
84-86	B	64-66	D
80-83	B-	60-63	D-
77-79	C+	0-59	E

A letter grade for the course will be assigned by me at the end of the semester and will be based upon the overall course percentage earned by the student, as calculated below.

Scores of less than 50% on any exam and as an overall average are failing (E).
Please do not ask me about any additional credit beyond this; there is none, per University guidelines, other than potential extra points on some examinations.

Absence due to religious observance: individual students absent because of religious beliefs will be provided with make-up examinations. Students should notify the instructor in a timely manner.

Academic Integrity. The University policy on academic honesty **will** be enforced. "*Every student has the responsibility to become familiar with the standards of academic integrity at the University. Student claims of ignorance, unintentional error, or personal or academic pressures cannot be excuses for violation of academic integrity. Students are responsible for familiarizing themselves with the standards and behaving accordingly. Anything less undermines the worth and value of our intellectual work, and the reputation and credibility of the University at Albany degree." (University's Standards of Academic Integrity Policy, Fall 2013)* For more information see https://www.albany.edu/undergraduate_bulletin/regulations.html If cheating occurs during an examination, a grade of zero will be assigned to the examinations of the students involved, and the incident will be reported to the Dean of Undergraduate Studies who might choose to pursue additional penalties. Other examples of violation of academic integrity include but are not limited to plagiarism, forgery, sabotage, unauthorized collaboration, falsification and bribery. **Cell**

phones, fitness trackers, smart watches, earbuds or headphones are not allowed during examinations.

Again, I adhere to the University's stated policy on incompletes (temporary grade of "I"; see the Undergraduate Bulletin). **An incomplete will not be assigned if you are failing**.

Email. Be sure to identify yourself by your full name and indicate what course and section you are in when you send email messages. Be sure to write professional emails. **I will only respond to messages sent using your university email.**

Letters of Recommendation. Please note that I do not write letters of recommendation for students earning less than a grade of A- in this class, or students who I do not know. The primary way in which I can get to know you is if you attend office hours. If you anticipate that you will need me to write a letter of recommendation on your behalf, you should work to earn good grades **AND** take steps to be sure that I get to know you.

Lecture Topics

Week	Topic
1	Introduction, Measurements
2	Measurements, Atoms and Molecules
3	Atoms and Molecules
4	Chemical Reactions, Reaction Stoichiometry
5	Reactions in Aqueous Solution
6	Reactions in Aqueous Solution
7	Thermochemistry
8	Thermochemistry, Electron Structure of Atoms
9	Periodic Properties of the Elements
10	Chemical Bonding
11	Chemical Bonding, Molecular Bonding and Bonding Theories
12	Molecular Bonding and Bonding Theories
13 & 14	Gases

Week 15 will be review sessions for the final exam.

Lab

Safety. Strict adherence to all safety rules is required including that from the Laboratory Safety Guidelines for the Chemistry Laboratory, safety video, lab manual, MSDS, signage in the lab and TA instruction. It is required that each student is aware of and working in accordance with all safety rules and regulations. If you are unsure or have questions about any safety rule or issue, it is your duty to ask the Lab Coordinator BEFORE performing the experiment. After (re)reading the booklet Laboratory Safety Guidelines for the Chemistry Laboratory, sign a consent form, which is located at the end of the guidelines, and then submit it to your instructor at the beginning of the first lab experiment.

Students must wear personal protective equipment in the lab at all times when an experiment is being performed. Failure to do so may result in dismissal form the lab.

Lab Reports. A detailed pre-lab is required for the course. The lab manual outlines the expected lab report. On the first day of lab, we will also spend time discussing the lab report requirements and you will get a chance to write you first pre-lab.

Lab Grades. Lab reports must be turned in each week before leaving the lab. A-E letter grade range with no plus/minus grades (the only possible grades are listed below). The combination of mistakes and how they incorporated into the final grade is subjective and therefore is at the discretion of the grader. However, some general guidelines are provided below.

- A (50 points) – a couple minor mistakes
- B (40 points) – several minor mistakes or one major mistake and the highest possible grade if the lab is turned in after the official lab end time.
- C (30 points) – a couple major mistakes or excessive minor mistakes
- D (20 points) – several major mistakes
- E (0 points) – did not attend/complete lab

Labs

Week	Topic
1	Course Introduction
2	Introduction to Chemistry
3	Understanding Solutions
4	Density
5	Stoichiometry 1
6	Stoichiometry 2
7	Finding the Empirical Formula
8	Solubility
9	Acid-Base Titrations
10	Polyprotic Acids
11	Lab Practical
12	Lewis Structures

Syllabus

ACHM 116 General Chemistry II and Lab (4 credits)
M, W, F - 1:30pm - 2:25pm

INSTRUCTOR INFO: Halimah Sayahi
Email: hsayahi@albany.edu
Office Hours: By Appointment

GENERAL INFORMATION FOR STUDENTS

Course Description: Elementary principles of chemical equilibrium, thermodynamics, and kinetics; electrochemistry; descriptive chemistry of the elements and their compounds. This is a combined lecture and lab. The lab includes laboratory techniques and experiments demonstrating chemical principles. Experiments including solution properties, kinetics, equilibrium, spectroscopy and a final project.

Prerequisites: ACHM 115 OR ACHM 120 and ACHM 124
Learning Objectives. Students should acquire general knowledge of the scientific facts and laws which have been developed from chemists' observations of the natural world, and should gain understanding of the theories and models that chemists employ to explain these natural phenomena. Students should gain an appreciation of the quantitative nature of chemistry and should develop the ability to apply principles they have learned to the mathematical solution of chemical problems. Students should also learn how to conduct lab experiments, use scientific equipment, interpret data and generate lab reports.

Meetings. The course consists of 3 lecture periods each week and one lab period each week.

Text. The required text for this course is OpenStax General Chemistry available for free as a pdf on Blackboard. If you desire a paper copy it can be purchased on Amazon.

Lab Requirements. All lab requirements can be purchased at the College of Arts and Sciences (C.A.S.) Laboratory Sciences window (CH-B44):

1) General Chemistry II Laboratory Manual: Henck, Huynh, Saxton, Carozza, Muzio. 2016
2) Splash-Resistant Goggles, Lab Coat and Heavy Duty Nitrile Gloves

Attendance and Decorum. Regular class attendance is **expected**, and daily attendance may be taken. **NOTE**: Examinations will emphasize material covered in class. Since some material will not be covered in the same manner or depth as in the textbook, you will find that **daily attendance will be most helpful for successful results**.

Students may get my attention during class at any time to ask questions, but otherwise, talking and other distracting activities will not be tolerated. Cell phone usage is not

allowed in class and laptops must be used to type notes and follow the lecture only. Students who use their cell phones in class will be dismissed from class.

Lab attendance is mandatory. Detailed information about what to do if you missed a lab is available on Blackboard. If you miss a lab, you have options; please see Blackboard as soon as you can.

Homework. Weekly homework sets are available on Blackboard. Homework sets include links to YouTube where you can find video explanations and solution manuals from some problems.

Online homework is due each week . Please complete your online homework on Blackboard.

Quizzes: Each week you will receive a quiz during lab based on the homework for that week. Quizzes will be multiple choice. It is essential to complete the homework before coming to lab. If you miss a quiz, it will be during a lab. If you miss a lab, you have options; please see Blackboard as soon as you can.

Examinations. There will be **four** 55-minute examinations spread throughout the semester. During the finals exams period, there will be a **fifth cumulative final exam** that **every student must take**. This final exam will be scheduled during what is called a Departmental Exam period. The date and time of the final exam will be announced later.

Note: ***Some*** examinations *might* include some extra points.

Exams will be of the multiple-choice variety. Each student must bring a supply of soft lead #2 pencils with good erasers and a calculator for use in all examinations. A scientific calculator having logarithmic and exponential functions will do. PHONE CALCULATORS OR CALCULATORS THAT ARE PART OF OTHER ELECTRONIC DEVICES ARE NOT PERMITTED. Calculators will NOT be provided to you if you forget one or if your batteries run out.
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information such as mathematical formulae is considered a breach of University policy on academic honesty.

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Students must attend all examinations. Absence from an examination will result in a grade of zero on that examination. A make-up exam will be given **only** after the student has presented acceptable **WRITTEN** documentation that the absence was caused by **serious** illness or other exceptional circumstance such as a personal emergency, death in the immediate family or a previously scheduled varsity athletic competition. The acceptability of the excuse is at my discretion. Students are advised to notify me in advance of absence from an examination, if possible. The form of the make-up exam may be different from that of the scheduled exam.

If you have special needs for taking examinations, you should clear it through Disability Resource Center as soon as possible. You must then show me written documentation from that office.
IMPORTANT: the date of the final exam EXAM is FIRM--do not plan on leaving campus EARLY--do not buy airplane/bus/train tickets for a date earlier than the date of these exams!!

Course Grade.

Weekly Graded Homework	10%
Weekly Quizzes	15%
Lab	25%
Hour Exams	40%
Cumulative Final Exam	10%

Percent	Letter Grade	Percent	Letter Grade
95-100	A	74-76	C
90-94	A-	70-73	C-
87-89	B+	67-69	D+
84-86	B	64-66	D
80-83	B-	60-63	D-
77-79	C+	0-59	E

A letter grade for the course will be assigned by me at the end of the semester and will be based upon the overall course percentage earned by the student, as calculated below.

Scores of less than 50% on any exam and as an overall average are failing (E).
Please do not ask me about any additional credit beyond this; there is none, per University guidelines, other than potential extra points on some examinations.

Absence due to religious observance: individual students absent because of religious beliefs will be provided with make-up examinations. Students should notify the instructor in a timely manner.

Academic Integrity. The University policy on academic honesty **will** be enforced. "*Every student has the responsibility to become familiar with the standards of academic integrity at the University. Student claims of ignorance, unintentional error, or personal or academic pressures cannot be excuses for violation of academic integrity. Students are responsible for familiarizing themselves with the standards and behaving accordingly. Anything less undermines the worth and value of our intellectual work, and the reputation and credibility of the University at Albany degree." (University's Standards of Academic Integrity Policy, Fall 2013)* For more information see https://www.albany.edu/undergraduate_bulletin/regulations.html If cheating occurs during an examination, a grade of zero will be assigned to the examinations of the students involved, and the incident will be reported to the Dean of Undergraduate Studies who might choose to pursue additional penalties. Other examples of violation of academic integrity include but are not limited to plagiarism, forgery, sabotage, unauthorized collaboration,

falsification and bribery. **Cell phones, fitness trackers, smart watches, earbuds or headphones are not allowed during examinations**.

Again, I adhere to the University's stated policy on incompletes (temporary grade of "I"; see the Undergraduate Bulletin). **An incomplete will not be assigned if you are failing**.

Email. Be sure to identify yourself by your full name and indicate what course and section you are in when you send email messages. Be sure to write professional emails. **I will only respond to messages sent using your university email.**

Letters of Recommendation. Please note that I do not write letters of recommendation for students earning less than a grade of A- in this class, or students who I do not know. The primary way in which I can get to know you is if you attend office hours. If you anticipate that you will need me to write a letter of recommendation on your behalf, you should work to earn good grades **AND** take steps to be sure that I get to know you.

Lecture Topics

Week	Topic
1	Introduction, Intermolecular Forces
2	Intermolecular Forces
3	Properties of Solutions
4	Chemical Kinetics
5	Chemical Kinetics
6	Chemical Equilibrium
7	Acid-Base Equilibria
8	Acid-Base Equilibria
9	Additional Aspects of Aqueous Equilibria
10	Additional Aspects of Aqueous Equilibria
11	Chemical Thermodynamics
12	Chemical Thermodynamics
13	Electrochemistry
14	Electrochemistry

Week 15 is review sessions for Final Exam.

Lab

Safety. Strict adherence to all safety rules is required including that from the Laboratory Safety Guidelines for the Chemistry Laboratory, safety video, lab manual, MSDS, signage in the lab and TA instruction. It is required that each student is aware of and working in accordance with all safety rules and regulations. If you are unsure or have questions about any safety rule or issue, it is your duty to ask the Lab Coordinator BEFORE performing the experiment. After (re)reading the booklet Laboratory Safety Guidelines for the Chemistry Laboratory, sign a consent form, which is located at the end of the guidelines, and then submit it to your instructor at the beginning of the first lab experiment.

Students must wear personal protective equipment in the lab at all times when an experiment is being performed. Failure to do so may result in dismissal form the lab.

Lab Reports. A detailed pre-lab is required for the course. The lab manual outlines the expected lab report. On the first day of lab, we will also spend time discussing the lab report requirements and you will get a chance to write you first pre-lab.

Lab Grades. Lab reports must be turned in each week before leaving the lab. A-E letter grade range with no plus/minus grades (the only possible grades are listed below). The combination of mistakes and how they incorporated into the final grade is subjective and therefore is at the discretion of the grader. However, some general guidelines are provided below.

- A (50 points) – a couple minor mistakes
- B (40 points) – several minor mistakes or one major mistake and the highest possible grade if the lab is turned in after the official lab end time.
- C (30 points) – a couple major mistakes or excessive minor mistakes
- D (20 points) – several major mistakes
- E (0 points) – did not attend/complete lab

Labs

Experiment
Introduction and Concept Review
Experiment 12: Gas Law
Experiment 13: Thermodynamics and Colligative Properties
Experiment 14: Introduction Spectroscopy
Experiment 15: Chemical Kinetics
Experiment 16: Chemical Equilibrium
Experiment 17: Intro to Organic Chemistry
Experiment 18: Buffer Solutions
Final Project Day 1
Final Project Day 2
Final Project Day 3
Final Project Day 4
Make-up Lab

Chemistry 326: QUANTITATIVE ANALYSIS FOR INDUSTRY

Instructor: Prof. Igor Lednev

Office: LS 1107
Office hours: Thursdays, 9:00-10:00 AM and by appointment
Phone: 591-8863
E-mail: ilednev@albany.edu

Course type: Hybrid, including in-person and online lectures

Prerequisites: A CHM 116, OR (A CHM 121/TCHM 131) and A CHM 125.

Auditorium: SS0256

Class meets: Monday/Wednesday 8:00AM - 9:20 AM

Textbook: Skoog, West, Holler, and Crouch, "Fundamentals of Analytical Chemistry" 9th edition

Learning Objectives and Course Description: Students will learn theory of quantitative analysis based on modern chemical principles. The theory and practical applications of gravimetric, volumetric, potentiometric and colorimetric analysis. The statistical treatment of experimental data is described. This course is mean to be taken with ACHM 327, which features guest chemical industry guest speakers to contextualize how analytical chemistry is used in real-world applications.

Course calendar: The following are important deadlines and events. The dates of the tests are definite. Mark these dates *ASAP* on your calendar to prevent surprises and misunderstandings.

Course calendar **Topics Covered**	
Sep 22	Recitation – Tools of Analytical Chemistry (Ch 1-8), Chemical Equilibrium (Ch 9-11)
Sep 27	*Test 1 on the material discussed in Chapters 1- 12*
Oct 25	Recitation – Classical Methods of Analysis (Ch 13-17)
Oct 27	*Test 2 on the material discussed in Chapters 13-17*
Nov 17	Recitation – Electrochemical Methods (Ch 18,19), Spectroscopic Methods (Ch 24-27)
Nov 22	*Test 3 on the material discussed in Chapters 18,19,24-27*
Dec 6	Final Recitation – Kinetics and Separations (Ch 31-33)
	Additional material for the final comprehensive exam: Chapters 31-33
The final (optional) exam will be online on **Friday, December 10th, 10:30am – 12:30pm**. The final exam is comprehensive and covers all the material presented in the course.	

Grading Policies:

Three mandatory tests	25% each
Homework	25%
Optional final exam	25%

The best two scores from the three tests and the final exam will be used for the final grading, which will be done using an absolute scale. Alternatively, a student who performed well in all three tests can choose not to take the final exam; the final grading will be done based on the three mandatory tests in this case. If a student takes the final exam, it will be always count for the final grading.

The numerical correspondence will probably be: above 90% will most likely receive a final grade in the A group (A and A−); below a 60, will most likely receive an E. In deciding final grades for the whole class, the grading may or may not be curved. Letter grades will be assigned by the instructor based on the class averages for the exams and by the distribution of final grades for the class.

Percent	Letter Grade	Percent	Letter Grade
95-100	A	74-76	C
90-94	A-	70-73	C-
87-89	B+	67-69	D+
84-86	B	64-66	D
80-83	B-	60-63	D-
77-79	C+	0-59	E

Tests and the final exams:

The course is divided into three approximately equal parts. Three 80-min tests will be on the material covered in class up to the time of the test and since the last test.
The final exam is comprehensive and will be made up of all the material covered in class.

All three tests are mandatory for all students. If one of the tests is missed, that test will be dropped from the final grading, but you will need to take the final exam in this case. If two or more tests should be missed for valid and appropriate reasons, a makeup test may be arranged. If you take the final exam, then its score will be included to the final grade together with the two highest scores from the three tests.

Lectures:

By default, all lectures will be in person and given in SS0256. Some lectures will be delivered on Zoom, and you will receive information about it and a zoom link at least two days in advance by an e-mail message from the instructor. These zoom lectures will be live and interactive. You will need a good internet connection. I encourage you to unmute the microphone and use the video camera, so I can see and hear you. Make sure that there is not any background noise. If noise is unavoidable, then mute your microphone. Zoom lectures will be recorded and available for your review.

Laboratory work:

The Instructor for the laboratory part of the course is

Colin Henck
Laboratory Coordinator
Ph: (518) 442-4442
Office: CH-309C
E-mail: chenck@albany.edu

Direct all questions concerning the laboratory work to him.

Office hour:

My office hour will be either **in person** on **Thursdays, 9:00-10:00 AM,** and **by appointment**. You can also contact me in advance (at least 24 hours before the meeting) and **request a zoom meeting.** I encourage you to come to my office hours to ask questions and discuss any problems. I will work diligently helping students be successful in the course.

Homework:

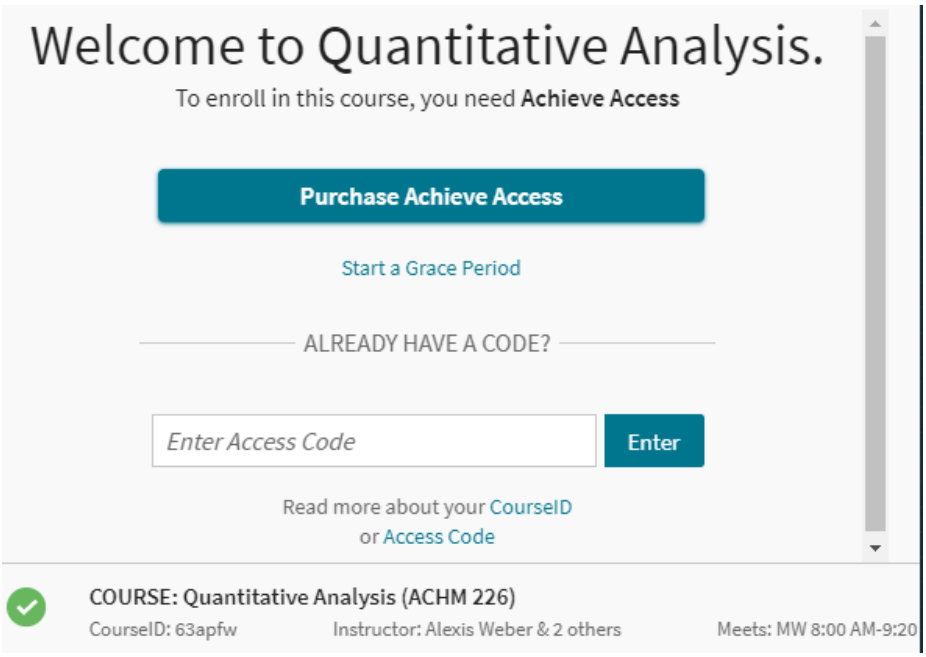
Regular assignments will be provided using Achieve Learning online system. Each HW assignment must be completed by the day and time of the announced deadlines. Any HW received thereafter will be penalized automatically by Achieve Learning system. Please check the course online regularly for HW assignments. HW assignments via Achieve Learning will be graded automatically. Instant feedback will be provided by the online learning system. Achieve Learning HW system will provide you with hints and tutorials.

The Teaching Assistant who can help with the online Achieve Learning system is

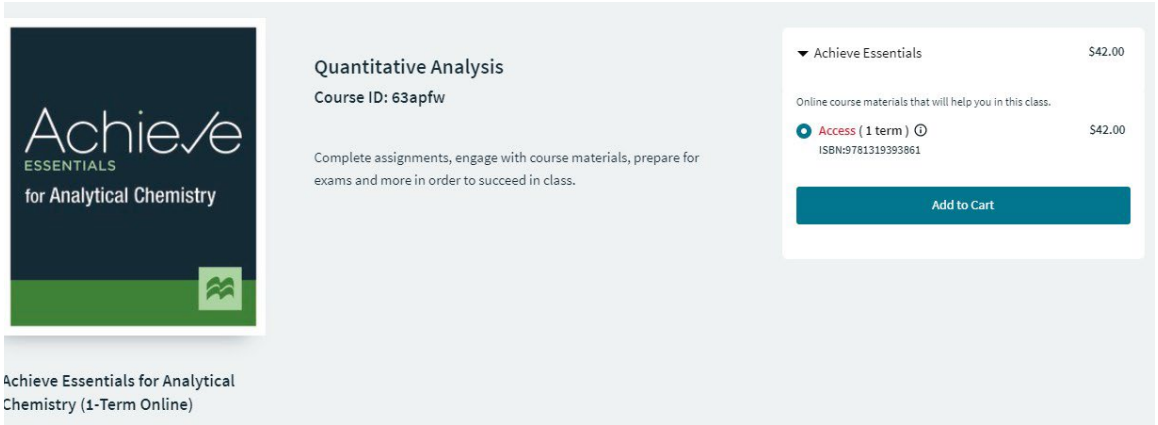
Luis Perez Almodovar
E-mail: lperezalmodovar@albany.edu

Each student must enroll in Achieve Learning using the following registration information:

- Go to https://achieve.macmillanlearning.com/start to log in or **create an account**.
- Create an account.
- Then on the main page, you should see *I Need to Enroll in a Course* at the bottom of the screen. Click to open a screen where to enter the class ID.
    - **Class ID: 63apfw**
- The following information should appear:



- Either click *Purchase Achieve Access* or enter your Access Code
- Purchase access for 1 term (See Below)



The following link includes more detailed instructions on how to register for your course: https://macmillan.force.com/macmillanlearning/s/article/Achieve-Join-a-course.

Need Help? The Macmillan Learning technical support team can be reached by phone, chat, or e-mail via the Student Support Community. To contact support, please open a service request by filling out the web form at: https://macmillan.force.com/macmillanlearning/s/. Make sure to select the product Achieve so that your questions are appropriately directed.

HOW TO DO WELL IN THE COURSE:

- ✓ Attend every class on Zoom; be active, ask questions.
- ✓ After class, review the notes and reread relevant parts of the textbook.
- ✓ Do practice problems and homework on Achieve Learning on time.
- ✓ Attend my office hours if you do not perform to your expectation.

ACHM 327 Quantitative Analysis For Industry Chemistry Laboratory

(2 Credits)

Course Description and Objectives: The goal of this course is to become proficient in laboratory techniques which are used to accurately determine the concentration of various chemical substances (organic and inorganic) in various samples representative of consumer products. Statistical evaluation of data will be used throughout the course to evaluate the accuracy and precision of the data obtained. This course also includes career discovery and professional development activities aimed at chemistry/biochemistry majors intending to join the chemical industry workforce after graduation. Students will learn about cutting-edge careers in forensic, environmental, biotech/biopharmaceutical, materials, cosmetic, and food chemistry from a series of industry guest speakers. Students will form individualized career plans via informational career interviews with alumni, participate in networking events and career fairs, prepare resumes and for internship/job interviews, and may attend an optional field trip to a regional industry job site to observe chemists at work. Students will also learn how to get involved with undergraduate research to increase their competitiveness for jobs and graduate programs. **Prerequisite(s) or corequisite(s): ACHM 326.**

Contact Information

- Instructor: Prof. Igor Lednev E-mail: ilednev@albany.edu
- Office Hours: By appointment
- Office: LS 1107

Course Materials: can be purchased in the *College of Arts and Sciences (C.A.S.) Laboratory Sciences* window (CH-B44)

- The Quantitative Analysis Lab Manual
- Equipment
  - PPE : Splash-Resistant Goggles, Lab Coat and Nitrile Gloves
  - Laboratory Safety Guidelines for the Chemistry Laboratory; University at Albany. Also, available in the lab manual.
- ***A CHEMISTRY LABORATORY SAFETY CONSENT*** form in the back of the safety guidelines document ***must be signed*** and handed in to the TA ***prior to starting the first lab experiment.*** Any student without a signed consent will not be allowed to do experimentation.

Grading:

There are five experimental sections each with a required lab report to be graded out of 100 points. Additionally, an experimental outline will be required each week based on the experiment to be completed that week. There are no quizzes or exams in this course. A grade percentage break down is below:

- Lab reports each worth ~17% of final grade.
- Weekly outlines each worth ~2% of final grade. Combined total to ~15% of final grade.
- Attendance at one 55-minute career development meeting/seminar per week is required

Safety Goggles Policy

Splash-resistant safety goggles must be worn at all times during the experiment. Safety glasses are not permitted in the lab. Although you must be in the lab at the officially scheduled time, the experiment begins after the TA has presented the lab instructions. This means that after the TA is done presenting, safety goggles must be worn at all times.

Failure to wear goggles after the experiment has begun will result in immediate dismissal from the lab. A grade of zero will be given for the lab report and no make ups will be granted. Random spot checks will be done to ensure cooperation with this policy. If anyone is seen without goggles by the TA or the Lab Coordinator, he or she will be asked to leave and receive a zero. There are no acceptable excuses or exceptions to this policy. If you need to take your goggles off for any reason you must first leave the lab.

At the end of the experiment you must wear your safety goggles out your way out of the lab. Please remember to bring your goggles to lab each week.

This policy is the law and is designed for the safety of all students in the lab. If you have any questions or concerns please contact the Lab Coordinator in CH-309C.

Thank you for your cooperation,

Colin Henck

Lab Coordinator

Safety

Strict adherence to all safety rules is required including that from the Laboratory Safety Guidelines *for the Chemistry Laboratory,* safety video, lab manual, MSDS, signage in the lab, and TA instruction. It is required that each student is aware of and working in accordance with all safety rules and regulations. If you are unsure or have questions about any safety rule or issue, it is your duty to ask the Lab Coordinator **BEFORE** performing the experiment. After (re)reading the booklet ***Laboratory Safety Guidelines*** *for the Chemistry Laboratory*, ***sign the consent form***, which is located at the end of the guidelines, and then submit it to your instructor at the beginning of the first lab experiment.

- Failure to wear proper eye protection (goggles) ***whenever inside*** the laboratory after an experiment has started, will result in your both being dismissed from the lab class and given a grade of zero for the lab report.
- **Proper laboratory apparel** must be worn, including a lab coat and gloves. You are required to wear long pants or other article of clothing that COMPLETELY covers the entire length of the legs and feet. Therefore, shorts, capris, skirts, or open-toed shoes, such as sandals or flip-flops are strictly **prohibited**. That is to say; **completely covered** legs and feet are required to perform experiments. In addition, long hair should be tied back. Failure to follow the dress code will result in immediate dismissal from the lab.
- **Contact lenses should not be worn in lab.** Contact lenses may be soluble in some solvents used in the lab. If someone wearing contact lenses gets solvent in their eye, it could permanently harm their vision. There is no way for us to check for contact lenses, so it is the student's responsibility to ensure they are not worn in the chemistry lab.
- **Gloves** are worn in the lab for your safety; they should ***never*** be worn out of the lab and into the hallway, or any other place. Wearing contaminated gloves outside the lab can be a hazard to everyone around by transferring dangerous chemical residues to public areas and surfaces.
- **NO FOOD OR DRINK** allowed in the lab at any time. The lab is not a safe place to eat or drink. Being seen with any food or beverage will result in immediate dismissal from the lab.
- Chemicals should ***never*** be poured into the sink drains; proper waste containers are provided inside the fume hood. Moreover, sinks must be kept free of debris, like paper towels, hoses, clamps, broken glassware, etc.
- **NO UNAUTHORIZED EXPERIMENTATION.** Unauthorized experimentation is a danger to everyone in the lab. The only experimentation permitted is the written procedure of the experiment to be performed. All other experimentation is strictly prohibited.
- The lab may contain chemicals that students in other courses are using. Working with chemicals, no matter their source, other than the chemicals described in the experiment being performed, is strictly prohibited. **READ THE LABELS BEFORE USING ANY AND ALL CHEMICALS**. This includes but is not limited to different concentrations of the same chemical. It is a danger to everyone in the lab..

REQUIREMENTS FOR WRITING AN

ACCEPTABLE LABORATORY REPORT

This is a writing intensive course and you are required to submit a well-written, detailed laboratory report. Well written implies that the report is carefully screened not only for scientific content but also for errors in spelling and grammar. The report must be typed. All laboratory reports are due two weeks following the completion of the final experiment of the section. Due to time constraints, this will not necessarily be the case at the end of the semester, and any changes to this policy will be announced by the TA in advance. There will be no exceptions to this rule. A lab report submitted after the deadline will be considered late and points will be deducted (see below).

Each student must submit his/her own outline prior to the start of each new laboratory experiment. The TA will grade the outlines to be handed back 1 week later. After the conclusion of the final lab within a section, group members will work together with their individually graded outlines to write a combined, cohesive laboratory report for the entire section.

Each student must submit his/her own laboratory report and outline. The reports and outlines will be graded by your TA. While each member of a group shares all experimental results, the text of the report must be individually developed and presented. A good laboratory report is a logical and lucid account of all aspects of the experiment as detailed below. Please do not hand in a hurriedly stapled set of notes or a manuscript with a spacing less than 1.5 between lines, or a hand-written report.

Each lab report must include the following sections:

1. **Title Page**

   This should include the course/number, the title of the section, your name and your lab partner's name, the date(s) the experiment was performed and the name of your TA.

2. **Introduction (points vary by report)**

   Briefly describe all background information as well as the techniques or methods used in the experiment, when it is used and the type(s) of information provided. All reactions and schemes relevant to the experiment should also be included here.

   Describe in detail the experimental system that was studied and what specific question(s) are asked.

3. **Materials and Methods (points vary by report)**

   Include all materials and details necessary for someone to reproduce the experiment. Do not include "common" or "standard" practices.

Remember that a key component of a technical report is that someone else who has not done the experiment before should be able to follow your procedure and repeat the experiment.

4. **Results & Discussion (points vary by report)**

   The Data Analysis section of each experiment is designed to serve as a guide to the presentation of this section.

   Include all of the data that you collected and all measurements that you made. Spectra, graphs, and tables should be properly oriented for ease of viewing and must be clearly and properly labeled. Students are encouraged to download data and images directly using a flash drive, and incorporate them directly into the lab report.

   Discuss each figure systematically and in its entirety.

   Present the results obtained for each experimental section with the appropriate error analysis. Discuss the deviations of your results versus the literature value(s) by analyzing the magnitude of the deviation, the trend and possible cause. Discuss whether the error is random or systematic and suggest how to minimize this error. Clearly state the conclusion of each experimental section, no matter how trivial it may seem.

   Include proper literature citations. The main reference is your text. Additional references include any or all of the following, only if you have actually read the reference: Papers in the literature, other texts or handbooks. While citing on-line only journal articles, the complete journal reference should be included – not just the URL. *Wikipedia* may be a useful learning tool; it is **NOT** a legitimate reference.

5. **Conclusion (points vary by report)**

   Relate the results to the objectives of the laboratory exercise. State your findings and what is expected from the literature, with proper citations.

   Comment on the overall success or failure of the lab. If the experiment did not work as expected, state so and speculate as to why this may have occurred.

6. **Appendix (10 pts).**

   All raw data, your original notes and observations should be included in an Appendix at the end of the lab report.

   Data must be clearly labeled/annotated and properly oriented.

   Include all formulae and calculations not discussed above.

Experimentation Outline

Week of (Monday Date Given)	**Experiment**	**Outline**	**Final Draft**
Section 1: Solutions			
Jan. 27	All Sections: Introduction/Syllabus Review/Safety		
Feb. 3	All Sections: Experiment 1: Introduction to Quantitative Analysis	All Sections: Outline 1	
Feb. 10	All Sections: Experiment 2: Analytical Preparation of Food Dye Solutions	All Sections: Outline 2	
Feb. 17	All Sections: Experiment 3: Analytical Preparation of Buffers	All Sections: Outline 3	
Section 2: Titrations			
Feb. 24	All Sections: Experiment 4: Automated Potentiometric Titration	All Sections: Outline 4	
Mar. 2	All Sections: Experiment 5: Manual Potentiometric Titration	All Sections: Outline 5	All Sections: Final Draft Section 1
Section 3: Spectroscopy			
Mar. 9	All Sections: Experiment 6: Blue dye in Food Products	All Sections: Outline 6	
Mar. 16	All Sections: **NO CLASSES**		
Mar. 23	All Sections: Experiment 7: Spectrophotometric Determination of pKa	All Sections: Outline 7	All Sections: Final Draft Section 2
Section 4: Gravimetric Analysis			
Mar. 30	All Sections: Experiment 8: Analysis of a Solid Mixture	All Sections: Outline 8	

FINAL PROJECT			
Apr. 6	<u>All Sections:</u> Final Project Day 1 (Project Design and Begin Hands on Experimental	<u>All Sections:</u> Final Outline	<u>All Sections:</u> Final Draft Section 3
Apr. 13	<u>All Sections:</u> Final Project Day 2 (Hands-on Experimental)		<u>All Sections:</u> Final Draft Section 4
Apr. 20	*** <u>All Sections:</u> Final Project Day 2 (continue) **AND** Make-up lab (Documentation Required)		
Apr. 27	Final Project Day 3 (Project Oral Presentation)		Final Draft Final Project

******Note: For the week of April 20 students can use this lab period to continue working on their project as needed to get better results or wrap up any last minute data collection. Students should not use this time to start their project work for the first time.***
Also, any student needs to make up a missed lab can also use this period to do their make -up lab. Plan accordingly if you need to do both tasks in this 3 ½ hours.

Blackboard

- <u>How to Log into Blackboard</u>

  The "ACHM327: Quantitative Analysis Laboratory" Course is accessible through the Internet. To access courses for the first time (from home or campus), enter the following URL:

  https://blackboard.albany.edu/

  You will see a dialog box that requests your username and password. Your login credentials are the same as your MyUAlbany username and password. Typically the username is your initials followed by 6 numbers.

  Please contact the ITS helpdesk (LC-27 or 442-4000) if you are having trouble logging in.

Laboratory Policies

The following policies have been established in order to safely operate the laboratory and to give you the greatest amount of time to perform each experiment. These policies should be used in conjunction with the Laboratory Safety Guidelines *for the Chemistry Laboratory*.

Safety must always be the first priority in the *General Chemistry Laboratory*. All safety rules will be strictly enforced. You must wear your safety goggles in the laboratory at **all** times. Failure to wear proper eye protection while in the laboratory will result in your being both dismissed from the lab class and given a grade of zero for the entire experiment. Moreover, proper laboratory apparel must be worn, including a lab coat and gloves. If you observe anything that you deem as unsafe, please report it immediately to your instructor, so that the problem can be remedied. In the event of an accident in the lab, the instructor should be notified immediately.

