March 10, 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 College of Arts and Sciences, I am pleased to submit our proposal for an update to our Physics BS registration that adds 3 new concentrations to our existing program.

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 Kim, Ph.D.
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

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 Ave 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:	Physics
	SED Program Code	03017, 89210, 28846, 82307
	Award(s) (e.g., A.A., B.S.):	B.S.
	Number of Required Credits:	Minimum [120] If tracks or options, largest minimum [ ]
	HEGIS Code:	1902
	CIP 2010 Code:	40.0801
	Effective Date of Change:	Fall 2023
	Effective Date of Completion[2]	Spring 2025
d) Campus Contact	Name and title: Kaitlyn Beachner, Staff Associate for Undergraduate 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.*** Fall 2021 Name and title: Carol Kim, Ph.D., Senior Vice President for Academic Affairs & Provost Signature and date: 3/10/2023	
	If the program will be registered jointly[3] with one or more other institutions, provide the following information for each 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.

[ ] 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
[X] 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 of Change:

The traditional B.S. Physics curriculum at research universities like U Albany gives students a well-rounded education in physics, a solid background in mathematics, and problem solving skills that are applicable to other facets of life.

A B.S. in Physics is a unique degree since it provides a variety of pathways: research at universities, government or private laboratories; jobs in STEM fields such as engineering, computer software and hardware, and medical fields; teaching at the secondary school level or in community colleges; finance; science journalism; patent law, etc. So, after earning a B.S. in Physics, a student can go on for Graduate Studies or enter the job market.

According to data collected by the American Physical Society, job titles, outside of academia, span the gamut of our technological society: Systems and Design Engineer, Project Manager, Test Engineer, Programmer, IT Consultant, Data analyst, Business Analyst, Research Associate, etc.; the list is long! In general, Physics majors are gainfully employed, with competitive starting salaries and excellent prospects for advancement.

Since technology is getting more and more specialized, we are proposing four concentrations, which will further increase the competitiveness of our graduates.

1) B.S. in Physics with a concentration in General Physics:

This concentration is our standard B.S. curriculum, and provides a well-rounded education, and is well suited for students who are planning to go on for Graduate Studies in Physics (or other fields). Upper division courses include 1-semester sequences for Classical Mechanics, Advanced Laboratory, and, Thermodynamics and Statistical Mechanics, and 2-semester sequences for Electricity & Magnetism, and Quantum Mechanics.

2) B.S. in Physics with a concentration in Computational Physics:

In general, physics problems are very difficult to solve exactly, which means that approximate solutions must be found. Computational Physics is a discipline which focuses on the numerical solutions of complex physical problems. This requires a knowledge of the underlying mathematical and physical models as well as computational methods that will enable computers to reach precise and accurate solutions in reasonable periods of time. Students will develop skills applicable to much in-demand careers in data science.

Consequently, in this concentration, we drop some of the required core courses from the standard curriculum (e.g., the 2nd semester of E&M and Quantum Mechanics), and add courses that will allow students to focus on topics in Computational techniques – they can also take courses relating to computer hardware, e.g., Electronics or Micro-processor laboratory courses.

3) B.S. in Physics with a concentration in Astronomy and Particle Astrophysics:

Humans have been engaged in astronomical observations for millennia using the naked eye, and since the 1600s using optical telescopes. This field has captured our imagination, what with the moon landing in the 1960s, NASA missions like the Voyager probe, Hubble telescope, James Webb telescope, a return to the Moon (Artemis), etc. More recently, private companies have joined the fray. As a result, Astronomy is becoming a larger draw for students, and this concentration will appeal to those who enjoy "outer space".

Since the early- to mid-1900s, we have started using techniques from Particle Physics to study the Universe, e.g., radio waves, infra-red waves, X-rays, gamma rays, neutrinos, cosmic rays, gravitational waves; all these use highly specialized detection systems.

This interdisciplinary concentration combines the signature strengths of our faculty members who do Astronomy, and Particle Astrophysics; we drop some of the required core courses from the standard curriculum (e.g., the 2nd semester of E&M and Quantum Mechanics), and add courses that will allow students to focus on topics in Astronomy and Particle Astrophysics. This concentration will give a students a "leg up" when applying to Graduate Studies in Astronomy or related fields, or applying for jobs related to these activities, e.g., at NASA or their sub-contractors, Space X, etc.

4) B.S. in Physics with a concentration in Bio-imaging:

Bio-imaging is a state-of-the-art modern field that combines Physics (particularly optics) and Medical Physics, and applies it to biological processes. A concentration in bio-imaging is a completely new opportunity that the department would like to offer. It will allow students to be more attractive on the job market, particularly in the biotech industry. Such a concentration may also be of interest to pre-med students trying to distinguish themselves from the standard biology path. This concentration, which is not readily available elsewhere, relies on the strengths of our faculty who are doing research in Optics, Biophysics and Medical Imaging techniques.

In this concentration, we drop some of the required core courses from the standard curriculum (e.g., the 2nd semester of E&M and Quantum Mechanics), and add courses that will allow students to focus on topics in Optics and Imaging techniques.

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.

Below is the most recent Physics BS curriculum with the newly proposed Physics BS General Program. This has very few changes. Following that depiction, please the next page which depicts the updated Physics BS program in column 1. We now want to continue to offer the Physics BS as the General Physics program, but additional offer concentrations in computational physics (column 2), astronomy and particle astrophysics (column 3). And bioimaging (column 4). You will notice each concentration has some variation to courses required, but in all three concentrations a majority of the course requirements are the same as the Physics BS with no concentration.

2022 SED Approved Physics B.S. Requirements:			**2023 *Proposed* Physics B.S. Requirements:**	
69-76 credits:			*69-73 Credits:*	
General program B.S.			***General program B.S.***	
Introductory physics sequence	*Select one*	APHY 140 – Physics I: Mechanics (3)	*Select one*	APHY 140 – Physics I: Mechanics (3)
		TPHY 141 – Honors Physics I: Mechanics (3)		TPHY 141 – Honors Physics I: Mechanics (3)
		APHY 142 – Physics I: Advanced Mechanics (3)		APHY 142 – Physics I: Advanced Mechanics (3)
	Select one	APHY 150 – Physics II: Electromagnetism (3)	*Select one*	APHY 150 – Physics II: Electromagnetism (3)
		TPHY 151 – Honors Physics II: Electromagnetism (3)		TPHY 151 – Honors Physics II: Electromagnetism (3)
		APHY 152 – Physics II: Advanced Electromagnetism (3)		APHY 152 – Physics II: Advanced Electromagnetism (3)
	APHY 240 – Physics III: Structure of Matter (3)			APHY 240 – Physics III: Structure of Matter (3)
Lab sequence for introductory courses	*Select one*	APHY 106 – General Physics Lab I (1)	*Select one*	APHY 106 – General Physics Lab I (1)
		APHY 145 – Physics Lab I (1)		APHY 145 – Physics Lab I (1)
	Select one	APHY 109 – General Physics Lab II (1)	*Select one*	APHY 109 – General Physics Lab II (1)
		APHY 155 – Physics Lab II (1)		APHY 155 – Physics Lab II (1)
	APHY 245 – Physics Lab III (1)		APHY 245 – Physics Lab III (1)	
Higher level physics courses	Select one	APHY 235 – Mathematics in Physics (3)	Select one	APHY 235 – Mathematics in Physics (3)
		AMAT 314 – Analysis for Applications I (3) and AMAT 315 – Analysis for Applications II (3)		AMAT 314 – Analysis for Applications I (3) and AMAT 315 – Analysis for Applications II (3)
	APHY 250 – Physics IV: Waves (3)		APHY 250 – Physics IV: Waves (3)	
	APHY 320 – Classical Mechanics (3)		APHY 410– Classical Mechanics (3) *Course Number Change Only	
	APHY 335Z – Advanced Physics Lab (3)		APHY 335Z – Advanced Physics Lab (3)	
	APHY 340 – Electromagnetism I: Statics (3)		APHY 470 – Electromagnetism I: Statics (3) *Course Number Change Only	
	APHY 350 – Electromagnetism II: Electrodynamics (3)		APHY 480 – Electromagnetism II: Electrodynamics (3) *Course Number Change Only	
	APHY 440 – Quantum Physics I (3)		APHY 440 – Quantum Physics I (3)	
	APHY 450 – Quantum Physics II (3)		APHY 450 – Quantum Physics II (3)	
	APHY 460 – Thermodynamics and Statistical Physics (3)		APHY 460 – Thermodynamics and Statistical Physics (3)	
Chemistry sequence	*Select one*	ACHM 120 – General Chemistry I (3) ***AND*** ACHM 124 – General Chemistry Laboratory I (1)	*Select one*	ACHM 120 – General Chemistry I (3) ***AND*** ACHM 124 – General Chemistry Laboratory I (1)
		ACHM 130 – Advanced Chemistry I (3) ***AND***		ACHM 130 – Advanced Chemistry I (3) ***AND***