All glassware will be placed on shelves/drawers in the lab and each student must obtain his or her items at the beginning of lab. **It is your responsibility to check that the glassware is in good condition BEFORE you start working with it. If you find an item is *broken* to begin with, you must alert the Teaching Assistant immediately.** Many of the glassware items are expensive, so use each item with care and be sure to clean all glassware used at the end of each experiment. When you have completed your laboratory work, you are responsible for returning your all your glassware in its original condition to where it came from. Dirty glassware and broken glassware may not be returned. Please inform your TA if something was broken.

Common sense and good safety practice require that side benches, hoods, and the lab equipment be kept clean. Any broken glass or spilled chemicals must be cleaned up immediately. Sinks must be kept free of debris such as paper towels, hoses, clamps, broken glassware, etc. You are responsible for cleaning your lab station by the end of each lab class. If your lab station is left in a mess or spills are not immediately wiped up then your instructor will deduct points from your lab report grade.

Chemicals should **never** be poured into the sink drains unless specifically authorized by the TA. Designated waste containers are provided inside the fume hood.

You are expected both to show courtesy toward fellow classmates and to respect the lab equipment that is provided. Anyone abusing any piece of furnished equipment will be charged for damages.

> "Reasonable accommodations will be provided for students with documented physical, sensory, systemic, cognitive, learning, and psychiatric disabilities. If you believe you have a disability requiring accommodation in this class, please notify the *Director of Disabled Student Services* (Campus Center 137, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations."

Your cooperation will be expected and required, so that the laboratory can operate as safely and efficiently as possible. If you have any problems concerning lab, please do not hesitate to contact the laboratory coordinator or the course instructor.

Academic Honesty

The policies, penalties, procedures and standards outlined in the *Undergraduate Bulletin* and in the *Policy on Community Rights & Responsibilities of University at Albany* will be followed. A failing grade is a possible result of academic dishonesty. Disruptive classroom behavior may result in lowering of a student's grade in accordance with the policies of the Dean of Undergraduate Studies. You are welcome to discuss any course-related problems with the chemistry faculty and staff members of the department.

You are welcome to discuss any course-related problems with the following chemistry staff members:

Lab Instructional Staff

Title	Name	Office	Telephone	E-mail
Lab Coordinator	Colin Henck	CH-309C	(44)2-4442*	chemlab@albany.edu
Assistant Lab Coordinator	Katie Saxton	CH-116(within CH-113)	(44)2-2622*	chemlab@albany.edu
Analytical Lab Associate	Jesse Carozza	CH-108(within CH- 113)	(44)2-4607*	chemlab@albany.edu
Organic Lab Associate	Kelli Allen	CH-108(within CH- 113)	(44)2-4607*	chemlab@albany.edu

Attendance

Laboratory attendance is **mandatory**. The course schedule is available on Blackboard. Always be sure you are prepared to do the lab on the day it is assigned to your section. If a student is absent (or anticipates an absence) from a lab class due to illness, family emergency, religious observance, or official university activity then he or she is urged to **make up** the laboratory experiment at another lab class—if possible. This rescheduling process is facilitated by your TA. An email allowing you to attend another lab class will be issued by your TA; admittance to another lab class will not be allowed without such an email. Make-ups will not be granted by phone or email.

*Note that each laboratory experiment is offered **only** during the days and times indicated on the experiment schedule and **cannot** be made up at any other time. Make-ups are available on a first come first serve basis.*

The last week of the lab is a make-up lab. This experiment must be performed by students who missed an experiment and did not or could not make it up. Even students with proper medical documentation, who were unable to make up a lab the week it was performed, must perform the make-up experiment.

If a student misses multiple experiments and has written documentation, that student must see the lab coordinator at office hours in a timely manner. Excused absences will only be considered in the most extenuating circumstances and with the consent of the lab coordinator ONLY. **Under no circumstances will credit be awarded for the course if you are absent from more than two lab experiments. If a lab is missed but made-up, it will not be considered an absence.** A grade of incomplete will only be considered in the case of unforeseen circumstances and only with proper documentation. Students who are absent for any reason are still responsible for the missed information, which may be subject matter on quizzes. So, you are encouraged to make-up missed experiments the week they are performed.

Lab Preparation

It is in your best interest to prepare for lab by reading all relevant material about the method utilized in the experiment from your lab manual and textbook. You are to work with your partner outside of lab to design your stepwise procedure efficiently and thoroughly before you are coming to lab. The lab manual procedure was not written in a stepwise manner. You must do that on your own so you would be able to divide the tasks between you and your lab partner. Preparation means all relevant information and calculations have to be understood and done before coming to lab. Any required calculations that are used during lab should be written down on the "experimentation note" section in your lab manual. All observations and data must by written in your lab manual in INK, pencil will not be accepted. The purpose of your lab manual/notebook is to act as a permanent, detailed reference for writing your lab report and performing final calculations. Your experimental note is only useful if you record the information neatly and organized. You are to also have pre-lab questions finished before you come to lab. You will **NOT** be allowed to start experiment until your pre-lab is checked.

Experimentation Note

- For each experiment, students must record all preliminary calculations, data, observation, results, and any other analysis in the lab manual experimentation note section and hand it to the TA for an approval signature. All data must be recorded in the note at the time the observation is made. Do not use scrap paper to temporary record data, it is not an effective way of collecting a large number of data, therefore, this habit should be eliminated. If a mistake is made in recording an observation, draw a single line through the incorrect entry and record the correct entry again, enter an explanation of the change. Do not make a big pile of ink all over your note.
- All graphs such as calibration curves must be done in Excel on a computer. Graphs must include a descriptive title, points must be clearly plotted, and axes must be labeled (including units).
- Record the physical appearance of your samples; also take not of any real or suspected error.
- Any inadequate record of any determination may lead to rejection of the results. Make sure your TA look over your data and initial any discussion needed in regards of your data with the TA.

Outlines

An individual (not team) outline is required each week. The outline should demonstrate a firm understanding of the concepts/calculations involved and contain any information you plan on collecting that day. Actual results obtained throughout the experiment will be fully formatted and added to the outline for the next experiment within the section. The outline must be printed and handed into the TA at the beginning of lab. **No late outlines will be accepted**.

As an example, the first outline in section 1 will start off with an introduction overview along with the expected data for experiment 1 and how it will be collected. The outline will be handed in at the beginning of class. Data will then be collected during experiment 1 and will be formally placed into the correct format and added to the outline for lab 2. Thus, lab 2 outline should contain,

experiment 2 introduction and expectations along with experiment 1 results to be handed at the beginning of the second experiment. This process will continue for the entire section of the lab.

Each outline will be graded at 10 points making the total outline score at the end of the semester 90 points (~15% of final grade). A sample outline is provided in the laboratory manual for reference.

Each of the five lab reports will be graded out of 100 points and will be ~17% of your final grade. 25% of your lab report grades will be allocated for the accuracy and precision of the experimental determination and the quality and completeness of the lab report. **Therefore, it's critical that all students work carefully and patiently when comes to carrying out a lab technique, collecting data and minimizing any source of error. DO NOT RUSH THROUGH THE EXPERIMENT. Knowing the expected results before hand is key. So come prepared!!!**

Cleaning Glassware – Very Important!

The quality of your results could be altered by the quality of how prepared you are in every step of the experiment including cleaning glassware. Be courteous to yourself and others sharing the same lab space as well as same equipment. Clean your glassware and equipment before and after each use throughout the semester. Normally, 3 – 4 small rinses with tap water, followed by 3 – 4 small rinses with DI water is sufficient. Residue from tap water contains substances that will interfere with your analyses as you will find out on the very first experiment. Soap is not really necessary in this course. If you need to use soap, you must rinse thoroughly with tap water to remove all traces of detergent when done. Always rinse the glassware over with DI water before you use the glassware or put them away.

Grade	Percent
A	>93
A-	90-02
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
E	<60

Syllabus

Physical Chemistry Lab (ACHM 352Z)

Spring 2022

Instructor:	Dr. Michael T. Yeung
Office:	Chem 121
Office phone:	518-442-4412
E-mail:	mtyeung@albany.edu
Office Hours:	By appointment

Course Description: The experimental understanding of the basic principles of physical chemistry and development of familiarity with instrumentation. Includes experiments on the electrical properties of solutions, chemical kinetics, spectroscopy, microcalorimetry and computer experiments in molecular orbital theory. The course also includes instruction on searching the chemical literature, data processing, and writing laboratory reports.

1. Course Organization

Lectures are Friday from 12:45-1:40 pm in Chemistry B18. Laboratory sessions will be held in Chemistry 230 Monday through Thursday except as noted. Attendance to all components of the course is mandatory. There will be optional 5 quizzes and a written exam at the end of the course. Lab work will follow the Experimental Schedule below. If the lab is cancelled due to health concerns, the course will shift to the on-line Schedule. The lecture and quiz schedule will remain the same.

There are two laboratory sections for this course:

Class number: **7109- M/W 6:00-9:10 PM**

TA: **Matthew Pennachio** mpennachio@albany.edu

Class number: **6688- T/Th 6:00-9:10 PM**

TA: **Audrey Crom** acrom@albany.edu

Prerequisite(s): A CHM 226 and 227; corequisite(s) or prerequisite(s): A CHM 350 or 444.

2. Course Fees

A **$25.00 laboratory fee** is assessed to offset the cost of running this lab and to cover a portion of the expenses for consumables. The lab fee is part of your student account.

The manual designed specifically for this course is available from CAS Store (Chem 044) for **$30**.

3. Laboratory Policies

Carefully review all materials provided in the lab manual for each week's lab activities in advance and raise any questions or concerns you have with the instructor before you begin the experiment. There are no make-up labs.

Before any laboratory work can be performed, students must read the Laboratory Safety Guidelines for the Chemistry Laboratory in the Appendix to the Laboratory Manual and sign and submit the Chemistry Laboratory Safety Consent form at the end of the Manual.

Safety is of primary concern in the laboratory.

Students are required to wear face masks and safety glasses at all times in the lab. Students must wear a mask inside all campus buildings. Students will be asked to leave the lab or building if they are not wearing masks properly. **Students must practice social distancing at all possible times**. **Students should not attend lab if they are sick. Students must wash hands when they enter the lab**

and before they leave. Disinfecting solutions will be provided to disinfect equipment, glassware, and other touch points before they begin work and before they leave the lab. No food or drink is allowed in the laboratory. Do not wear open-toed shoes to lab.

If you have an emergency, notify the instructor and obtain permission to be excused. Otherwise, your grade is zero for that lab. If you miss three labs, the final grade for the course will be zero.

4. Lab Reports & Writing Assignments

This is writing intensive course. A well-written, detailed, comprehensive report is required for each laboratory exercise. Electronic versions of the lab report must be submitted using Microsoft Word. Graphs and Tables should be inserted into the document. Mathematical expressions and calculations may be hand-written photographed and inserted into the document. Excel spreadsheets may be submitted separately as Appendices. A flash-drive is recommended to transfer digital images for the written lab reports. Well written implies that the report is carefully screened not only for scientific content but also for errors in spelling and grammar. Each student must analyze and present data individually and provide your own interpretations and ideas in the report. Refer to Appendices 3 & 4 in the Laboratory Manual for detailed guidelines.

Laboratory reports will be graded by the TA and are due on the date indicated on the syllabus. A lab report is considered late if not handed in to the TA by the due date. The TA will note the date received. Ten points will be deducted for labs submitted late. Keep a copy of the original data and all materials that you submit to the instructor, in case some items get lost or need to be resubmitted.

Several labs are scheduled for two weeks. For these much of the experimental data can be collected in two or three sessions so that a preliminary analysis can be completed before the beginning of the final sessions. This provides an opportunity to identify bad data that may generate faulty results, allowing for new data to be collected during the second week if necessary. Presenting bad data with no attempt to re-collect the data, when possible, will result in a bad grade, no matter how well written the lab report.

There are two **Writing Workshops** separate from and in addition to the regular lab reports dealing with how to write and **Abstract** and an **Introduction**. The details of these assignments are described in the Laboratory Manual.

5. Grading

Writing Workshop Assignments	10%	A-/A	$\geq$90
8 Lab Reports	80%	B-/B/B+	80-89
Written exam:	10%	C-/C/C+	70-79
Quizzes	0-5 pts to average	D-/D/D+	60-69
		E	<60

Five optional quizzes will be administered over the course of the semester at the end of Friday lectures. Quizzes will cover laboratory work performed/completed during the previous week. No electronic devices are allowed during the written exam. There will be no incomplete grade given in this course.

Learning Objective: Students who complete this course will have an understanding of the basic principles of physical chemistry and will have familiarity with instrumentation. They will also be familiar with chemical literature, data processing, and writing laboratory reports.

Experiment Schedule- Spring 2022

	Lecture/Experiment	Due Date
M-Th Jan 24-27 Fri Jan 28	**Writing Workshop** (Chem 215) **Lecture:** Linear Least Squares Analysis	Fri Feb 04
M-Th Jan 31-Feb 03 Fri Feb 04	**Lab 1:** Curve Fitting (Chem 215) **Lecture:** Chemical Kinetics	Fri Feb 11
M-Th Feb 07-10 Fri Feb 11	**Lab 2:** Hydrolysis of Crystal Violet **Lecture:** Absorbance spectra, Q1 Kinetics	Fri Feb 18
M-T Feb 14-17 Fri Feb 18	**Lab 3:** Absorbance spectra of conjugated dyes **Lecture:** Data analysis Lab 4, Q2 Conj Dyes	Fri Feb 25
M-Th Feb 21-24 Fri Feb 25	**Lab 4:** Freezing point depression- I **Lecture:** Colligative properties	
M-Th Feb 28-Mar 03 Fri Mar 04	**Lab 4:** Freezing point depression- II **Lecture:** Bomb calorimetry, Q3 FPD	Fri Mar 11
M-Th Mar 07-10 Fri Mar 11	**Lab 5:** Heats of combustion-I **Lecture:** NMR-I	
M-F Mar 14-18	**No Class**	
M-Th Mar 21-24 Fri Mar 25	**Lab 5:** Heats of combustion-II **Lecture:**, NMR-II; Q4 Calorimetry	Fri Apr 01
M-Th 28-31 Fri Apr 01	**Lab 6:** NMR Spectroscopy **No Lecture**	
M-Th Apr 04-07 Fri Apr 08	**Lab 6:** NMR Spectroscopy **Lecture:** Tautomer Equilibrium; Q5 NMR	Fri Apr 15
M-Th Apr 11-14 Fri Apr 15	**Lab 7:** Tautomer Equilibrium **No Lecture**	
M-Th Apr 18-21 Fri Apr 22	**Lab 7:** Tautomer Equilibrium **Lecture:** Cyclic voltammetry	Fri Apr 29
M-Th Apr 25-28 Fri Apr 29	**Lab 8:** Cyclic voltammetry **L**ab Exam	Fri May 06

Course Syllabus

ACHM 408: Polymer Chemistry (3 credits)
Tuesday/Thursday 1:15-2:35 pm. HU027.

Instructor:
Jeremy I. Feldblyum (pronounced FELD-bloom)
Office phone: (518) 442-4426
jfeldblyum@albany.edu
Office: Chem 029
Office hours: Tuesdays from 11:00 am to 1:00 pm or by appointment
A note about emails: I generally check my email three times a day (morning, early afternoon, early evening). Hence, I won't always reply quickly to your emails. Please keep this in mind especially before tests and assignment due dates!
Prerequisites: ACHM 222/223 and ACHM 226/227

Course Goal:
Polymers represent a large fraction of the materials we interact with on a daily basis. Products as diverse as paints, clothes, soaps and detergents, and contact lenses are all based on polymers. In this course, we will learn what polymers are, how they are made, and how we can study and understand their often complex characteristics. Due to the applied nature of polymers and polymeric materials, the course will draw on concepts from many of your previous courses including organic, inorganic, analytical, and physical chemistry. We will also introduce modern concepts in polymer science including structural control at the nanometer scale and supramolecular polymers.

Textbook:
This course will follow "Principles of Polymerization," by George Odian. The book will cover about 90% of the course material; I will provide the other 10% of necessary literature during lectures. I encourage you to consult alternative, authoritative resources to gain different perspectives on the course material. Assigned problems from the book will be made available through Blackboard.

This textbook is somewhat encyclopedic – it is large for a one-semester course, but you will find it to be a tremendously useful reference text for your future work and studies in chemistry.

Grading
Your final grade (on an A-E scale) will be based on homework assignments (10 points each), three mid-term exams (100 points each), and one final exam (200 points). Please note that THERE IS NO CURVE FOR THIS CLASS. The following grading scale will be used:

	B+: 87-89.99%	C+: 77-79.99%	D+: 67-69.99%	E: <60%
A: 93-100%	B: 83-86.99%	C: 73-76.99%	D: 63-66.99%	
A-: 90-92.99%	B-: 80-82.99%	C-: 70-72.99%	D-: 60-62.99%	

If you are concerned about your grade, please meet with me *as soon as you have concerns*. I am more than willing to discuss course concepts, study habits, and anything else that will help you succeed!

Policy on Cheating

According to university policy: cheating during any exam will result in an automatic E in this course at the end of the semester, and prosecution by the university's judicial system. Please refer to the University's Academic Integrity Policy for more information: http://www.albany.edu/undergraduate_bulletin/regulations.html.

Course Description:

Polymers represent a large fraction of the materials individuals interact with on a daily basis. Products as diverse as paints, clothes, soaps and detergents, and contact lenses are all based on polymers. In this course, students will learn what polymers are, how they are made, and how their often complex characteristics can be studied and understood. Due to the applied nature of polymers and polymeric materials, the course will draw on concepts from many other branches of chemistry including organic, inorganic, analytical, and physical chemistry.

Other Course Policies

• Please silence all electronics (cellphones, tablets, laptops, etc.) during lectures.

• The course will make extensive use of Blackboard, which can be accessed at http://blackboard.albany.edu.

• Exams Missed/with Excused Absences: Only due to serious illness and emergency problems can a make-up hour or final exam be given. Should a student encounter such a problem, the student should notify me as soon as the person's health permits. Otherwise a student must ask my permission for a make-up exam, at the latest, BEFORE the day of a scheduled exam. The acceptability of the excuse is at my discretion. Students should obtain an excused absence letter from the Dean of Undergraduate Affairs (Room LC-30). Also at my discretion are the format, the timing, and the place of a make-up exam. If you miss an exam for a valid reason, then with a written excuse approved through the office of the Dean of Undergraduate Studies, a makeup will be given. Finally, please refer to the University's Medical Excuse Policy: http://www.albany.edu/health_center/medicalexcuse.shtml

• Please note that the last day to drop without a W is Tuesday, February 5.

• For exams, each student should bring a pen and a calculator. The calculator should be non-programmable, should not have internet connectivity, and should not be part of a more versatile electronic device such as a cellphone or tablet.

Course and Schedule

Please note that this schedule represents a rough guide to the topics we will cover, and that additional information will be given in lecture that is not available in the book. As such, please follow the lecture notes carefully in addition to your textbook reading assignments.

Dates	Topic	Pages in Text
2/14/19	2-9, 2-10, 2-11: Branching and cross-linking	101 - 117
2/19/19	2-12: Crosslinking chemistry and step copolymerization	117 – 144
2/21/19	Exam 1 Review	(Not in book)
2/26/19	**First Hour Exam (covering material from 1/24 to 2/19)**	
2/28/19	3-1, 3-2, 3-3: Introduction to chain polymerization, initiation	199 – 236

3/5/19	3-4: Chain polymerization: Initiation (cont'd)	209 – 236
3/7/19	3-5, 3-6: Molecular weight and chain transfer	236 – 254
3/12/19	3-7: Advanced kinetics of chain polymerization	255 – 263
3/14/19	3-9: Thermodynamics of chain polymerization	271 – 282
3/26/19	3-10, 3-11, 3-12, 3-13: Autoacceleration, *Đ*, and reaction conditions	282 – 299
3/28/19	3-14: Chain polymerization in industry, living radical polymerization	300 – 330
4/2/19	Exam 2 Review	(Not in book)
4/4/19	**Second Hour Exam (covering material from 2/28 to 3/21)**	
4/9/19	5-1, 5-2a, b, c: Introduction to ionic polymerization	372 – 387
4/11/19	5-2d, e, f: Kinetics and chemistry of cationic polymerization	388 – 406
4/16/19	5-3: Anionic polymerization	412 – 443
4/18/19	6-1, 6-2, 6-3: Introduction and radical chain copolymerization	465 – 505
4/23/19	6-4, 6-6, 6-7, 6-8: Ionic and other copolymerization and applications	506 – 512, 521 – 532
4/25/19	Exam 3 Review	(Not in book)
4/30/19	**Third Hour Exam (covering material from 4/2 to 4/16)**	
5/2/19	9-1, 9-2: More polymer reactivity and cross-linking techniques	729 – 744
5/7/19	9-9, 9-10: Graft and block copolymers	752 – 760
5/15/19	FINAL EXAM, 1:00 – 3:00 pm	

Computational Chemistry I (ACHM 411)
Spring 2020- 3 credits

Course Objectives: This course will introduce modern computational chemistry methods with a focus on applications of quantum chemistry calculations for chemical research and molecular modelling for drug-design applications. An overview of the different levels of molecular orbital theory will be presented in conjunction with case studies highlighting selected applications to organic, materials, and biophysical chemistry. Students will develop a sense for each technique's strengths and limitations through homework assignments which entail calculations performed on a remote computational server through a web-browser graphical interface (WebMO). For the final module introducing computer-aided drug design will utilize the MOE computational chemistry package. No programming experience is required, however access to a computer with internet connection is required for homework.
Prerequisite(s): A CHM 350 and 351, or A PHYS 440, or permission of instructor.

Instructor: **Professor Alan Chen,** achen6@albany.edu
Office Hours: **LSRB 2033E*, by appointment***
Meeting Time & Locations: **MWF 12:35-1:30 in Chemistry 151**
Textbook: **Essentials of Computational Chemistry**, 2nd ed. by Christopher Cramer ***(required)***
Molecular Orbitals and Organic Chemical Reactions by Ian Fleming ***(optional)***

Computational Chemistry Workshop:
On 3/18/20, there will be a mini-symposium held at UAlbany organized by the instructor featuring a series of invited talks by computational chemistry researchers. Enrolled students are required to attend the symposium; alternatively, students unable to attend may instead provide a written report critically analyzing a topic from computational chemistry literature of the student's choice (requiring instructor approval).

Exams/Computational Project:
Students will be required to complete an individual computational project based on a topic of their choosing, in consultation with the instructor. Developing a proposal for a computational project serves in place of a mid-term exam. This includes both a written report as well as an in-class, 15-minute presentation. The student will then actually carry out this project over the course of the semester, with guidance from the instructor. A formal writeup on the outcome of the individual computational project will replace the final exam. If needed for the project, students can request an account on UAlbany's high-performance computing cluster and will have access to computational chemistry software licenses, including an educational license for the MOE computational chemistry package generously provided by CCG (www.chemcomp.com).

Homework:
For the first half of the semester, weekly homework problems will be solved using WebMO, a graphical, web-based interface for launching calculations performed by Q-Chem, a full-featured professional quantum chemistry software which runs on a remote server maintained by the instructor. For the latter half of the semester, students will work on their individual projects in consultation with the instructor.

Grading:

Weekly homework assignments are cumulatively worth 25% of the final grade. The “mid-term” literature review/project proposal is worth 25%. The final project (including formal writeup and class presentation) is worth 50% of the overall grade.

Outline of Major Topics Covered

1) **Review of postulates of quantum chemistry**
2) **Foundations of Molecular Orbital theory**
3) **Hartree-Fock Theory**
4) **Methods for calculating Electron Correlations**
   a) **Post-HF Methods (MP2/CI/CC)**
   b) **Density Functional (DFT) Methods**
5) **Predicting Reactivity w/ Frontier Molecular Orbital theory**
6) **Reaction Dynamics and Transition State Theory**
7) **Thermochemical Calculations**
8) **Charge distributions and Spectroscopic Properties**
9) **Photophysics/excited state calculations**
10) **Molecular Mechanics and Molecular Dynamics**
11) **Drug docking, virtual screening, computer-aided drug design**

Course Description:

Practical applications of quantum chemical calculations for chemical research. Overview of different levels of molecular orbital theory with case studies highlighting selected applications to organic, inorganic, and biophysical chemistry. Evaluation of each technique's strengths and limitations. Prior programming experience is not required.

Grade	Percent
A	>93
A-	90-02
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
E	<60

Computational Chemistry II: (ACHM 412) Spring 2019 – 3 credits

Course Objectives: This course covers computer simulation methods commonly used in biochemistry/biophysics research. This offering will primarily focus on using molecular modelling and simulations to study structure-function relationships in proteins, nucleic acids, and lipid systems. The underlying "nuts and bolts" of each computational model will be discussed so that students will gain an appreciation for how simulation results can be related to experimental observables. Students will learn in hands-on computational "labs" and homework assignments how to design, run, and analyze molecular simulations in a variety of contexts and applications. Complimentary simulation methods such as hybrid Quantum Mechanical/Molecular Mechanics (QM/MM) used to study enzyme active sites, coarse-grained simulations for studying very large biomolecular systems, and Poisson-Boltzmann calculations for studying reaction-diffusion systems will be also be introduced. Strengths and limitations of different techniques will be explored through hands-on calculations performed on a high-performance Linux computational cluster. Selected applications such as biomolecular folding, computational drug design, and simulation of membrane proteins will be discussed. *NOTE this course can be taken **independently** of Computational Chemistry I (ACHM 411) which focuses on quantum calculations for synthetic chemistry and spectroscopy applications.*

Pre-requisites:

Prerequisite(s): Requires prior knowledge of physical chemistry at the level of ACHM 350&351 OR ACHM 444&445 OR APHYS 460. Familiarity with undergraduate biochemistry is helpful (i.e. ABIO 365 or ACHM 342 or ACHM 442&443). Please seek permission of the instructor if you are unsure about prerequisites. No programming experience is required, as self-contained introductions to Linux/Unix and Matlab will be the first hands-on computational assignments.

Instructor: **Professor Alan Chen,** achen6@albany.edu

Office Hours: **LSRB 2033E*, by appointment***

Meeting Time & Locations: **MWF 12:35-1:30 in Chemistry CH 151;**
Hands-on Labs 12:35-1:30 in AS 13 (Computer lab) during Friday meeting time

Required Textbook:
"Molecular Modeling and Simulation: An Interdisciplinary Guide" by Tamar Schlick, 2nd Ed.

Auxiliary Texts:
"Molecular Driving Forces" by Ken Dill and Sarina Bromberg, 2nd edition

"Understanding Molecular Simulation: From Algorithms to Applications" by Daan Frenkel and Berend Smit, 2nd edition

Exams:

Short-answer quizzes based on the readings will emphasize a qualitative, conceptual understanding of the various methods and their applications to selected classes of biochemical problems. Each of the hands-on labs will be preceded by a pre-lab quiz to ensure students arrived prepared. The mid-term exam will require each student to prepare a literature review on a computational topic of their choosing which will then be presented in-class. For students choosing to complete the computational project (see below), the project write-up and presentation replaces the final exam.

Computational Project:

Students will be required to complete an individual computational project based on a topic of their choosing, in consultation with the instructor. A temporary account on a high-performance computing cluster and access to appropriate software will be provided. An educational license for the MOE computational chemistry package has been generously provided by CCG (www.chemcomp.com). Students will present progress updates on their project at regular intervals in the class in order to spur discussion and solicit feedback. A formal lab-report writeup and a 15-minute in-class presentation will serve as the final exam. Undergraduates can receive extra credit by electing to complete a project but are not required to do so.

Grading:

Pre-lab quizzes are cumulatively worth 25% of the final grade. The "mid-term" literature review/project proposal is worth 25%. The final project (including formal writeup and class presentation) is worth 50% of the overall grade.

GRADING SCALE
A = 100-93 | A- = 92-90 | B+ = 89-87 | B = 86-83 | B- = 82-80 |C+ = 79-77 | C = 76-73 | C- = 72-70 | D = 69-65 | E = Below 65 points

Topics Covered

1. Potential Energy functions and surfaces; properties, conformational analysis, minimization
    a. *Lab: Intro to Linux and basic data analysis with Matlab*
2. Equilibrium Simulations Techniques: Monte-Carlo/Molecular Dynamics
    a. *Lab: Preparing, running, and analyzing all-atom molecular dynamics simulations*
3. Electrostatics and Implicit Solvent Models: electrolyte behavior, Continuum electrostatics models
4. Reaction Kinetics: Transition State Theory, Brownian/Langevin methods, non-equilibrium simulations
    a. *Lab: reaction-diffusion of acetylcholinesterase; simulating AFM pulling experiments*
5. Biomolecular simulation advanced topics
    a. Force-Field Parameterization & Validation Strategies specific for Biomolecular interactions
    b. Enhanced Sampling Methods: Replica exchange, Steered/Targeted MD, Umbrella sampling
    c. Simulating biomolecular folding, membrane proteins/ion channels, ligand binding
6. Computational drug design: structure-based drug design, binding free energy calculations
    a. *Lab: small molecule docking using MOE (for more information see www.chemcomp.com)*
7. Mesoscale & coarse-grained models
    a. *Lab: SBM for simulating folding and binding of large macromolecular complexes*
8. Brief Intro to Quantum Chemistry/Foundations of MO theory: Hartree-Fock, Post HF/DFT methods for electron correlations, QM/MM methods
    a. *Lab: simulating simple organic reactions using Quantum Chemistry (Q-Chem)*

Course Description:

Molecular mechanics as a tool in biochemical and biophysical research. Statistical mechanics of equilibrium systems and enhanced sampling techniques in different thermodynamic ensembles will be reviewed. Strengths and limitations of commonly used methods will be explored. Prior programming experience is not required, but prior exposure to Linux will be helpful. Note that this course may be taken independently of A CHM 411.

ADVANCED SYNTHESIS LABORATORY - ACHM 417
Fall 2022 - 3 Credits
Room CH 236 (labs), CH018 (lectures & quizzes F 1:50 - 2:45 pm)
Prof. Qiang Zhang (CH-120, e-mail: qzhang5@albany.edu)
Office Hours: Friday 12:50pm-1:50pm

Syllabus

Course Objectives

The purpose of this laboratory course is to provide practical experience in modern synthetic techniques for organic and inorganic compounds, including their separation, purification and chemical and spectroscopic analyses.

COVID-19 Related Course Amendments

Per school regulation, the course will be taught in person only. Lectures will be held on every Friday in chemistry build room 018. You are required to attend all lectures unless reasonable excuse was provided prior to the class. The quizzes will be administered via in person only, lab sections are performed in person as well, with society distancing rules strictly observed. Face mask might be optional (align real-time with school requirement) and gloves are expected to be worn at the all-time in the laboratory.

Course Eligibility

ACHM 223 (Organic Chemistry Laboratory II) is a pre-requisite for this course.

Course Materials

- Lab Manual — A Lab Manual should be purchased from the Chemistry Stockroom (CH-B44), a nominal fee will be charged to cover printing costs.
- Equipment — You must purchase and have the following items:
  - Splash-Resistant Goggles
  - Lab Coat
  - Nitrile Gloves
  - A Calculator (cell-phones are not allowed)
- Safety Guide — If you do not already have one, the following safety manual should also be obtained from the *C.A.S. Laboratory Sciences Kit Program* window (CH-B44):
  - *Safety Guide for the Chemistry Laboratory*; Heller, C. H., Ed.; University at Albany, Department of Chemistry: Albany, NY, 1995.

Attendance

Laboratory attendance is **mandatory**; a zero will be assigned for any missed experiment. Each experiment is offered **ONLY** the day scheduled. The options for make-ups are **limited**.

- If a student is absent (or anticipates an absence) from a lab class due to illness, religious observance, or official university activity then he or she is urged to **make up** the laboratory experiment. This rescheduling process is facilitated by **Teaching Assistants only after providing proper documentation to the Dean of Undergraduate Studies and receiving an official confirmation note from the Dean's office.**

- You are required to attend all lectures which are designed to assist you in preparation for the laboratory experiments and quizzes. **You are responsible for all material covered during lectures**

whether or not you are present. If you are absent from class, you should find out what was covered from your classmates, not from the instructor.

- Students who are absent for any reason will still be responsible for the missed material on subsequent quizzes.

Laboratory Policies and Safety

The following policies have been established in order to safely operate the laboratory and to give you the greatest amount of time to perform each experiment:

Safety is the first priority in the *Advanced Synthesis Laboratory*: adherence to all safety rules is required and all safety rules will be strictly enforced.

- You must wear your safety goggles in the laboratory at **all** times. Failure to wear proper eye protection ***whenever inside*** the laboratory will result in your being both dismissed from the lab class and given a grade of zero for the entire experiment.
- Failure to wear proper facial coverings or maintain social distance whenever inside the laboratory at any time will result in your beings dismissed from the lab class and given a grade of zero for the lab report.
- ***Proper laboratory apparel must be worn, including a lab coat and gloves. You may not wear shorts, short skirts, sleeveless shirts, or open-toed shoes, like sandals. Long hair should be tied back. The wearing of contact lenses is permitted only with a physician's note.***
- Chemicals should ***never*** be poured into the sink drains; proper waste containers are provided inside the fume hood. Acetone must be used sparingly and all washings should be discarded into the designated waste container.

You must choose a lab station where you will work during each lab class. During the lab, multiple sets of glasswares are needed to perform the experiments. Much of the glassware is very expensive, so use each item with care. In order to make use of your time in the laboratory most efficiently, you are encouraged to wash dirty glassware items at the end of each experiment, so they will be clean and dry for the next lab class. At the end of the experiment, you must return all of the glassware in its original condition. Replacements for broken or missing items must be purchased at the *C.A.S. Life Sciences Kit Program* window (CH-B44). Breaking glassware might result in a $25 fine in addition to any replacement charges. If you must withdraw from the course at any time during the semester then you must arrange to check out with your TA.

Common sense and good safety practice require that side benches, hoods, and the lab equipment be kept clean. Any broken glass or spilled chemicals must be cleaned up immediately. Sinks must be kept free of debris, like paper towels, hoses, clamps, broken glassware, etc. You are responsible for cleaning your lab station by the end of each lab class. If your lab station is left in a mess or spills are not immediately wiped up then your TA will deduct technique points from your lab report grade.

You are expected to show courtesy toward fellow classmates and to respect the lab equipment that is provided. Anyone misusing balances, heating mantles, melting-point apparatuses, chromatographs, spectrometers, or any other piece of equipment will be charged for damages.

If you observe anything that you deem as unsafe, please report it immediately to your TA, so that the problem can be remedied.

"Reasonable accommodations will be provided for students with documented physical, sensory, systemic, cognitive, learning, and psychiatric disabilities. If you believe you have a disability requiring

accommodation in this class, please notify the *Director of Disabled Student Services* (Campus Center 137, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations."

Your cooperation will be expected and required, so that the laboratory can operate as safely and efficiently as possible. If you have any problems concerning lab, please do not hesitate to contact the laboratory coordinator or the course instructor.

Academic Honesty and Class Behavior

The policies, penalties, procedures and standards outlined in the *Undergraduate Bulletin* and in the *Policy on Community Rights & Responsibilities of University at Albany* will be followed. A failing grade is a possible result of academic dishonesty. Inappropriate behavior of any kind will not be tolerated. Disruptive classroom behavior may result in lowering of a student's grade in accordance with the policies of the Dean of Undergraduate Studies.

Disruptive activities include but are not limited to being late for class, **talking** and/or **making disruptive sounds**, **eating**, **sleeping**, **texting**, etc. **No food is allowed in the class.** Persons engaging in such behavior will be dismissed from the course. Students **who are late for a class will not be allowed to perform experiments**.