		ACHM 124 – General Chemistry Laboratory I (1)			ACHM 124 – General Chemistry Laboratory I (1)	
					ACHM 115 – General Chemistry I and Laboratory (4) *New Course Designed to Include Laboratory	
	Select one	ACHM 121 – General Chemistry II (3) ***AND*** ACHM 125 – General Chemistry Laboratory II (1)		*Select one*	ACHM 121 – General Chemistry II (3) ***AND*** ACHM 125 – General Chemistry Laboratory II (1)	
		ACHM 131 – Advanced Chemistry II (3) ***AND*** ACHM 125 – General Chemistry Laboratory II (1)			ACHM 131 – Advanced Chemistry II (3) ***AND*** ACHM 125 – General Chemistry Laboratory II (1)	
					ACHM 116 – General Chemistry II and Laboratory (4) *New Course Designed to Include Laboratory	
Calculus sequence	Select one sequence	A	AMAT 112 – Calculus I (4)	Select one sequence	A	AMAT 112 – Calculus I (4)
			AMAT 113 – Calculus II (4)			AMAT 113 – Calculus II (4)
		B	TMAT 118 – Honors Calculus I (4)		B	TMAT 118 – Honors Calculus I (4)
			TMAT 119 – Honors Calculus II (4)			TMAT 119 – Honors Calculus II (4)
	AMAT 214 – Calculus of Several Variables (4)			AMAT 214 – Calculus of Several Variables (4)		
Mathematics elective (select one)	AMAT 220 – Linear Algebra (3)			AMAT 220 – Linear Algebra (3)		
	AMAT 314 – Analysis for Applications I (3)			AMAT 314 – Analysis for Applications I (3)		
	AMAT 367 – Discrete Probability (3)			AMAT 367 – Discrete Probability (3)		
	AMAT 412 – Complex Variables for Applications (3)			AMAT 412 – Complex Variables for Applications (3)		
"An additional physics course numbered 300 or higher, and appended with a Y suffix"	APHY 409Y – Mathematical Models in Physics (3)			APHY 409Y – Mathematical Models in Physics (3)		
	APHY 415Y – Electronics (3)			APHY 415Y – Electronics (3)		
	APHY 426Y – Introduction to Particle Physics (3)			APHY 426Y – Introduction to Particle Physics (3)		
	APHY 430Y – Optics (3)			APHY 430Y – Optics (3)		
	APHY 443Y – Introduction to Cosmology (3)			APHY 443Y – Introduction to Cosmology (3)		
	APHY 448Y – Medical Imaging (3)			APHY 448Y – Medical Imaging (3)		
	APHY 449Y – Introduction to Quantum Foundations and Quantum Information (3)			APHY 449Y – Introduction to Quantum Foundations and Quantum Information (3)		
	APHY 451Y – Bayesian Data Analysis and Signal Processing (3)			APHY 451Y – Bayesian Data Analysis and Signal Processing (3)		
	APHY 459Y – Symmetry in Physics (3)			APHY 459Y – Symmetry in Physics (3)		
	APHY 462Y – Physics of Materials (3)			APHY 462Y – Physics of Materials (3)		
	APHY 466Y – X-ray Optics, Analysis, and Imaging (3)			APHY 466Y – X-ray Optics, Analysis, and Imaging (3)		
	APHY 477Y – Computational Methods (3)			APHY 477Y – Computational Methods (3)		
Computer Science Course	ICEN/ICSI 201 – Introduction to Computer Science (4)			*Select one*	IECE/ICSI 201 – Introduction to Computer Science (4)	
					APHY 277 – Computers in Physics (4)	

Course Categories	Physics B.S. Also listed above, the last registration against this general Physic B.S. curriculum.		Physics B.S. with a concentration in Computational Physics		Physics B.S. with a concentration in Astronomy & Particle Astrophysics		Physics B.S. with a concentration in Bio-imaging	
	69-73 credits:		*78-81 Credits:*		*74-78 Credits:*		*69 - 73 Credits:*	
Introductory physics sequence	*Select one*	APHY 140 – Physics I: Mechanics (3)	*Select one*	APHY 140 – Physics I: Mechanics (3)	*Select one*	APHY 140 – Physics I: Mechanics (3)	*Select one*	APHY 140 – Physics I: Mechanics (3)
		TPHY 141 – Honors Physics I: Mechanics (3)		TPHY 141 – Honors Physics I: Mechanics (3)		TPHY 141 – Honors Physics I: Mechanics (3)		TPHY 141 – Honors Physics I: Mechanics (3)
		APHY 142 – Physics I: Advanced Mechanics (3)		APHY 142 – Physics I: Advanced Mechanics (3)		APHY 142 – Physics I: Advanced Mechanics (3)		APHY 142 – Physics I: Advanced Mechanics (3)
	Select one	APHY 150 – Physics II: Electromagnetism (3)	*Select one*	APHY 150 – Physics II: Electromagnetism (3)	*Select one*	APHY 150 – Physics II: Electromagnetism (3)	*Select one*	APHY 150 – Physics II: Electromagnetism (3)
		TPHY 151 – Honors Physics II: Electromagnetism (4)		TPHY 151 – Honors Physics II: Electromagnetism (4)		TPHY 151 – Honors Physics II: Electromagnetism (4)		TPHY 151 – Honors Physics II: Electromagnetism (4)
		APHY 152 – Physics II: Advanced Electromagnetism (3)		APHY 152 – Physics II: Advanced Electromagnetism (3)		APHY 152 – Physics II: Advanced Electromagnetism (3)		APHY 152 – Physics II: Advanced Electromagnetism (3)
	Required Course: APHY 240 – Physics III: Structure of Matter (3)		*Required Course:* APHY 240 – Physics III: Structure of Matter (3)		*Required Course:* APHY 240 – Physics III: Structure of Matter (3)		*Required Course:* APHY 240 – Physics III: Structure of Matter (3)	
Lab sequence for introductory courses	*Select one*	APHY 106 – General Physics Lab I (1)	*Select one*	APHY 106 – General Physics Lab I (1)	*Select one*	APHY 106 – General Physics Lab I (1)	*Select one*	APHY 106 – General Physics Lab I (1)
		APHY 145 – Physics Lab I (1)		APHY 145 – Physics Lab I (1)		APHY 145 – Physics Lab I (1)		APHY 145 – Physics Lab I (1)
	Select one	APHY 109 – General Physics Lab II (1)	*Select one*	APHY 109 – General Physics Lab II (1)	*Select one*	APHY 109 – General Physics Lab II (1)	*Select one*	APHY 109 – General Physics Lab II (1)
		APHY 155 – Physics Lab II (1)		APHY 155 – Physics Lab II (1)		APHY 155 – Physics Lab II (1)		APHY 155 – Physics Lab II (1)

	Required Course: APHY 245 – Physics Lab III (1)		*Required Course:* APHY 245 – Physics Lab III (1)		*Required Course:* APHY 245 – Physics Lab III (1)		*Required Course:* APHY 245 – Physics Lab III (1)	
Higher level physics courses	*Select one*	APHY 235 – Mathematics in Physics (3)	*Select one*	APHY 235 – Mathematics in Physics (3)	*Select one*	APHY 235 – Mathematics in Physics (3)	*Select one*	APHY 235 – Mathematics in Physics (3)
		AMAT 314 – Analysis for Applications I (3) and AMAT 315 – Analysis for Applications II (3)		AMAT 314 – Analysis for Applications I (3) & AMAT 315 – Analysis for Applications II (3)		AMAT 314 – Analysis for Applications I (3) & AMAT 315 – Analysis for Applications II (3)		AMAT 314 – Analysis for Applications I (3) & AMAT 315 – Analysis for Applications II (3)
	APHY 250 – Physics IV: Waves (3)		APHY 250 – Physics IV: Waves (3)		APHY 250 – Physics IV: Waves (3)		APHY 250 – Physics IV: Waves (3)	
	APHY 410 – Classical Mechanics (3)		APHY 410 – Classical Mechanics (3)		APHY 410 – Classical Mechanics (3)		APHY 410 – Classical Mechanics (3)	
	APHY 335Z – Advanced Physics Lab (3)		APHY 335Z – Advanced Physics Lab (3)		APHY 335Z – Advanced Physics Lab (3)		APHY 335Z – Advanced Physics Lab (3)	
	APHY 470 – Electromagnetism I: Statics (3)		APHY 470 – Electromagnetism I: Statics (3)		APHY 470 – Electromagnetism I: Statics (3)		APHY 470 – Electromagnetism I: Statics (3)	
	APHY 480 – Electromagnetism II: Electrodynamics (3)							
	APHY 440 – Quantum Physics I (3)		APHY 440 – Quantum Physics I (3)		APHY 440 – Quantum Physics I (3)		APHY 440 – Quantum Physics I (3)	
	APHY 450 – Quantum Physics II (3)							
	APHY 460 – Thermodynamics and Statistical Physics (3)		APHY 460 – Thermodynamics and Statistical Physics (3)		APHY 460 – Thermodynamics and Statistical Physics (3)		APHY 460 – Thermodynamics and Statistical Physics (3)	
Chemistry sequence	*Select one*	ACHM 120 – General Chemistry I (3) ***or*** ACHM 130 – Advanced Chemistry I (3) ***and*** ACHM 124 – General Chemistry Laboratory I (1)	*Select one*	ACHM 120 – General Chemistry I (3) ***or*** ACHM 130 – Advanced Chemistry I (3)	*Select one*	ACHM 120 – General Chemistry I (3) ***or*** ACHM 130 – Advanced Chemistry I (3)	*Select one*	ACHM 120 – General Chemistry I (3) ***or*** ACHM 130 – Advanced Chemistry I (3) ***and*** ACHM 124 – General Chemistry Laboratory I (1)
		ACHM 115 – General Chemistry I and Laboratory (4)		ACHM 115 – General Chemistry I and Laboratory (4)		ACHM 115 – General Chemistry I and Laboratory (4)		ACHM 115 – General Chemistry I and Laboratory (4)
	Select one	ACHM 121 – General Chemistry II (3) ***or*** ACHM 131					*Select one*	ACHM 121 – General Chemistry II (3) ***or*** ACHM 131 – Advanced

		– Advanced Chemistry II (3) ***and*** ACHM 125 – General Chemistry Laboratory II (1)									Chemistry II (3) ***and*** ACHM 125 – General Chemistry Laboratory II (1)
		ACHM 116 – General Chemistry II and Laboratory (4)									ACHM 116 – General Chemistry II and Laboratory (4)
Calculus sequence	*Select one sequence A or B*	**A**	AMAT 112 – Calculus I (4)	**A**	AMAT 112 – Calculus I (4)	**A**	AMAT 112 – Calculus I (4)	**A**	AMAT 112 – Calculus I (4)		
			AMAT 113 – Calculus II (4)		AMAT 113 – Calculus II (4)		AMAT 113 – Calculus II (4)		AMAT 113 – Calculus II (4)		
		B	TMAT 118 – Honors Calculus I (4)	**B**	TMAT 118 – Honors Calculus I (4)	**B**	TMAT 118 – Honors Calculus I (4)	**B**	TMAT 118 – Honors Calculus I (4)		
			TMAT 119 – Honors Calculus II (4)		TMAT 119 – Honors Calculus II (4)		TMAT 119 – Honors Calculus II (4)		TMAT 119 – Honors Calculus II (4)		
	Required Course: AMAT 214 – Calculus of Several Variables (4)			*Required Course:* AMAT 214 – Calculus of Several Variables (4)		*Required Course:* AMAT 214 – Calculus of Several Variables (4)		*Required Course:* AMAT 214 – Calculus of Several Variables (4)			
Mathematics elective (select one)	AMAT 220 – Linear Algebra (3)			*Required Course:* AMAT 220 – Linear Algebra (3)		*Required Course:* AMAT 220 – Linear Algebra (3)					
	AMAT 314 – Analysis for Applications I (3)										
	AMAT 367 – Discrete Probability (3)										
	AMAT 412 – Complex Variables for Applications (3)										
One additional physics course numbered 300 or higher, and appended with a Y suffix				***All Three Courses are Required*** **Only one course*		***Choose four courses from the Astro-physics Course Electives***	APHY 300 – Introduction to Astrophysics (3)	***Choose four courses from these Upper Division Physics Electives***			
									APHY 404 – Biophysics (3)		
	APHY 409Y – Mathematical Models in Physics (3)										
	APHY 415Y – Electronics (3)										
	APHY 426Y – Introduction to Particle Physics (3)						APHY 426Y – Introduction to Particle Physics (3)				
	APHY 430Y – Optics (3)								APHY 430Y – Optics (3)		
	APHY 443Y – Introduction to Cosmology (3)						APHY 443Y – Introduction to Cosmology (3)				

			with a Y suffix is required.		*Only one course with a Y suffix is required.*		*Only one course with a Y suffix is required.*	APHY 446Y – Laser Physics and Applications (3)
	APHY 448Y – Medical Imaging (3)							APHY 448Y – Medical Imaging (3)
	APHY 449Y – Introduction to Quantum Foundations and Quantum Information (3)			APHY 449Y – Introduction to Quantum Foundations and Quantum Information (3)				
	APHY 451Y – Bayesian Data Analysis and Signal Processing (3)			APHY 451Y – Bayesian Data Analysis and Signal Processing (3)				
						APHY 452(Y) –Astro-particle Physics (3)		
								APHY 458Y – Physics of Radiation Detectors (3)
	APHY 459Y – Symmetry in Physics (3)							
	APHY 462Y – Physics of Materials (3)							
	APHY 466Y – X-ray Optics, Analysis, and Imaging (3)							APHY 466Y – X-ray Optics, Analysis, and Imaging (3)
						APHY 471Y – Introduction to Neutrino Astronomy (3)		
	APHY 477Y – Computational Methods (3)			APHY 477Y – Computational Methods (3)				
	APHY 497Y – Independent Study/Research (3)							
Computer Science Course	*Select one*	IECE/ICSI 201 – Introduction to Computer Science (4)	*Both Required*	IECE/ICSI 201 – Introduction to Computer Science (4)	*Select one*	IECE/ICSI 201 – Introduction to Computer Science (4)	*Select one*	IECE/ICSI 201 – Introduction to Computer Science (4)
		APHY 277 – Computers in Physics (4)		APHY 277 – Computers in Physics (4)		APHY 277 – Computers in Physics (4)		APHY 277 – Computers in Physics (4)
			Choose three courses from this list of Comput		***Choose two courses from this list of Physics***	APHY 100 – Contemporary Astronomy (3)		
						APHY 103 – Exploration of Space (3)		
						APHY 112 – Star Systems (3)		
				ICSI 333 – System Fundamentals (4)				

	***ational Physics** course options:*	ICSI 401 – Numerical Methods (3)	***Elective** course options:* ***Note: Only one 100 level course may count in this section.***		
		ICSI 410 – Database Systems (3)			
		ICSI 431 – Data Mining (3)			
		ICSI 436 – Machine Learning (3)			
		APHY 353 – Microprocessor Applications (3)			
				APHY 409(Y) – Math Models in Physics (3)	
		APHY 415(Y) – Electronics (3)			
		APHY 416 – Electronics Projects (3)			
				APHY 430Y – Optics (3)	
		APHY 433 – Physics Measurements (3)			
				APHY 442 – Introduction to GR (3)	
		APHY 454 – Microprocessor Applications Lab (3)			
				APHY 458(Y) – Physics of Rad Detectors (3)	
		APHY 497 – Independent Study (3)		APHY 497 – Independent Study (3)	
		AMAT 367 – Discrete Probability (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.*

Please see addendum for new syllabi.