Cell phones are prohibited to use while class is in session. If your phone rings during class, you will be asked to leave. **During the quizzes, scientific calculators will be needed, but cell phones, and other devices with memories and web access are not allowed.**

Cheating on quizzes will not be tolerated. Cheating will result in an automatic E in this course at the end of the semester, and prosecution by the University's judicial system. **Using cell-phones during quizzes is considered cheating.**

Grades

Quizzes

There will be two quizzes. They will count as **30%** of the final course grade.

Lab Reports

Lab reports will count as **70%** of the final course grade. Lab reports will be graded according to the guidelines outlined below. The lab write-up and post-lab questions are due at the beginning of lab one weeks from when the experiment is completed.

- Laboratory Write-Up (**50%**) All laboratory reports should be **LEGIBLE** and either printed in ink or typed. No pencil written report can be accepted

  - Pre-Lab (25%)

The pre-lab is to be completed **before** coming to the laboratory and must follow the format of the attached example. It should include the title of the experiment; the purpose of the experiment; a reaction scheme showing the molar masses, the limiting reagent, and the theoretical yield; a step-by-step columnar outline of the procedure that will be used (including **SPECIAL HAZARDS**); and a product separation scheme. The format of the sample pre-lab (page 5) must be followed precisely.

> *The teaching assistant will check and grade pre-lab assignments at the beginning of the lab class. Incomplete pre-labs will receive a grade of zero and the student will not be permitted to work in the laboratory until the pre-lab assignment is complete.*

  - Observations and Results (10%)

Observations and results recorded during the lab class include masses (determined by difference); observations made during the experiment, e.g., color change or formation of a precipitate; product appearance and yield; melting points; calculations; TLC analyses, and annotated spectroscopic data; Remember that your results may not be an unauthorized duplicate of another student's.

It is the student's responsibility to submit the pre-lab and recorded observations to the teaching assistant at the end of the laboratory class.

- Post-Lab (15%)

Assignments will be given for each experiment. Lab write-ups that are not received within two weeks of finishing the experiment will **NOT** be accepted.

- Laboratory Performance (**20%**)
  - Technique (15%)

    The laboratory instructor will evaluate your laboratory techniques: neatness, weighing, crystallization, melting point determination, distillation, extraction, TLC, and correct use of glassware. The product yield and purity are also accounted in this evaluation.
  - Organization (5%)

Arriving prepared for lab class, efficient use of time during the lab experiment, conducting experiments in a safe manner, and clean-up. No organization points will be given to any student who cannot finish experiments on time, or arriving **late for the class**. Any student arriving more than **10** minutes late will not be permitted to do the lab and will receive a 0 grade.

Grading: Scores of less than 50% as an overall average are failing (E). Anyone who has the following overall average is guaranteed at least the grade shown: **> 80 = A-; > 70 = B-**. The policies, penalties, procedures and standards on Academic Integrity outlined in the Undergraduate Bulletin and in the Policy on Community Rights and Responsibilities are followed.

Suggested Reading

Durst, H. D.; Gokel, G. W. *Experimental Organic Chemistry, 2nd ed.*; McGraw-Hill: NY, 1987.

Pavia, D. L.; Lampman, G. M.; Kriz, G. S.; Engel, R. G. *Introduction to Organic Laboratory Techniques: (A) Small-Scale Approach*, 1st ed.; Harcourt (or Saunders): New York, 1998.

Szafran, Z.; Pike, R. M.; Singh, M. M. *Microscale Inorganic Chemistry: A Comprehensive Laboratory Experience*; Wiley: New York, 1991.

Wilcox, C. F., Jr. *Experimental Organic Chemistry: A Small-Scale Approach*; Macmillan: NY, 1988.

Woollins, J. D. *Inorganic Experiments*; Wiley: New York, 1995.

Contact Information

You are welcome to discuss any course-related problems with your Teaching Assistants or with the following chemistry faculty and staff members:

Course Description: Experimental investigation of advanced synthetic methods for the preparation, separation and analysis of inorganic, organometallic and organic compounds with an emphasis on the former two types of materials. The development of skills and understanding for the application of complex procedures and techniques common in current practice, including airless chemistry and catalysis, as well as the exploration and application of modern spectroscopic and diffraction methods, including vibrational, electronic and NMR spectroscopies and powder X-ray diffraction. One lecture and two laboratory periods per week.

ACHM 417 Fall 2022 Calendar

Week	Dates	Monday (Lab) 6:00-9:10 PM CH-236 Tuesday (Lab) 12-3:10 PM CH-236	Wednesday (Lab) 6:00-9:10 PM CH-236 Thursday (Lab) 12-3:10 PM CH-236	Friday (Lecture) 1:50-2:45 PM
1	Aug. 22-26	**No Class**	Lab Syllabus Day	Syllabus Day /Peptide Chemistry
2	Aug. 29-Sept. 2	Peptide Coupling Day 1	Peptide Coupling Day 2	Organic chemistry technique I
3	Sept. 5-9	**No Class – Labor Day**	Methyl Salicylate Day 1	Organic chemistry technique II
4	Sept. 12-16	Methyl Salicylate Day 2	Markovnikov vs. Anti-markovnikov Day 1	Inorganic chemistry technique
5	Sept. 19-23	Markovnikov vs. Anti-markovnikov Day 2	Ferrocene and Acetylferrocene Day 1	NMR basic
6	Sept. 26-30	Ferrocene and Acetylferrocene Day 2	Ferrocene and Acetylferrocene Day 3	NMR examples and Diels-Alder reaction
7	Oct 3-7	Tetraphenylporphyrin and Cu (II) Day 1	Tetraphenylporphyrin and Cu (II) Day 1	Quiz I
8	Oct. 10-14	**No Class – Fall Break**	Geometrical Isomers of $[Mo(CO)_6(L)_2]$ Day 1	Survey of oxidation reactions
9	Oct. 17-21	Geometrical Isomers of $[Mo(CO)_6(L)_2]$ Day 2	Diels-Alder Reaction Day 1	IR and Mass spec.
10	Oct. 24-28	Diels-Alder Reaction Day 2	Regiospecific Oxidation Day 1	Survey of alkylation reactions
11	Oct. 31 – Nov. 4	Regiospecific Oxidation Day 2	Wittig Synthesis Day 1	Literature search method
12	Nov. 7-11	Wittig Synthesis Day 2	Preparation of 3-phenylthioisobenzofuran-1-one	Class review and miscellaneous problems.
13	Nov. 14-18	Preparation of 3-phenylsulfonylisobenzofuran-1-one	Preparation of Benzo[b]naphtha-[2,3-d]pyran-6-one	**No Class**
14	Nov. 21-24	Alkene Isomerization by a Nickle Catalyst	**No Class – Thanksgiving Day**	**No Class**
15	Nov. 28 – Dec. 2	**Make-up Day**	**Make-up Day**	Quiz II

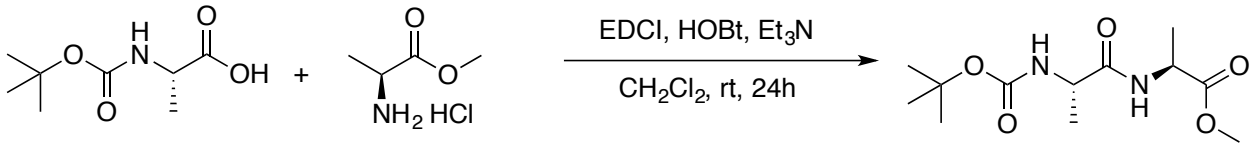
Name	Office	Telephone	E-mail	Office Hour
Prof. Qiang Zhang	CH-121	442-4405	Qzhang5@albany.edu	Fri 1:30–2:30 pm
Colin Henck	CH-309C	442-4442	chenck@albany.edu	—

Sample Pre-Lab

The following sample pre-lab is to be used as experiment II.

Title: Synthesis of peptide from L-amino acids

Purpose: To prepare Boc-Ala-Ala-OMe (dipeptide) with efficient coupling reagents.



L-Boc-Alanine

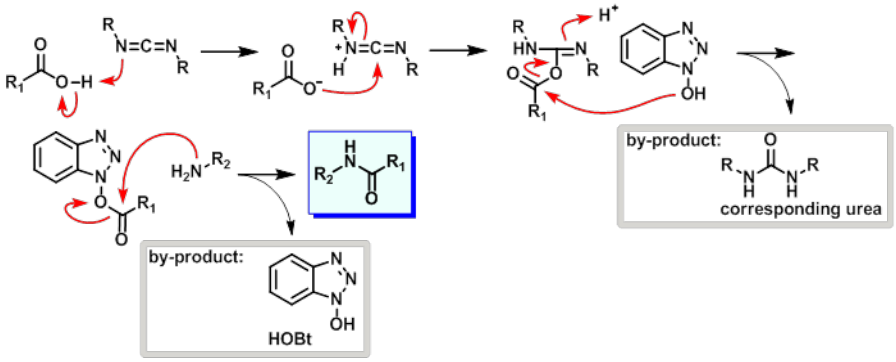
L-Alanine methylester hydrochloride salt

Boc-Ala-Ala-OMe

Reagent	Amount	M.W	Equivalent	Density	M.P.
Boc-Ala-OH	190 mg	189 g/mol	1		79-83°C
H-Ala-OMe	140 mg	139.04 g/mol	1		78-80 °C
EDCI	222 mg	191.7 g/mol	1.15		110-115 °C
HOBt	154 mg	153.1g/mol	1.0		156-159 °C
Et_3N	0.35 mL	101.2 g/mol	2.5	0.73 g/mL	
CH_2Cl_2	10 mL				

Limiting reagent: Boc-Ala-OH or H-Ala-OMe **Theoretical Yield:** 274mg

Reaction mechanism:



Procedure	Observations
Preparation of Boc-Ala-Ala-OMe: • In a 25mL round bottom flask, a solution of L-alanine methyl ester hydrochloride salt (140 mg, 1.0 mmol) and Boc-L-Ala-OH (190 mg, 1.0 mmol) in anhydrous dichloromethane (10 mL) was treated with EDCI (222 mg, 1.1 mmol), HOBt (154 mg, 1.1 mmol), and Et_3N (352 uL, 2.5 mmol) at 0 °C under nitrogen. • After stirring at 0 °C for 1 h, the mixture was allowed to warm to room temperature and stirred for 24 h. • Check reaction TLC with Hexane/EtOAc 2:1 to monitor the disappearance of starting materials. • This solution was treated with saturated aqueous Ammonium Chloride (10 mL) and extracted with dichloromethane (3x10 mL). • The combined organic fractions were washed with saturated aqueous NaHCO3 (10 mL), water (10 mL), and brine (10 mL), dried over anhydrous Na_2SO_4, and concentrated in vacuo. • Transfer residue to a pre-weighed round bottom flask (rbf). • Weigh the crude product and calculate the CRUDE percentage yield. Vacuum Filtration: • The residue was purified by vacuum Hirsch funnel over silica gel (**CAUTION!**) (Hexane/ethyl acetate= 2:1) to yield the desired product. Use the TLC to monitor the completion of purification. • All the eluents were evaporated on rotavapor to generate a white solid. • Weigh the product and calculate the percentage yield.	Mass of Boc-Ala-OH: Paper + Boc-Ala-OH 500 mg – Paper 312 mg Boc-Ala-OH 188 mg (Repeat above for ALL other reagents) 0.35 mL of triethyl amine used. 10 mL of dichloromethane was added. —All of the starting material dissolved immediately. Reaction mixture was pale yellow. —At room temperature, the reaction was let go for overnight. —Reaction color changed to dark brown. TLC was checked, no starting material was found, reaction quenched by NH_4Cl. (draw TLC plate profile here) —Extracted with about 10 mL of dichloromethane, repeat twice. —Combine all the organic layers and wash with NaHCO3 (10 mL), water (10 mL), and brine (10 mL). —Organic layer was dried over anhydrous Na_2SO_4 erlenmeyer flask. Decant supernatant to a large rbf (200mL) and place the rbf on rotavapor. —Yellow residue was formed when all the solvents being removed. Transfer residue to a pre-weighed rbf. Mass of crude product: rbf + crude product 48.88 g – rbf 48.58 g crude product 300 mg crude yield: 109% —Prepare Hirsch funnel load with silica gel(~1 inch high), wash silica gel with 2:1 hexane/ ethyl acetate ~ 20 mL

Procedure	Observations
Characterization: • Dissolve a small portion of final product in a test tube with ethyl acetate, co-spot with the authentic sample provided by TA to determine the purity of your sample.	—Dissolve crude product with 2:1 hexane/ ethyl acetate 1 mL. Load solution onto the funnel. Run additional 100mL of 2:1 hexane/ ethyl acetate until no product being eluted. TCL monitor the whole process —All the eluent was evaporated by rotavapor and transfer the sample to a pre-weighed small rbf. Mass of purified product: rbf + purified product 48.821 g – rbf 48.580 g purified product 270 mg yield: 87.9%

Post Lab:

1. **Please identify the roles of each reagent that were used in the peptide coupling reaction. (Reactant, Activator, Base, Solvent)**

2. **When free alanine and valine were subjected to the peptide coupling conditions that we used today, how many dipeptides do you expect to be generated from the reaction? Please draw the structure of products (free alanine and valine means the no protecting group used on the amino acid; use Google to check the structure of valine)**

3. **Young researchers often found their reaction yields are greater than 100% theoretical yield, what are the most common reasons causing the inaccurate yield? Name at least three reasons.**

ACHM 426: Undergraduate Research in Chemistry
3 Credits – Fall 2020

Professor: Paul Toscano
Email: ptoscano@albany.edu

Course Description/Learning Objectives Student will gain hands-on chemical research experience supervised by a faculty member. A printed or typewritten final report is required. May be repeated for credit but not more than 3 credits of A CHM 425 and/or 426 may be applied toward the advanced course requirement of the chemistry major. Laboratory and conference hours to be arranged.

Prerequisite(s): junior or senior standing and permission of instructor. **Prerequisite(s) or corequisite(s):** A CHM 424. *Note: you cannot directly enroll in this course,* you must first arrange for a specific faculty member to be your research advisor and obtain a permission code to enroll in the course section specific to your professor.

Assignments: An independent research project under faculty supervision, with emphasis on the principles of experimental design, data collection, evaluation of findings, and reporting of results. Students should discuss with their professor an agreed upon schedule that they can be expected to be available to participate in research. All work will culminate in a formal paper submitted prior to the end of the semester. Students are also strongly encouraged to present a poster describing their research at the annual Chemistry Undergraduate Research Symposium.

Office Hours: By appointment. Students should arrange regular meetings with your research advisor to discuss your progress.

GRADING: *S/U* graded. A "satisfactory" grade requires a consistent effort and participation in research on an agreed-upon schedule developed in consultation with your research advisor, which may include attending lab meetings and research update meetings in addition to time spent in lab. A formal paper should be submitted to your professor by the date specified by the professor, which will be at end of the semester, summarizing your research progress.

Course Resources: Appropriate research resources will be made available by the research advisor, which will differ depending on each student's project focus.

ACHM 428: Forensic Chemistry Research
3 Credits – Fall 2020

Professor: Igor Lednev
Email: ilednev@albany.edu

Course Description/Learning Objectives: Student will gain hands-on experience applying chemical methods to research problems in forensic chemistry, supervised by a faculty member. A printed or typewritten final report is required. May be repeated for credit but not more than 6 credits total may be applied toward the advanced elective course requirement of the comprehensive forensics chemistry or honors forensics chemistry emphases. Laboratory and conference hours to be arranged.

Prerequisite(s): junior or senior standing and permission of instructor. *Note: you cannot directly enroll in this course,* you must first arrange for a specific faculty member to be your research advisor and obtain a permission code to enroll in the course section specific to your professor.

Assignments: An independent research project under faculty supervision, with emphasis on the principles of experimental design, data collection, evaluation of findings, and reporting of results. Students should discuss with their professor an agreed upon schedule that they can be expected to be available to participate in research. All work will culminate in a formal paper submitted prior to the end of the semester. Students are also strongly encouraged to present a poster describing their research at the annual Chemistry Undergraduate Research Symposium.

Office Hours: By appointment. Students should arrange regular meetings with your research professor to discuss your progress.

GRADING: *S/U* graded. A "satisfactory" grade requires a consistent effort and participation in research on an agreed-upon schedule developed in consultation with your research professor, which may include attending lab meetings and research update meetings in addition to time spent in lab. A formal paper should be submitted to your professor by end of the semester summarizing your research progress.

Course Resources: Appropriate research resources will be made available by the research advisor, which will differ depending on each student's project focus.

ACHM 429 – Instrumental Analysis (3 credits)
Tuesdays and Thursdays, 10:15 - 11:35 AM in CH-018 (lectures)

Instructor: Professor Igor Lednev
Office: LS 1107 Telephone Number: 591-8863
Email address: ilednev@albany.edu
Office Hours: By Appointment
Prerequisites: ACHM 226 and 227; **Pre/Co-requisites:** ACHM 351 or 445 or permission of instructor

TEXT BOOK:
Skoog, Holler and Nieman, "Principles of Instrumental Analysis", 6th edition

Learning Objectives: Students will learn theoretical principles and chemical applications of selected methods of instrumental analysis. Main emphasis is on modern analytical methods including polarography, conductance, potentiometry, and coulometric methods, gas chromatography, mass spectrometry, atomic absorption as well as absorbance and fluorescence spectroscopy. Statistical analysis of data will be discussed.

Lectures: Students are expected to attend all lectures. Lectures will provide students information on the most important topics and introduce the student to the experimental concepts. Students are strongly encouraged to review the assigned chapters and/or handouts prior to class and come prepared with questions.

Assessment Exams: Students should complete readings before the lectures a in which they will be discussed. There are three exams through the semester and a cumulative final exam.

Exams and Grading: Examinations may include questions related to anything presented during lectures, textbooks, or handouts. The format of examinations will vary. You should be prepared for calculations, multiple choice, fill in the blank, short answer, and comparison questions. Some exams may consist of only one of these types, while others may be a combination. For all examinations you are expected to have full comprehension of the material. You may also need a calculator in order to take the exams.

Your grade will solely (i.e. 100%) be based on your exam scores. No extra-credit outside of possible bonus questions on the exams will be given. Of the four exams (3 regular and 1 final), the lowest grade will be dropped. However, it is in your best interest to take all exams in order to achieve the highest possible grade for the course.

Students must attend all examinations. **No make-up exams** will be given without acceptable **WRITTEN** documentation from the Office of Academic Affairs that the absence was caused by **serious** illness or other exceptional circumstance such as a personal emergency, or death in the immediate family. Students are advised to notify the Instructor of Record in advance in the event of an absence, if possible.

Course Description: Theoretical principles and chemical applications of selected methods of instrumental analysis. Main emphasis is on modern analytical methods including polarography, conductance, potentiometry, and coulometric methods, gas chromatography, mass spectrometry, atomic absorption as well as absorbance and fluorescence spectroscopy. Statistical analysis of data will be discussed.

The schedule of lectures is **tentative**, although every effort will be made to stay on schedule. Each test will cover the material presented in lectures up to the date of the test.

Course Outline

Month	Dates	Chapter	Topic
January	26, 31	1, 5 and Appendix 1	Introduction, Statistics, and Signals And Noise
February	2	6	Introduction to Spectrometric Methods
February	7	7, 8	Introduction to Optical Atomic Spectrometry, Components of Optical Instruments
February	9, 12	9, 10	Atomic Absorption, Fluorescence Spectrometry, and Atomic Emission Spectrometry
February	14		Review
February	16		**TEST 1**
February	21	11, 20	Atomic and Molecular Mass Spectrometry
February	23	13, 14	UV/Vis Molecular Absorption Spectrometry
February	28	15	Molecular Luminescence Spectrometry
March	2	16, 17, 18	Infrared Spectrometry Raman Spectroscopy
March	7		Review
March	9		**TEST 2**
March	14	NO CLASS – SPRING BREAK	
March	16	NO CLASS – SPRING BREAK	

March	21, 23	22, 23	Electroanalytical Chemistry Potentiometry
March	28	24	Electroanalytical Chemistry Coulometry
March, April	30, 4	25	Electroanalytical Chemistry Voltammetry
April	6	19	NMR
April	11	NO CLASS – PASSOVER	
April	13, 18	26	Introduction to Chromatography
April	20, 25	27	Gas Chromatography
April	27	28	Liquid Chromatography
May	2		Review
May	4		**TEST 3**
May	9		Final Review / Q&A
May	11	NO CLASS – READING DAY	
Wednesday May 17th 10:30am – 12:30pm			**FINAL**

Grade	**Percent**
A	>93
A-	90-02
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
E	<60

ACHM 431 Instrumental Analysis Lab (1 credit hour)

Course Objectives: The goal of this course is to become proficient in instrumentation laboratory techniques which are used to accurately determine the concentration of various chemical substances (organic or inorganic) in various samples representative of real life collected samples. Students are expected to independently learn about the instrument related to each experiment without any detail instructions given in the lab manual **Prerequisite or corequisite:** ACHM 429 Instrumental Analysis Lecture

Contact Information

Professor: Igor Lednev
Email: ilendnev@albany.edu
Office Hours: by appointment

Teaching Assistant:

- TBA
- TBA

- Office Hours: To be announced by TA, by appointment as necessary
- Office: Chemistry Learning Center CH-242

Course Materials: can be purchased in the *College of Arts and Sciences (C.A.S.) Laboratory Sciences* window (CH-B44)

- The Instrumental Chemistry Lab Manual
- Equipment
  - PPE : Splash-Resistant Goggles, Lab Coat and Nitrile Gloves
  - Laboratory Safety Guidelines for the Chemistry Laboratory; University at Albany. Also, available in the lab manual.
    - ***A CHEMISTRY LABORATORY SAFETY CONSENT*** form in the back of the safety guidelines document ***must be signed*** and handed in to the TA ***prior to starting the first lab experiment.*** Any student without a signed consent will not be allowed to do experimentation.

Lab Report Submission: Lab reports must be typed and turned in on or before the due date through Blackboard. You will turn an electronic copy to Blackboard so it can be evaluated by the program SafeAssign for originality. SafeAssign accepts a variety of popular file formats including .docx and .pdf. The program allows instructors to evaluate written assignments for originality against Internet sources, other student submissions, academic databases, etc. While each member of a group shares all experimental results, the text of the report must be individually developed and presented. You will be able to see the SafeAssign report when you submit your paper. Please check the report and, if necessary, resubmit an edited version of your paper to avoid plagiarism. More details about lab report requirements are provided in the sections below.

Grading:

There are five rotations experiments graded out of 100 points each. Your grade in the course is based on the final average of all lab reports, each lab report is worth 20% of your grade. There are no quizzes or exams in this course. **If a lab report is plagiarized as determined by a SafeAssign report: First offense**

– lose 10 points and resubmission of a corrected report is required for a grade to be assigned. Subsequent offenses – lab report not accepted.

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
100-94	93-89	88-85	84-82	81-79	78-76	75-73	72-70	69-67	66-63	63-60	60-0

Course Description: *Applications of the principles and methods discussed in A CHM 429. Experiments chosen for this course aid students in developing a more detailed understanding of analytical methods. Specifically, students will perform analytical experiments in absorbance, fluorescence and Raman spectroscopy, atomic absorption and gas chromatography using modern instrumentation. Statistical analysis of data will be performed.*

Safety Goggles Policy

Splash-resistant safety goggles must be worn at all times during the experiment. Safety glasses are not permitted in the lab. Although you must be in the lab at the officially scheduled time, the experiment begins after the TA has presented the lab instructions. This means that after the TA is done presenting, safety goggles must be worn at all times.

Failure to wear goggles after the experiment has begun will result in immediate dismissal from the lab. A grade of zero will be given for the lab report and no make ups will be granted. Random spot checks will be done to ensure cooperation with this policy. If anyone is seen without goggles by the TA or the Lab Coordinator, he or she will be asked to leave and receive a zero. There are no acceptable excuses or exceptions to this policy. If you need to take your goggles off for any reason you must first leave the lab.

At the end of the experiment you must wear your safety goggles out your way out of the lab. Please remember to bring your goggles to lab each week.

This policy is the law and is designed for the safety of all students in the lab. If you have any questions or concerns please contact the Lab Coordinator in CH-309C.

Thank you for your cooperation,

Colin Henck

Lab Coordinator

Safety

Strict adherence to all safety rules is required including that from the Laboratory Safety Guidelines *for the Chemistry Laboratory,* safety video, lab manual, MSDS, signage in the lab and TA instruction. It is required that each student is aware of and working in accordance with all safety rules and regulations. If you are unsure or have questions about any safety rule or issue, it is your duty to ask the Lab Coordinator **BEFORE** performing the experiment. After (re)reading the booklet ***Laboratory Safety Guidelines*** *for the Chemistry Laboratory*, ***sign a consent form***, which is located at the end of the guidelines, and then submit it to your instructor at the beginning of the first lab experiment.

- Failure to wear proper eye protection (goggles) ***whenever inside*** the laboratory after an experiment has started, will result in your both being dismissed from the lab class and given a grade of zero for the lab report.
- **Proper laboratory apparel** must be worn, including a lab coat and gloves. You are required to wear long pants or other article of clothing that COMPLETELY covers the entire length of the legs and feet. Therefore, shorts, capris, skirts, or open-toed shoes, such as sandals or flip-flops are strictly prohibited. That is to say; completely covered legs and feet are required to perform experiments. In addition, long hair should be tied back. The wearing of contact lenses is permitted only with a physician's note. Failure to follow the dress code will result in immediate dismissal from the lab.
- **Gloves** are worn in the lab for your safety; they should ***never*** be worn out of the lab and into the hallway, or any other place. Wearing contaminated gloves outside the lab can be a hazard to everyone around by transferring dangerous chemical residues to public areas and surfaces.
- **NO FOOD OR DRINK** allowed in the lab at any time. The lab is not a safe place to eat or drink. Being seen with any food or beverage will result in immediate dismissal from the lab.
- Chemicals should ***never*** be poured into the sink drains; proper waste containers are provided inside the fume hood. Moreover, sinks must be kept free of debris, like paper towels, hoses, clamps, broken glassware, etc.
- **NO UNAUTHORIZED EXPERIMENTATION.** Unauthorized experimentation is a danger to everyone in the lab. The only experimentation permitted is the written procedure of the experiment to be performed. All other experimentation is strictly prohibited.
- The lab may contain chemicals that students in other courses are using. Working with chemicals, no matter their source, other than the chemicals described in the experiment being performed, is strictly prohibited. **READ THE LABELS BEFORE USING ANY AND ALL CHEMICALS**. This includes but is not limited to different concentrations of the same chemical. It is a danger to everyone in the lab.

REQUIREMENTS FOR WRITING AN ACCEPTABLE LABORATORY REPORT

This is a writing intensive course and you are required to submit a well-written, detailed laboratory report. Well written implies that the report is carefully screened not only for scientific content but also for errors in spelling and grammar. The report must be typed. All laboratory reports are due one week following the completion of the experiment. Due to time constraints, this will not necessarily be the case at the end of the semester, and any changes to this policy will be announced by the TA in advance. There will be no exceptions to this rule. A lab report submitted after the deadline will be considered late and points will be deducted.

Each student must submit his/her own laboratory report. The reports will be graded by your TA. While each member of a group shares all experimental results, the text of the report must be individually developed and presented. A good laboratory report is a logical and lucid account of all aspects of the experiment as detailed below. Please do not hand in a hurriedly stapled set of notes or a manuscript with a spacing less than 1.5 between lines, or a hand-written report.

Each lab report must include some combination of the following sections, as specified for each experiment:

1. **Title Page**

   This should include the course/number, the title of the section, your name and your lab partner's name, the date(s) the experiment was performed and the name of your TA.

2. **Abstract (10 points)**

   A brief summary of the entire experiment including your results and conclusions.

3. **Introduction (20 points)**

   Briefly describe all background information as well as the techniques or methods used in the experiment, when it is used and the type(s) of information provided. All reactions and schemes relevant to the experiment should also be included here.

   Describe in detail the experimental system that was studied and what specific question(s) are asked.

4. **Materials and Methods (5 points)**

   Include all materials and details necessary for someone to reproduce the experiment. Do not include "common" or "standard" practices.

   Remember that a key component of a technical report is that someone else who has not done the experiment before should be able to follow your procedure and repeat the experiment.

5. **Results (15 points)**

The Data Analysis section of each experiment is designed to serve as a guide to the presentation of this section.

Include all of the data that you collected and all measurements that you made. Spectra, graphs, and tables should be properly oriented for ease of viewing and must be clearly and properly labeled. Students are encouraged to download data and images directly using a flash drive, and incorporate them directly into the lab report.

Present the results obtained for each experimental section with the appropriate error analysis.

6. **Discussion & Conclusion (25 Points)**

Discuss each figure systematically and in its entirety.

Discuss the deviations of your results versus the literature value(s) by analyzing the magnitude of the deviation, the trend and possible cause. Discuss whether the error is random or systematic and suggest how to minimize this error. Clearly state the conclusion of each experimental section, no matter how trivial it may seem.

Relate the results to the objectives of the laboratory exercise. State your findings and what is expected from the literature, with proper citations.

Comment on the overall success or failure of the lab. If the experiment did not work as expected, state so and speculate as to why this may have occurred.

Include proper literature citations. The main reference is your text. Additional references include any or all of the following, only if you have actually read the reference: Papers in the literature, other texts or handbooks. While citing on-line only journal articles, the complete journal reference should be included – not just the URL. *Wikipedia* may be a useful learning tool; it is **NOT** a legitimate reference.

7. **Appendix (10 points)**

All raw data, your original notes and observations should be included in an Appendix at the end of the lab report.

Data must be clearly labeled/annotated and properly oriented.

Include all formulae and calculations not discussed above.

8. **Pre Lab Questions (15 points)**

Must be completed before you begin an experiment.

ACHM 431 Laboratory Schedule Spring

Dates	Experiment	Lab Report Due Dates
Jan 22-24	**No Class**	
Jan 29-31	Syllabus Review	
Feb. 5-7	Rotation 1 Week 1	
Feb. 12-14	Rotation 1 Week 2	
Feb. 19-21	Rotation 2 Week 1	**Rotation 1**
Feb. 26-28	Rotation 2 Week 2	
March 4-6	Rotation 3 Week 1	**Rotation 2**
March 11-13	Rotation 3 Week 2	
March 18-20	**NO CLASS**	
March 25-27	Rotation 4 Week 1	**Rotation 3**
April 1-3	Rotation 4 Week 2	
April 8-10	Rotation 5 Week 1	**Rotation 4**
April 15-17	Rotation 5 Week 2	
April 22-24	**MAKEUP LAB 1**	**Rotation 5**
April 29-May 1	**MAKEUP LAB 2**	**(all makeup lab reports are due before 5PM May 5th. No late lab reports will be accepted.)**

Rotation Experiment List: Gas Chromatography Mass Spectrometry, Fluorescence Spectrometry, UV Spectrometry, Visible Spectrometry, Potentiometric Titration

Blackboard

- How to Log into Blackboard

  The "ACHM 430: Instrumental Chemistry Laboratory" Course is accessible through the Internet. To access courses for the first time (from home or campus), enter the following URL:

  https://blackboard.albany.edu/

  You will see a dialog box that requests your username and password. Your login credentials are the same as your MyUAlbany username and password. Typically the username is your initials followed by 6 numbers.

  Please contact the ITS helpdesk (LC-27 or 442-4000) if you are having trouble logging in.

Laboratory Policies

The following policies have been established in order to safely operate the laboratory and to give you the greatest amount of time to perform each experiment. These policies should be used in conjunction with the Laboratory Safety Guidelines *for the Chemistry Laboratory*.

Safety must always be the first priority in the *General Chemistry Laboratory*. All safety rules will be strictly enforced. You must wear your safety goggles in the laboratory at **all** times. Failure to wear proper eye protection while in the laboratory will result in your being both dismissed from the lab class and given a grade of zero for the entire experiment. Moreover, proper laboratory apparel must be worn, including a lab coat and gloves. If you observe anything that you deem as unsafe, please report it immediately to your instructor, so that the problem can be remedied. In the event of an accident in the lab, the instructor should be notified immediately.

All glassware will be placed on shelves/drawers in the lab and each student must obtain his or her items at the beginning of lab. **It is your responsibility to check that the glassware is in good condition BEFORE you start working with it. If you find an item is *broken* to begin with, you must alert the Teaching Assistant immediately.** Many of the glassware items are expensive, so use each item with care and be sure to clean all glassware used at the end of each experiment. When you have completed your laboratory work, you are responsible for returning your all your glassware in its original condition to where it came from. Dirty glassware and broken glassware may not be returned. Please inform your TA if something was broken.

Common sense and good safety practice require that side benches, hoods, and the lab equipment be kept clean. Any broken glass or spilled chemicals must be cleaned up immediately. Sinks must be kept free of debris such as paper towels, hoses, clamps, broken glassware, etc. You are responsible for cleaning your lab station by the end of each lab class. If your lab station is left in a mess or spills are not immediately wiped up then your instructor will deduct points from your lab report grade.

Chemicals should **never** be poured into the sink drains unless specifically authorized by the TA. Designated waste containers are provided inside the fume hood.

You are expected both to show courtesy toward fellow classmates and to respect the lab equipment that is provided. Anyone abusing any piece of furnished equipment will be charged for damages.

> "Reasonable accommodations will be provided for students with documented physical, sensory, systemic, cognitive, learning, and psychiatric disabilities. If you believe you have a disability requiring accommodation in this class, please notify the *Director of Disabled Student Services* (Campus Center 137, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations."

Your cooperation will be expected and required, so that the laboratory can operate as safely and efficiently as possible. If you have any problems concerning lab, please do not hesitate to contact the laboratory coordinator or the course instructor.

Academic Honesty

The policies, penalties, procedures and standards outlined in the *Undergraduate Bulletin* and in the *Policy on Community Rights & Responsibilities of University at Albany* will be followed. A failing grade is a possible result of academic dishonesty. Disruptive classroom behavior may result in lowering of a student's grade in accordance with the policies of the Dean of Undergraduate Studies. You are welcome to discuss any course-related problems with the chemistry faculty and staff members of the department.

You are welcome to discuss any course-related problems with the following chemistry staff members:

Lab Instructional Staff

Title	Name	Office	Telephone	E-mail
Lab Coordinator	Colin Henck	CH-309C	(44)2-4442*	chemlab@albany.edu
Assistant Lab Coordinator	Katie Saxton	CH-116(within CH-113)	(44)2-2622*	chemlab@albany.edu
Analytical Lab Associate	Jesse Carozza	CH-108(within CH- 113)	(44)2-4607*	chemlab@albany.edu
Organic Lab Associate	Kelli Allen	CH-108(within CH- 113)	(44)2-4607*	chemlab@albany.edu

Attendance

Laboratory attendance is **mandatory**. The course schedule is available on Blackboard. Always be sure you are prepared to do the lab on the day it is assigned to your section. If a student is absent (or anticipates an absence) from a lab class due to illness, family emergency, religious observance, or official

university activity then he or she is urged to **make up** the laboratory experiment at another lab class—if possible, or else at the end of the semester. This rescheduling process is facilitated by your TA. A *Permission Notice* to attend another lab class will be issued by your TA and the TA that you will make up your lab with; admittance to another lab class will not be allowed without a *Permission Notice*. Office hours are the only time to get a permission notice for a make-up lab (appointments can be made well in advance in extenuating circumstances). Excuse documentation of the absence must be presented in order to make-up the experiment. Documentation must be turned in during office hours. Emailed and faxed documentation of an absence will be ignored.