ACHM 115 General Chemistry I and Lab
ACHM 116 General Chemistry II and Lab
APHY 277 Computers in Physics
APHY 100 Contemporary Astronomy
APHY 103 Exploration of Space
APHY 112 Star Systems
APHY 300 Introduction to Astrophysics
APHY 404 Biophysics and Bioimaging
APHY 416 Electronics Projects
APHY 442 Introduction to GR
APHY 446Y Laser Physics and Applications
APHY 452 Astro-Particle Physics
APHY 458 (Y) Physics of Rad Detectors
APHY 471Y Introduction to Neutrino Astronomy
ICSI 333 System Fundamentals
ICSI 401 Numerical Methods
ICSI 410 Database Systems
ICSI 431 Data Mining
ICSI 436 Machine Learning

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

No additional costs are expected. All but two courses are already being taught, and the two new courses, which are electives, are envisioned to be taught every two years and can be easily accommodated in our current teaching load. None of the courses require additional equipment.

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:_____Physics BS_____

a) Indicate **academic calendar type**: [X] 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: _____Physics_____ 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**
APHY 140 Physics I: Mechanics or TPHY 141 Honors Physics I: Mechanics or APHY 142 Physics I: Advanced Mechanics	3	NS	X	3	X		
APHY 106 General Physics Lab I or APHY 145 Physics Lab I	1	NS	X	1	X		
AMAT 112 Calculus I or TMAT 118 Honors Calculus I or	4	MS	X	4	X		
UUNI 110 Writing and Critical Inquiry	3	BC	X				
ACHM 120 General Chemistry I or ACHM 130 Advanced General Chemistry I AND ACHM 124 General Chemistry Lab OR ACHM 115 General Chemistry I and Laboratory	4	NS	X	4	X	ACHM 115	
General Education: Social Science	3	SS	X				
Term credit totals:	18	18	18	12			

Term 2:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 150 Physics II: Electromagnetism or TPHY 151 Honors Physics II: Electromagnetism or APHY 152 Physics II: Advanced Electromagnetism	3-4	NS	3-4	3-4	X		APHY 140 TPHY 141 APHY 142
APHY 109 General Physics Lab II or APHY 155 Physics Lab II	1	NS	1	1	X		APHY 106 APHY 145
AMAT 113 Calculus II or TMAT 119 Honors Calculus II	4	MS	4	4	X		AMAT 112 TMAT 118 AMAT 101
General Education: American History	3	AH	3				
ACHM 121 General Chemistry II or ACHM 131 Advanced General Chemistry II AND ACHM 125 General Chemistry Laboratory II OR ACHM 116 General Chemistry II and Laboratory	4	NS	4	4	X	ACHM 116	ACHM 120 ACHM 130 ACHM 124 ACHM 115
Term credit totals:	15-16	15-16	15-16	12-13			

Term 3:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 240 Physics III: Structure of Matter	3		3	3	X		APHY 150, 152, or TPHY 151
APHY 245 Physics III Lab	1		1	1			Co: APHY 240
AMAT 214 Calculus of Several Variables	4	MS	4	4	X		AMAT 113
IECE/ICSI 201 Introduction to Computer Science or APHY 277 Computers in Physics	4		4	4	X	APHY 277	APHY 150, 152, or TPHY 151

Term 4:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
AMAT 220 Linear Algebra or AMAT 314 Analysis for Applications I or AMAT 367 Discrete Probability or AMAT 412 Complex Variables for Applications	3		3	3	X		AMAT 113 AMAT 214 and AMAT 220 AMAT 113 and 6 credits of 200+ Math AMAT 214
General Education: Foreign Language	3	FL	3				
APHY 250 Physics IV: Waves	3		3	3	X		APHY 240
APHY 235 – Mathematics in Physics or AMAT 314 Analysis for Applications	3		3	3	X		APHY 150, 152, or TPHY 151 AMAT 214

General Education: Art	3	AR						General Education: Humanities	3	HU	3				
General Education: International Perspectives	3	OW or WC	3												
Term credit totals:	17	10	15	12				Term credit totals:	15	6	15	9			
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**
APHY 410 Classical Mechanics	3		3	3			APHY 235	APHY 480 Electromagnetism II: Electrodynamics	3		3	3			APHY 250 and APHY 470
APHY 335Z Advanced Physics Lab	3		3	3			APHY 250	APHY 440 Quantum Physics I	3		3	3			APHY 235 and APHY 240
APHY 470 Electromagnetism I: Statics	3		3	3			APHY 235 and 250	Upper-Division Free Elective	3						
Upper-Division Free Elective	3							Upper-Division Free Elective	3						
AMAT 315 Analysis for Applications II or Free Elective	3		3 or 0	3 or 0				Free Elective	3						
Term credit totals:	15		9 or 12	9 or 12				Term credit totals:	15		6	6			
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**
APHY 450 – Quantum Physics II	3		3	3			APHY 440	Upper-Division Physics Elective	3		3	3			
APHY 460 – Thermodynamics and Statistical Physics	3		3	3			APHY 440	Upper-Division Free Elective	3						
Upper-Division Free Elective	3							Upper-Division Free Elective	3						
Upper-Division Free Elective	3							Free Elective	4						
Term credit totals:	12		6	6				Term credit totals:	13		3	3			

Program Totals (in credits):	**Total Credits: 120 - 121**	**SUNY GER: 49 - 50**	**LAS: 87 - 91**	**Major: 69-73**	**Elective & Other: 28-31**	**Upper Division: 45-51**	**Upper Division Major: 24 - 27**	**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 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:_____Physics B.S. with a concentration in Computational Physics_____

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

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

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

h) 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**
APHY 140 Physics I: Mechanics or TPHY 141 Honors Physics I: Mechanics or APHY 142 Physics I: Advanced Mechanics	3	NS	3	3	X		
APHY 106 General Physics Lab I or APHY 145 Physics Lab I	1	NS	1	1	X		
AMAT 112 Calculus I or TMAT 118 Honors Calculus I or	4	MS	4	4	X		
UUNI 110 Writing and Critical Inquiry	3	BC	3				
ACHM 120 General Chemistry I or ACHM 130 Advanced General Chemistry I AND ACHM 124 General Chemistry Lab OR ACHM 115 General Chemistry I and Laboratory	4	NS	4	4	X	ACHM 115	
General Education: Social Science	3	SS	3				
Term credit totals:	18	18	18	12			

Term 2:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 150 Physics II: Electromagnetism or TPHY 151 Honors Physics II: Electromagnetism or APHY 152 Physics II: Advanced Electromagnetism	3-4	NS	3-4	3-4	X		APHY 140 TPHY 141 APHY 142
APHY 109 General Physics Lab II or APHY 155 Physics Lab II	1	NS	1	1	X		APHY 106 APHY 145
AMAT 113 Calculus II or TMAT 119 Honors Calculus II	4	MS	4	4	X		AMAT 112 TMAT 118 AMAT 101
General Education: American History	3	AH	3				
IECE/ICSI 201 Introduction to Computer Science	4		4	4	X		
Term credit totals:	15-16	11-12	15-16	11-12			