*Note that each laboratory experiment is offered **only** during the days and times indicated on the experiment schedule and **cannot** be made up at any other time. Make-ups are available on a first come first serve basis.*

If a student misses multiple experiments and has written documentation, that student must see the lab coordinator at office hours in a timely manner. Excused absences will only be considered in the most extenuating circumstances and with the consent of the lab coordinator ONLY. **Under no circumstances will credit be awarded for the course if you are absent from more than two lab experiments. If a lab is missed but made-up, it will not be considered an absence.** A grade of incomplete will only be considered in the case of unforeseen circumstances and only with proper documentation. Students who are absent for any reason are still responsible for the missed information.

Lab Preparation

It is in your best interest to prepare for lab by reading all relevant material about the method utilized in the experiment from your lab manual and textbook. You are to work with your partner outside of lab to design your stepwise procedure efficiently and thoroughly before you are coming to lab. The lab manual procedure was not written in a stepwise manner. You must do that on your own so you will be able to divide the tasks between you and your lab partner. Preparation means all relevant information and calculations have to be understood and done before coming to lab. Any required calculations that are used during lab should be written down on the "experimentation note" section in your lab notebook. All observations and data must be written in INK, pencil will not be accepted. The purpose of your lab manual/notebook is to act as a permanent, detailed reference for writing your lab report and performing final calculations. Your experimental note is only useful if you record the information neatly and organized. You are to also have any pre-lab questions finished before you come to lab.

Experimentation Notes

- For each experiment, students must record all preliminary calculations, data, observation, results, and any other analysis in their lab notebook, hand it to the TA for an approval signature. All data must be recorded in the note at the time the observation is made. Do not use scrap paper to temporary record data, it is not an effective way of collecting a large number of data, therefore, this habit should be eliminated. If a mistake is made in recording an observation, draw

a single line through the incorrect entry and record the correct entry again, enter an explanation of the change. Do not make a big pile of ink all over your note.

- All graphs such as calibration curves must be done in Excel on a computer. Graphs must include a descriptive title, points must be clearly plotted, and axes must be labeled (including units).
- Record the physical appearance of your samples; also take note of any real or suspected error.
- Any inadequate record of any determination may lead to rejection of the results. Make sure your TA look over your data and initiate any discussion needed in regards of your data with the TA.

Cleaning Glassware – Very Important!

The quality of your results could be altered by the quality of how prepared you are in every step of the experiment including cleaning glassware. Be courteous to yourself and others sharing the same lab space as well as same equipment. Clean your glassware and equipment before and after each use throughout the semester. Normally, 3 – 4 small rinses with tap water, followed by 3 – 4 small rinses with DI water is sufficient. Residue from tap water contains substances that will interfere with your analyses as you will find out on the very first experiment. Soap is not really necessary in this course. If you need to use soap, you must rinse thoroughly with tap water to remove all traces of detergent when done. Always rinse the glassware over with DI water, remove any labels on the glassware before you use or put them away.

AChm 437

ORGANIC Synthesis (3 credits)

Max Royzen, Spring

The objective of this course is to explore the realm of total synthesis of complex organic molecules, such as natural products and pharmaceutical reagents. We will focus on synthetic strategies towards assembling complex molecular structures. We will also take a close look at molecular mechanisms of every reaction presented in class. The class will involve oral presentations by the students, as well as frequent class participation at the blackboard. These activities will be geared towards learning, as well as development of scientific communication skills.

In order to make your experience with AChm 437 as productive and enjoyable as possible, you are strongly advised to review the concepts learned in the undergraduate organic chemistry courses (ACHM 220 and AChm 221), which are prerequisites for this course. You are also strongly encouraged to prepare for each class by reading and understanding the assigned material. You will need to familiarize yourself with ChemDraw software and modern chemical search engines:

SciFinder Scholar
https://scifinder.cas.org
If you are a new user, you can register by going to UAlbany Library -> Databases -> Chemistry

ChemSpider
www.chemspider.com

Another highly useful resource is Organic Chemistry Portal:
www.organic-chemistry.org

Instructor's Contact information				
	Office	Phone	email	Office hours
Dr. M. Royzen	LSRB 1136	917-974-4391	mroyzen@albany.edu	Mon/Wed 5:35-7:00 pm

General information			
Units	3	**Grading**	A-E
Prerequisites	AChm 220, AChm 221		
Class	Mon/Wed at 4:15-5:35 p.m., room CH 018		
Class Text	The class will be based on recent scientific publications assigned below		

Course Description: The course will focus on the total synthesis of complex organic molecules, such as natural products. Synthetic strategies as well as reaction mechanisms of every step will be discussed.

Exams. The material is divided in three approximately equal portions that will be tested separately in two Midterm and one Final Exams. Each Midterm Exam will take a full lecture period and will cover the topics presented in class up to that date. The Final Exam will take two full hours and will be cumulative of the entire course. The schedule of lectures is tentative, although every effort will be made to stay on pace. In contrast, **the dates of the Exams provided in the Course Calendar are definitive**. Therefore, mark them on your calendar ***ASAP***. All Exams are mandatory. If an Exam is missed for justified reasons, as defined by University policy on excused absence, an oral exam may be arranged for make-up. Any unexcused missed exam cannot be made up and will result in a score of zero (0).

Note 1): *When solving problems,* ***ALL WORK*** *must be shown to receive any credit. No points will be earned by just writing in the answer, even if correct. Partial credit will be given where applicable. Points will be deducted for significant figures errors.*

Note 2): *During the Exams, cell phones and other devices with memory storage and web access are not allowed.*

Note 3): *Any graded material (i.e., Exams, Homework assignments, and Lab reports) must be written in pen with permanent ink. Any material written in pencil will not be graded and receive a score of zero (0). Any unreadable material will receive a score of zero (0).*

Note 4): *Cheating during any exam will result in an automatic E in this course and prosecution by the University's judicial system.*

Grading policy.

Each Exam will be scored anywhere between 100 and 0, with the weight of individual questions included in the text.

The different components of the course have different weight on the overall course grade. Their scores will be expressed in percentage terms as indicated below:

Breakdown of overall score	
Class participation	**20%**
Two Midterm Exam	**20% each**
Final Exam	**40%**
Total	**100%**

At the end of the course, the overall score will be converted into a final letter grade. If your score falls within the ranges indicated below, the corresponding letter grade is guaranteed.

Grade conversion	
Score	Letter Grade
100-90	A
89-80	B
79-69	C
68-56	D
55-0	F

Course calendar: The following are important deadlines and events. Mark these dates *ASAP* on your own calendar to prevent surprises and misunderstandings.

Course calendar			
Week 1	Jan 21	Week 8	Mar 9, Mar 11
Week 2	Jan 26, Jan 28	Week 9	Mar 23, Mar 25
Week 3	Feb 2, Feb 4	Week 10	Mar 30, Apr 1 **Review & Exam**
Week 4	Feb 9, Feb 11	Week 11	Apr 6, Apr 8
Week 5	Feb 16, Feb 18	Week 12	Apr 20, Apr 22
Week 6	Feb 23, Feb 25 **Review & Exam**	Week 13	Apr 27, Apr 29
Week 7	Mar 2, Mar 4	Week 14	May 5

Paper Assignments:

Week 1 Introduction.

Week 2 (a) Royzen, M.; Taylor, M. T.; DeAngelis, A.; Fox, J. M. *Chem. Sci.,* **2011**, *2*, 2162-2165. (b) Royzen, M.; Yap, G. P. A.; Fox, J. M. *J. Am. Chem. Soc.* **2008**, *130*, 3760-3761. (c) Lauritsen, A.; Madsen, R. *Org. Biomol. Chem.*, **2006**, *4*, 2898–2905.

Weeks 3-4 (a) Liu, W.-J.; Ye, J.-L.; Huang, P.-Q. *Org. Biomol. Chem.*, **2010**, *8*, 2085–2091. (b) Zhou, X.; Liu, W.-J.; Ye, J.-L.; Huang, P.-Q. *Tetrahedron*, **2007**, *63*, 6346–6357.

Weeks 4-5 (a) Weiss, M. E.; Carreira, E. M. *Angew. Chem. Int. Ed.* **2011**, *50*, 11501–11505. (b) Chemler, S. R.; Trauner, D. Danishefsky, S. J. Angew. Chem. Int. Ed. **2001**, *40*, 4544–4568.

Week 6 **Review and Exam**

Week 7 K. C. Nicolaou, Adsool, V. A.; Hale, C. R. H. *Angew. Chem. Int. Ed.* **2011**, *50*, 5149 –5152.

Weeks 8-9 Maimone, T. J.; Shi, J.; Ashida, S.; Baran, P. S. *J. Am. Chem. Soc.* **2009**, *131*, 17066–17067.

Week 10 **Review and Exam**

Weeks 11-12 Corminboeuf, O.; Overman, L. E.; Pennington, L. D. *J. Org. Chem.* **2009**, *74*, 5458–5470.

Weeks 13-14 Knowles, R. R.; Carpenter, J.; Blakey, S. B.; Kayano, A.; Mangion, I. K.; Sinz, C. J.; MacMillan, D. W. C. *Chem. Sci.,* **2011**, *2*, 308–311.

S Y L L A B U S – Fall 2019

ACHM 444: Biophysical Chemistry, Call No. 5954

Instructor of Record: Professor Mehmet Yigit

CONTACT INFORMATION

Office: Life Sciences Research Building, Room 1125 (LSRB 1125)
Office hours: Friday: 11:00 AM – 12:45 PM
Email: myigit@albany.edu
Phone: 442-3002

COURSE INFORMATION

Time: MW 04:15-5:35 PM
Location: (Massry Center for Business Basement Room 010) BBB10
Textbook (required): ***Physical Chemistry: Principles and Applications in Biological Sciences (5th Edition***. Additional supporting materials not in the text or not explained well in the text will be posted on blackboard as needed. You are responsible for reviewing the assigned and posted materials prior to coming to class.
Prerequisite: Prerequisite(s): ACHM 221, AMAT 113 or 119, and APHY 150. You will be expected to know how to do differentiation and integration. Thus, sufficient calculus background is required.
Course grading: A-E
Mastering Chemistry ID: **MCYIGIT5989840** (ACHM 444/541A Fall 2019)
SECONDARY TEXTS: A Recent Biochemistry Text, Introductory Calculus-based Physics, Introductory Calculus

COURSE DESCRIPTION

ACHM 444: Biophysical Chemistry (3 credits): The class will cover (1) First and Second Laws of Thermodynamics and (2) Application of these to Chemical Reactions and Equilibria. **Learning Outcomes:** Foundations of the physical principles and their applications to biochemical systems.

Internet requirement: Students are allowed to use internet resources, either personal, or available in the Chemistry computing room. We will use the Blackboard Learning System website to post slides in PDF format, class announcements, grades and answers for tests. To use the Blackboard, you must have an active UNIX account.

The login and its instructions are available at http://bls.its.albany.edu/webct/entryPageIns.dowebct.

Attendance: Students are expected to attend all classes and come prepared to class after reviewing the chapters and other materials posted on blackboard or mastering chemistry.

EXAMS AND GRADING POLICY

Quizzes: There will be **3 unannounced short in-class quizzes** during the semester, during the **first or last** 15 min. of class. Absolutely, no make-up for a missed quiz.

Exams: There will be three exams on the days indicated in the projected schedule. A comprehensive final will be held on the day and time shown below. Students are not allowed to use their cell phones during the exam. Calculators with memory are not allowed. A simple scientific calculator is needed for exams and or quizzes.

Mastering Chemistry Policy: Mastering Chemistry on-line problems and tutorials count 15 % of your course grade. They should be completed by the time specified on the Mastering Chemistry Calendar and the syllabus. 1 % of the credit for an assignment will be deducted for each hour the assignment is overdue. It is to your benefit to take the hints in doing the Mastering Chemistry Homework. Some people even take the hints, which can help in developing future insight, even if they can do the problem without hints. It is important to do these on-line homeworks, which will give you hints and immediate feedback in a timely fashion.

Note: Besides mastering chemistry there might be practice questions posted on blackboard (and/or mastering chemistry). These problems are for studying purpose and won't be graded.

Grading:

Mastering Chemistry (15%)

In-class quizzes (3)– 12% (4% each)

In-class 1-Hour Exams (3) - 54% (18% each)

Final Exam - 19%

Exam Make–up Policy: Students are expected to take all exams, quizzes and do the assignments as specified on the syllabus. Except in the case of "excused absences" (as defined in the undergraduate and graduate bulletins), or other important reasons, no make-up exams will be offered. Students should obtain an excused absence letter from the Dean of Undergraduate Affairs. Please note that without exception, clear documentation is required before a make-up exam can be given. Also, at my discretion are the format, the timing, and the place of a make-up exam. There will be no make-up of a make-up.

There will be no make-up of a missed quiz.

GRADING

90 and above	A
85-90	A-
81-85	B+
77-81	B
73-77	B-
69-73	C+
65-69	C
61-65	C-
57-61	D+
53-57	D

50-53 D-

Below 50 E

PROJECTED LECTURE/ ASSIGNMENT SCHEDULE

Lecture #	Date	Topic	Pages in Text	Mastering Chem. Assignment	Additional notes
1-Mon	Aug 26	Introduction		CH 02 Due Sept 25	
2 – Wed	Aug 28	Conservation of Energy, Forms of Energy	Ch. 2 (pp. 14-26)		
3 - Mon	Sep 2	**CLASS SUSPENDED (Labor Day)**			
4 - Wed	Sep 4	Forms of Energy - Heat, Work	Ch. 2 (pp. 14-26)		
5 - Mon	Sep 9	Reversibility, Variables of State, Pressure, Temp., Energy	Ch. 2 (pp. 26-36)		
6 – Wed	Sep 11	Variables of State, Pressure, Temp., Energy, Enthalpy	Ch. 2 (pp. 26-36)		
7 – Mon	Sep 16	Phase Changes; Enthalpy and Energy of Chemical Reactions	Ch. 2 (pp. 36-39)		
8 - Wed	Sep 18	Phase Changes; Enthalpy and Energy of Chemical Reactions	Ch. 2 (pp. 39-47)		
9 – Mon	Sep 23	REVIEW before Exam I			
10 – Wed	**Sep 25**	**EXAM 1**			
11 – Mon	Sept 30	Carnot Cycle and Entropy the "Heat Engine" Approach	Ch. 3 (pp 55-58)	CH 03 due Oct 23	
12 – Wed	Oct 2	The 2nd Law and Entropy	Ch. 3 (pp 75-81)		

13 – Mon	Oct 7	Methods of calculating entropy	Ch. 3 (pp 60-70)		
14 – Wed	Oct 9	Gibbs Free Energy-Phase Changes	Ch. 3 (pp 71-74)		
15 – Mon	Oct 14	**FALL BREAK**			
16 – Wed	Oct 16	Gibbs Free Energy	Ch. 3 (pp 74-90)		
17 – Mon	Oct 21	REVIEW before Exam II			
18 – Wed	**Oct 23**	**EXAM 2**			
19 – Mon	Oct 28	Chemical Potential and Equilibrium Constants	Ch. 4 (pp 101-102)	CH 04 due Nov 11	
20 – Wed	Oct 30	Ideal Gas Reactions	Ch. 4 (pp 102-108)		
21 – Mon	Nov 4	Solution Reactions-Standard States, pH	Ch. 4 (pp 108-118)		
22 – Wed	Nov 6	Review pH Problems, Duplex formation of nucleic acids	Ch. 4 (pp 119-125)		
23 – Mon	Nov 11	Galvanic Cells – Biochemical Applications	Ch. 7 (pp 238-248)	CH 07 due Nov 18	
24 – Wed	Nov 13	Galvanic Cells – Biochemical Applications & REVIEW for Exam III	Ch. 7 (pp 254-258)		
25 – Mon	**Nov 18**	**EXAM 3**			
26 -Wed	Nov 20	Phase Equilibria	Ch. 6 (pp 196-200)	CH 06 due Dec 10	
27 – Mon	Nov 25	Scatchard Plots, Membrane Potentials	Ch. 6 (pp 197-206) Ch. 7 (pp 248-254		
28 – Wed	Nov 27	**CLASS SUSPENDED (THANKSGIVING)**			
29 – Mon	Dec 2	Chemical potential/Colligative Properties	Ch. 6 (pp 211-213)		
30– Wed	Dec 4	Chemical potential/Colligative Properties	Ch. 6 (pp 220-231)		
31 – Mon	Dec 9	REVIEW FOR FINAL EXAM	Ch. 6 (pp 220-231)		
Comprehensive FINAL EXAM on Dec. 11 (Wednesday) between 3:30-5:30 pm in room BBB010					

Classroom Policy

Silence your cell phones during lectures. A simple scientific calculator is needed for exams and or quizzes. You will not be allowed to use any other electronic devices during a quiz or an exam, i.e., programmable or graphing calculators, phones, or computers, Ipads, smart devices or tablets. Absolutely no devices with memories and web access are allowed during the exams and quizzes. **According to University policy:** *Cheating during any exam will result in an automatic E in this course at the end of the semester, and prosecution by the University's judicial system.*

STUDY TIPS:

Start studying early. Do not get behind. In a course like this where each concept is closely related to understanding the previous concepts, getting behind is a disaster. You cannot memorize or cram your way through this course. If the Mastering Chemistry problems are not done by the date due, there will be a diminishing credit (1 % per hour) for doing them.

Practice and Engagement.

Practice: Mastering Chemistry assignments give you the opportunity to practice and to demonstrate that you can apply concepts and principles to solving real problems. There is absolutely no replacement for working problems when learning physical chemistry. You learn how to interpret concepts and apply them skillfully.

Engagement: Interact with your peers who are also part of the class.

WARNING

This is a problem-oriented, concept-based physical science course, not a memory course.

Study habits and skills that may have been successful for more descriptive, less concept-based courses may be irrelevant.

SPRING SEMESTER 2018

ACHM 445: Biophysical Chemistry-II (3 credits)

MW 04:15 PM - 05:35 PM **Location: ES 245**

ACHM 445: Class Number: 6562

Instructor of record: Professor Mehmet Yigit **Email:** myigit@albany.edu

Office: Life Sciences 2076, Tel. 591-8842

Office Hours: Tuesdays, 11 AM – 1 PM, or by appointment. **Prereqs:** ACHM 444 Biophysical Chem I

TEXT: Physical Chemistry: Principles and Applications in Biological Sciences, Fifth Edition, by Tinoco, Sauer, Wang and Puglisi, Harbison and Rovnyak, **with Mastering Chemistry.** Please see the links below provided by the University Bookstore:

Course Description: Foundations of the physical principles and their applications to biochemical systems. Topics include transport phenomena and sedimentation and electrophoresis, chemical and biochemical kinetics, chemical quantum mechanics and spectroscopy. Does not yield credit toward the major for B.S. Chemistry students with emphasis in Chemistry.

Learning Objectives:

Students will learn foundations of the physical principles and their applications to biochemical systems. Topics include transport phenomena and sedimentation and electrophoresis, chemical and biochemical kinetics, chemical quantum mechanics and spectroscopy

Course Policy and Schedule

I all students to do well in this course. Students are expected to attend all lectures and are required to do the homework assignments. The course schedule shown below is tentative and is likely to change once the course begins, depending on the pace we are able to keep. You are expected to have a basic understanding of General, Organic, Inorganic and Biochemistry in this course. *If you are lacking in any of these subjects, please review them on your own. We will NOT be covering these subjects in class.*

This course will be run in an interactive manner whenever possible, and you are encouraged to actively participate in the in-class discussions. Please review the relevant chapter sections before coming to the lecture. The end-of-the-chapter "Summary" and "Mathematics needed" sections of each chapter are very useful and should be reviewed during self-study. *We cannot cover everything in class, and you need to put in the additional effort needed outside of class.* Please see me **early on** if you are having difficulties with the course material — either during office hours or by appointment. Talking to me the day before an exam will not help much.

Use of Blackboard and Mastering Chemistry

We will use *Blackboard Learn* to post all course materials and announcements. Lecture notes *will not* be posted on blackboard – therefore it is important to attend all lectures and take your own notes. In general, lectures will be delivered using the chalk/whiteboard, with the use of power point slides only as needed. Other materials (e.g. articles, chapters from other texts etc.) that are helpful, will be posted on blackboard, also as needed. Homework will be assigned using the Mastering Chemistry link as stated above.

Examination Policy

There will be six concepts quizzes, three hour examinations and a final exam (topics included on all quizzes and exams will be discussed and posted ahead of time). All concepts tests and examinations will be similar

(but usually not identical) to the homework problems, the examples we discuss in class and problems posted for practice. **Mandatory for Graduate Students:** Additional 2 problems (Section-II) will be included on each hour exam and the final exam.

Grading Policy

This is an A-E graded course and the final grade will be based on the following:

(i) Concepts Quizzes given at the beginning of class as shown – (30%)

(ii) Homework – (10%)

(iii) Three hour exams, Section-I – (30%)

(iv) Final Exam – (30%).

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
100-94	93-89	88-85	84-82	81-79	78-76	75-73	72-70	69-67	66-63	63-60	60-0

Mechanism for extra credit

In-class participation by a student in the form of relevant and meaningful questions/discussions will be recognized by a **small** credit (bonus points) in the overall grade computation. Occasionally, we may have surprise, 2-minute (pop) quizzes for one or two bonus points. Each hour exam and the final exam will have **one** extra-credit question worth up to 5 points. ***There is no other mechanism for earning "extra credit" in this course, so please do not ask for it.*** If the overall points earned are below 45, the corresponding letter grade is usually an E. No "incomplete" grades will be given – unless you can show documented evidence approved by the Dean of Undergraduate Studies that the circumstances merit the "I" grade.

Make-up Exam Policy

If you miss an exam or a Concepts Quiz because of an excused absence, then a make-up test or exam will be given, *provided you show adequate documentation* ***before a make-up exam can be given****.* This is the course policy whether you are absent for one day or multiple days.

CLASS RULES

Electronic Devices & other Personal Items: Before starting a concept quiz or exam, you are required to leave backpacks, laptops, cell phones and all electronic devices with memory and internet access, in the front section of the room. **No exceptions.** Please bring only a simple scientific calculator (i.e. without internet access) during quizzes and exams. A calculator will NOT be provided - so please remember to bring one.

Breaks (restroom or other) during quizzes or exams: If you need to step out during an hour exam or quiz, you are required to hand in the test to me. You will be given a different test when you return, and can continue your work from the next question onwards. Please note that cheating will result in an automatic "E" grade in the course and prosecution by the University's judicial system.

Cell phones and In-class Conversations: **Cell phones and pagers must be in "silent" mode or turned off in class, and head-phones are not allowed.** Laptops can be used only during lectures. Conversation amongst yourselves must be kept to a minimum, except during group discussions. Please note that whispering, giggling snickering and other distracting behavior is disrespectful to your professor and your classmates. Please refrain from behaving in a disruptive manner.

PLEASE RESPECT THE CLASS RULES, AS WELL AS YOUR CLASSMATES AND PROFESSOR

This is an essential component of learning

COURSE SCHEDULE (TENTATIVE – Subject to some adjustments as needed)

DATE	TOPIC	CHAPTER IN TEXT
1/23-W	Overview of syllabus, Introduction to Kinetics, Rate Law, 0^{th} Order Reactions, 1^{st} & 2^{nd} Order Reactions	Ch. 9
1/28-M	Rate Law, 0^{th} Order Reactions, 1^{st} & 2^{nd} Order Reactions Reaction Mechanisms & Rate Laws	Ch. 9
1/30-W	Reaction Mechanisms & Rate Laws Series and Parallel reactions	Ch. 9
2/4-M	Equilibrium and Kinetics Complex reactions: The steady-state approximation	Ch. 9
2/6-W	**CONCEPTS QUIZ - 1 (15 MIN. at the start of class)** Temperature Dependence of Rates & Transition State Theory	Ch. 9
2/11-M	Transition State Theory, Diffusion Controlled Reactions	Ch. 9
2/13-W	**CONCEPTS QUIZ - 2 (15 MIN. at the start of class)** Photochemistry & Photobiology	Ch. 9
2/18-M	Photochemistry & Photobiology, Brief Review for HE-1	Ch. 9
2/20-W	Enzyme Kinetics	Ch. 10
2/25-M	Enzyme Kinetics	Ch. 10
2/27-W	**FIRST HOUR EXAM – (Chemical Kinetics, Ch. 9)**	
3/4-M	Enzyme Inhibition	Ch. 10
3/6-W	**CONCEPTS QUIZ - 3 (15 MIN. at the start of class)** Molecular Structures & Interactions: Introduction to Quantum Mechanics, Wave-particle duality	Ch. 11
3/11-M	Heisenberg Uncertainty Principle, Wave Functions, Schrödinger Equation, Particle in a Box, Tunneling	Ch. 11
3/13-W	**CONCEPTS QUIZ - 4 (15 MIN. at the start of class)** Simple Harmonic Oscillator, Rigid Rotator	Ch. 11

S P R I N G B R E A K: C L A S S E S S U S P E N D E D 3/16 - 3/22/19

3/25-M	Hydrogen Atom Electron Distribution in a Hydrogen Atom	Ch. 11
3/27-W	**SECOND HOUR EXAM – Enzyme Kinetics, Ch. 10 & Molecular Structure and Spectroscopy Ch. 11 (covered thus far)**	
4/1-M	Hybridization, Molecular Orbitals Molecular Structure: Biomolecules	Ch. 11-12 Ch. 12
4/3-W	**CONCEPTS QUIZ - 5 (15 MIN. at the start of class)** Molecular Structure & Molecular Orbitals,	Ch. 12

4/8-M	Molecular Structure & Molecular Orbitals, Inter- and Intra-molecular forces	Ch. 12
4/10-W	**CONCEPTS QUIZ - 6 (15 MIN. at the start of class)** Noncovalent Interactions	Ch. 12
4/15-M	OPTICAL SPECTROSCOPY: Absorption & Emission of Radiation, Beer-Lambert's Law	Ch. 13
4/17-W	UV-Absorption, Proteins & Nucleic Acids	Ch. 13
4/22-M	Circular Dichroism	Ch. 13
4/24-W	**THIRD HOUR EXAM – Molecular Structure and Spectroscopy (Chs. 11, 12 & 13)**	
4/29-M	Circular Dichroism, Fluorescence	Ch. 13
5/1-W	Fluorescence	Ch. 13
5/6-M	Infrared & Raman Spectroscopy	Ch. 13
5/8-W	Infrared & Raman Spectroscopy Review for Final	Ch. 13

FINAL EXAM

Saturday, May 11th, 2019, 3:30 – 5:30 PM in the classroom

(Please look out for any last minute changes)

Syllabus
Chemical Biology Lab ACHM 446
3 Credits - Fall 2019

Instructor: Dr. Li Niu

Office: Chem B38
Office phone: 442-4413
E-mail: lniu@albany.edu
Office hours: by appointment (walk-ins permitted)

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1. Course Organization

During a regular week there will be a **lecture in Chem 137 on Monday from 12:35 pm to 1:30 pm. Laboratory sessions will be held in Chem 137 on Tuesday and Wednesday from 12:50 pm to 3:50 pm.** Changes to these regular schedules will be announced in a timely manner.

Prerequisite(s): A CHM 221 and 223; corequisite(s): A CHM 350, 442, and 443.

Learning Outcomes: The lab will provide the basics for protein purification, protein characterization, and DNA manipulation through the use of chromatographic, electrophoretic, and spectroscopic tools of biochemistry and biophysics. One class period, two laboratory periods each week.

Course Description: The lab will provide the basics for protein purification, protein characterization, and DNA manipulation through the use of chromatographic, electrophoretic, and spectroscopic tools of biochemistry and biophysics. One class period, two laboratory periods each week.

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2. Course Fees

A **$50 laboratory fee** is assessed to offset the cost of running this lab and to cover a portion of the expenses for consumables. The lab fee is part of your student account.

The manual recommended for this course is available from CAS ChemStore (Chem 044) for **$30**. The manual is unique and designed specifically for this course.

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3. Laboratory Policies

All laboratory work will be performed in pairs. Identify your lab partner at the beginning of the semester. Because of the nature of Chemical Biology experiments, you will have to perform some experimental manipulations outside the normally scheduled times (refer to the experimental schedule). In addition, you may have to work beyond the times normally allowed for the laboratory portion of the course.

Carefully **review all materials provided in the lab manual** for each week's lab activities **in advance** and raise any questions or concerns you have with the instructor **before** you begin the experiment.

Safety is of primary concern in the laboratory. Please wear lab coats and safety glasses. Do not wear open-toed shoes to lab. No food or drink is allowed in the laboratory.

Before any laboratory work can be performed, students must read the Laboratory Safety Guidelines for the Chemistry Laboratory in the Appendix to the Laboratory Manual and sign and submit the Chemistry Laboratory Safety Consent form at the end of the Manual.

Please always come to lab on time, preferably early. Unless you have an excused absence with proper documentation participation in every experiment is expected. There are no make-up labs scheduled. Make-up labs may be offered only following discussion with the instructor for that particular experiment.

A flashdrive is recommended to transfer digital images for the written lab reports.

If you have an emergency, notify the instructor and obtain permission to be excused. Otherwise, your grade is zero for that lab. If you miss three labs, the final grade for the course will be zero.

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4. Lab Reports

A well-written, detailed, comprehensive report is required for each laboratory exercise. A hard copy of the lab report must be submitted, digital versions are not acceptable. Well written implies that the report is carefully screened not only for scientific content but also for errors in spelling and grammar. The report must be typed, but complex mathematical expressions may be hand-written legibly and numbered sequentially. Refer to **Appendices 9 & 10** in the Laboratory Manual for detailed guidelines on what to include in the lab report.

Because each member of a group collectively performs the experiment, each student may use and submit the same raw data. However, you cannot submit a duplicate lab report. Duplicate reports will be graded as zero. Each member must analyze and present data individually and provide your own interpretations and ideas in the report. The computers in the CELL lab may be used to write the lab report and perform calculations.

Laboratory reports will be graded by the TA and are due one week from the date of the completion of your experiment, as determined by the instructor or TA. If the experiment lasts longer than one week, then the due date will be one week from the last day of that experiment. <u>There are no exceptions to this rule</u>. A lab report is considered late if not handed in to the TA by the due date. The TA will note the date received. Ten points will be deducted for each day that the report is overdue. Keep a copy of the original data and all materials that you submit to the instructor, in case some items get lost or need to be resubmitted.

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5. Exams and Grades

Lab reports will be graded on a 100-point scale and will account for 90% of the grade. An in-class written final exam will account for 10% of the final grade. The final will cover the principles and experimental methods used in the experiments that you have performed. The date for the lab exam will be announced. No electronic devices are allowed during the exam. There will be no incomplete grade given in this lab.

<u>GRADING</u>

<u>≥</u>90	A
80-89	B
70-79	C

60-69	D
<60	E

Experimental Schedule- Fall 2019

	Date/times	Experiment	
WEEK 1			
Mon Aug 26	12:35-1:30 pm	**Lecture 1**	
Tues Aug 27	12:50-3:50 pm	1.1.1, **Lecture 2**	LB media; pour plates
Wed Aug 28	12:50-3:50 pm	1.2.1, 1.3.1, 1.4.1, 1.4.2	Practice pipetting, sterile transfers cell density, spread plates
WEEK 2			
Mon Sep 02	No class	2.1.1	
Tues Sep 03	*10-10:30 am	2.1.2	Start 2° culture
"	12:50-3:50 pm	1.4.2, 2.1.2	Competent cell prep
Wed Sep 04	12:50-3:50 pm	2.2.1	Bacterial transformation
WEEK 3			
Mon Sep 09	12:35-1:30 pm	**Lecture 3**; 2.3.1	Start 1° o/n culture
Tues Sep 10	12:50-3:50 pm	2.2.2, 2.3.2, 2.4.1, 2.5.1	Plasmid prep; agarose gel, OD_{260}
Wed Sep 11	12:50-3:50 pm	3.1.1	Restriction digestions
WEEK 4			
Mon Sep 16	12:35-1:30 pm	**Lecture 4**	
Tue Sep 17	12:50-3:50 pm	3.1.2, 3.2.1	Agarose gel- digestions/PCR
Wed Sep 18	12:50-3:50 pm	3.2.2	Agarose gel- PCR
WEEK 5			
Mon Sep 23	12:35-1:30 pm	**Lecture 5**	
"	*1:30-2 pm	4.1.1	Start 1° o/n culture
Tue Sep 24	*10-10:30 am	4.1.2	Start 2° culture
	12:50-3:50 pm	3.2.2, 4.1.2	Agarose gel- PCR, induce o/e
Wed Sep 25	12:50-3:50 pm	4.1.3, 4.1.4, 4.1.5, 4.1.6	Harvest cells; SDS-PAGE
WEEK 6			
Mon Sep 30	12:35-1:30 pm	**Lecture 6**	
Tue Oct 01	12:50-3:50 pm	5.1.1, 5.1.2	Lyse cells; HisTrap column
Wed Oct 02	12:50-3:50 pm	5.2.1	SDS-PAGE
WEEK 7			
Mon Oct 07	12:35-1:30 pm	**Lecture 7**	
Tues Oct 08	12:50-3:50 pm	5.3.1	Concentrate protein
Wed Oct 09	12:50-3:50 pm	5.4.1, 5.4.2, 5.4.3	SDS-PAGE; OD_{280}; storage

Experimental Schedule- Fall 2019

Date/times		Experiment	
WEEK 8			
Mon Oct 14	No class		
Tues Oct 15	No lab		
Wed Oct 16	No lab		
WEEK 9			
Mon Oct 21	12:35-1:30 pm	**Lecture 8**	
Tues Oct 22	12:50-3:50 pm	6.1.1, 6.1.2	RT; pour polyacrylamide gels
Wed Oct 23	12:50-3:50 pm	6.2.1	Pilot PCR
WEEK 10			
Mon Oct 28	12:35-1:30 pm	**Lecture 9**	
Tues Oct 29	12:50-3:50 pm	6.2.2, 7.1.1	PAGE; PCR
Wed Oct 30	12:50-3:50 pm	7.1.2, 7.2.1	PAGE; Purify DNA
WEEK 11			
Mon Nov 04	12:35-1:30 pm	**Lecture 10**	
Tues Nov 05	12:50-3:50 pm	7.3.1	*In vitro* transcription
Wed Nov 06	12:50-3:50 pm	(7.3.1), 8.1.1	(DNase); PAGE
WEEK 12			
Mon Nov 11	12:35-1:30 pm	**Lecture 11**	
Tues Nov 12	12:50-3:50 pm	8.2.1	Phenol-chloroform extraction
Wed Nov 13	12:50-3:50 pm	8.2.2, 9.1.1	Isolate RNA, Urea-PAGE
WEEK 13			
Mon Nov 18	12:35-1:30 pm	**Lecture 12**	
Tues Nov 19	12:50-3:50 pm	9.2.1, 9.2.2	Cleavage assay; gels, software
Wed Nov 20	12:50-3:50 pm	9.3.1	Urea-PAGE
WEEK 14			
Mon Nov 25	12:35-1:30 pm	**Lecture 13**	
Tue Nov 26	12:50-3:50 pm	9.3.1, 9.3.2, 9.3.3	Analysis of cleavage assay
Wed Nov 27	No lab		
WEEK 15			
Mon Dec 02	12:35-1:30 pm	tbd	
Tue Dec 03	12:50-3:50 pm	tbd	
Wed Dec 04	12:50-3:50 pm	tbd	

* Times outside normally scheduled class.
tbd- to be determined

ADANCED FORENSIC CHEMISTRY I (3 credits)
ACHM 447
Fall 2020, T/TH 9:00 am – 10:20 am
Professor Rabi Musah

Class Location: Online and synchronous (lectures occur online during the lecture period via Zoom)

Office Hours: 10:30 – 11:30 am on Tuesday and by appointment (all online)

Phone: 518-437-3740 (when on campus, dial 7-3740)

E-mail: rmusah@albany.edu

Text: Handouts, lecture slides, journal articles and other reading materials

Prerequisites: Full year of organic chemistry (ACHM 220/221); quantitative analysis lecture and lab (ACHM 226 and 227); comprehensive biochemistry I (ACHM 442); instrumental analysis lecture and lab (ACHM 429 and 431). All of these courses are essential prerequisites and it will be ***extremely difficult*** to pass this course without a thorough knowledge of their content. **It is your responsibility to make sure that you are well versed in these areas**.

Learning Objectives: This course focuses on current topics and analytical methods utilized in today's modern forensic laboratories. Forensic Chemistry will include topics such as introduction to criminalistics, ethical dilemmas, computer-assisted data analysis, public speaking on technical and non-technical subjects, as well as courtroom testimony. The course will also include a detailed description of how modern analytical techniques are applied to forensic chemistry.

General Course Description:

This course focuses on current topics and analytical methods utilized in today's modern forensic laboratories. Forensic Chemistry will include topics such as introduction to criminalistics, ethical dilemmas, computer-assisted data analysis, public speaking on technical and non-technical subjects, as well as courtroom testimony. The course will also include a detailed description of how modern analytical techniques are applied to forensic chemistry. Specifically, gas chromatography, mass spectrometry, DART, headspace chromatography, TLC, liquid-liquid extraction, solid phase extraction, immunoassay and electrochemistry will be applied to the fields of forensic drug chemistry and toxicology. The course includes advanced statistical methods such as chi-square tests, multiple regression and correlation, nonparametric statistics, and analytical variances.

Topics will be covered over the course of the term include:

1. *Introduction to Forensic Chemistry: Terms and Definitions*
2. *Overview of the Tools of the Trade*
    a. *Forensic Science Standards*
    b. *Field Tests*
    c. *Elemental Analysis*
    d. *Chromatography*
    e. *Spectroscopic Techniques*
    f. *Mass Spectrometric Techniques*
    g. *"Hyphenated" Techniques*
    h. *Capillary Electrophoresis*
    i. *Miscellaneous Analytical Approaches*
3. *Colorimetric Assays—Focus on field detection of drugs of abuse*
4. *The Chemistry of Fingerprint Analysis*
5. *Drugs of Abuse—Forensic detection and confirmation of drugs featuring mass spectrometry, IR spectroscopy, and complementary analytical techniques; study of both natural products, synthetics and semi-synthetics; discussion of emerging drugs*
6. *Forensic Toxicology—Pharmacodynamics, pharmacokinetics and the trace analysis of drugs, toxins and their metabolites in biological matrices*
7. *Trace Evidence*
8. *The Forensic Chemistry of Arson*
9. *The Chemistry of Firearms and Explosives*
10. *Miscellaneous Special Topics*

Course content will be covered within the context of discussions of numerous case studies, journal articles associated with various relevant analytical techniques, and the chemical analyses relevant to solving the cases. Course materials will be made available through Blackboard.

Attendance: The course will be delivered via Zoom. In general, a link will be sent to you within 24 hours of the lecture via e-mail, and this will allow you to access the lecture. ***You are required to attend all lectures live, and you are required during lectures to appear on-screen and participate in the discussions (i.e. your camera must be on and activated).*** You are responsible for all material covered during lectures whether or not you are present. ***If you are absent from class, you should find out what was covered from your classmates, not me. I give each lecture only once***.

Lecture format: Lectures will include powerpoint slides, consideration of journal articles and media pieces, YouTube videos, discussions and exercises.

Communication: I will often communicate with you via e-mail. It is therefore essential that you check your e-mail several times a day, as ignorance about important announcements will not be an acceptable excuse for failing to be apprised of critical information.

Exams/Grading: **There will be a total of 3 exams. The date of each exam will be announced at least 1 week prior to the exam date.** The final grade in the class will be based on performance on the 3 in-class exams.

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
100-94	93-89	88-85	84-82	81-79	78-76	75-73	72-70	69-67	66-63	63-60	60-0

Academic Integrity: You are responsible for familiarizing yourself with the University's rules and regulations regarding adherence to academic integrity standards. You will be held to these standards.

DEFINITIONS OF ACADEMIC DISHONESTY:

1.1 CHEATING:

Cheating is the act of obtaining or attempting to obtain credit for academic or research work through the use of any dishonest, deceptive, or fraudulent means. It includes but is not limited to copying and claiming as one's own, work that one has not done, or willfully allowing someone else to claim the work as work he or she has done.

1.2 PLAGIARISM

Plagiarism is the act of representing the work of another as ones' own without appropriate references, and submitting it to fulfill academic and/or research requirements.

It should be noted especially that anyone who helps someone else to cheat in any way is considered equally culpable.

CONSQUENCES
Cheating during any exam will result in an automatic E in this course at the end of the semester as well as prosecution.

ACHM 448 Advanced Forensic Chemistry Lab I (2 credits)

Learning Objectives: The ultimate goal of this course is to become proficient in forensic laboratory techniques which are used to accurately determine the concentration of various chemical substances (organic or inorganic) in various samples representative of forensic samples.
Prerequisite(s): A CHM 226, 227, 429, and 431 or permission of instructor.

Contact Information

Professor: Rabi Musah
Email: rmusah@albany.edu

Teaching Assistant:
- TBA
- TBA

- Office Hour: To be announced by TA, by appointment as necessary
- Office: Chemistry Learning Center CH-242

Course Materials: can be purchased in the *College of Arts and Sciences (C.A.S.) Laboratory Sciences* window (CH-B44)

- The Forensic Chemistry Lab Manual
- Equipment
  - PPE : Splash-Resistant Goggles, Lab Coat and Nitrile Gloves
  - Laboratory Safety Guidelines for the Chemistry Laboratory; University at Albany. Also, available in the lab manual.
    - ***A CHEMISTRY LABORATORY SAFETY CONSENT*** form in the back of the safety guidelines document ***must be signed*** and handed in to the TA ***prior to starting the first lab experiment.*** Any student without a signed consent will not be allowed to do experimentation.

Lab Report Submission: Lab reports must be typed and turned in on or before the due date through Blackboard. You will turn an electronic copy to Blackboard so it can be evaluated by the program SafeAssign for originality. SafeAssign accepts a variety of popular file formats including .docx and .pdf. The program allows instructors to evaluate written assignments for originality against Internet sources, other student submissions, academic databases, etc. While each member of a group shares all experimental results, the text of the report must be individually developed and presented. You will be able to see the SafeAssign report when you submit your paper. Please check the report and edit and resubmit your paper to avoid plagiarism. More details about lab report requirements are provided in the sections below.

Grading:

Each lab report is graded out of 100 points and there are 11 lab reports in this course. Your grade in the course is based on the final average of all lab reports, each lab report is worth roughly 9% of the grade. There are no quizzes or exams in this course. If a lab report is plagiarized as

determined by a SafeAssign report: First offense – lose 10 points and resubmission of a corrected report is required for a grade to be assigned. Subsequent offenses – lab report not accepted.

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
100-94	93-89	88-85	84-82	81-79	78-76	75-73	72-70	69-67	66-63	63-60	60-0

Course Description: Applications of the principles and methods discussed in A CHM 447. Experiments chosen for A CHM 448 aid the student in developing a more detailed understanding of quantitative methods. Specifically, students will perform method development in gas chromatography. Students will also perform electrochemical and immunoassay experiments. Statistical analysis of data will be performed.

Safety Goggles Policy

Splash-resistant safety goggles must be worn at all times during the experiment. Safety glasses are not permitted in the lab. Although you must be in the lab at the officially scheduled time, the experiment begins after the TA has presented the lab instructions. This means that after the TA is done presenting, safety goggles must be worn at all times.

Failure to wear goggles after the experiment has begun will result in immediate dismissal from the lab. A grade of zero will be given for the lab report and no make ups will be granted. Random spot checks will be done to ensure cooperation with this policy. If anyone is seen without goggles by the TA or the Lab Coordinator, he or she will be asked to leave and receive a zero. There are no acceptable excuses or exceptions to this policy. If you need to take your goggles off for any reason you must first leave the lab.

At the end of the experiment you must wear your safety goggles out your way out of the lab. Please remember to bring your goggles to lab each week.

This policy is the law and is designed for the safety of all students in the lab. If you have any questions or concerns please contact the Lab Coordinator in CH-309C.

Thank you for your cooperation,

Colin Henck

Lab Coordinator

Safety

Strict adherence to all safety rules is required including that from the Laboratory Safety Guidelines *for the Chemistry Laboratory,* safety video, lab manual, MSDS, signage in the lab and TA instruction. It is required that each student is aware of and working in accordance with all safety rules and regulations. If you are unsure or have questions about any safety rule or issue, it is your duty to ask the Lab Coordinator **BEFORE** performing the experiment. After (re)reading the booklet ***Laboratory Safety Guidelines*** *for the Chemistry Laboratory*, ***sign a consent form***, which is located at the end of the guidelines, and then submit it to your instructor at the beginning of the first lab experiment.

- Failure to wear proper eye protection (goggles) ***whenever inside*** the laboratory after an experiment has started, will result in your both being dismissed from the lab class and given a grade of zero for the lab report.
- **Proper laboratory apparel** must be worn, including a lab coat and gloves. You are required to wear long pants or other article of clothing that COMPLETELY covers the entire length of the legs and feet. Therefore, shorts, capris, skirts, or open-toed shoes, such as sandals or flip-flops are strictly prohibited. That is to say; completely covered legs and feet are required to perform experiments. In addition, long hair should be tied back. The wearing of contact lenses is permitted only with a physician's note. Failure to follow the dress code will result in immediate dismissal from the lab.
- **Gloves** are worn in the lab for your safety; they should ***never*** be worn out of the lab and into the hallway, or any other place. Wearing contaminated gloves outside the lab can be a hazard to everyone around by transferring dangerous chemical residues to public areas and surfaces.
- **NO FOOD OR DRINK** allowed in the lab at any time. The lab is not a safe place to eat or drink. Being seen with any food or beverage will result in immediate dismissal from the lab.
- Chemicals should ***never*** be poured into the sink drains; proper waste containers are provided inside the fume hood. Moreover, sinks must be kept free of debris, like paper towels, hoses, clamps, broken glassware, etc.
- **NO UNAUTHORIZED EXPERIMENTATION.** Unauthorized experimentation is a danger to everyone in the lab. The only experimentation permitted is the written procedure of the experiment to be performed. All other experimentation is strictly prohibited.
- The lab may contain chemicals that students in other courses are using. Working with chemicals, no matter their source, other than the chemicals described in the experiment being performed, is strictly prohibited. **READ THE LABELS BEFORE USING ANY AND ALL CHEMICALS**. This includes but is not limited to different concentrations of the same chemical. It is a danger to everyone in the lab.

REQUIREMENTS FOR WRITING AN ACCEPTABLE LABORATORY REPORT

This is a writing intensive course and you are required to submit a well-written, detailed laboratory report. Well written implies that the report is carefully screened not only for scientific content but also for errors in spelling and grammar. The report must be typed. All laboratory reports are due one week following the completion of the experiment. Due to time constraints, this will not necessarily be the case at the end of the semester, and any changes to this policy will be announced by the TA in advance. There will be no exceptions to this rule. A lab report submitted after the deadline will be considered late and points will be deducted (see below).

Each student must submit his/her own laboratory report. The reports will be graded by your TA. While each member of a group shares all experimental results, the text of the report must be individually developed and presented. A good laboratory report is a logical and lucid account of all aspects of the experiment as detailed below. Please do not hand in a hurriedly stapled set of notes or a manuscript with a spacing less than 1.5 between lines, or a hand-written report.

Each lab report must include some combination of the following sections, as specified for each experiment:

1. **Title Page**

   This should include the course/number, the title of the section, your name and your lab partner's name, the date(s) the experiment was performed and the name of your TA.

2. **Abstract (10 points)**

   A brief summary of the entire experiment including your results and conclusions.

3. **Introduction (20 points)**

   Briefly describe all background information as well as the techniques or methods used in the experiment, when it is used and the type(s) of information provided. All reactions and schemes relevant to the experiment should also be included here.

   Describe in detail the experimental system that was studied and what specific question(s) are asked.

4. **Materials and Methods (5 points)**

   Include all materials and details necessary for someone to reproduce the experiment. Do not include "common" or "standard" practices.

Remember that a key component of a technical report is that someone else who has not done the experiment before should be able to follow your procedure and repeat the experiment.

5. **Results (15 points)**

The Data Analysis section of each experiment is designed to serve as a guide to the presentation of this section.

Include all of the data that you collected and all measurements that you made. Spectra, graphs, and tables should be properly oriented for ease of viewing and must be clearly and properly labeled. Students are encouraged to download data and images directly using a flash drive, and incorporate them directly into the lab report.

Present the results obtained for each experimental section with the appropriate error analysis.

6. **Discussion & Conclusion (25 Points)**

Discuss each figure systematically and in its entirety.

Discuss the deviations of your results versus the literature value(s) by analyzing the magnitude of the deviation, the trend and possible cause. Discuss whether the error is random or systematic and suggest how to minimize this error. Clearly state the conclusion of each experimental section, no matter how trivial it may seem.

Relate the results to the objectives of the laboratory exercise. State your findings and what is expected from the literature, with proper citations.

Comment on the overall success or failure of the lab. If the experiment did not work as expected, state so and speculate as to why this may have occurred.

Include proper literature citations. The main reference is your text. Additional references include any or all of the following, only if you have actually read the reference: Papers in the literature, other texts or handbooks. While citing on-line only journal articles, the complete journal reference should be included – not just the URL. *Wikipedia* may be a useful learning tool; it is **NOT** a legitimate reference.

7. **Appendix (10 points)**

All raw data, your original notes and observations should be included in an Appendix at the end of the lab report.

Data must be clearly labeled/annotated and properly oriented.

Include all formulae and calculations not discussed above.

8. **Pre Lab Questions (15 points)**

Must be completed before you begin an experiment.

Blackboard

- How to Log into Blackboard

  The "ACHM 449: Advanced Forensic Chemistry Laboratory I" Course is accessible through the Internet. To access courses for the first time (from home or campus), enter the following URL:

  https://blackboard.albany.edu/

  You will see a dialog box that requests your username and password. Your login credentials are the same as your MyUAlbany username and password. Typically the username is your initials followed by 6 numbers.

  Please contact the ITS helpdesk (LC-27 or 442-4000) if you are having trouble logging in.

Laboratory Policies

The following policies have been established in order to safely operate the laboratory and to give you the greatest amount of time to perform each experiment. These policies should be used in conjunction with the Laboratory Safety Guidelines *for the Chemistry Laboratory*.

Safety must always be the first priority in the *General Chemistry Laboratory*. All safety rules will be strictly enforced. You must wear your safety goggles in the laboratory at **all** times. Failure to wear proper eye protection while in the laboratory will result in your being both dismissed from the lab class and given a grade of zero for the entire experiment. Moreover, proper laboratory apparel must be worn, including a lab coat and gloves. If you observe anything that you deem as unsafe, please report it immediately to your instructor, so that the problem can be remedied. In the event of an accident in the lab, the instructor should be notified immediately.

All glassware will be placed on shelves/drawers in the lab and each student must obtain his or her items at the beginning of lab. **It is your responsibility to check that the glassware is in good condition BEFORE you start working with it. If you find an item is *broken* to begin with, you must alert the Teaching Assistant immediately.** Many of the glassware items are expensive, so use each item with care and be sure to clean all glassware used at the end of each experiment. When you have completed your laboratory work, you are responsible for returning your all your glassware in its original condition to where it came from. Dirty glassware and broken glassware may not be returned. Please inform your TA if something was broken.

Common sense and good safety practice require that side benches, hoods, and the lab equipment be kept clean. Any broken glass or spilled chemicals must be cleaned up immediately. Sinks must be kept free of debris such as paper towels, hoses, clamps, broken glassware, etc. You are responsible for cleaning your lab station by the end of each lab class. If your lab station is left in a mess or spills are not immediately wiped up then your instructor will deduct points from your lab report grade.

Chemicals should **never** be poured into the sink drains unless specifically authorized by the TA. Designated waste containers are provided inside the fume hood.

You are expected both to show courtesy toward fellow classmates and to respect the lab equipment that is provided. Anyone abusing any piece of furnished equipment will be charged for damages.

> "Reasonable accommodations will be provided for students with documented physical, sensory, systemic, cognitive, learning, and psychiatric disabilities. If you believe you have a disability requiring accommodation in this class, please notify the *Director of Disabled Student Services* (Campus Center 137, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations."

Your cooperation will be expected and required, so that the laboratory can operate as safely and efficiently as possible. If you have any problems concerning lab, please do not hesitate to contact the laboratory coordinator or the course instructor.

Academic Honesty

The policies, penalties, procedures and standards outlined in the *Undergraduate Bulletin* and in the *Policy on Community Rights & Responsibilities of University at Albany* will be followed. A failing grade is a possible result of academic dishonesty. Disruptive classroom behavior may result in lowering of a student's grade in accordance with the policies of the Dean of Undergraduate Studies. You are welcome to discuss any course-related problems with the chemistry faculty and staff members of the department.

You are welcome to discuss any course-related problems with the following chemistry staff members:

Lab Instructional Staff

Title	Name	Office	Telephone	E-mail
Lab Coordinator	Colin Henck	CH-309C	(44)2-4442*	chemlab@albany.edu
Assistant Lab Coordinator	Katie Saxton	CH-116(within CH-113)	(44)2-2622*	chemlab@albany.edu
Analytical Lab Associate	Jesse Carozza	CH-108(within CH- 113)	(44)2-4607*	chemlab@albany.edu
Organic Lab Associate	Kelli Allen	CH-108(within CH- 113)	(44)2-4607*	chemlab@albany.edu

Attendance

Laboratory attendance is **mandatory**. The course schedule is available on Blackboard. Always be sure you are prepared to do the lab on the day it is assigned to your section. If a student is absent (or anticipates an absence) from a lab class due to illness, family emergency, religious observance, or official university activity then he or she is urged to **make up** the laboratory experiment at another lab class—if possible, or else at the end of the semester. This rescheduling process is facilitated by your TA. A *Permission Notice* to attend another lab class will be issued by your TA and the TA that you will make up your lab with; admittance to another lab class will not be allowed without a *Permission Notice*. Office hours are the only time to get a permission notice for a make-up lab (appointments can be made well in advance in extenuating circumstances). Excuse documentation of the absence must be presented in order to make-up the experiment. Documentation must be turned in during office hours. Emailed and faxed documentation of an absence will be ignored.

*Note that each laboratory experiment is offered **only** during the days and times indicated on the experiment schedule and **cannot** be made up at any other time. Make-ups are available on a first come first serve basis.*

If a student misses multiple experiments and has written documentation, that student must see the lab coordinator at office hours in a timely manner. Excused absences will only be considered in the most extenuating circumstances and with the consent of the lab coordinator ONLY. **Under no circumstances will credit be awarded for the course if you are absent from more than two lab experiments. If a lab is missed but made-up, it will not be considered an absence.** A grade of incomplete will only be considered in the case of unforeseen circumstances and only with proper documentation. Students who are absent for any reason are still responsible for the missed information.

Lab Preparation

It is in your best interest to prepare for lab by reading all relevant material about the method utilized in the experiment from your lab manual and textbook. You are to work with your partner outside of lab to design your stepwise procedure efficiently and thoroughly before you are coming to lab. The lab manual procedure was not written in a stepwise manner. You must do that on your own so you will be able to divide the tasks between you and your lab partner. Preparation means all relevant information and calculations have to be understood and done before coming to lab. Any required calculations that are used during lab should be written down on the "experimentation notes" section in your lab notebook. All observations and data must be written in INK, pencil will not be accepted. The purpose of your lab manual/notebook is to act as a permanent, detailed reference for writing your lab report and performing final calculations. Your experimental notes are only useful if you record the information in an organized fashion. You must complete pre-lab questions before you come to the first day of the experiment.

Experimentation Note

- For each experiment, students must record all preliminary calculations, data, observation, results, and any other analysis in their lab notebook, hand it to the TA for an approval signature. All data must be recorded in the notes at the time the observation is made. Do not use scrap paper to temporary record data, it is not an effective way of collecting a large number of data, therefore, this habit should be eliminated. If a mistake is made in recording an observation, draw a single line through the incorrect entry and record the correct entry again, enter an explanation of the change. Do not make a big pile of ink all over your notes.
- All graphs such as calibration curves must be done in Excel on a computer. Graphs must include a descriptive title, points must be clearly plotted, and axes must be labeled (including units).
- Record the physical appearance of your samples; also take note of any real or suspected error.
- Any inadequate record of any determination may lead to rejection of the results. Make sure your TA looks over your data and initiate any discussion needed in regards of your data with the TA.

Cleaning Glassware – Very Important!

The quality of your results could be altered by the quality of how prepared you are in every step of the experiment including cleaning glassware. Be courteous to yourself and others sharing the same lab space as well as same equipment. Clean your glassware and equipment before and after each use throughout the semester. Normally, 3 – 4 small rinses with tap water, followed by 3 – 4 small rinses with DI water is sufficient. Residue from tap water contains substances that will interfere with your analyses as you will find out on the very first experiment. Soap is not really necessary in this course. If you need to use soap, you must rinse thoroughly with tap water to remove all traces of detergent when done. Always rinse the glassware over with DI water, remove any labels on the glassware before you use or put them away.

Week	Monday/Tuesday	Wednesday/Thursday
1	Syllabus, GC lecture, Intro to GC project	Exp 1: Intro to GC
2	**No Class**	Exp 2: GC Primary Maintenance
3	Exp 3: GC Method Development	Exp 4: GC Chlorohydrate
4	Exp 5: GC Caffeine Quant Day 1	Exp 5: GC Caffeine Quant Day 2
5	Exp 6: GC Number of Carbons	Exp 7: GC Headspace BAC
6	Exp 8: GC Arson Investigation	**No Class – Exp 7 Due**
7	GC Final Project Day 1 - Experimental	GC Final Project Day 2 – Experimental
8	**No Class**	GC Final Project Day 2 - Presentation
9	Rotation 1 Day 1	Rotation 1 Day 2
10	Rotation 1 Day 3	Rotation 1 Day 4
11	Rotation 2 Day 1	Rotation 2 Day 2
12	Rotation 2 Day 3	Rotation 2 Day 4
13	Rotation 3 Day 1	Rotation 3 Day 2
14	Rotation 3 Day 3	**No Class**
15	Rotation 3 Day 4	**Makeup Lab**
16	**No Class – Rotation 3 Due**	**No Class**

Rotation Experiment List:
GC MS of Controlled Substances
Voltammetry
Atomic Absorption Spectrometry
Biocatalytic Analysis of Alkaline Phosphatase Levels for Age Determination (UV/Vis)
Blood Alcohol Content Determination by Enzymatic Cascades (UV/Vis)
Solid Phase Extraction
Gender Determination of Fingerprints by Chemical Assays using UV/Vis

ACHM 449/549 Advanced Forensic Chemistry Lab II (2 credits)

Course Objectives: The goal of this course is to become proficient in forensic laboratory techniques which are used to accurately determine the concentration of various chemical substances (organic or inorganic) in various samples representative of forensic samples. **Prerequisite(s):** A CHM 448

Contact Information

Professor: Rabi Musah
Email: rmusah@albany.edu

Teaching Assistant:

- TBA
- TBA

- Office Hour: To be announced by TA or by appointment as necessary
- Office: Chemistry Learning Center CH-242

Course Materials: can be purchased in the *College of Arts and Sciences (C.A.S.) Laboratory Sciences* window (CH-B44)

- The Forensic Chemistry Lab Manual
- Equipment
  - PPE : Splash-Resistant Goggles, Lab Coat and Nitrile Gloves
  - Laboratory Safety Guidelines for the Chemistry Laboratory; University at Albany. Also, available in the lab manual.
    - ***A CHEMISTRY LABORATORY SAFETY CONSENT*** form in the back of the safety guidelines document ***must be signed*** and handed in to the TA ***prior to starting the first lab experiment.*** Any student without a signed consent will not be allowed to do experimentation.

Lab Report Submission: Lab reports must be typed and turned in on or before the due date through Blackboard. You will turn an electronic copy to Blackboard so it can be evaluated by the program SafeAssign for originality. SafeAssign accepts a variety of popular file formats including .docx and .pdf. The program allows instructors to evaluate written assignments for originality against Internet sources, other student submissions, academic databases, etc. While each member of a group shares all experimental results, the text of the report must be individually developed and presented. You will be able to see the SafeAssign report when you submit your paper. Please check the report and edit and resubmit your paper to avoid plagiarism. More details about lab report requirements are provided in the sections below.

Grading: Each lab report is graded out of 100 points and there are 4 rotation experiments this semester worth a total of 67% of the final grade. Your grade in the course is based on the final average of all lab reports and your score on the final project worth 200 points or 33% of the final grade. There are no quizzes or exams in this course. If a lab report is plagiarized as determined

by a SafeAssign report: First offense – lose 10 points and resubmission of a corrected report is required for a grade to be assigned. Subsequent offenses – lab report not accepted.

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
100-94	93-89	88-85	84-82	81-79	78-76	75-73	72-70	69-67	66-63	63-60	60-0

Course Description: Applications of the principles and methods discussed in A CHM 447 and a continuation of A CHM 448. Experiments chosen for A CHM 449 aid the student in developing a more detailed understanding of quantitative methods as they apply to forensics. Specifically, students will perform method development in solid phase extraction. Students will also perform atomic absorption and GC-MS experiments. This course will culminate in a final project where students will apply what they have learned to independently research a forensic chemistry problem. Statistical analysis of data will be performed.

Safety Goggles Policy

Splash-resistant safety goggles must be worn at all times during the experiment. Safety glasses are not permitted in the lab. Although you must be in the lab at the officially scheduled time, the experiment begins after the TA has presented the lab instructions. This means that after the TA is done presenting, safety goggles must be worn at all times.

Failure to wear goggles after the experiment has begun will result in immediate dismissal from the lab. A grade of zero will be given for the lab report and no make ups will be granted. Random spot checks will be done to ensure cooperation with this policy. If anyone is seen without goggles by the TA or the Lab Coordinator, he or she will be asked to leave and receive a zero. There are no acceptable excuses or exceptions to this policy. If you need to take your goggles off for any reason you must first leave the lab.

At the end of the experiment you must wear your safety goggles out your way out of the lab. Please remember to bring your goggles to lab each week.

This policy is the law and is designed for the safety of all students in the lab. If you have any questions or concerns please contact the Lab Coordinator in CH-309C.

Thank you for your cooperation,

Colin Henck

Lab Coordinator

Safety

Strict adherence to all safety rules is required including that from the Laboratory Safety Guidelines *for the Chemistry Laboratory,* safety video, lab manual, MSDS, signage in the lab and TA instruction. It is required that each student is aware of and working in accordance with all safety rules and regulations. If you are unsure or have questions about any safety rule or issue, it is your duty to ask the Lab Coordinator **BEFORE** performing the experiment. After (re)reading the booklet ***Laboratory Safety Guidelines*** *for the Chemistry Laboratory*, ***sign a consent form***, which is located at the end of the guidelines, and then submit it to your instructor at the beginning of the first lab experiment.

- Failure to wear proper eye protection (goggles) ***whenever inside*** the laboratory after an experiment has started, will result in your both being dismissed from the lab class and given a grade of zero for the lab report.
- **Proper laboratory apparel** must be worn, including a lab coat and gloves. You are required to wear long pants or other article of clothing that COMPLETELY covers the entire length of the legs and feet. Therefore, shorts, capris, skirts, or open-toed shoes, such as sandals or flip-flops are strictly prohibited. That is to say; completely covered legs and feet are required to perform experiments. In addition, long hair should be tied back. The wearing of contact lenses is permitted only with a physician's note. Failure to follow the dress code will result in immediate dismissal from the lab.
- **Gloves** are worn in the lab for your safety; they should ***never*** be worn out of the lab and into the hallway, or any other place. Wearing contaminated gloves outside the lab can be a hazard to everyone around by transferring dangerous chemical residues to public areas and surfaces.
- **NO FOOD OR DRINK** allowed in the lab at any time. The lab is not a safe place to eat or drink. Being seen with any food or beverage will result in immediate dismissal from the lab.
- Chemicals should ***never*** be poured into the sink drains; proper waste containers are provided inside the fume hood. Moreover, sinks must be kept free of debris, like paper towels, hoses, clamps, broken glassware, etc.
- **NO UNAUTHORIZED EXPERIMENTATION.** Unauthorized experimentation is a danger to everyone in the lab. The only experimentation permitted is the written procedure of the experiment to be performed. All other experimentation is strictly prohibited.
- The lab may contain chemicals that students in other courses are using. Working with chemicals, no matter their source, other than the chemicals described in the experiment being performed, is strictly prohibited. **READ THE LABELS BEFORE USING ANY AND ALL CHEMICALS**. This includes but is not limited to different concentrations of the same chemical. It is a danger to everyone in the lab.

REQUIREMENTS FOR WRITING AN ACCEPTABLE LABORATORY REPORT

This is a writing intensive course and you are required to submit a well-written, detailed laboratory report. Well written implies that the report is carefully screened not only for scientific content but also for errors in spelling and grammar. The report must be typed. All laboratory reports are due one week following the completion of the experiment. Due to time constraints, this will not necessarily be the case at the end of the semester, and any changes to this policy will be announced by the TA in advance. There will be no exceptions to this rule. A lab report submitted after the deadline will be considered late and points will be deducted (see below).

Each student must submit his/her own laboratory report. The reports will be graded by your TA. While each member of a group shares all experimental results, the text of the report must be individually developed and presented. A good laboratory report is a logical and lucid account of all aspects of the experiment as detailed below. Please do not hand in a hurriedly stapled set of notes or a manuscript with a spacing less than 1.5 between lines, or a hand-written report.

Each lab report must include some combination of the following sections, as specified for each experiment:

1. **Title Page**

   This should include the course/number, the title of the section, your name and your lab partner's name, the date(s) the experiment was performed and the name of your TA.

2. **Abstract (10 points)**

   A brief summary of the entire experiment including your results and conclusions.

3. **Introduction (20 points)**

   Briefly describe all background information as well as the techniques or methods used in the experiment, when it is used and the type(s) of information provided. All reactions and schemes relevant to the experiment should also be included here.

   Describe in detail the experimental system that was studied and what specific question(s) are asked.

4. **Materials and Methods (5 points)**

   Include all materials and details necessary for someone to reproduce the experiment. Do not include "common" or "standard" practices.

Remember that a key component of a technical report is that someone else who has not done the experiment before should be able to follow your procedure and repeat the experiment.

5. **Results (15 points)**

The Data Analysis section of each experiment is designed to serve as a guide to the presentation of this section.

Include all of the data that you collected and all measurements that you made. Spectra, graphs, and tables should be properly oriented for ease of viewing and must be clearly and properly labeled. Students are encouraged to download data and images directly using a flash drive, and incorporate them directly into the lab report.

Present the results obtained for each experimental section with the appropriate error analysis.

6. **Discussion & Conclusion (25 Points)**

Discuss each figure systematically and in its entirety.

Discuss the deviations of your results versus the literature value(s) by analyzing the magnitude of the deviation, the trend and possible cause. Discuss whether the error is random or systematic and suggest how to minimize this error. Clearly state the conclusion of each experimental section, no matter how trivial it may seem.

Relate the results to the objectives of the laboratory exercise. State your findings and what is expected from the literature, with proper citations.

Comment on the overall success or failure of the lab. If the experiment did not work as expected, state so and speculate as to why this may have occurred.

Include proper literature citations. The main reference is your text. Additional references include any or all of the following, only if you have actually read the reference: Papers in the literature, other texts or handbooks. While citing on-line only journal articles, the complete journal reference should be included – not just the URL. *Wikipedia* may be a useful learning tool; it is **NOT** a legitimate reference.

7. **Appendix (10 points)**

All raw data, your original notes and observations should be included in an Appendix at the end of the lab report.

Data must be clearly labeled/annotated and properly oriented.

Include all formulae and calculations not discussed above.

8. **Pre Lab Questions (15 points)**

Must be completed before you begin an experiment.

ACHM 449/549 Spring 2020 Schedule

Week	Dates	Monday/Tuesday	Wednesday/Thursday	Report Due Dates (One week after the last day of rotation)
1	Jan 20-24	**No Class**	Lab Syllabus Day	
2	Jan 27-Jan 30	Rotation 4 Day 1	Rotation 4 Day 2	
3	Feb 3 –6	Rotation 4 Day 3	Rotation 4 Day 4	
4	Feb 10-13	Rotation 5 Day 1	Rotation 5 Day 2	**Rotation 4**
5	Feb 17-20	Rotation 5 Day 3	Rotation 5 Day 4	
6	Feb 24-27	Rotation 6 Day 1	Rotation 6 Day 2	**Rotation 5**
7	March 2-5	Rotation 6 Day 3	Rotation 6 Day 4	
8	March 9-12	Rotation 7 Day 1	Rotation 7 Day 2	**Rotation 6**
9	March 16-19	**No Class**	**No Class**	
10	March 23-26	Rotation 7 Day 3	Rotation 7 Day 4	
11	March 30 - April 2	Project Day 1	Project Day 2	**Rotation 7**
12	April 6-9	Project Day 3	Project Day 4	
13	April 13-16	Project Day 5	Project Day 6	
14	April 20-23	Project Day 7[1]	Project Day 8	
15	April 27-30	Project Day 9	**Makeup Day**	
16	May 4-5	Project Day 10 - Presentation	**No Class**	**Final Project Report due on Day 10**

Rotation Experiment List:
GC MS of Controlled Substances
Voltammetry
Atomic Absorption Spectrometry
Biocatalytic Analysis of Alkaline Phosphatase Levels for Age Determination (UV/Vis)
Blood Alcohol Content Determination by Enzymatic Cascades (UV/Vis)
Solid Phase Extraction
Gender Determination of Fingerprints by Chemical Assays using UV/Vis

Final Project:
The final project is a student designed research project consisting of experimental development, data collection, data analysis, a final lab report, and a presentation.

Blackboard

- How to Log into Blackboard

  The "ACHM 449: Advanced Forensic Chemistry Laboratory I" Course is accessible through the Internet. To access courses for the first time (from home or campus), enter the following URL:

  https://blackboard.albany.edu/

  You will see a dialog box that requests your username and password. Your login credentials are the same as your MyUAlbany username and password. Typically the username is your initials followed by 6 numbers.

  Please contact the ITS helpdesk (LC-27 or 442-4000) if you are having trouble logging in.

Laboratory Policies

The following policies have been established in order to safely operate the laboratory and to give you the greatest amount of time to perform each experiment. These policies should be used in conjunction with the Laboratory Safety Guidelines *for the Chemistry Laboratory*.

Safety must always be the first priority in the *General Chemistry Laboratory*. All safety rules will be strictly enforced. You must wear your safety goggles in the laboratory at **all** times. Failure to wear proper eye protection while in the laboratory will result in your being both dismissed from the lab class and given a grade of zero for the entire experiment. Moreover, proper laboratory apparel must be worn, including a lab coat and gloves. If you observe anything that you deem as unsafe, please report it immediately to your instructor, so that the problem can be remedied. In the event of an accident in the lab, the instructor should be notified immediately.