Term 3:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 240 Physics III: Structure of Matter	3		3	3	X		APHY 150, 152, or TPHY 151
APHY 245 Physics III Lab	1		1	1			Co: APHY 240
AMAT 214 Calculus of Several Variables	4	MS	4	4	X		AMAT 113
General Education: Art	3	AR					
General Education: International Perspectives	3	OW or WC	3				
APHY 277 Computers in Physics	4		4	4		X	APHY 150, 152, or TPHY 151

Term 4:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
AMAT 220 Linear Algebra	3		3	3	X		AMAT 113
General Education: Foreign Language	3	FL	3				
APHY 250 Physics IV: Waves	3		3	3	X		APHY 240
APHY 235 – Mathematics in Physics or AMAT 314 Analysis for Applications	3		3	3	X		APHY 150, 152, or TPHY 151 AMAT 214
General Education: Humanities	3	HU	3				

Term credit totals:	18	10	15	12			
Term 5:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 410 Classical Mechanics	3		3	3			APHY 235
APHY 335Z Advanced Physics Lab	3		3	3			APHY 250
APHY 470 Electromagnetism I: Statics	3		3	3			APHY 235 and 250
Upper-Division Free Elective	3						
AMAT 315 Analysis for Applications II or Free Elective	3		3 or 0	3 or 0			
Term credit totals:	15		9 or 12	9 or 12			
Term 7:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 460 – Thermodynamics and Statistical Physics	3		3	3			APHY 440
APHY 449Y Introduction to Quantum Foundations and Quantum Information	3		3	3		X	APHY 440
Upper-Division Computational Physics Elective (1 of 3)	3			3		X	
Upper-Division Free Elective	3						
Term credit totals:	15		6	9			

Term credit totals:	15	6	15	9			
Term 6:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 440 Quantum Physics I	3		3	3			APHY 235 and APHY 240
APHY 451Y Bayesian Data Analysis and Signal Processing	3		3	3		X	AMAT 214 and ICSI 201
APHY 477Y Computational Methods	3		3	3		X	APHY 235 and APHY 277
Upper-Division Free Elective	3						
Free Elective	3						
Term credit totals:	15		9	9			
Term 8:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
Upper-Division Computational Physics Elective (2 of 3)	3			3		X	
Upper-Division Computational Physics Elective (2 of 3)	3			3		X	
Upper-Division Free Elective	3						
Upper-Division Free Elective	3						
Term credit totals:	12			6			

Program Totals (in credits):	**Total Credits: 120**	**SUNY GER: 45-46**	**LAS: 87 – 90**	**Major: 78-81**	**Elective & Other: 15-18**	**Upper Division: 45 - 48**	**Upper Division Major: 33-36**	**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 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:_____Physics BS with concentration in Astronomy and Particle Astrophysics

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

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

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

l) 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**
APHY 140 Physics I: Mechanics or TPHY 141 Honors Physics I: Mechanics or APHY 142 Physics I: Advanced Mechanics	3	NS	3	3	X		
APHY 106 General Physics Lab I or APHY 145 Physics Lab I	1	NS	1	1	X		
AMAT 112 Calculus I or TMAT 118 Honors Calculus I	4	MS	4	4	X		
UUNI 110 Writing and Critical Inquiry	3	BC	3				
ACHM 120 General Chemistry I or ACHM 130 Advanced General Chemistry I AND ACHM 124 General Chemistry Lab OR ACHM 115 General Chemistry I and Laboratory	4	NS	4	4	X	ACHM 115	
General Education: Social Science	3	SS	3				
Term credit totals:	18	18	18	12			

Term 2:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 150 Physics II: Electromagnetism or TPHY 151 Honors Physics II: Electromagnetism or APHY 152 Physics II: Advanced Electromagnetism	3-4	NS	3-4	3-4	X		APHY 140 TPHY 141 APHY 142
APHY 109 General Physics Lab II or APHY 155 Physics Lab II	1	NS	1	1	X		APHY 106 APHY 145
AMAT 113 Calculus II or TMAT 119 Honors Calculus II	4	MS	4	4	X		AMAT 112 TMAT 118 AMAT 101
General Education: American History	3	AH	3				
APHY 100 Contemporary Astronomy or APHY 103 Exploration of Space or APHY 112 Star Systems	3		3	3			APHY 140 or APHY 142 or TPHY 141
Term credit totals:	14-15	11-12	14-15	11-12			

Term 3:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
IECE/ICSI 201 Introduction to Computer Science or APHY 277 Computers in Physics	4		4	4	X		APHY 150, 152, or TPHY 151
APHY 240 Physics III: Structure of Matter	3		3	3	X		APHY 150, 152, or TPHY 151
APHY 245 Physics III Lab	1		1	1			Co: APHY 240
AMAT 214 Calculus of Several Variables	4	MS	4	4	X		AMAT 113
AMAT 220 Linear Algebra	3		3	3	X		AMAT 113

Term 4:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 250 Physics IV: Waves	3		3	3	X		APHY 240
APHY 235 – Mathematics in Physics or AMAT 314 Analysis for Applications	3		3	3	X		APHY 150, 152, or TPHY 151 AMAT 214
General Education: Foreign Language	3	FL	3				
General Education: Humanities	3	HU	3				
Upper-Division Free Elective	3						

General Education: Art	3	AR														
Term credit totals:	18	7	15	15				Term credit totals:	15	6	12	6				
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**	
APHY 410 Classical Mechanics	3		3	3			APHY 235	Upper-Division Physics Elective	3		3	3				
APHY 335Z Advanced Physics Lab	3		3	3			APHY 250	APHY 440 Quantum Physics I	3		3	3			APHY 235 and APHY 240	
APHY 470 Electromagnetism I: Statics	3		3	3			APHY 235 and 250	Upper-Division Free Elective	3							
Upper-Division Astrophysics Elective (1 of 4)	3		3	3				Upper-Division Free Elective	3							
AMAT 315 Analysis for Applications II or Free Elective	3		3 or 0	3 or 0				Free Elective	3							
Term credit totals:	15		12 or 15	12 or 15				Term credit totals:	15		6	6				
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**	
APHY 460 – Thermodynamics and Statistical Physics	3		3	3			APHY 440	Upper-Division Astrophysics Elective (3 of 4)	3		3	3				
Upper-Division Astrophysics Elective (2 of 4)	3		3	3				Upper-Division Astrophysics Elective (4 of 4)	3		3	3				
Upper-Division Free Elective	3							Upper-Division Free Elective	3							
Free Elective	3							Free Elective	3							
Free Elective	3															
Term credit totals:	15		6	6				Term credit totals:	12		6	6				

Program Totals (in credits):	**Total Credits: 122-123**	**SUNY GER: 42-43**	**LAS: 89-93**	**Major: 74-78**	**Elective & Other: 27-30**	**Upper Division: 45-51**	**Upper Division Major: 30-36**	**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 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:_____Physics BS with a concentration in Bio-imaging_____

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

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

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

p) 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**
APHY 140 Physics I: Mechanics or TPHY 141 Honors Physics I: Mechanics or APHY 142 Physics I: Advanced Mechanics	3	NS	X	3	X		
APHY 106 General Physics Lab I or APHY 145 Physics Lab I	1	NS	X	1	X		
AMAT 112 Calculus I or TMAT 118 Honors Calculus I or	4	MS	X	4	X		
UUNI 110 Writing and Critical Inquiry	3	BC	X				
ACHM 120 General Chemistry I or ACHM 130 Advanced General Chemistry I AND ACHM 124 General Chemistry Lab OR ACHM 115 General Chemistry I and Laboratory	4	NS	X	4	X	ACHM 115	
General Education: Social Science	3	SS	X				
Term credit totals:	18	18	18	12			