All glassware will be placed on shelves/drawers in the lab and each student must obtain his or her items at the beginning of lab. **It is your responsibility to check that the glassware is in good condition BEFORE you start working with it. If you find an item is *broken* to begin with, you must alert the Teaching Assistant immediately.** Many of the glassware items are expensive, so use each item with care and be sure to clean all glassware used at the end of each experiment. When you have completed your laboratory work, you are responsible for returning your all your glassware in its original condition to where it came from. Dirty glassware and broken glassware may not be returned. Please inform your TA if something was broken.

Common sense and good safety practice require that side benches, hoods, and the lab equipment be kept clean. Any broken glass or spilled chemicals must be cleaned up immediately. Sinks must be kept free of debris such as paper towels, hoses, clamps, broken glassware, etc. You are responsible for cleaning your lab station by the end of each lab class. If your lab station is left in a mess or spills are not immediately wiped up then your instructor will deduct points from your lab report grade.

Chemicals should **never** be poured into the sink drains unless specifically authorized by the TA. Designated waste containers are provided inside the fume hood.

You are expected both to show courtesy toward fellow classmates and to respect the lab equipment that is provided. Anyone abusing any piece of furnished equipment will be charged for damages.

> "Reasonable accommodations will be provided for students with documented physical, sensory, systemic, cognitive, learning, and psychiatric disabilities. If you believe you have a disability requiring accommodation in this class, please notify the *Director of Disabled Student Services* (Campus Center 137, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations."

Your cooperation will be expected and required, so that the laboratory can operate as safely and efficiently as possible. If you have any problems concerning lab, please do not hesitate to contact the laboratory coordinator or the course instructor.

Academic Honesty

The policies, penalties, procedures and standards outlined in the *Undergraduate Bulletin* and in the *Policy on Community Rights & Responsibilities of University at Albany* will be followed. A failing grade is a possible result of academic dishonesty. Disruptive classroom behavior may result in lowering of a student's grade in accordance with the policies of the Dean of Undergraduate Studies. You are welcome to discuss any course-related problems with the chemistry faculty and staff members of the department.

You are welcome to discuss any course-related problems with the following chemistry staff members:

Lab Instructional Staff

Title	Name	Office	Telephone	E-mail
Lab Coordinator	Colin Henck	CH-309C	(44)2-4442*	chemlab@albany.edu
Assistant Lab Coordinator	Katie Saxton	CH-116(within CH-113)	(44)2-2622*	chemlab@albany.edu
Analytical Lab Associate	Jesse Carozza	CH-108(within CH- 113)	(44)2-4607*	chemlab@albany.edu
Organic Lab Associate	Kelli Allen	CH-108(within CH- 113)	(44)2-4607*	chemlab@albany.edu

Attendance

Laboratory attendance is **mandatory**. The course schedule is available on Blackboard. Always be sure you are prepared to do the lab on the day it is assigned to your section. If a student is absent (or anticipates an absence) from a lab class due to illness, family emergency, religious observance, or official university activity then he or she is urged to **make up** the laboratory experiment at another lab class—if possible, or else at the end of the semester. This rescheduling process is facilitated by your TA. A *Permission Notice* to attend another lab class will be issued by your TA and the TA that you will make up your lab with; admittance to another lab class will not be allowed without a *Permission Notice*. Office hours are the only time to get a permission notice for a make-up lab (appointments can be made well in advance in extenuating circumstances). Excuse documentation of the absence must be presented in order to make-up the experiment. Documentation must be turned in during office hours. Emailed and faxed documentation of an absence will be ignored.

*Note that each laboratory experiment is offered **only** during the days and times indicated on the experiment schedule and **cannot** be made up at any other time. Make-ups are available on a first come first serve basis.*

If a student misses multiple experiments and has written documentation, that student must see the lab coordinator at office hours in a timely manner. Excused absences will only be considered in the most extenuating circumstances and with the consent of the lab coordinator ONLY. **Under no circumstances will credit be awarded for the course if you are absent from more than two lab experiments. If a lab is missed but made-up, it will not be considered an absence.** A grade of incomplete will only be considered in the case of unforeseen circumstances and only with proper documentation. Students who are absent for any reason are still responsible for the missed information.

Lab Preparation

It is in your best interest to prepare for lab by reading all relevant material about the method utilized in the experiment from your lab manual and textbook. You are to work with your partner outside of lab to design your stepwise procedure efficiently and thoroughly before you are coming to lab. The lab manual procedure was not written in a stepwise manner. You must do that on your own so you will be able to divide the tasks between you and your lab partner. Preparation means all relevant information and calculations have to be understood and done before coming to lab. Any required calculations that are used during lab should be written down on the “experimentation notes” section in your lab notebook. All observations and data must be written in INK, pencil will not be accepted. The purpose of your lab manual/notebook is to act as a permanent, detailed reference for writing your lab report and performing final calculations. Your experimental notes are only useful if you record the information in an organized fashion. You must complete pre-lab questions before you come to the first day of the experiment.

Experimentation Note

- For each experiment, students must record all preliminary calculations, data, observation, results, and any other analysis in their lab notebook, hand it to the TA for an approval signature. All data must be recorded in the notes at the time the observation is made. Do not use scrap paper to temporary record data, it is not an effective way of collecting a large number of data, therefore, this habit should be eliminated. If a mistake is made in recording an observation, draw a single line through the incorrect entry and record the correct entry again, enter an explanation of the change. Do not make a big pile of ink all over your notes.
- All graphs such as calibration curves must be done in Excel on a computer. Graphs must include a descriptive title, points must be clearly plotted, and axes must be labeled (including units).
- Record the physical appearance of your samples; also take note of any real or suspected error.
- Any inadequate record of any determination may lead to rejection of the results. Make sure your TA looks over your data and initiate any discussion needed in regards of your data with the TA.

Cleaning Glassware – Very Important!

The quality of your results could be altered by the quality of how prepared you are in every step of the experiment including cleaning glassware. Be courteous to yourself and others sharing the same lab space as well as same equipment. Clean your glassware and equipment before and after each use throughout the semester. Normally, 3 – 4 small rinses with tap water, followed by 3 – 4 small rinses with DI water is sufficient. Residue from tap water contains substances that will interfere with your analyses as you will find out on the very first experiment. Soap is not really necessary in this course. If you need to use soap, you must rinse thoroughly with tap water to remove all traces of detergent when done. Always rinse the glassware over with DI water, remove any labels on the glassware before you use or put them away.

INTRODUCTION TO MEDICINAL CHEMISTRY AND PHARMACOLOGY

ACHM 458; Class Numbers 10482

MWF 8:45 – 10:05 am (3 credits)

Professors Rabi Musah and Alexander Shekhtman

Class Location: Chemistry B-18

Office Hours:

Musah: 10:30 – 11:30 am on Monday and by appointment (in Chem. 222)
Shekhtman: 10:00 am – Noon on Friday and by appointment (in LSRB 1149)

Phone:

Musah: 518-437-3740 (when on campus, dial 7-3740)
Shekhtman: 518-442-4163 (when on campus, dial 3-4163)

E-mail:

Musah: rmusah@albany.edu
Shekhtman: ashekthman@albany.edu

Text: *An Introduction to Medicinal Chemistry*, 5th Ed. By Graham L. Patrick

Prerequisites: Both a full year of organic chemistry (ACHM 221) as well as biochemistry (ACHM 442) are essential prerequisites for this course. It will be ***extremely difficult*** to pass this course without a thorough knowledge of both. **It is your responsibility to make sure that you are well versed in organic and chemistry.** Topics from biochemistry that are particularly relevant include but are not limited to: amino acids and their characteristics; proteins and protein structure; enzymes and enzyme kinetics; small molecule/enzyme interactions; nucleic acid structure; and cloning (i.e. site-directed mutagenesis). *If these topics are unfamiliar to you, you should delay taking this course until you have taken courses in which these topics are covered in detail.*

Course Description: Medicinal chemistry is an interdisciplinary course at the interface of chemistry and pharmacy and is involved with designing, synthesizing and developing pharmaceutical drugs.
Learning Objectives: Students will learn the following topics: molecular modeling, rational drug design, combinatorial chemistry, QSAR, and cheminformatics.
Instruction: The first half of this course will be covered by Professor Alex Shekhtman and the second half by Professor Rabi Musah. The schedule shown below for the dates on which various topics will be covered is TENTATIVE. We may be behind or ahead of this schedule at any given time.

The following topics will be covered during the first half:

Jan	23	Introduction	189-212	(CH 12)
	25	Structure Activity Relationships, SAR	215-226	(CH 13)
	30	Quantitative Structure Activity Relationship, QSAR	383-404	(CH 18)
Feb	1	Combinatorial Synthesis, solid phase techniques	313-331	(CH 16)

	6	Protein Synthesis, Homework Assignment	17-28, slides (CH 2)
	8	RNA aptamers	slides
	13	High throughput screening (*in vivo* assays)	195-199, slides (CH 12)
	15	High throughput screening (*in vitro* assays)	195-199, slides (CH 12)
	20	Exam#1	
	22	*In silico* protein design	337-356 (CH 17)
	27	Docking procedures	356-366 (CH 17)
March	1	AUTODOCK TOOLS, Basics	slides
	6	AUTODOCK VINA, Docking procedure	slides
	8	Analysis of Docking Results, Autodock assignment	slides

The following topics will be covered during the second half (***Note:*** *Interspersed with the material covered in class will be in-class and take-home assignments*).

March	20	Enzymes: structure and function; Receptors structure & Function	(CH 3/4)
	22	Receptors: signal transduction	(CH 5)
	27	Nucleic acids: structure and function; Enzymes as drug targets	(CH 6/7)
	29	Receptors as drug targets	(CH 8)
April	3	Nucleic acids as drug targets	(CH 9)
	5	Miscellaneous drug targets	(CH 10)
	10	Pharmacokinetics	(CH 11)
	19	Getting a drug to market	(CH 15)
	24	Case study—Phosphodiesterase inhibitors	
	26	Case study—Statins	
May	1	Case study—Opioids	
	3	Case study—Anticancer agents	

8 Case study—Cholinergics, anticholinergics and anticholinesterases

10 Case study—Antidepressant agents

TBA (Final exam)

Attendance: You are required to attend all lectures, even though attendance may not be formally monitored. You are responsible for all material covered during lectures whether or not you are present. ***If you are absent from class, you should find out what was covered from your classmates, not us. We give each lecture only once.***

Lecture format: Lectures will include chalk talks, discussions, powerpoint slides, and group work.

Exams/Grading: **There will be homework and in-class assignments (100 pts total), 3 exams (one in Professor Shekhtman's part and 2 in Professor Musah's—300 points in total) and one "Docking" project (100 points). The date of each exam is either listed above or will be announced at least 1 week prior to the exam date.** The final grade in the class for students will be based on performance on exams and the assignments.

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
100-94	93-89	88-85	84-82	81-79	78-76	75-73	72-70	69-67	66-63	63-60	60-0

Academic Dishonesty:
DEFINITIONS OF ACADEMIC DISHONESTY:

1.1 CHEATING:

Cheating is the act of obtaining or attempting to obtain credit for academic or research work through the use of any dishonest, deceptive, or fraudulent means. It includes but is not limited to copying and claiming as one's own, work that one has not done, or willfully allowing someone else to claim the work as work he or she has done.

1.2 PLAGIARISM

Plagiarism is the act of representing the work of another as one's own without appropriate references, and submitting it to fulfill academic and/or research requirements.

It should be noted especially that anyone who helps someone else to cheat in any way is considered equally culpable.

CONSEQUENCES
Cheating during any exam will result in an automatic E in this course at the end of the semester as well as prosecution. ***Depending on the exam, a scientific calculator may be needed. Calculators that are components of devices that have internet access or memory storage are not be allowed.***

ACHM 470 (3 credits), Fall Semester
X-ray Crystallography
(Structure Analysis by Single-Crystal X-ray Diffraction for Practicing Chemists)
Tuesday, Thursday 1:15 – 2:35, CH 018

Instructor:	Prof. Evgeny V. Dikarev
Office:	CH 315
Phone:	442-4401
e-mail:	edikarev@albany.edu
Office hours:	Tuesday, Thursday 3:00 – 4:00, or by appointment

Instructor for practical work:	Dr. Zheng Wei
Office:	CH 220
Phone:	442-4428
e-mail:	zwei@albany.edu
Office hours:	Monday, Wednesday 1:30 – 2:30, or by appointment

Prerequisites: Permission of instructor

Required texts (available in the University Bookstore):
1. W. Massa. *Crystal Structure Determination*. Springer, 2004 2nd Ed.

Additional materials (available from instructor):
1. *International Tables for Crystallography.* Volume A, Th. Hahn, ed., Kluwer Academic Publishers, 2002.
2. *SHELXTL Reference Manual.* V.5.1., Bruker AXS, 2002.
3. Tutorials and manuals on different aspects of crystallography from crystal growth to structure solution and refinement in ppt and pdf formats.

Additional texts (available in the University Science Library):
1. G. H. Stout, L. H. Jensen. *X-ray Structure Determination. A Practical Guide.* 2nd Ed., John Wiley & Sons, 1989. **QD 945 S8**
2. M. F. C. Ladd, R. A. Palmer. *Structure Determination by X-ray Crystallography.* 3rd Ed., Plenum Press, 1993. **QD 945 L32**
3. J. D. Dunitz. *X-ray Analysis and the Structure of Organic Molecules.* 2nd Ed., HVCA, 1995. **QD 945 D84**
4. P. Luger. *Modern X-ray Analysis on Single Crystal.* Walter de Gruyter, 1980. **QD 945 L77**
5. M. W. Woolfson. *An Introduction to X-ray Crystallography.* Cambridge University Press, 1997. **QD 945 W58**
6. W. Borchardt-Ott. *Crystallography.* 2nd Ed., Springer-Verlag, 1995. **QD 905.2 B713**
7. G. Rhodes. *Crystallography Made Crystal Clear*, 3rd Edition: A Guide for Users of Macromolecular Models. Academic Press (1st and 2nd editions are available).

Highly recommended text as an additional guide to SHELXTL Reference Manual (not available in the University Science Library):
1. P. Müller, Ed. *Crystal Structure Refinement. A Crystallographer's Guide to SHELXL.* Oxford Science Publications, 2006.

Learning Objectives:

This course will cover the geometry and structure of crystalline solids and methods of importance in their investigation. Internal and external symmetry properties as a consequence of atomic types and bonding possibilities: lattice types and space groups, x-ray diffraction, and optical techniques.

This course will include lectures, real-time demonstrations, practical crystallographic work, and reports of structure refinement results by students.

Each student will select single crystal, collect X-ray data, and solve a crystal structure. The crystal might be from your own research, from the project of your research group, or from other research groups in the Department. In the end of semester, each student in CHM 570 class will make a presentation (15-20 minutes) on the crystal structure solved. All students (CHM 470/570) are required to submit a final report on crystal structure solution.

Grading: Grades will be based on the final average of each student. Each student average will be calculated from the quiz (50 points – **14%** of overall grade), two exams (100 points each – **57%** of overall grade), practical work (100 points – **29%** of overall grade). ***Graduate students enrolling in ACHM 570 will also be graded on presentation of crystallographic results (50 points, ACHM 570 only)***

Examinations may include questions related to anything presented during lectures, whether that information is in the text or not. The examinations will consist of multiple choice, short answer and work out the answer questions. The quiz and first examination will cover the "theoretical" part of the course (10-11 first lectures). The second exam will be primarily devoted to the "practical" crystallography problems.

Tentative Schedule and Course Program

August 28 (Tue.)	Introduction to X-ray Crystallography. Crystal growth and selection.
August 30 (Th.)	Unit cells and crystal lattices. Crystal systems. Lattice symmetry.
September 4 (Tue.)	14 Bravais lattices.
September 6 (Th.)	X-ray data collection. Single crystal X-ray diffractometer.
September 11 (Tue.)	X-ray diffraction. Miller indices. Laue and Bragg equations.
September 13 (Th.)	**Quiz.**
September 18 (Tue.)	Reciprocal lattice. Ewald sphere. Diffractometry.
September 20 (Th.)	Structure factor amplitudes. Symmetry in three dimensions.
September 25 (Tue.)	Space groups.
September 27 (Th.)	Space groups.
October 2 (Tue.)	Systematic absences. Space group assignment.
October 4 (Th.)	Space group assignment and structure solution using SHELXTL.
October 9 (Tue.)	Patterson function and direct methods for structure solution.

October 11 (Th.)	**Test 1.**
October 16 (Tue.)	Real-time demonstration of crystal structure solution.
October 18 (Th.)	Least squares structure refinement.
October 23 (Tue.)	Electron density syntheses. Difference Fourier maps.
October 25 (Th.)	Real-time demonstration of crystal structure refinement.
October 30 (Tue.)	Bond length and angle calculations, estimation of errors in derived parameters.
November 1 (Th.)	Refinement of disordered structures.
November 6 (Tue.)	Interpretation and analysis of results. Searching the crystallographic databases.
November 8 (Th.)	Preparation of the CIF file.
November 13 (Tue.)	Refinement of hydrogen atoms.
November 15 (Th.)	Publication of X-ray crystal structures.
November 20 (Tue.)	Structure calculations.
November 22 (Th.)	No class.
November 27 (Tue.)	Preparation for the test.
November 29 (Th.)	**Test 2.**
December 4 (Tue.)	Presentations by students.
December 6 (Th.)	Presentations by students.

Course Description: The geometry and structure of crystalline solids and methods of importance in their investigation. Internal and external symmetry properties as a consequence of atomic types and bonding possibilities: lattice types and space groups, x-ray diffraction, and optical techniques. This course will include real-time demonstrations and practical crystallographic work, including the opportunity to work on a provided structural experiment or a crystal from an undergraduate research project.

Grade Scale:

A	> 93%	C	73 - 76%
A-	90 - 92%	C-	70 - 72%
B+	87 - 89%	D+	67 - 69%
B	83 - 86%	D	63 - 66%
B-	80 - 82%	D-	60 - 62%
C+	77 - 79%	E	< 60%

Syllabus

FALL SEMESTER

AChm 471 Theory and Techniques of Biophysics and Biophysical Chemistry
General Information for Students (3 credits)

TTh 4:15PM - 5:35PM, CH-0018

Prof. Alexander Shekhtman
Office: LSRB 1149
Phone: 442-4163
Email ashekhta@albany.edu
Office hours: Friday 9:00 AM - 11:00 AM

This course is designed to provide the foundation of spectroscopic techniques widely used for the characterization of - primarily - biomolecules. The course requires a basic knowledge of all the main branches of chemistry, Physical, Organic and Inorganic, as well as quantum mechanics. Students are required to have sufficient knowledge of Physical Chemistry/Biophysical Chemistry (at the level of ACHM 350/351 and/or ACHM 444/445).

There will be two lecture periods per week. A tentative lecture schedule is given at the end of this syllabus. The actual schedule will depend on the pace we are able to maintain in class.

The first part of the course is on NMR spectroscopy. The recommended text for the NMR section of this course is:

"Protein NMR spectroscopy" by Cavanagh, Fairbrother, Skelton, and Palmer. You should be able to purchase this at the University Bookstore. The NMR text is also available on amazon.com http://www.amazon.com/Protein-NMR-Spectroscopy-Principles-Practice/dp/012164491X/ref=sr_1_1/104-0724167-7116766?ie=UTF8&s=books&qid=1187616452&sr=8-1.

In the second part of this course the emphasis shifts to surveying some frequently-used spectroscopic techniques such as Circular Dichroism, fluorescence, and Vibrational spectroscopy (IR and Raman). There is no text for this segment but relevant materials will be posted on blackboard and also presented in class. In the case of fluorescence, the 2nd and 3rd editions of the following book have been placed on reserve at the Science Library for your use, with borrowing privileges of 48 hours.

"Principles of fluorescence spectroscopy" by J.R. Lakowicz

Please note that it is your responsibility to check the blackboard system regularly to keep pace with all the materials posted, and to bring any problems you encounter to the attention of Dr. Shekhtman.

Learning Objectives: Students will learn the foundation of spectroscopic techniques widely used for the characterization of - primarily - biomolecules. Students will also learn how to apply some of the common spectroscopic techniques for the analysis of biopolymers and other molecules.

Course Description: Introduction to basic theory and general applications of spectroscopic methods in biophysics and biochemistry. Discussion will be based on classical and quantum mechanical approach. Topics include: nuclear magnetic resonance spectroscopy, absorption and fluorescence spectroscopy, and vibrational spectroscopy; determination of structure by diffraction and scattering techniques.

Prerequisites: ACHM 350 and 351 or APHY 450, and permission of instructor

Lectures: Students are expected to attend all lectures. The material presented on the lectures will focus the student's attention on the most important topics and cannot be substituted by merely reading a textbook.

In-class tests and Projects: There will be one 30-40 minute quiz and one in-class test during both Parts - I and II of this course, which will account for 30% of the final grade. Both parts of the course will contain an additional project which will account for 20% of the final grade.

Graduate Students will have to do two term papers (one on NMR and the second on any one of the spectroscopy topics discussed in Part-II), which will test their understanding of the subject literature. It will be counted towards 10% of the final grade. Undergraduate students may elect to do this project for extra credit.

Examinations and Grading: Examinations will include questions similar to the test and will be related to anything presented during lectures, posted on blackboard, or drawn from the assigned papers. The final examination will be given on December 20th as indicated on the registrar's website and noted below.

Letter Grades for Students will be assigned based on the overall average, as follows:

Part-I	**Part-II**
In-class quiz - 10 points	In-class quiz - 10 points
In-class test - 20 points	In-class test - 20 points
NMR project - 30 points	Spectroscopy project - 30
Final Exam - 40 points	Final Exam - 40 points

Grade Scale: The following grading scale will be used to determine your grade.

A	(93%)	A-	(90%)
B+	(87%)	B	(83%)
B-	(80%)	C+	(77%)
C	(73%)	C-	(70%)
D+	(67%)	D	(63%)
D-	(60%)	E	(<60%)

Students are encouraged to do a term paper to earn up to 10 bonus points.
There is no other mechanism for extra credit in this course.

Class Rules

While in class, please be courteous and professional towards your classmates as well as your professors. *Cell phones must be turned off during class.* Talking and discussing must be kept to a minimum during lecture, except during scheduled group discussion or activity. Your comments regarding the course are important, and you are fully encouraged to voice your opinions and offer suggestions for improvement.

Part-I NMR Spectroscopy

Date/Day	Subject/Chapter or Other info.	
Aug. 27/T	Spin in electromagnetic field I	2.1 C-P
Aug. 29/Th	One pulse experiment	2.4 C-P
Sept. 3/T	Data processing	3.3 C-P
Sept. 5/Th	**Classes Suspended**	**Rosh Hashanah**
	NMR spectrometer	3.1 C-P
Sept. 10/T	NMR spectrometer	3.1 C-P
Sept. 12/Th	NMR Relaxation & Chemical Exchange	5.1 C-P, 5.6 C-P
Sept. 17/T	**Quiz (30-40 min),** NMR Relaxation & Chemical Exchange continued	
Sept. 19/Th	Spin systems in liquids	2.5, 2.6 C-P
Sept. 24/T	Product Operator Formalism	2.7 C-P
Sept. 26/Th	FT-NMR	3.2-3.3 C-P
Oct. 1/T	COSY, TOCSY, and NOESY Experiments	6.2, 6.5, 6.6 C-P
Oct. 3/Th	COSY, TOCSY, and NOESY Experiments continued	6.2, 6.5, 6.6 C-P
Oct. 8/T	Heteronuclear NMR experiments	7.1 7.2 C-P
Oct. 10/Th	**In-class test**	
Oct. 15/T	Introduction to NMR assignments I	10.1 C-P
Oct. 17/Th	Introduction to NMR assignments II	10.1 C-P

Part-II Other Spectroscopic Techniques

Oct. 22/T	Overview of Part - II & Basic Principles of Circular Dichroism
Oct. 24/Th	Circular Dichroism of Proteins and Nuclei Acids
Oct. 29/T	Review of Fluorescence Basics, Steady-State Methods
Oct. 31/Th	Anisotropy, Time-Resolved Fluorescence
Nov. 5/T	Fluorescence Resonance Energy Transfer
Nov. 7/Th	**Quiz (30-40 min), Applications**
Nov. 12/T	Vibrational Spectroscopy: Basic Principles of IR and Raman spectroscopy
Nov. 14/Th	Infrared Spectroscopy
Nov. 19/T	Infrared Spectroscopy, Raman Spectroscopy

Nov. 21/Th		Raman Spectroscopy	
Nov. 26/T		Applications	
Nov. 28/Th		**Classes Suspended**	**Thanksgiving Break**
Dec. 3/T		**In-class test**	
Dec. 5/Th	**Part-II**	**TERM PAPER DUE**	
Dec. 10/T		Last day of classes, Review for the final exam and any remaining items.	

Final Examination

Dec. 18/W	**1:00 - 3:00 PM**	**Final examination**	**CH-0018**

COURSE SYLLABUS
Experimental Methods of Organic Structure Elucidation
ACHM 472 (3 credits) I
NSTRUCTOR: Professor Rabi Musah

Meeting Time: Mondays/Wednesdays 8:45-10:05 am
Location: Chemistry B 18

Instructor: Professor Rabi Musah
Office: Chem 222
Phone: 437-3740 (on campus, dial 7-3740).
E-mail: rmusah@albany.edu

Office hours: Tuesdays Mondays 10:30 – 11:30 am, and by appointment
Text: There is no required text. I will share with you my extensive notes, provide assigned readings, and draw your attention to recommended texts.

Prerequisites: ACHM 221, 223, and permission of instructor
Background reading: As assigned.
Course Description: Discussion of modern methods of organic structure determination such as multinuclear NMR and 2D-NMR techniques, IR spectroscopy, and mass spectrometry. Interpretation and correlation of spectral results in order to assign structures of organic, biological, and related molecules.

Learning Objectives: Students will learn modern methods of organic structure determination such as multinuclear NMR and 2D-NMR techniques, IR spectroscopy, and mass spectrometry. Interpretation and correlation of spectral results in order to assign structures of organic, biological, and related molecules

Attendance: You are required to attend all lectures, even though attendance may not be formally monitored. You are responsible for all material covered during lectures whether or not you are present. **If you are absent from class, you should find out what was covered from your classmates, not me. I give each lecture only once**.

Lecture format: In general, lectures will be presented using power point slides, board work, and handouts. Numerous problems will be done in class.

Electronic Devices: All electronic devices including but not limited to cell phones, blackberries, pagers, tablet PCs, mobile presenters, wireless tablets, digital recorders, beepers, palms, Ipods, Ipads, MP3 players, texting calculators, camera phones, and digital cameras or laptops, are not to be used during class unless I have authorized their use. If I give you permission to use a personal computer and/or other electronic device for note-taking or text book access, that device can only be used in class for these purposes, and ***you must sit on the front row if you choose to use the device***. Violation of these rules will result in immediate dismissal from class. **Unless I give you permission to do so, you are not allowed to use an electronic device of any kind, including a calculator, on any exam**. **Doing so will be considered to be cheating and will result in a grade of zero for that exam.**

Exams/Grading: **You will be given three exams during the course of the semester.** You will also be given a series of class assignments that will add up to a total of 100 points, and this will count as one test grade. Exams therefore cumulatively comprise 75%, and assignments are 25% of the overall grade.

GRADING SCALE
A = 100-93 | A- = 92-90 | B+ = 89-87 | B = 86-83 | B- = 82-80 |C+ = 79-77 | C = 76-73 | C- = 72-70 | D = 69-65 | E = Below 65 points

FINAL EXAM: **TBA.**

Topics tentatively scheduled to be covered:

Infrared Spectrometry

1. *Theory*
2. *Instrumentation*
3. *Sample handling*
4. *Characteristic group absorptions*
    a. *Normal alkanes*
    b. *Branched alkanes*
    c. *Cyclic alkanes*
    d. *Alkenes*
    e. *Alkynes*
    f. *Mononuclear aromatic hydrocarbons*
    g. *Polynuclear aromatic hydrocarbons*
    h. *Alcohols and phenols*
    i. *Ethers, epoxides and sulfides*
    j. *Ketones*
    k. *Aldehydes*
    l. *Carboxylic acids*
    m. *Carboxylate anion*
    n. *Esters and lactones*
    o. *Acid halides*
    p. *Carboxylic acid anhydrides*
    q. *Amides and lactams*
    r. *Amines*
    s. *Amine salts*
    t. *Amino acids and salts of amino acids*
    u. *Nitriles*
    v. *Isonitriles, cyanates, isocyantes, thiocyanates and isothiocyanates*
    w. *Diazo compounds*
    x. *Nitro compounds*
    y. *Organosulfur compounds*
    z. *Organic halogen compounds*

Mass Spectrometry

1. *Instrumentation*
    a. *Magnetic field only*

   b. *Double focusing*
   c. *Quadrupole mass filter*
   d. *Ion trap*
   e. *Time of flight*
   f. *Fourier transform-ion cyclotron resonance*
   g. *Tandem mass spectrometry*
   h. *Ambient Mass Spectrometry*
2. *Determination of a Molecular formula*
   a. *Stable isotopes: classification according to natural abundance*
   b. *A + 2 elements*
   c. *A + 1 elements*
   d. *Rings and double bonds*
   e. *Deducing elemental compositions*
3. *Recognition of the molecular ion peak*
   a. *Chemical ionization*
   b. *Fast atom bombardment*
   c. *Electrospray ionization*
   d. *Matrix assisted laser desorption ionization (MALDI)*
   e. *Requirements of the molecular ion*
   f. *Odd-electron ions*
   g. *The nitrogen rule*
   h. *Relative importance of peaks*
   i. *Logical neutral losses*
   j. *Molecular ion abundance vs. structure*
4. *Basic mechanisms of ion fragmentation*
   a. *Unimolecular ion decompositions*
   b. *Factors that influence ion abundance*
   c. *Reaction initiation at radical or charge sites*
   d. *Sigma bond dissociations*
   e. *Alpha cleavage*
   f. *Inductive cleavage*
   g. *Decompositions of cyclic structures*
   h. *Radical site rearrangements*
   i. *Charge-site rearrangements*
5. *Mass spectra of common compound classes*
   a. *Hydrocarbons*
   b. *Hydroxy compounds*
   c. *Ethers*
   d. *Aldehydes and ketones*
   e. *Esters*
   f. *Acids, anhydrides and lactones*
   g. *Thiols and sulfides*
   h. *Amines*
   i. *Amides*
   j. *Nitrile and nitro compounds*
   k. *Aliphatic halides*

l. *Natural products*

Nuclear Magnetic Resonance Spectrometry

1. *Continuous wave NMR spectrometry*
2. *Relaxation*
3. *Pulsed Fourier transform spectrometry*
4. *Rotating frame of reference*
5. *Instrumentation and sample handling*
6. *Chemical Shift*
7. *Spin coupling*
8. *Protons on oxygen, nitrogen and sulfur*
9. *Protons on or near chlorine, bromine or iodine nuclei*
10. *Chemical shift equivalence*
11. *Magnetic equivalence*
12. *AMX, ABX and ABC rigid systems with three coupling constants*
13. *Chirality*
14. *Vicinal and geminal coupling*
15. *Long-range coupling*
16. *Spin decoupling*
17. *Nuclear Overhauser Effect difference spectrometry*
18. *^{13}C NMR Spectrometry*
    a. *peak assignments*
    b. *chemical classes and chemical shifts*
    c. *^{13}C-^{1}H spin coupling (J values)*
    d. *DEPT*
19. *Correlation NMR spectrometry*
20. *Theory*
21. *^{1}H-^{1}H COSY*
22. *Double-quantum filtered ^{1}H-^{1}H COSY*
23. *^{1}H-^{13}C COSY: HETCOR*
24. *Proton-detected HETCOR: HMQC*
25. *Proton-detected long-range ^{1}H-^{13}C heteronuclear correlation: HMBC*
26. *^{13}C-^{13}C correlation: INADEQUATE*

Policy on Academic Integrity:

The Department of Chemistry considers academic dishonesty to be a very serious violation. Academic dishonesty defrauds all who depend upon the integrity of the Department, its courses, and its research.

1.0 DEFINITIONS OF ACADEMIC DISHONESTY:

1.1 CHEATING:

Cheating is the act of obtaining or attempting to obtain credit for academic or research work through the use of any dishonest, deceptive, or fraudulent means. It includes but is not limited to copying and claiming as ones own, work that one has not done, or willfully allowing someone else to claim the work as work he or she has done.

1.2 PLAGIARISM

Plagiarism is the act of representing the work of another as ones own without appropriate references, and submitting it to fulfill academic and/or research requirements.

It should be noted especially that anyone who helps someone else to cheat in any way is considered equally culpable.

2.0 REPORTING

When a faculty member responsible for a course or a research laboratory has reason to believe, and has evidence to substantiate, that the behavior of a student or students is dishonest, it is that faculty member's responsibility to report it to the Undergraduate Studies Committee. If more than one instructor is involved in the instruction of the lecture or laboratory course, the other faculty member(s) shall be also notified.

3.0 SANCTIONS

Responses to violations of Academic Integrity may include one or a combination of the following, as implemented by the instructor of record, the Undergraduate Committee, or both.

1) Partial grades and a final grade for the course is the prerogative of the instructor and no one can interfere with the final decision of that instructor in this regard. However, a final grade of E for the course is recommended. An incident of cheating in a team-taught course will result in a partial failing grade or a failing grade for the entire course as jointly determined by the instructors, regardless of whether the course segment during which the student(s) cheated was conducted by the instructor of record, or the extent to which the course segment during which the student cheated contributes to the final course grade. Again, a final grade of E is recommended. The instructor may choose to submit the case to the

University Judicial system, which may impose sanctions such as disciplinary probation, suspension, or expulsion from the University).

2) The instructor must decide if he/she wishes to pursue further disciplinary action beyond grade adjustments.

   a) No action is required beyond the determination of an appropriate grade. However he/she may also choose to refer the incident in question to the University Judicial Board for consideration. The Department of Chemistry will then be required by the University to abide by whatever decision is made by the Judicial Board.

   b) Beyond simply reporting the incident, the instructor may refer the incident to the Undergraduate Studies Committee for consideration and recommended sanctions. Should the instructor choose to take this action, the following policy actions are recommended:

      i. A stern letter of reprimand from the Undergraduate Committee. Additionally, documentation of the incident shall be placed in the students' file/record.
      ii. If the student is suspended or placed on probation, her/his case will be assessed and evaluated at the end of the probationary/suspension period. Satisfactory performance, as assessed by the Undergraduate Committee, is required in order for the suspension/probation to be lifted. Unless otherwise stated, the term for a suspension is one semester.

3) A student under suspension and/or probation must reimburse the Department/University in tuition corresponding to the number of credits for the registered course or research during which the cheating incident took place. The reimbursement may be made by paying tuition for a corresponding number of credits for a course taken at a future time. In the event that the student has completed all her/his coursework, he/she must pay for a corresponding number of research credits. It will be the student's responsibility to pay for these credits at the bursar's office. The receipt for payment shall be submitted to the Department and placed in the student's file. It may be used by the Undergraduate Committee as supporting evidence to demonstrate satisfactory progress towards completion of sanction requirements. The justification for this reimbursement by the student is the fact he/she failed a course or research for which the university has awarded prior tuition. Therefore, no faculty member at any time and in any department can submit payment for the tuition reimbursement on behalf of the student.

4) A student who has been sanctioned for academic misconduct in the categories listed above shall be assigned one-semester of community service. Duties of a reasonable amount shall be clearly defined by the graduate committee. The faculty adviser, if any, will be fully apprised of the expectations of the Undergraduate Committee in this regard. Examples of service to the Department may include but

are not limited to facilitating seminar preparation, conducting department office or other work, conducting instructional laboratory prep work, etc.