Term 2:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 150 Physics II: Electromagnetism or TPHY 151 Honors Physics II: Electromagnetism or APHY 152 Physics II: Advanced Electromagnetism	3-4	NS	3-4	3-4	X		APHY 140 TPHY 141 APHY 142
APHY 109 General Physics Lab II or APHY 155 Physics Lab II	1	NS	1	1	X		APHY 106 APHY 145
AMAT 113 Calculus II or TMAT 119 Honors Calculus II	4	MS	4	4	X		AMAT 112 TMAT 118 AMAT 101
General Education: American History	3	AH	3				
ACHM 121 General Chemistry II or ACHM 131 Advanced General Chemistry II AND ACHM 125 General Chemistry Laboratory II OR ACHM 116 General Chemistry II and Laboratory	4	NS	4	4	X	ACHM 116	ACHM 120 ACHM 130 ACHM 124 ACHM 115
Term credit totals:	15-16	15-16	15-16	12-13			

Term 3:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
IECE/ICSI 201 Introduction to Computer Science or APHY 277 Computers in Physics	4		4	4	X		APHY 150, 152, or TPHY 151
APHY 240 Physics III: Structure of Matter	3		3	3	X		APHY 150, 152, or TPHY 151
APHY 245 Physics III Lab	1		1	1			Co: APHY 240
AMAT 214 Calculus of Several Variables	4	MS	4	4	X		AMAT 113

Term 4:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 250 Physics IV: Waves	3		3	3	X		APHY 240
APHY 235 – Mathematics in Physics or AMAT 314 Analysis for Applications	3		3	3	X		APHY 150, 152, or TPHY 151 AMAT 214
General Education: Foreign Language	3	FL	3				
Upper-Division Free Elective	3						

General Education: Art	3	AR					
General Education: Humanities	3	HU	3				
Term credit totals:	18	10	15	12			
Term 5:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 410 Classical Mechanics	3		3	3			APHY 235
APHY 335Z Advanced Physics Lab	3		3	3			APHY 250
APHY 470 Electromagnetism I: Statics	3		3	3			APHY 235 and 250
Upper-Division Free Elective	3						
AMAT 315 Analysis for Applications II or Free Elective	3		3 or 0	3 or 0			
Term credit totals:	15		9 or 12	9 or 12			
Term 7:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
APHY 460 – Thermodynamics and Statistical Physics	3		3	3			APHY 440
Upper-Division Physics Elective (2 of 4)	3		3	3		X	
Upper-Division Free Elective	3						
Free Elective	3						
Term credit totals:	12		6	6			

Free Elective	3						
Term credit totals:	15	3	9	6			
Term 6:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
Upper-Division Physics Elective (1 of 4)	3		3	3		X	
APHY 440 Quantum Physics I	3		3	3			APHY 235 and APHY 240
Upper-Division Free Elective	3						
Upper-Division Free Elective	3						
Free Elective	3						
Term credit totals:	15		6	6			
Term 8:	See KEY.						
Course Number & Title	**Cr**	**GER**	**LAS**	**Maj**	**TPath**	**New**	**Co/Prerequisites**
Upper-Division Physics Elective (3 of 4)	3		3	3		X	
Upper-Division Physics Elective (4 of 4)	3		3	3		X	
Upper-Division Free Elective	3						
Free Elective	3						
Term credit totals:	12		6	6			

Program Totals (in credits):	**Total Credits: 120-124**	**SUNY GER: 46-47**	**LAS: 84-87**	**Major: 69-73**	**Elective & Other: 33-36**	**Upper Division: 45-51**	**Upper Division Major: 27-33**	**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) Faculty Member Name and Title and/or Rank at the Institution (Include and identify Program Director.)	(b) % of Time Dedicated to This Program	(c) Program Courses Which May Be Taught (Number and Title)	(d) Highest and Other Applicable Earned Degrees (include College or University)	(e) Discipline(s) of Highest and Other Applicable Earned Degrees	(f) Additional Qualifications: List related certifications and licenses and professional experience in field.
PART 1. Full-Time Faculty					
Vivek Jain, Associate Professor *Undergraduate Program Director*	100	APHY 471Y Introduction to Neutrino Astronomy	Ph.D., University of Hawaii	Physics	
Cecilia Levy, Associate Professor	100	APHY 100 Contemporary Astronomy, APHY 300 Introduction to Astrophysics, APHY 458Y Physics or Rad Detectors	Ph.D., University Muenster, Germany	Physics	
Daniel Robbins, Assistant Professor	100	APHY 277 Computers in Physics, APHY 442 Introduction to GR	Ph.D., University of Chicago	Physics	
Amirreza Masoumzadeh, Associate Professor	33	ICSI 333 System Fundamentals	University of Pittsburgh	Information Science	
Abram Magner, Assistant Professor.	50	ICSI 401 Numerical Methods	Purdue University	Computer Science	
Shaghayegh Sahebi, Assistant Professor	33	ICSI 410 Database Systems	University of Pittsburgh	Intelligent Systems	
Ming-Ching Chang, Associate Professor	67	ICSI 431 Data Mining, ICSI 436 Machine Learning	Brown University	Engineering/Machine Systems	
Alexander Khmaladze, Associate Professor	100	APHY 404 Biophysics and Bioimaging	Ph.D., University of South Florida	Applied Physics	
Matthew Szydagis, Associate Professor	100	APHY 100 Contemporary Astronomy	Ph.D., University of Chicago	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.**
Kevin Knuth, Associate Professor	100	APHY 112 Star Systems	Ph.D., University of Minnesota	Physics	
Carolyn MacDonald, Professor	100	APHY 416 Electronics Projects	Ph.D., University of Harvard	Physics	
Ariel Caticha, Professor	100	APHY 442 Introduction to GR	Ph.D., California Institute of Technology	Physics	
Jonathan Petruccelli, Associate Professor	100	APHY 446Y Laser Physics and Applications	Ph.D., University of Rochester	Physics	
Part 2. Part-Time Faculty					
Halimah Sayahi, Lecturer for Chemistry	100	ACHM 115 General Chemistry I, ACHM 116 General Chemistry II	Ph.D., University at Albany	Chemistry	
Eric Woods, Lecturer for Physics	100	APHY 103 Exploration of Space	Ph.D., Harvard University	Astronomy	
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:	Physics
	SED Program Code	03017
	Award(s) (e.g., A.A., B.S.):	B.S.
	Number of Required Credits:	Minimum [120] If tracks or options, largest minimum [120]
	HEGIS Code:	1902
	CIP 2010 Code:	40.0801
c) Distance Education Contact	Name and title: Billie Franchini, Ph.D., Director for the Institute for teaching, Learning and Academic Leadership; and Interim Director of Online Teaching and Learning Telephone: (518)443-4850 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: 3/10/2023	
	If the program will be registered jointly[1] 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] If the partner institution is non-degree-granting, see SED's CEO Memo 94-04.

Section 2: Enrollment

Year	Anticipated Headcount Enrollment			Estimated FTE
	Full-time	Part-time	Total	
1	16	0	16	16
2	16	0	16	16
3	16	0	16	16
4	16	0	16	16
5	16	0	16	16

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.*

The online classes are designed to be equivalent in terms of instructional time and total material covered to the face-to-face classes, which follow SED guidelines of 150 minutes/week for 15 weeks.

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?

100% will be online. Students may be limited in which *concentration courses they can take online, but they will be able to complete the whole program online. The campus-based program will also be offered, so students can also do a hybrid if that is preferable.*

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

20-150 students in our introductory courses; some of these courses have large sections and some have small sections. And 10-30 students in our upper-level courses.

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.

The curriculum for the Distance Education program is the same as the campus-based version. The courses have the same template/syllabi, instructors, and requirements. Students may take participate either on

campus or via an online format. The requirements are all the same, but some of the directions for assignments may use technology in different ways to ensure students are learning the same outcomes as those within a face-to-face class. For example, some online courses may require discussion board participation, to replace in-class discussion within face-to-face courses or students may also have to work in groups via Zoom breakout rooms, instead of sitting with each other in class for group works.

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

Courses will be offered on a regular basis, with each student assigned a departmental faculty advisor who works with students to make sure courses they need are available, advising which semester to take a particular course. All courses are available at on a rotation basis (typically every year or every semester). Program can be complete in the same amount of time as the face-to-face program.

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

The faculty use the standard learning platform, provided by the university. Currently we are using the Blackboard learning platform. This platform is updated regularly and enables video, student discussion and collaboration, weblinks, video uploads, document uploads, and one on one messaging between students and faculty. In addition, the university provides Zoom as a video platform for meetings between students and between students and faculty, as well as lecture in real time. Lectures may also be recorded from Zoom and uploaded for Blackboard for viewing at a later date.

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

For online courses, faculty hold office hours via Zoom. This allows students to be able to meet 'face-to-face' over a video platform. Zoom can be used for student group work and break out sessions within Zoom can take place during classes for group work as well. Blackboard allows for students to message the faculty member or submit assignments, and faculty can send out emails through Blackboard to individual or entire courses of students. Faculty also have office phones that students may use to reach the professor if needed.

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?

The University at Albany utilizes two layers of authorization and authentication for students who participate in online learning. Students are required to establish an account and to log in to the University password protected domain using the NETID protocol and must also log into the BLS Learning Management System using their university credentials. Blackboard also uses Safe Assign as a tool to monitor the completion of certain tasks within the LMS environment.

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?

Each course has a syllabus with course goals, content focus, readings, and assignments. Led by course leads, program faculty annually discuss and revise the course syllabi student learning outcome, the same for both the campus and online formats based on program assessments and evidence of student learning. Syllabi are also reviewed annually to ensure that updates have been made if suggested by course leads.

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 the courses have assessments aligned to our student learning outcomes. The assessments are specific to the course goals and may involve video analysis, discussion, essay response, written reflection, response to student's learning, analysis of learning strategies, critique of available resources, publications etc. The assessments require integration, application, and analysis of course content. Annually, courses are reviewed by a departmental committee. If the committee feels as if a course needs to change the assessments, faculty are informed of this for the following semester to ensure students are meeting program learning outcomes.

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?

Whether a course is face-to-face or online there are similar methods to evaluate program effectiveness: a yearly review of student learning outcomes by a departmental committee. The periodic assessment and length of assessment cycle is the same for the currently registered program and the distance education program. The departmental committee reviews each syllabus, student grades, and student surveys. If a course is not meeting the learning outcomes required for the program, then the committee brings this to the attention of the faculty teaching the course and the course is updated to ensure learning outcomes are met.

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

Evaluation results are used to make changes and modify the curriculum. Departmental committee evaluations are conducted annually of each course taught that year. Student evaluations are conducted at the conclusion of each course. Both evaluations are reviewed and shared with faculty teaching the course, to ensure if updates are required they are made before the next offering of the course.

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?

The program evaluation is the same for students taking online or campus-based courses. The courses meet university requirements for rigor and breadth required of graduate coursework, including credits, format, and assignments needed for a graduate degree. Rigor and breadth are reviewed by the departmental review committee annually. If a committee member believes that changes have altered the rigor and breadth of a course, the committee discusses the change and brings it to the attention of the faculty teaching the course.

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?

Distance learning students will be flagged in our integrated administrative system. This will allow regular querying so that we can identify any out of state students who participate from their home state. The University is a member of the National Council for State Authorization Reciprocity Agreement (NC-SARA). This is a voluntary agreement among member states and U.S. territories that establishes comparable national standards for interstate offering of postsecondary distance-education courses and programs. As a member institution, the University is approved to offer distance education courses to students outside of New York.

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? ***NOTE:*** *Links to information for other states can be found at here.*

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

ALBANY LAW SCHOOL
80 NEW SCOTLAND AVENUE, ALBANY, NEW YORK 12208-3494
TEL: 518-445-2311 FAX: 518-445-2315 WWW.ALBANYLAW.EDU

July 2, 2021

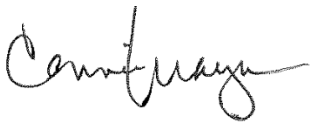
Shadi Shahedipour-Sandvik, Ph.D.
Provost-in-Charge
State University of New York
System Administration
State University Plaza
Albany, NY 12246

Dear Dr. Shahedipour-Sandvik,

Albany Law School and the University at Albany have a long and established partnership, working together for decades to ensure that the students of the Capital District have access to quality education and can attain their career objectives. Years ago, we worked together to create combination degrees that linked many of the University at Albany's undergraduate degrees to our JD program. This partnership has been successful and continues to this day.

As the University at Albany has updated several of their bachelor programs, we would like to continue this valued partnership and update the degrees that are connected to our JD program. At this time, please accept this letter as agreement from Albany Law School that the updates made to the following programs are acceptable to us and that the combination programs listed on the attached list may be updated appropriately.

Sincerely,



Connie Mayer
Associate Dean for Academic Affairs
Raymond and Ella Smith Distinguished Professor of Law
ALBANY LAW SCHOOL
80 New Scotland Ave | Albany, NY 12208
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E-mail: cmaye@albanylaw.edu

89204	English	1501	BA
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89221	Geography	2206	BA
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89205	Linguistics	1505	BA
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89208	Mathematics	1701	BS
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89209	Mathematics	1701	BA
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89194	Music	1005	BA
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89207	Philosophy	1509	BA
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89214	Public Policy and Management	2102	BA
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89235	Social Welfare	2104	BS
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89199	Spanish	1105	BA
	M/I with 402000 Albany Law		
	M/A Law	1401	JD
89195	Theatre	1007	BA
	M/I with 402000 Albany Law		
	M/A Law	1401	JD

Physics Syllabi:

APHY 100 Contemporary Astronomy

APHY 103 Exploration of Space

APHY 112 Star Systems

APHY 277 Computers in Physics

APHY 300 Introduction to Astrophysics

APHY 353 – Microprocessor Applications (3)

APHY 404 Biophysics and Bioimaging

APHY 409(Y) – Math Models in Physics (3)

APHY 415(Y) – Electronics (3)

APHY 416 Electronics Projects

APHY 430Y – Optics (3)

APHY 433 – Physics Measurements (3)

APHY 442 Introduction to GR

APHY 446Y Laser Physics and Applications

APHY 454 – Microprocessor Applications Lab (3)

APHY 452 Astro-Particle Physics

APHY 458 (Y) Physics of Rad Detectors

APHY 471Y Introduction to Neutrino Astronomy

ACHM 115 General Chemistry I and Lab

ACHM 116 General Chemistry II and Lab

AMAT 367 – Discrete Probability (3)

ICSI 333 System Fundamentals

ICSI 401 Numerical Methods

ICSI 410 Database Systems

ICSI 431 Data Mining

ICSI 436 Machine Learning

APHY100, class# 6372,10540: Contemporary Astronomy—The Cosmic Connection, Spring 2021 (3 units course credit)

Mondays and Wednesdays 3:00-4:20 PM Lecture Center Room 23 and Online Zoom channel #: 863 195 468. Password: 776750. (Do NOT Share)

Assoc. Prof. Matthew Szydagis, mszydagis@albany.edu, Physics 312, https://www.albany.edu/physics/faculty/matthew-szydagis, w/ TA Tyler O. Fish, tofish@albany.edu
Office Hours: 12:00-1:00 MW or by appointment, Room 312 / ZOOM

Text: Individual chapters of my detailed PDF PowerPoint slides, essentially my virtual textbook, will be provided on-line, and real world articles, historical *and* on cutting-edge research, will be assigned (an internet connection is required). *There is no book*

Course Description: Modern developments in astronomy, the birth and death of stars, solar and planetary science, neutron stars and black holes, galactic structure, cosmology, and theories of the origin and future of the universe. No Prerequisite.