5) A second incident of academic dishonesty during the course of his/her undergraduate study, failure to pay tuition credits to the university, or failure to meet the assigned community service responsibilities will result in immediate expulsion from the program.

4.0 APPEAL

The student has a right to appeal the decision of the Undergraduate Studies Committee and to have her/his case considered by the appropriate University Judicial office instead.

AChm 473 (3 credits)

Chemical and Enzymatic Kinetics

Fall Semester

Monday, 4:15 pm – 7:15 pm @Chem B18

Instructor: Dr. Li Niu

Office Hour

Office hour:	Friday, 9-11 am or by appointment
Office:	Life Sciences Research Building 1060
Phone:	591-8819
e-mail:	lniu@albany.edu

Text book

The instruction is mainly based on two textbooks by Kenneth Connors' Chemical Kinetics – the study of the reaction rates in solution (VCH Publishers, ISBN 3-527-21822-3) and Alan Fersht's Structure and Mechanism in Protein Science (2nd printing, 1999, WH Freeman). You could purchase the book, although not greatly encouraged (because they are expensive). So, I shall try to provide a better board writing and you shall try to take thorough lecture notes. Additional reference books will be used such as Physical and Chemical Kinetics (by Berry, Rice and Ross, 2nd edition, Oxford Univ. Press). I therefore emphasize that a good note-taking in class is essential for this course.

Course Introduction

What happens in a chemical or biological reaction during the period between the initial (reactant) state and the final (product) state? An answer to this question constitutes a description of the mechanism of the reaction. The study of reaction mechanism is a major application of chemical kinetics. Kinetics, in a very broad term, is a subject dealing with evolution in time of processes in aggregations of molecules, small or large, organic or biological. Physical kinetics deal with the rates of physical processes such as diffusion and viscosity, whereas chemical kinetics concern the rates of reactions. It is the latter that is a major focus of this course. Furthermore, we will pay greater attention to the rates of reactions in solution, because a considerable number of chemical and enzymatic reactions occur in solution. **Prereqs: ACHM 351 AMAT 214, APHY 240** and instructor consent.

The course materials will be a presented by a balance of phenomenology, physical theory, empiricism and application. In phenomenology, as in application of kinetics, a broad range of reactions will be discussed, including gas phase reactions, enzymatic reactions (biological catalysis), and chemical reactions of covalent bonding. The following chapters will be covered.

1. Basic Concepts of Kinetics. Definition of rate of reactions, rate equations, rate constants, rate orders, definition of reaction mechanism.

2. Simple Rate Equations. Integrated rate laws for various orders, determination of the order of reactions, methods of data analysis. In the methods of analysis section, the topics include calculation of rate constants from experimental data, statistics, errors of observation and propagation, and accuracy.

3. Complex Rate Equations. Use of integrated rate equations, kinetic models, and data analysis. Microscopic reversibility and detailed balance will be introduced. The methods of data analysis include topics such as simplification of experimental kinetics (e.g., the use of area variable instead of time variable, and various pseudo-order reaction conditions), Laplace transformation, secular equations and matrix operation, pre-equilibrium and steady-state assumptions, the principle of numerical integration and Monte Carlo simulations.

4. Fast Reactions. Diffusion-controlled reactions (both chemical and enzymatic reactions), the principle and application of relaxation kinetics, kinetic techniques involving rapid mixing.

5. Theory of Chemical Kinetics. Arrhenius equation, collision theory, potential energy surface, transition-state theory. Partition functions in various forms will be introduced. Chemical interpretation of transition state parameters such as $\Delta S^{\neq}$ and $\Delta H^{\neq}$ will be also discussed. Some examples used will include gas phase reactions. A number of examples will be introduced for application of transition state theory such as construction of free energy reaction coordinate diagram, and primary isotope effects.

6. Enzymatic Catalysis. Origin of catalysis, type of catalysis such as covalent catalysis and general acid-base catalysis. Homogeneous catalysis (using gas phase reaction as examples). Enzyme catalysis (Michealis-menten mechanism). In heterogeneous catalysis, Langmuir adsorption isotherm and various modified Langmuir isotherms such as Hinshelwood and Eley-Rideal mechanism will be discussed.

7. Forces in Aqueous Solutions, and Effects of Medium on Rates of Reactions. The major theme in this section is the application of transition state theory. Three important variables for reaction in solution: solvent permittivity, viscosity, and polarizability of solvent molecules. Hydrogen bonding, electrostatic interactions, hydrophobic forces, physical models of medium effects.

9. Physical Kinetics. Thermal conductivity, viscosity, diffusion, electrical conductivity and electrophoresis (this chapter will be given if time allows).

Home Work, Exams and Grading

Homework assignments: throughout the semester (20% of the final grades)
Midterm exam: Oct 21 (close-book exam) @B18 (35% of the final grade)
Final: Friday, Dec 16, 5:45 pm – 7:45 pm @B18 (maybe, open book) (45% of the final grade)

Note:
(1) There will be "bonus" questions in the exams and therefore extra credits.
(2) A make-up exam may be considered, but the request must be made prior to the exam, unless there is a health emergency.
(3) No "incomplete" grade will be given.

Grading scale

A = 93-100	A- = 90-92	B+ = 87-89
B = 83-86	B- = 80-82	C+ = 77-79
C = 73-76	C- = 70-72	D+ = 66-69
D = 63-65	D- = 60-62	F = 0-59

Course Description: Empirical and theoretical treatment of reaction rates and reaction mechanisms; experimental techniques. Emphasis on reactions in solutions, complex reactions, enzyme kinetics, homogeneous catalysis (enzymatic and nonenzymatic), and transition state theory.

Learning Outcome: After completion of this course, students will understand both empirical and theoretical treatment of reaction rates and reaction mechanisms.

Chemistry 474 (ACHM 474 – 3 credits)

Physical Organic Chemistry I
Prof. John Welch
Fall 2020

Instructor	Prof. John Welch
Office:	Chemistry 309B
Office Hours:	Monday afternoon 5:30-7:00 Tuesday afternoon 2:30-4 or *by appointment*
Texts:	Modern Physical Organic Chemistry by Eric V. Anslyn & Dennis A. Dougherty, University Science Books, 2006 www.uscibooks.com
Prereqs:	ACHM 221 and consent of instructor.

Examination and Homework Policies

Two hourly exams will be given and count for 75% of the final grade.

Homework will be assigned and must be submitted on time. The work must be submitted in a satisfactory manner to receive the remaining 25% of the points. Class participation will be considered when determining the grade as well but only to improve a grade.

Course Description

Organic reaction mechanisms with emphasis on the theoretical and experimental tools used in their elucidation.

Learning Objectives

The principles of Physical Organic chemistry will be expanded beyond the undergraduate level. Students will study perturbational molecular orbital theory and the qualitative application of the associated methods to practical problems. In addition both the thermodynamics and reaction mechanisms will be discussed. Students should receive a sufficient and appropriate background in to enable them to approach new research problems independently and autonomously.

Attendance

Material will be presented in class that complements that found in the text. It is highly recommended that you read and ***outline*** the pages assigned before coming to class. A failure to attend class could result in your inability to perform well on examinations. As mentioned class participation will be considered when determining grades.

Academic Integrity

:

Talking will not be allowed in examinations. Programmable calculators or PC's will also not be allowed in examinations. Personal electronic devices to include cell phones and MP3 players must be TURNED OFF and placed well under the desk.

The policies, penalties, procedures and standards outlined in the Undergraduate Bulletin http://www.albany.edu/undergraduate_bulletin/regulations.html and in the Policy on Community Rights & Responsibilities of University at Albany will be followed. Homework problem set s must be completed by each student and must represent the work of the individual student. A failing grade is a possible result of academic dishonesty. Disruptive classroom behavior may result in lowering of a student's grade in accord with the policies of the Dean of Undergraduate Studies.

Chemistry 474
Physical Organic Chemistry I
Prof. John Welch
Fall 2020

Class	Date	Subject	Pages
1	26 Aug	Intro	
2	28 Aug	Structure and Bonding	3-26
3	2 Sept	No Class	
4	4 Sept	Orbital Mixing	26-64
5	9 Sept	Strain and Stability	65-91
6	11 Sept	Structure and Energetics	92-14
7	16 Sept	Solutions and Non-covalent Binding	145-162
8	18 Sept	Binding Forces	163-204
9	23 Sept	Molecular Recognition	207-256
10	25 Sept	Acid-Base Chemistry	259-296
11	30 Sept	Stereochemistry	297-350
12	2 Oct	Review	
13	7 Oct	Exam 1	
14	9 Oct	Energy Surfaces and Kinetic Analyses	355-382
15	14 Oct	No Class	
16	16 Oct	Kinetic Experiments	382-417
17	21 Oct	Experiments related to Thermodynamics	421-441
18	23 Oct	Substituent Effects	441-464
19	28 Oct	Acid-Base Effects	464-487
20	30 Oct	Catalysis	489-535
21	4 Nov	Organic Reaction Mechanisms	537-556
22	6 Nov	Organic Reaction Mechanisms(contd)	
23	11 Nov	Nucleophilic Additions	556-576
24	13 Nov	Review	
25	18 Nov	Exam 2	
26	20 Nov	Eliminations	577-595
27	25 Nov	Eliminations from Intermediates	596-624
28	27 Nov	Thanksgiving	
29	30 Nov	Substitutions α-to a carbonyl center	627-671
30	2 Dec	Isomerizations & Rearrangements	671-703
31	4 Dec	Review	
32	11 Dec	Final Exam (1530-1730)	

Chemistry 474
Physical Organic Chemistry I
Prof. John Welch
Fall 2020

Homework

Homework			Date
1	p62-64	1-1, 1-4, 1-13, 1-19, 1-21,1-32	9 Sept
2	p138-143	2-6, 2-15,2-29, 2-44,2-51	18 Sept
3	p202-203	3-1, 3-10, 3-17,3-22	25 Sept
4	p253-256	4-3, 4-13	30 Sept
5	p292-294	5-3, 5-9,5-17, 5-18	2 Oct
6	p344-350	6-9, 6-15,6-17,6-21,6-22	16 Oct
7	p413-416	7-1, 7-8, 7-17, 7-21	23 Oct
8	p482-487	8-128-15,8-19, 8-25	4 Nov
9	p531-534	9-10, 9-15, 9-16, 9-18	11 Nov
10	p617-624	10-8, 10-14, 10-23,10-42	2 Dec

Grade	Percent
A	>93
A-	90-02
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
E	<60

Chemistry 475 (ACHM 475 – 3 credits)

Physical Organic Chemistry II

Prof. John Welch

(Planned Spring 2020 but cancelled due to low enrollment)

Instructor	Prof. John Welch
Office:	Chemistry 309B
Office Hours:	Monday afternoon 5:30-7:00 Tuesday afternoon 2:30-4 or *by appointment*
Texts:	Advanced Organic Chemistry by David E. Lewis, Oxford University Press, 2016
Prerequisites:	ACHM 221 and consent of instructor

Examination and Homework Policies

Two hourly exams will be given and count for 75% of the final grade.

Homework will be assigned and must be submitted on time. The work must be submitted in a satisfactory manner to receive the remaining 25% of the points. Class participation will be considered when determining the grade as well but only to improve a grade.

Course Description

Materials constitute an important role in modern society. This course covers materials chemistry from synthesis to properties. Topics include (but are not limited to) semiconductors, metallic alloys, magnetism, optical properties, and energy storage.

Learning Objectives

The principles of Physical Organic chemistry will be expanded beyond the undergraduate level. Students will study organic reaction mechanisms with emphasis on the theoretical and experimental tools used in their elucidation. In addition both the thermodynamics and reaction mechanisms will be discussed. Students should receive a sufficient and appropriate background in to enable them to understand novel reactions independently and autonomously.

Attendance

Material will be presented in class that complements that found in the text. It is highly recommended that you read and ***outline*** the pages assigned before coming to class. A failure to attend class could result in your inability to perform well on examinations. As mentioned class participation will be considered when determining grades.

Academic Integrity

:

Talking will not be allowed in examinations. Programmable calculators or PC's will also not be allowed in examinations. Personal electronic devices to include cell phones and MP3 players must be TURNED OFF and placed well under the desk.

The policies, penalties, procedures and standards outlined in the Undergraduate Bulletin http://www.albany.edu/undergraduate_bulletin/regulations.html and in the Policy on Community Rights & Responsibilities of University at Albany will be followed. Homework problem set s must be completed by each student and must represent the work of the individual student. A failing grade is a possible result of academic dishonesty. Disruptive classroom behavior may result in lowering of a student's grade in accord with the policies of the Dean of Undergraduate Studies.

Chemistry 475
Physical Organic Chemistry II
Prof. John Welch
Spring 2020

Class	Date	Subject	Pages
1	26 Aug	Intro	
2	28 Aug	Structure Bonding & Reactivity	1-36
3	2 Sept	No Class	
4	4 Sept	Pericyclic Reactions	163-220
5	9 Sept	Physical Organic Chemistry & Reaction Mechanisms	259-316
6	11 Sept	-continued	
7	16 Sept	Carbocations and C-C Bond forming	347-390
8	18 Sept	Carbanions and Reactivity	391-438
9	23 Sept	Carbon Nucleophiles; Substitution	439-496
10	25 Sept	Carbon Nucleophiles; Substitution contd	
11	30 Sept	Review	
12	2 Oct	Exam 1	
13	7 Oct	Free Radicals	497-532
14	9 Oct	Free Radical in Synthesis	533-576
15	14 Oct	-continued	
16	16 Oct	Organic Synthesis-Retrosynthetic Analysis	577-646
17	21 Oct	-continued	
18	23 Oct	Organic Reactions: Condensations	647-688
19	28 Oct	-continued	
20	30 Oct	Organic Reactions: Metal catalyzed reactions	689-760
21	4 Nov	-continued	
22	6 Nov	Oxidations	761-854
23	11 Nov	-continued	
24	13 Nov	Review	
25	18 Nov	Exam 2	
26	20 Nov	Reduction with hydrogen	855-890
27	25 Nov	Reduction with complex hydrides	891-942
28	27 Nov	Thanksgiving	
29	30 Nov	Asymmetric Oxidation and Reduction	943-973
30	2 Dec	Asymmetric hydrogentation	973-986
31	4 Dec	Review	
32	11 Dec	Final Exam (1530-1730)	

Chemistry 475
Physical Organic Chemistry II
Prof. John Welch
Spring 2020

Homework

Homework			Date
1	Chapter 6	6-23, 6-24, 6-26	9 Sept
2	Chapter 8	8-30, 8-31, 8-39, 8-41	18 Sept
3	Chapter 11	11-10, 11-13, 11-14, 11-15, 11-19	25 Sept
4	Chapter 12	12-10, 12-11, 12-12, 12-13	30 Sept
5	Chapter 13	13-17, 13-29, 13-33, 13-34	2 Oct
6	Chapter 15	15-18, 15-20, 15-21, 15-22, 15-26, 15-28, 15-30	16 Oct
7	Chapter 16	16-5, 16-8, 16-11, 16-13	23 Oct
8	Chapter 17	17-8, 17-9	4 Nov
9	Chapter 18	18-17, 18-22, 18-25	11 Nov
10	Chapter 19	19-10, 19-12	2 Dec

Grade	**Percent**
A	>93
A-	90-02
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
E	<60

APHY140, Physics I (3 credits) Fall 2019
Tu-Th 8:45-10:05 in LC 23 plus Discussion Class (various times)

Professor William A. Lanford, wlanford@albany.edu
Google Scholar: "W. A. Lanford"

Office Hours: At end of lecture in LC23 or Tu-Th 11:30-12:00 PHY110

Text: Physics for Scientists and Engineers, R. A. Serway and J. W. Jewett (9TH edition) HYBRID, Clickers and WebAssign required.

Course Description: A calculus based introduction to the fundamentals of classical mechanics.

Learning Objectives: Students will learn to apply concepts of force, energy, and work applied to kinematics of particle and rigid bodies (Newton's Laws) with an introduction to special **relativity.**

Prereqs/Co-req: Must have taken or be enrolled in Calculus I (AMAT 111 or AMAT 112 or AMAT 118)

General Education Category: Disciplinary Perspectives: natural sciences. See Undergraduate Bulletin page 53 for general criteria governing General Education courses and specific learning objectives for Natural Science General Education courses (natural phenomena, scientific method, and social impact).

Week Beginning		**Chapter**
Aug 26	Lecture 1: Physics, Lecture 2 1D motion, a = constant	1,2
Sept 2	Lectures 3&4 1D motion a = constant **&** numerical solution	2
Sept 9	Lecture 5: **a** = **F**/M, calculus and vectors	3
Sept 16	Motion in 2D	4
Sept 23	Newton's Law, **a** =**F**/M	5
Sept 30	Newton's Law (**a**=**F**/M), Applications	6
Oct 7	Energy and Work, **Exam on Thursday Oct 10**	**7**
Oct 14	Conservation of energy, Power	8
Oct 21	Momentum and collisions	9
Oct 28	Rotations	10
Nov 4	Angular momentum	11
Nov 11	**Angular momentum and** Gravitation	13
Nov 18	Gravitation	13
Nov 25	Relativity and Thanksgiving	39
Dec 2	**catch up and Review**	

1. Attendance in lecture and discussion is required. Lecture attendance will be recorded by Clickers.
2. Most home assignments will be answered over the internet using WebAssign and are due at the time specified. You must do the home assignments. If you fail to submit 2 home assignments, your course grade will be lowered. Late assignments are not accepted without approval. While home assignments will be submitted over the internet (WebAssign) you will also have to turn in solution written out on paper in your weekly discussion

Summary: attempt and submit all assignments when they are due. Homework is very important in this class.

3. Come to class prepared to take notes. Quizzes can be given any time, including in Lecture
4. Expect a weekly quiz in discussion on the previous week's home assignment.

Help: You are free to ask anyone for help on homework. We will have tutors available in Physics 224 for 30-35 hours a week on a walk in basis.). I urge that you not just copy homework solutions. If you do so, your quiz grades will likely be poor.

Do not even think of cheating on quizzes or exams. If I detect cheating, I will do whatever I can to get the cheater removed from the University.

There will be one hour exam and a final exam (cumulative). The tentative date for the hour exam is Oct 10.

Your grade will be determined approximately as follows:

Hour exam	20%
Quizzes	30%
Home assignments/clickers	10% but note late home assignment and attendance policy above
Final	**40%**

Grading Scale

A = 93-100%; A- = 90-<93%; B+ = 87-<90%; B = 83-<87%; B- = 80-<83%; C+ = 77-<80%; C = 73-<77%; C- = 70-<73%; D+ = 67-<70%; D = 63-<67%; D- = 60-<63%; E = <60%.

Honors Physics I: Mechanics TPHY 141, Fall 2020, class number 8443
Monday-Wednesday-Friday 10:35-11:30 A.M. in the Physics Building Room 225

3 credit-hours. Associate Professor Matthew Szydagis, mszydagis@albany.edu,
https://www.albany.edu/physics/faculty/matthew-szydagis (TA: None)
Office Hours: MWF 9:30-10:30, Physics Building Room 312 3rd floor / Zoom (456-587-8403) OR, by appt.

Text: Physics for Scientists and Engineers, R.A. Serway and J.W. Jewett (10th ed) w/ homework via WebAssign

Course Description and Prerequisites: Course content will follow A PHY 140. However, topics will be covered in more depth and at a somewhat more advanced level. T PHY 141 is the Honors College version of A PHY 142. Only one of A PHY 140 or T PHY 141 may be taken for credit. Prerequisite(s) or corequisite(s): A MAT 111 or A MAT 112 or A MAT 118. Open to Honors College students only. *WebAssign key* albany 2133 5036

Course Objectives: Understand the basics of classical mechanics: Newton's 3 Laws of Motion, vectors, energy, momentum, gravitation, and introductory special relativity. Apply the fundamental concepts behind these, and understand how they apply to daily life. Be able to solve (calculus-based) problems in physics.

The following is a tentative course plan; it is natural to fall behind or get ahead and adjust topics

	Monday	Wednesday	Friday
8/24,26,28	Introduction	Ch. 1: Measurement	Ch. 2: Motion in 1-D
8/31,9/2,9/4	Ch. 2: Motion in 1-D	Ch. 3: Vectors	Ch. 4: Motion in 2-D
9/7,9,11	Ch. 4: Motion in 2-D	Ch. 4: Motion in 2-D	Ch. 4: Motion in 2-D
9/14,16,18	Ch. 5: The Laws of Motion	Ch. 5: The Laws of Motion	Ch. 5: The Laws of Motion
9/21,23,25	Ch. 6: Circular Motion, etc.	Ch. 6: Circular Motion, etc.	Ch. 6: Circular Motion, etc.
9/28,9/30,10/2	Ch. 7: Energy of a System	Ch. 7: Energy of a System	Ch. 7: Energy of a Sytem
10/5,7,9	[buffer]	Review for Midterm Exam	MIDTERM EXAM
10/12,14,16	Ch. 8: Energy Conservation	Ch. 8: Energy Conservation	Ch. 8: Energy Conservation
10/19,21,23	Ch. 9: Linear Momentum	Ch. 9: Linear Momentum	Ch. 9: Linear Momentum
10/26,28,30	Ch. 10: Rigid-Body Rotation	Ch. 10: Rigid-Body Rotation	Ch. 10: Rigid-Body Rotation
11/2,4,6	Ch. 11: Angular Momentum	Ch. 11: Angular Momentum	Ch. 11: Angular Momentum
11/9,11,13	Ch. 12: Static Equilibrium	Ch. 12: Static Equilibrium	Ch. 12: Static Equilibrium
11/16,18,20	Ch. 13: Universal Gravitation	Ch. 13: Universal Gravitation	Chapter 38: Relativity
11/23,25,27	Review for Final Exam	*class suspended (Thanksgiving)*	*class suspended (Thanksgiving)*

See table at left for topic for each date for each week of this fall.

Please note that the final exam will be on WebAssign in December. It will be online but timed. Assume it will be *comprehensive*.

There is a zero-tolerance policy on cheating and plagiarism. If you choose to engage in such activities, it would result in being dropped from the course with a failing grade of E, with me notifying the Dean, and your expulsion would be a probable outcome then. So, do not even THINK about it.

To register for WebAssign: https://play.vidyard.com/WuQeps5jUErLbnEzRzJEDy **Grades will be determined with this rubric**

Midterm Exam	30% (exam will consist of similar problems from HW of comparable difficulty)
Homework	20% (note you get 3 freebies for missed assignments – but, late is never accepted)
Final Exam	40% (largest portion of your grade, so you cannot pass this class w/o taking it)
In-Class/Zoom Attendance	10% (going to class, with 3 freebie absences, and synchronous zoom acceptable)

A through E with +'s / –'s in 15% blocks: A=100-85% where for example A- is 85-90%, etc. NO CURVE

Extra Credit: You can earn up to 5% in bonus points attending the Tuesday seminars and Friday colloquia at 2:45-4:15 in Physics 129 (now via Zoom) Find me and say hi. Will lead to me taking note. You get 1% per talk attended, as long as you do not leave early nor arrive later than start of talk.

Classroom Conduct: While you are in this class, electronic devices will be a necessary part of any in-class activities, such as notetaking on a laptop computer or a tablet device, and answering in-class questions online. But absolutely no texting, e-mailing, or web surfing is allowed, on a laptop, tablet, smartphone, or a comparable device (forbidden on exams). Lastly, leaving early and/or arriving late hurts not just you but all.

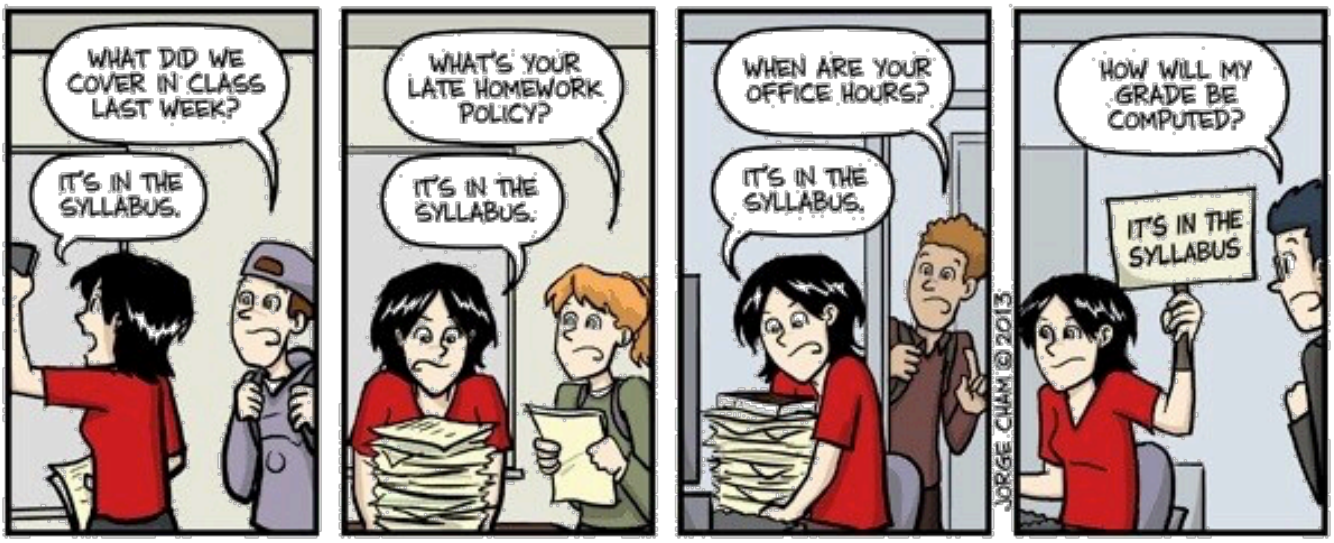
Communication: I will be sending important announcements and updates to you by e-mail (to your UAlbany accounts ONLY) so be sure to check on a regular basis. You'll be informed of your class progress via e-mails.

Homework and Exams: Problem sets will be primarily based on WebAssign*. They'll generally be assigned on a weekly basis. Getting the answers from Google and getting 100% on all of the homework is guaranteed to result in your failing the class. Homework is due at the start of class (so, literally before 10:35 am) on the date specified on the assignment, usually the following week. It is not accepted late in any circumstance. While not counting for much %-wise, homework enforces lecture and serves as exam prep, so take seriously. Together, your two exams will be worth 70% of your grade. You will be allowed self-written formula sheets.

Absences: Excusable absences are defined by the university and require documentation. Acceptable excuses include: (a.) illness, tragedy, or other personal emergency; (b.) foreseeable time conflicts resulting from required appointments; and (c.) religious observance (without penalty) For details on university policy, see: https://www.albany.edu/undergraduateeducation/attendance.php (student athletes also an exception) and https://www.albany.edu/health_center/medicalexcuse.shtml For missing class or missing assignments, you do not even need to talk to me unless you have (A.) burned through the 3 freebies or (B.) you will miss an exam.

Website: Lecture slides and supplements, as well as solution sets to exams and homework, and the assignments themselves, will appear either at **webassign.net** or https://www.albany.edu/physics/phy577/ Please note I do not use Blackboard, but instead prefer to make my own site: no user name/password.

Honors Level Material: Since this is an honors-level course, I have instituted "Matthew's Weekly/Daily Mindblower," which will cover an extra-textual topic but still tangentially related, usually from contemporary physics research. Yes, it will be covered on exams in some form, so do not just tune out.



* https://play.vidyard.com/1zqPAhSGqCaDZ8L2K3xHuD Video tutorial to help you in completing assignments

PHY142 - Physics I: Advanced Mechanics, Fall 2021, 3 Credits

Tuesday/Thursday 12:00 PM - 1:15 PM

Room: Physics 225

Instructor: Dr. Alexander Khmaladze – akhmaladze@albany.edu

Office Hours: Tuesdays 1:15 pm – 3:00 pm; I will also be available by appointment.

Text: Physics for Scientists and Engineers, R. A. Serway and J. W. Jewett (9th edition), course materials will be posted on Blackboard: https://blackboard.albany.edu/.

Course Description: A calculus-based introduction to the fundamentals of classical mechanics (Chapters 1-13). Prerequisite(s) or corequisite(s): A MAT 111 or A MAT 112.

Course organization: The lectures are given in PowerPoint. Some derivations will be shown on a whiteboard. We will also do some homework/exam problems in class. I will make homework/exam solutions available to everyone via Blackboard.

I have also uploaded the videos of all the lectures and problem solving session (as .mp4) on OneDrive: https://1drv.ms/u/s!AjSHGatJRE2T4XqYTPOMKmv1SrbW?e=4z8BXU

Zoom: If an in-person meeting is not possible (e.g., I am travelling to conferences, COVID-19 is back, etc), we will virtually meet on zoom instead: https://albany.zoom.us/j/96426201318?pwd=anRvbHBsK0VGemJxL09FaElQS0ovdz09 Meeting ID: 964 2620 1318, Passcode: 039890

Course Outline: This is a *tentative course outline* and will be adjusted to account for Mid-term Exams and pre-exam review sessions, Fall and Thanksgiving breaks.

Week 1: Chapters 1 and 2 (1-D motion)

Week 2: Chapter 3 (Vectors)

Week 3: Chapter 4 (2-D Motion)

Week 4: **Review and Exam 1**

Week 5: Chapter 5 (Newton's Laws)

Week 6: Chapter 6 (More examples of Newton's Laws)

Week 7: Chapter 7 (Work, Kinetic Energy and Potential Energy)

Week 8: **Review and Exam 2**

Week 9: Chapter 8 (Conservation of Energy)

Week 10: Chapter 9 (Linear Momentum and Collisions)

Week 11: Chapter 10 (Rotational Dynamics)

Week 12: **Review and Exam 3**

Week 13: Chapter 11 (Angular Momentum)

Week 14: Chapter 12 (Static Equilibrium)

Week 15: Chapters 13 and 39 (Gravitation and Special Relativity)

Final Exam: Dec. 14 (10:30 AM – 12:30 PM)

Homework Assignments: *There will be homework for each of the chapters listed above.* You are free to ask anyone for help on homework, *but please consider asking me first*. Due dates for each assignment will be announced in class. Please do the homework and send a picture of it taken with your phone by 11:59 pm on the day they are due to me (akhmaladze@albany.edu).

Homework Assignments often require an algebraic solution first, followed by numerical calculation. Please make sure you follow that.

Exams: Dates will be announced at the start of the semester. *Problems on Exams will be of similar style and difficulty level as the homework problems.*

Problem Solving Sessions: Since there are no recitations for this class, we will have a set of problem-solving sessions, which will be conducted before each exam. I will make the problems available for you to try at home prior to each session. There are also problem-solving sets for you to try at home (which we will not do in class)

Grade will be determined using the following inputs:

Homework Assignments	20% *(all assignments must be submitted; late submissions need valid reason & prior permission)*
Exam 1	15% *(Chapters 1-4)*
Exam 2	15% *(Chapters 5-7)*
Exam 3	15% *(Chapters 8-10)*
Last Exam	35% *(Comprehensive)*

Grading on a curve: Your final grade is based on a curve. All contributions, e.g., HW, mid-terms, final exam, term paper, attendance, etc., are added in the proportion listed in the syllabus to determine an overall score. An average and standard deviation (SD) is calculated based on the overall scores of all students in the class, and these are used to determine how your overall score translates into a letter grade. For example, in a hypothetical case, if the class average is 65%, and the SD is 15, then a B- corresponds to the range 65-70%, A- to 80-85%, and C- to 50-55%, etc.

Using computers/web resources: You are free to use whatever you can find on the Internet (provided that you reference it), but you are responsible for the accuracy of the content. You are encouraged to use any software packages available to you, as well as write your own programs. I will be happy to provide you with any assistance.

Most typical metric prefixes and SI units:

giga (G)	10^{9}	1 billion
mega (M)	10^{6}	1 million
kilo (k)	10^{3}	1 thousand
centi (c)	10^{-2}	1 hundredth
milli (m)	10^{-3}	1 thousandth
micro (μ)	10^{-6}	1 millionth
nano (n)	10^{-9}	1 billionth
pico (p)	10^{-12}	1 trillionth
femto (f)	10^{-15}	1 quadrillionth

Conversions:
Convert **5.12 fm/ns^2** to **m/s^2**: **5.12 fm/ns^2 = 5.12 ·1 fm/(1 ns)^2 = 5.12 ·10^{-15}m / (10^{-9}s) ^{2} = 5.12 ·10^{-15}m / (10^{-18}s^2) = 5.12·10^3 m/s^2**

meter (m)	distance
kilogram (kg)	mass
second (s)	time
ampere (A)	electric current
kelvin (K)	temperature
mole (mol)	amount of substance
candela (cd)	intensity of light

Solving problems algebraically, and only then numerically:
Example: if you are given that a 200 g wooden block is pushed along a frictionless surface with a force of 10 N. Find acceleration.

Since **F = m a**, the solution is: **a = F/m = 10 N/ 0.2 kg = 50 m/s^2**.

Course Learning Objective: Students who complete this course will understand calculus-based fundamentals of classical mechanics. Students will be able to understand and calculate concepts of force, energy and work applied to the kinematics and dynamics of particles and rigid bodies. This course is designed for students who are interested in careers in physical science and engineering and will prepare them to complete advanced courses in physics.

More information on next page:

More information:

Disability Resource Center Recommendations (https://www.albany.edu/disability/**)**
Reasonable accommodations will be provided in this course for students with documented physical, sensory, systemic, cognitive, learning and psychiatric disabilities. If you believe you have a disability requiring accommodation in this class, please notify the Director of the Disability Resource Center (Campus Center 130; 518-442-5501; drc@albany.edu). That office will provide the course instructor with verification of your disability and will recommend appropriate accommodations.

Mental Health
As a student there may be times when personal stressors interfere with your academic performance and/or negatively impact your daily life. The University at Albany Counseling and Psychological Services (CAPS) provides free, confidential services including individual and group psychological counseling and evaluation for emotional, social and academic concerns. Given the COVID pandemic, students may consult with CAPS staff remotely by telephone, email or Zoom appointments regarding issues that impact them or someone they care about. For questions or to make an appointment, call (518) 442-5800 or email consultation@albany.edu. Visit www.albany.edu/caps/ for hours of operation and additional information
If your life or someone else's life is in danger, please call 911. If you are in a crisis and need help right away, please call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).
Students dealing with heightened feelings of sadness or hopelessness, increased anxiety, or thoughts of suicide may also text "GOT5" to 741741 (Crisis Text Line).

Religious Holidays
New York State Education Law (https://www.nysenate.gov/legislation/laws/EDN/224-A) allows for absences due to religious observances. Students absent because of religious beliefs will be given equivalent opportunities for make-up examinations and assignments, but no later than a week after the original due date.
You must report the religious holidays that you observe and notify me of any needed accommodations prior to the end of the first week of classes.
Requests submitted after this time will be more difficult to accommodate given the structure of the class.

University's Standards of Academic Integrity:
https://www.albany.edu/undergraduate_bulletin/regulations.html

Absence policies:
https://www.albany.edu/health_center/medicalexcuse.shtml.

APHY 145 PHYSICS LAB I SYLLABUS FALL 2019 (ROOM PH 119, 1 CREDIT)

Lab	Week	Experiment
	8/26 – 9/6	*No labs*
1	9/9 – 9/13	***Uncertainty and statistics***
2	9/16 – 9/20	***Linear motion***
3	9/23 – 9/27	***Vectors***
4	9/30 – 10/4	***Projectile motion***
5	10/7 – 10/11	***Measuring g***
	10/14 – 10/18	*No labs – Fall break*
6	10/21 – 10/25	***Impulse and momentum***
7	10/28 – 11/1	***Centripetal force***
8	11/4 – 11/8	***Rotational motion and moment of inertia***
9	11/11 – 11/15	***Density and buoyancy***
	11/18 – 11/22	***Harmonic motion***
10	11/25 – 11/29	*No labs – Thanksgiving*
	12/2 – 12/6	***Make-up labs for documented absences only****
* Any lab canceled for snow will be rescheduled to the week of 12/2 – 12/6		

1. **Attendance**: **Your grade will consist of the average of the best 9 out of 10 labs**. If you cannot attend your regularly scheduled session, you may attend another section that week, provided that the class has space (no more than 2 students per set up). In this case, email your TA for instructions first. You cannot turn in a lab report if you miss the lab. *You may only make up labs if you have a documented reason for your absence (such as illness)*, in which case you must arrange with your TA to schedule a make-up (week of 12/2 – 12/6).

2. **Absence policies:** For medical excuse policy, please see https://www.albany.edu/health_center/medicalexcuse.shtml. For absence due to religious observance, please refer to New York State Education Law (Section 224-A).

3. **Preparation/lab materials**: **Before** the start of each lab (except the first), you ***must*** read the lab and **answer the prelab questions**. ***Prelabs will be collected at the start of class. Late prelabs will not be accepted.*** All lab materials will be available on Blackboard.

4. **Lab reports** are due the next class meeting after the lab (usually next week). **Late labs will be penalized by 50% if submitted within 2 weeks of the due date, and not graded thereafter.** Reports should be prepared by a student independently, not in collaboration with other students. **Each report should be 100% your own work:** *plagiarism may lead to course failure and disciplinary action.*

5. Academic integrity: the University's academic integrity policy is described in the undergraduate bulletin (https://www.albany.edu/undergraduate_bulletin/regulations.html).

6. **Lab grading (A – E course):**

Before the lab	
Prelab questions	30 points
During the lab	
Lab participation	5 points
Raw data	25 points
(Includes measuring and recording all necessary raw data, creating spreadsheets described in the lab, printing out all required plots, and showing all your data to the TA before leaving the lab)	
Lab report: no longer than one page (excluding attached lab data)	
Introduction (one paragraph)	5 points
Results (three – four paragraphs)	30 points
Conclusions (one paragraph)	5 points
Total	**100 points**

Important: *performance in class includes figuring out what to do next. Your TA is there to help, but read the instructions first, or try asking other groups.* ***Use Excel for ALL calculations****, so that both you and the TA can figure out where things went wrong. The use of calculators (on any device) is not allowed. Read the lab carefully before the class, and you will not struggle to finish it in the time provided.*

7. **Course description/objective:** this class is meant to provide hands-on demonstrations of the material covered in Physics 140, as well as an understanding of measurement uncertainty and analysis, and instruction in the use of plotting and calculation software, such as Excel. **Prerequisite/Co-requisite: APHY 140 or TPHY 141**

8. **Contact info and help:**
1) Contact your TA: all TA email addresses will be posted on Blackboard.
2) Physics tutoring (in PH 224): the schedule will be posted on Blackboard.
3) Supervisor: Dr. Anna Sharikova (asharikova@albany.edu), office hours: Wednesday 12 – 2 pm in BIO 055.

UNIVERSITY AT ALBANY
State University of New York

SYLLABUS - APHY 150: Physics II: Electromagnetism Spring 2019

Basic Course Information

Course: APHY 150 Physics II: Electromagnetism (class # 1992) - 3 credits
Time/Place: Lecture:T,Th 10:15-11:35 in LC-025
Professor : Jesse Ernst (PH-309, 2-4538, jae@albany.edu)
Office Hours : Tue,Thu 1:30-2:30 and by appointment.
Required Textbook : Serway, Physics for Scientists and Engineers, 9/e or any other recent edition. Used copies of older editions are easily found online and are often very cheap.
Prerequisites: APhy140 or 141 (or equivalent), or permission from instructor.
Pre/Co-requisites: AMAT 113 or AMAT 119

Course Policies and Grading

Course policies/Learning Objectives

This course is the second semester of the introductory calculus-based physics sequence; Electricity and Magnetism. Students will learn fundamental physical principle including the laws of Gauss, Ampere, Faraday and Maxwell's equations; basic electric circuits, and some topics in electromagnetic wave generation and propagation including geometric optics.
Aside from class, the primary source of information for the course schedule and policies is this site. A syllabus (subject to change) and solutions to homework and exams are posted on this Blackboard site. Also, I will post announcements here. However, I can't guarantee that all important information and announcements will be here. So, if you miss a class, you must find someone else in the class and ask them
what you missed, and if there are any announcements/changes that you need to know about. The syllabus is a rough outline, and it is subject to change (the exam dates are also subject to change). If your absence was unavoidable, then please feel free to contact me

and we can discuss what material you missed and if there are any other items you will need to catch up. You can find more course policies etc. in the FAQ section.

Grading

Your grade will be based on two in-class exams (45% total), recitation quizzes (25%), and the final exam (30%). Most students are honest and so I'm sorry to raise the issue of cheating. Unfortunately, university policy requires that I state my policy at the start of the course. My policy is that any cheating on exams or quizzes will result in an immediate failing grade for the course. I will also write a letter to the provost urging expulsion from the university. Honesty is an essential part of science.

Homework, Quizzes, and Tests

Homework will not be collected and will not be graded! Instead, the recitation quizzes will be an exact copy of one or more of the homework problems. The quiz problem(s) will be chosen at random by the TA at the time of the quiz. The reason for this somewhat unusual approach to the homework is that I don't want students to waste time searching around the internet for hw solutions or struggling with webassign trying to get an answer into a format that webassign will accept. Instead, the approach I strongly recommend to do well on the quizzes, and more importantly to learn the material, is to write detailed step-by-step solutions to every hw problem on paper. Solutions will be posted so that once you have done all the problems on your own, you can check your work and correct any misunderstandings you might have had about the problems. I recommend that once you think you understand all the problems, that you write full detailed solutions on paper again, just as you would do for the quiz. Also, if you try to explain the solutions to yourself as you're writing them you're more likely to build a solid understanding of the problem.

Because the quiz problems will all be known in advance, the quizzes will only be ten minutes, and the standards for partial credit will be high. If you have: a) written detailed paper solutions of every hw problem, b) carefully compared your solutions to the posted solutions for every problem, c) redone every problem on paper at least one more time after you think you understand the problem, then the quizzes shouldn't be hard.

The exam problems will be similar to the homework problems, but in general will not be copies of any of them.

Make-up quizzes and exams will not be given except in the case of very serious emergency. Things like oversleeping, car-trouble, traffic-jams, work-trouble, etc. are not serious emergencies. Plan to be within walking-distance of the test a little early just to make sure that nothing prevents you from getting there. Also, since the exams have to end at the end of the scheduled class, be sure to be on time so that you don't reduce your time for finishing it.

You can work together on homework, though be sure that you are not relying too heavily on others to help with your homework, as that will make it more difficult to do well on the exams. There is no collaborating of any kind on quizzes or tests. You can use a calculator during the tests/quizzes, but not anything that can store solutions to problems, formulas, or algorithms.

Extra Tutoring

Tutoring hours are in room 0224 of the physics building. The schedule will be posted here once it is available. It's a good place to go for some extra help with concepts or

problems, but don't let them help too much with homework problems or you're unlikely to learn the material well.

You can also get help from the CARRS study group on campus (here). This is not a walk-in program. You need to commit to joining a study group. Students who join this program and do the work find it very helpful. Diane Jester manages the program and will come to class to give us a brief introduction.

Grading Scale

A = 93-100%; A- = 90-<93%; B+ = 87-<90%; B = 83-<87%; B- = 80-<83%; C+ = 77-<80%; C = 73-<77%; C- = 70-<73%; D+ = 67-<70%; D = 63-<67%; D- = 60-<63%; E = <60%.

Recitation Sections

W 12:35_PM-01:30_PM PH0116 (5970) Nick Carrara
TH 02:45_PM-03:40_PM PH0225 (5200) Pedro Pessoa
TH 04:15_PM-05:10_PM PH0129 (5170) Pedro Pessoa
TH 05:45_PM-06:40_PM PH0224 (5201) Pedro Pessoa
F 09:20_AM-10:15_AM PH0129 (5171) Nick Carrara
F 10:25_AM-11:20_AM PH0229 (5172) Nick Carrara

TA email addresses:

Nick Carrara ncarrara@albany.edu
Pedro Pessoa ppessoa@albany.edu

Course Description: An introduction to the fundamentals of physics: electrostatics and magnetism, including the concepts of the electric and magnetic fields, electric potential and basic circuits; the laws of Gauss, Ampere, and Faraday; Maxwell's equations; geometrical optics.

SCHEDULE OF TOPICS COVERED:

class date	lec #	chapter covered	recitation (Wed, Thu or Fri)
Thu 24-Jan-2019	1	23 Electric Fields	
Tue 29-Jan-2019	2	23 Electric Fields	discussion: ch23, quiz: none
Thu 31-Jan-2019	3	24 Gauss' Law	
Tue 05-Feb-2019	4	24 Gauss' Law	discussion: ch24, quiz: ch23
Thu 07-Feb-2019	5	24 Gauss' Law	
Tue 12-Feb-2019	6	25 Electric Potential	discussion: ch24, quiz: ch24
Thu 14-Feb-2019	7	25 Electric Potential	
Tue 19-Feb-2019	8	26 Capacitance	discussion: ch25, quiz: none
Thu 21-Feb-2019	9	26 Capacitance	
Tue 26-Feb-2019	10	27 Current and Resistance	discussion: ch26, quiz: ch25
Thu 28-Feb-2019	11	exam1 (material through ch 26)	
Tue 05-Mar-2019	12	27 Current and Resistance	discussion: ch27, quiz: ch26
Thu 07-Mar-2019	13	28 DC circuits	
Tue 12-Mar-2019	14	28 DC circuits	discussion: ch28, quiz: 27
Thu 14-Mar-2019	15	29 Magnetic fields	
Tue 19-Mar-2019		break	
Thu 21-Mar-2019	15	break	
Tue 26-Mar-2019	16	29 Magnetic fields	discussion: ch29, quiz: ch28
Thu 28-Mar-2019	17	29 Magnetic fields	
Tue 02-Apr-2019	18	30 Sources of Magnetic fields	discussion: ch29, quiz: none
Thu 04-Apr-2019	19	30 Sources of Magnetic fields	
Tue 09-Apr-2019	20	30 Sources of Magnetic fields	discussion: ch30, quiz: ch29
Thu 11-Apr-2019	21	31 Faraday's Law	
Tue 16-Apr-2019	22	exam2 (chapters 27-30)	discussion: ch31, quiz: none
Thu 18-Apr-2019	23	31 Faraday's Law	
Tue 23-Apr-2019	24	31 Faraday's Law	discussion: ch31, quiz: ch30
Thu 25-Apr-2019	25	32 Inductance	
Tue 30-Apr-2019	26	32 Inductance	discussion: ch32, quiz: ch31
Thu 02-May-2019	27	32 Inductance	
Tue 07-May-2019	28	Special Relativity and E&M	discussion: ch32, quiz: none
Sat 12-May-2018		Final exam (cumulative)	10:30am-12:30pm

Homework is not collected or graded in any way. Instead, the recitation quizzes will be exact copies of one or more of the homework problems (drawn at random at the start of the quiz). Because the quiz problems will all be known in advance, the quizzes will only be ten minutes, and the standards for partial credit will be high. If you: a) write detailed paper solutions of every hw problem, b) carefully compare your solutions to the posted solutions, c) redo every problem at least one more time, adding what you've learned from the solutions, then the quizzes shouldn't be hard.

Honors Physics II: Electromagnetism (APHY 151 - 3 credits)

Spring 2020

Instructor: Oleg Lunin.
Office: Physics 310.
E-mail: olunin@albany.edu.
Teaching Assistant: Shahab Bahreini.

Time and Location: MWF 10:15-12:05, Physics 129.
Office Hours: Tue 4:15–5:15 p.m., F 12:00–2:00 p.m., or by appointment.
Textbook: R.A. Serway and J.W. Jewett, *Physics for Scientists and Engineers* (10-th edition).

Pre/Co-requisites: A MAT 113 or A MAT 119 or T MAT 119; prerequisite(s): A PHY 140, or T PHY 141 or A PHY 142. Open to Honors College students only.

Goals of the course (Learning Objectives):

- Introduce natural phenomena involving electricity and magnetism.
- Develop a quantitative description of such phenomena.
- Use the history of specific physical theories to illustrate the general scientific method.
- Develop appreciation for the role of science in the progress of society.

Grading: two 60-minute midterm exams 20+20%
final exam 35%
homework 10%
quizzes 10%
class participation 5%

Exams: The midterm exams will be on February 25 and April 2, in class.
The final exam will be on May 12 at 1:00–3:00 p.m.

Quizzes: There will be regular online quizzes on Blackboard, as well as pop quizzes in class.

Homework: There will be homework problems on WebAssign, as well as occasional pen–and–paper assignments. The detailed instructions will be given on Blackboard.

Just–in–time teaching method:

You will be asked to read book chapters and complete short online quizzes on them *before* we start discussing the relevant topics in class. This will allow us to focus on resolving confusions and difficulties you might encounter in the reading phase, making the class meetings more effective, improving your understanding of the covered material, and boosting your performance on homeworks and exams.

Academic integrity:

The highest standards of integrity and ethical conduct are required in this course.
A link to UAlbany academic guidelines and standards of academic integrity can be found on the Blackboard page for this class.

Absence policies:

Since class participation is an important part of this course, attendance will be recorded. Three lectures can be missed without explanation, but you will need documents for additional absences to avoid penalty in the "class participation" part of your grade. Make–up quizzes will be given only for justified absences.

In compliance with Section 224-A of the NYS Education Law, students absent because of religious beliefs will be given equivalent opportunities for make-up examinations and assignments. Students are encouraged to report the religious holidays to the instructor in the first week of classes. A link to the University's Medical Excuse Policy can be found on the Blackboard page.

Policy on electronic devices:

No electronic devices (computers, programmable calculators, phones, etc) are permitted during exams. If you happen to bring such a device, please turn it off.
Please refrain from using your phone during lectures.

Description of the course:

Dates	Topics	Book chapters
1/23	Introduction and review of Newtonian gravity	
1/28-30	Electric fields	22
2/4-6	Gauss's law	23
2/11-13	Electric potential	24
2/18-20	Capacitance and dielectrics	25
2/25	**Midterm exam and its review**	22–25
2/27, 3/3	Current and resistance	26
3/5-10	DC circuits	27
3/12, 3/24	Magnetic fields	28
3/17-19	Spring break	
3/26–31	Sources of the magnetic field	29
4/2	**Midterm exam and its review**	26–29
4/7-9	Faraday's law	30
4/14-16	Inductance	31
4/21-23	AC circuits	32
4/28-30	Electromagnetic waves	33
5/5	Review	
5/12	**Final exam**	22–33

Please note that this timetable is tentative, and adjustments will be made in the course of the semester.

Course Description: An introduction to the fundamentals of physics: electrostatics and magnetism, including the concepts of the electric and magnetic fields, electric potential and basic circuits; the laws of Gauss, Ampere and Faraday; Maxwell's equations; geometrical optics. Course content will follow A PHY 150.

Course Letter Grade Determination

Points	Grade		Points	Grade
≥ 93	A		73 – 76	C
90 – below 93	A–		60 – 62	C–
87 – 89	B+		67 – 69	D+
83 – 86	B		63 – 66	D
80 – 82	B–		60 – 62	D–
87 – 89	C+		< 60	E

PHY152 - Physics II: Advanced Electromagnetism, Spring 2022

3 credits, Class Number 7408

Tuesday/Thursday 12:00 PM - 1:20 PM

Room: Physics 225

Instructor: Dr. Alexander Khmaladze – akhmaladze@albany.edu

Office Hours: Tuesdays 1:20 pm – 3:00 pm; I will also be available by appointment.

Text: Physics for Scientists and Engineers, R. A. Serway and J. W. Jewett (9th edition), course materials will be posted on Blackboard: https://blackboard.albany.edu/.

Course Description: A calculus-based introduction to the fundamentals of electricity and magnetism (Chapters 23-34). Prerequisite or Co-requisite: A MAT 113 or 119; Prerequisite: APHY 140 or APHY 142 or TPHY 141.

Course organization: The lectures are given in PowerPoint. Some derivations will be shown on a whiteboard. We will also do some homework/exam problems in class. I will make homework/exam solutions available to everyone via Blackboard.

I have also uploaded the videos of all the lectures and problem solving session (as .mp4) on OneDrive: https://1drv.ms/u/s!AjSHGatJRE2T4XqYTPOMKmv1SrbW?e=4z8BXU

Zoom: If an in-person meeting is not possible (e.g., I am travelling to conferences, COVID-19 is back, etc), we will virtually meet on zoom instead: https://albany.zoom.us/j/96426201318?pwd=anRvbHBsK0VGemJxL09FaElQS0ovdz09

Meeting ID: 964 2620 1318, Passcode: 039890

Course Outline: This is a *tentative course outline* and may need to be adjusted as we progress through the semesters.

Week 1: Chapters 23 (Electric Fields)

Week 2: Chapter 24 (Gauss's Law)

Week 3: Chapter 25 (Electric Potential)

Week 4: **Review and Exam 1**

Week 5: Chapter 26 (Capacitance) and Chapter 27 (Resistance and Current)

Week 6: Chapter 28 (DC Circuits)

Week 7: **Review and Exam 2**

Spring Break

Week 8: Chapter 29 (Magnetic Forces and Fields)

Week 9: Chapter 30 (Sources of Magnetic Fields)

Week 10: Chapter 31 (Faraday's Law)

Week 11: **Review and Exam 3**

Week 12: Chapter 32 (Inductance)

Week 13: Chapter 33 (AC Circuits) and Chapter 34 (Electromagnetic Waves)

Week 14: **Review - Final Exam - as per university schedule**

Homework Assignments: *There will be homework for each of the chapters listed above.* You are free to ask anyone for help on homework, *but please consider asking me first*. Please do the homework and send a picture of it taken with your phone by 11:59 pm on the day they are due to me (akhmaladze@albany.edu).

Homework Assignments often require an algebraic solution first, followed by numerical calculation. Please make sure you follow that.

Exams: Dates will be announced at the start of the semester. *Problems on Exams will be of similar style and difficulty level as the homework problems.*

Problem Solving Sessions: Since there are no recitations for this class, we will have a set of problem-solving sessions, which will be conducted before each exam. I will make the problems available for you to try at home prior to each session. There are also problem-solving sets for you to try at home (which we will not do in class)

Your grade will be determined as follows:

Home Assignments	20% *(all assignments must be submitted; late submissions need valid reason & prior permission)*
Exam 1	15% *(Chapters 23-25)*
Exam 2	15% *(Chapters 26-28)*
Exam 3	15% *(Chapters 29-31)*
Last Exam	35% *(Comprehensive)*

Grading on a curve: Your final grade is based on a curve. All contributions, e.g., HW, mid-terms, and final exam are added in the proportion listed in the syllabus to determine an overall score. An average and standard deviation (SD) is calculated based on the overall scores of all students in the class, and these are used to determine how your overall score translates into a letter grade. For example, in a hypothetical case, if the class average is 65%, and the SD is 15, then a B- corresponds to the range 65-70%, A- to 80-85%, and C- to 50-55%, etc.

Using computers/web resources: You are free to use whatever you can find on the internet (provided that you reference it), but you are responsible for the accuracy of the content. You are encouraged to use any software packages available to you, as well as write your own programs. I will be happy to provide you with any assistance.

Most typical metric prefixes and SI units:

giga (G)	10^{9}	1 billion
mega (M)	10^{6}	1 million
kilo (k)	10^{3}	1 thousand
centi (c)	10^{-2}	1 hundredth
milli (m)	10^{-3}	1 thousandth
micro (μ)	10^{-6}	1 millionth
nano (n)	10^{-9}	1 billionth
pico (p)	10^{-12}	1 trillionth
femto (f)	10^{-15}	1 quadrillionth

meter (m)	distance
kilogram (kg)	mass
second (s)	time
ampere (A)	electric current
kelvin (K)	temperature
mole (mol)	amount of substance
candela (cd)	intensity of light

Conversions:
Convert **5.12 fm/ns^2** to **m/s^2**: **5.12 fm/ns^2 = 5.12 ·1 fm/(1 ns)^2 = 5.12 ·10^{-15}m / (10^{-9}s) ^{2} = 5.12 ·10^{-15}m / (10^{-18}s^2) = 5.12·10^3 m/s^2**

Solving problems algebraically, and only then numerically:
Example: if you are given that a 200 g wooden block is pushed along a frictionless surface with a force of 10 N. Find acceleration.
Since **F = m a**, the solution is: **a = F/m = 10 N/ 0.2 kg = 50 m/s^2**.

Course Objective: Students who complete this class will understand the fundamentals of physics: electrostatics and magnetism. Students will understand and be able to calculate the concepts of the electric and magnetic fields, electric potential and basic circuits; the laws of Gauss, Ampere, and Faraday; Maxwell's equations; geometrical optics.

More information on next page:

More information:

Disability Resource Center Recommendations (https://www.albany.edu/disability/**)**
Reasonable accommodations will be provided in this course for students with documented physical, sensory, systemic, cognitive, learning and psychiatric disabilities. If you believe you have a disability requiring accommodation in this class, please notify the Director of the Disability Resource Center (Campus Center 130; 518-442-5501; drc@albany.edu). That office will provide the course instructor with verification of your disability and will recommend appropriate accommodations.

Mental Health
As a student there may be times when personal stressors interfere with your academic performance and/or negatively impact your daily life. The University at Albany Counseling and Psychological Services (CAPS) provides free, confidential services including individual and group psychological counseling and evaluation for emotional, social and academic concerns. Given the COVID pandemic, students may consult with CAPS staff remotely by telephone, email or Zoom appointments regarding issues that impact them or someone they care about. For questions or to make an appointment, call (518) 442-5800 or email consultation@albany.edu. Visit www.albany.edu/caps/ for hours of operation and additional information
If your life or someone else's life is in danger, please call 911. If you are in a crisis and need help right away, please call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).
Students dealing with heightened feelings of sadness or hopelessness, increased anxiety, or thoughts of suicide may also text "GOT5" to 741741 (Crisis Text Line).

Religious Holidays
New York State Education Law (https://www.nysenate.gov/legislation/laws/EDN/224-A) allows for absences due to religious observances. Students absent because of religious beliefs will be given equivalent opportunities for make-up examinations and assignments, but no later than a week after the original due date.
You must report the religious holidays that you observe and notify me of any needed accommodations prior to the end of the first week of classes.
Requests submitted after this time will be more difficult to accommodate given the structure of the class.

University's Standards of Academic Integrity:
https://www.albany.edu/undergraduate_bulletin/regulations.html

Absence policies:
https://www.albany.edu/health_center/medicalexcuse.shtml.

Physics Lab II: APHY 155 SYLLABUS (1 credit)

Lab	Week of	Experiment
	1/23	No Labs
1	1/30	Electrical Force Balance
2	2/6	Electric Potential
3	2/13	Current Balance
	2/20	* Make up Labs only
4	2/27	Ohm's Law
5	3/6	Series and Parallel Circuits
	3/13	Spring Break
6	3/20	RC circuits
7	3/24	Magnetic fields
8	3/31	Geometrical Optics
	4/10	* Make up Labs Only
9	4/17	e charge/mass
10	4/24	Standing Waves
11	5/1	Interference
	5/8	* Make up Labs Only
* Any lab canceled for **snow** will be rescheduled for the week of 2/20, 4/10 or 5/8.		

1. **Attendance**: **Your grade will consist of the average of the best 10 of the 11 labs**. If you cannot attend your regularly scheduled session, you may attend another section that week if the class has space (no more than 2 students per set up). You must contact your TA and arrange for your own TA to receive the prelab and prior lab report before it is due. You cannot turn in a lab report if you miss the lab. You may only make up labs for documented serious illness and other documented events of equal severity, in which case you must arrange with your TA to schedule a time (some days during the weeks of 2/17, 4/14 and 5/5).

2. **Preparation**: **Before** the start of each lab you ***must*** read the lab and do the prelab questions. ***Prelabs will be collected at the start of class. Late prelabs will not be accepted.*** The lab materials are on blackboard. If you are having trouble, come to any of the TAs office hours in 224 or email your TA. Emails and **office hours** will be posted on the blackboard site. The lab handouts explain all the theory relevant to the labs, but read the relevant material in the book before the lab, even if your lectures have not covered it yet.

3. **Lab reports** are due at the beginning of the next lab meeting. Lab report grades will be reduced by **10%** for each week they are late. Each report should be done by an individual student, not a collaboration of the lab partners. **Each report should be 100% your own work:** ***plagiarism may lead to automatic failure and possible disciplinary action.***

4. **Grading:**

Before the lab:

Prelab questions	20 points

During the lab:

Lab Participation	5 points
Data: Excel sheets, basic uncertainty assessment and basic graphs	30 points

In the report:

Theory: One short paragraph overview—the why	5 points
Experimental Technique: One short paragraph—the how	5 points
Results: (about one page in length)	30 points
Graphs, calculations, etc. and **descriptions** of the significance (e.g.is the graph supposed to be straight or curved and what does it mean that it is or isn't), analysis of uncertainty and systematic error, answers to questions asked in the handout.	
Conclusions—what was the result? Did it agree with theory?	5 points
Total	**100 points**

Note: Performance in class includes figuring out what to do next. Your TA is there to help, but try asking other groups or even reading the instructions. **Use Excel for ALL calculations**, so both you and the TA can figure out where things went wrong.

5. **Learning Objectives:** This class is meant to provide hands on demonstrations of the material covered in Physics 150 (Electricity and magnetism, circuits, and optics), as well as an understanding of measurement uncertainty and analysis, and instruction in the use of plotting and calculation software such as Excel. **Pre/Co-requisites:** APHY 150 or T PHY 151

6. **Problems:** 1) Contact your TA. A list of TA email addresses is online. 2) Come to tutoring sessions, also posted online. 3) For administrative issues, suggestions for lab handouts, etc., Contact Prof. Keith Earle, Phy 112, kearle@albany.edu. 3) other (missing TAs, etc): the physics office room 215

Course Description: Experiments in electricity and magnetism, circuits, and optics. One laboratory period each week.

AMAT 118/TMAT 118: Honors Calculus 1 Fall 2020

WebAssign: albany 1479 9300

Instructor: J. Tambroni **Email:** jtambroni@albany.edu,

Office Hours: MW 1:00pm – 2:00pm and 6:00pm – 7:00pm, in Zoom

Course Materials: Calculus Early Transcendentals 9th edition with WebAssign Access by James Stewart ISPN: 9780357531273, A strong internet connection, CamScanner smart phone app
Prerequisite(s): Honors College Approval

Description: This course begins the study of calculus, one of the great intellectual achievements of the 17th century. The prerequisites for this course are an understanding of pre-calculus - the ability to do algebra and solve elementary equations, and familiarity with the notion of a function and the standard elementary functions like polynomials, trig functions, exponentials and logarithms.
This course has the same topics as A MAT 112, but some topics are covered in greater depth. This course is for students with more than average ability and more than average interest in mathematics. **4 credits**

GE Category: Satisfies the MATH GE.

Homework (15%): Homework will be assigned regularly and must be completed on the WebAssign website. Typically, homework will be due Mondays and Thursdays by 11:59pm. **Typically, there will be no makeups/extensions given.** As such, your lowest two homework assignments will be automatically dropped.

Quizzes (20%): There will be weekly quizzes. Quiz questions will be based on homework, suggested problems, and notes. These will be posted to blackboard each week. ***You will have 24 hours to complete the quiz and submit as a single PDF file to blackboard. CamScanner makes this process simple. File formats other than PDF will not be eligible for credit.*** Your two lowest quiz scores will be dropped at the end of the semester. **Make-up quizzes will not be given.**

Tests (35%): There will be a test in October and a test in November. Test dates will be announced at least one week in advance. ***You will have 24 hours to complete the quiz and submit as a single PDF file to blackboard. CamScanner makes this process simple. File formats other than PDF will not be eligible for credit.***

Final Exam (30%): TBA. Makeup exams will only be given with documentation from the Office of the Vice Provost for Undergraduate Education located in Lecture Center 30.

Office Hours: Office hours are available for you to see me when you're having trouble understanding the material. The material will accumulate quickly; do not wait to stop by office hours. I will be far more helpful if you can demonstrate that you're putting forth significant effort.
I do not reteach full lectures in office hours. Plan accordingly.

Undergraduate Academic Regulations: Academic dishonesty of any kind will not be tolerated. Students are bound by the University's academic integrity policy. UAlbany's academic policies can be found at http://www.albany.edu/undergraduate_bulletin/regulations.html

Students with Disabilities: Special accommodations of some kind can be made for students with well-documented diagnosed disabilities, please contact me at your earliest convenience, or, speak with the Disability Resource Center at 442-5490, BA120. For any Policies not covered in this syllabus, refer to the U Albany Undergraduate Bulletin, or ask me directly.

Academic Calendar: https://www.albany.edu/registrar/academic_calendar.php

Remark on Grades: Please do not contact me requesting an unjustified higher grade. The grade you earn, is the grade that I report.

Grade distribution:

A: 93 - 100%
A-: 90 - 92%
B+: 87 - 89%
B: 83 - 86%
B-: 80 - 82%
C+: 77 - 79%
C: 73 - 76 %
C-: 70 - 72%
D+: 67 - 69%
D: 63- 66%
D-: 60 - 62%
E: 0 - 59%

Excellent advice from How to Think Like a Mathematician by Kevin Houston

• It's up to you – Your actions are likely to be the greatest determiner of the outcome of your studies. Consider the ancient proverb: The teacher can open the door, but you must enter by yourself.
• Be active – Read the book. Do the exercises set.
• Think for yourself – Always good advice.
• Question everything – Be skeptical of all results presented to you. Don't accept them until you are sure you believe them.
• Observe – The power of Sherlock Holmes came not from his deductions but his observations.
• Prepare to be wrong – You will often be told you are wrong when doing mathematics. Don't despair; mathematics is hard, but the rewards are great. Use it to spur yourself on.
• Don't memorize – seek to understand – It is easy to remember what you truly understand.
• Develop your intuition – But don't trust it completely.
• Collaborate – Work with others, if you can, to understand the mathematics. This isn't a competition. Don't merely copy from them though!
• Reflect – Look back and see what you have learned. Ask yourself how you could have done better.

New York State Education Law (Section 224-A) requires campuses to excuse, without penalty, individual students absent because of religious beliefs, and to provide equivalent opportunities for make-up examina-tions, study, or work requirements missed because of such absences. I will work directly with you to ac-commodate religious observances, provided that you notify me in a timely manner.

Course Objectives: The student who successfully completes this course will understand the concept of the derivative, know how to differentiate a wide variety of functions, and begin to develop ru1 appreciation for their uses - finding maxima and minima of functions, estimating values of functions, and their applications in physics, economics, and other areas.

Topics to be covered: Surface area, functions and models, four ways to represent a function, mathematical models, new functions from old functions, exponential functions, triple integrals, inverse functions and logarithms, limits and derivatives, tangent and velocity, problems, limit of a function, calculating limits, continuity, limits at the infinity, triple Integrals in cylindrical coordinates, derivatives and rates of change, implicate differentitation, differentiation rules, hyperbolic functions, the chain rule, exponential growth and decay, related rates, maximum and minimum values, the mean value theorem, and others if time allows.

TMAT 119 Honors Calculus II
Spring 2020, (4 credits)
MWF 11:30-12:25, W 12:35-1:30 BB 209

Professor: Steven Plotnick (splotnick@albany.edu)
Office: ES 123B (442-4615)
Office Hours: MWF 9:20-10:15 and by appointment

Text: **Calculus of a Single Variable**, 8th ed., James Stewart
Prerequisite(s): A MAT 118, a grade of A in A MAT 112, or permission of instructor.

Course Description: This course continues the study of calculus, one of the great intellectual achievements of the 17th century. We pick up where Math 112/118 leaves off. (Prerequisites: Math 112118, or a sufficiently high grade on the AP exam) After a short review, we will discuss applications of the definite integral to geometry, physics, and probability, along with specific techniques for finding integrals. We will learn about polar coordinates and parametric curves, and we will spend a good deal of time on infinite sequences and series. We will cover chapters 6, 7, 8, 10, and 11.

Learning Outcomes: The student who successfully completes this course will understand a variety of applications of calculus to geometry and the physical sciences, and will know how to carry out these calculations. He/she will also understand how and why we attempt to represent functions by 'infinite' polynomials, and will begin to develop an appreciation for how their calculator determines certain functions.

This course satisfies the Mathematics requirement of the General Education program. The specific learning objectives for general education courses in mathematics are:

1) *the ability to decipher, interpret, and draw conclusions from formal or mathematical models such as formulas, graphs, and/or truth tables, and an understanding of the concepts used in such models*
2) *the ability to formulate and/or represent problems in manners appropriate to mathematical, statistical, or logical analysis*
3) *the ability to employ appropriate mathematical computations, statistical techniques, or logical methods to solve problems and/or draw conclusions from data*
4) *the ability to evaluate results and recognize the limits of methods and/or models within the context of the discipline, as appropriate*

This is an honors class, so we will do more than just cover the standard material (as in Math 113). We will present more proofs, try to develop an appreciation for the theoretical underpinnings of calculus, and look at interesting/challenging applications.

There will be two in-class tests, a final, and numerous quizzes. Dates for the tests will be announced in class, at least a week in advance. Needless to say, it is expected that you take the exams at the scheduled time except in (documented) cases of family emergencies or serious illness. If there is a reason why you cannot take a test, you are expected to contact me **in advance** of the test. Quizzes will be given about once a week, generally on Friday, and will be announced in advance. There are no make-up quizzes, but I will drop your lowest two quizzes. Students who take the homework seriously should do well on quizzes.

Homework will be assigned on webassign.net. This will require an access code. If you bought a new book, it should have come with an access code. If not, these can be purchased online. We will start using this system almost immediately, once I give you the information you need to get started on this website. Beside the fact that it is being graded, you will find that doing the homework is essential to learning this material. Trust me: Nobody learns mathematics at any level without spending a lot of time doing problems.

Homework: 10%
Exam 1: 20%
Exam 2: 20%
Quizzes: 20%
Final: 30%

The grading scale is as follows:

100-95	94-90	89-87	86-83	82-80	79-77	76-73	72-70	69-67	66-63	62-60	<60
A	A-	B+	B	B	C+	C	C-	D+	D	D-	E

For additional help, the mathematics department maintains a Tutoring Room, ES 138, which is available to all students in 100-level courses on a first-come, first-served basis. Students should feel free to use the Tutoring Room for assistance in coursework and homework. Of course, I am available during office hours (or by appointment if you cannot meet me during office hours) for help. Please don't hesitate to come by

Students are, of course, expected to follow the University's policy on academic integrity. Go to http://www.albany.edu/undergraduate_bulletin/regulations.html. Also, look at the University's Medical Excuse Policy: http://www.albany.edu/health_center/medicalexcuse.shtml.

Out of respect for other students and the instructor, it is expected that students arrive on time, turn off cell phones, and refrain from emailing, texting, tweeting, facebooking, instagramming, snapchatting, etc. during class. This includes all social media techniques invented after this syllabus is written.

Topics Covered:
- Applications of the definite integral to geometry, physics, and probability,
- Specific techniques for finding integrals
- Polar coordinates
- Parametric curves
- Infinite sequences and series