Course Goals: A student who completes this course will have learned to

1. Apply the scientific method to a novel situation, after assessing examples online and in class face-to-face.
2. Judge and critique a scientific article in the popular press according to criteria from class.
3. Recognize and classify a theory/model or claim as being scientific vs. pseudo-scientific or neither.
4. Summarize the properties of different astronomical phenomena for an inquisitive non-scientist.
5. Outline the impacts physics and astronomy have on daily life, producing a list of concrete examples.

Your grades will be calculated according to this rubric, every part delineated, w/o curve:

The Final Exam	*25%*	*A traditional exam (15), and final report on case studies (10)*
Midterm Exam	*25%*	*A test in class (15) along with an essay turned in online (10)*
Class Participation	*25%*	*Q&A mine/yours (15) and attend, in person or on Zoom (10)*
HW: the Quizzes	*25%*	*Answering the reading-based questions due nightly at 12am*

Grades will be determined acc. to: 90-100% is A, 80-90 B, etc. (+/-'s added as well)

Homework: Assignments will be based on material covered in class

Exams: Questions will be of the same scope and difficulty as the HW assignments

Extra Credit: Weather permitting, you can earn bonus pts. by participating in telescope observing. Opportunities to do so will be announced irregularly (and may not happen at all due to pandemic). Amount of credit is 1%/evening, up to 5% of your final grade max

APHY100, class# 6372,10540: Contemporary Astronomy—The Cosmic Connection, Spring 2021 (3 units course credit)

Absence: *Excusable absences are defined by the university and require documentation. Acceptable excuses include illness, tragedy, other personal emergency, foreseeable time conflicts resulting from required appointments, religious observance.*

All course materials will be located at: https://www.albany.edu/physics/phy577/

For details on university policy see https://www.albany.edu/undergraduateeducation/attendance.php, http://www.albany.edu/health_center/medicalexcuse.shtml Lastly, I give you 2 freebies. Academic Dishonesty: 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, with me notifying the Dean; expulsion could be possible.

The following is a tentative course plan:
Weeks 1-2: Unit 1, Thinking like a Scientist and Observing like an Astronomer
Weeks 3-4: Unit 2, Planetary Science
Weeks 5-7: Unit 3, Stars and Stellar Evolution
MIDTERM EXAM is Monday March 22
Weeks 8-9: Unit 4, History of Astronomy
Week 10: Unit 5, Dark Energy
Week 11: Unit 6, Galaxies
Week 12: "Special" Topics
Weeks 13-14: Unit 7, Astrophysics and Astroparticle Physics
Week 15: Unit 8, Contemporary Cosmology.
Time permitting: astronomy in popular culture

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, social impact). My main goal for you: scientific literacy.

Some Strategies for Your Success:
* Be responsible for your own learning: focus on gaining knowledge rather than on scores
* Respect midnight (11:59) submission (NOT start) deadlines for quizzes. Late policy strict!
* Ask questions in person or online of instructor, whatever you are more comfortable doing
* Talk to me, and through me to each other, in class. **Up to *2* absences will be forgiven.**
* Remember that due on is NOT "do on." Quizzes time-stamped and NEVER accepted late. Make-up *tests* only if a valid excuse is secured
* Retake quizzes until you get right, not for credit but to prepare for the midterm and final. **The lowest 2 quiz scores (0's can qualify) will be dropped** at the semester's end, so please don't come to me with excuses for missing quizzes please, they will not be heard out

Specific Skills You Will Cultivate:
1. Ability to recognize the steps, along with their proper order, in the scientific method, as used in astronomy
2. Focused close reading skill that filters for the most relevant, significant material: key sentences related to 1.
3. Capability to gather evidence for comparing and contrasting two or more competing notions/ideas.
4. Ability to evaluate an argument based on the level and type of evidence given (see also 5 for evidence).
5. Recognition of what scientists especially astronomers consider evidence & what tools they use to gather it.

6. Making connections between lack of evidence and pseudoscience, when evidence claimed, vs. non-science.
7. The focus and discipline to read a long article instead of just the beginning, ending, and figures.
8. Capability to identify basic astronomical phenomena and celestial bodies and their fundamental properties.

Lastly, please note the discussions and debates are NOT about being "right." Credit is given for participation and justification of your reasoning. Arguments must be rationally explained, supported by logic, reasoning, and best of all, evidence. 100-level course does NOT mean less work, but does mean less depth (it's introductory).

Grades will be assigned on the following scheme:

% Possible	Grade
90% and up	A
80% - 89%	B
70% - 79%	C
60% - 69%	D
below 60%	E

Exploration of Space (APHY 103)
3 credits
Fall 2022

Instructor : Eric Woods (eawoods@albany.edu)

Office Hours: MW 1:15 – 2:45 PM in Physics 223

"Earth is the cradle of humankind, but one cannot live in the cradle forever."
- Konstantin Tsiolkovsky (grandfather of modern rocket science)

Prerequisite(s): None

What is this class about? (Course Description)

When you think about our species' long-term future, what do you envision? Most likely you imagine a continued and expanding human presence in space. (Most people do!) It's remarkable how far our exploration has progressed in the 65 years that have passed since the launch of the first artificial satellite in 1957. It's not hard to imagine that perhaps someday human beings will live on other worlds or encounter alien civilizations. Still, today those outcomes seem a long way off. Only the tiniest fraction of humanity's total population has yet traveled into space.

Learning Outcomes: Our ultimate goal will be to assess humanity's prospects for becoming a truly spacefaring people. To do this we will need first to master the physics of space travel. We will come to understand what we have learned about our planet and our solar system through direct exploration with spacecraft - past and present, manned and unmanned. We will also begin to appreciate how virtually every imaginable branch of science, including the human sciences, plays a role in this endeavor. We will consider the question of *why* we explore space, sometimes taking cues from science fiction. In the end we will see if we can predict what our planetary civilization will look like by this century's end. Is the sky the limit, or are we constrained by the laws of physics, chemistry, biology, economics, and politics to remain forever an Earthbound people? Stay in your seats, and enjoy the ride!

How will you be graded?

Exams: There will be four multiple-choice exams, one at the end of each of the four modules we will cover. Your grade at the end of the semester will be entirely based on your scores on these exams. Each exam is 50 questions, each worth 2 points, for a total possible score of 100. *These four exams will determine your end-of-semester grade, each comprising 25% of the total* (there are no other mandatory assignments or evaluations). There are, however, two ways to potentially boost your grade by quite a bit:

Answering online lecture questions: On Blackboard in the Online Lectures section, I have posted versions of the lectures I give in class, to help you review. Accompanying each of the Online Lecture presentations on Blackboard will be a set of multiple-choice questions for you to attempt. These questions are optional but highly recommended! At the end of the term, I will calculate your percentage of correct answers on these (out of 100%), and will then *substitute that percentage for your lowest exam score – only if this helps you* (that is, only if your average on the lecture questions is higher than your lowest exam score. So for example, if your lowest exam score was 60/100, and your percent correct on the lecture questions was 78/100, then I would substitute the 78/100 for the 60/100 and combine that with your score out of 300 on the other 3 exams. On the other hand, if your lecture question score was only 52/100 then I would not make this substitution and you'd keep that lowest exam score.

In addition to the opportunity to substitute your online lecture question average for your lowest exam score, you can earn extra credit by submitting an optional project by the end of the semester:

Extra Credit Projects (optional)

There is a possibility for a substantial amount of extra credit here, up to 50 *additional* points figured into your total end-of-semester score.

You may, if you wish, do an optional project, due as an electronic submission by midnight on December 13. If you opt for the project, your challenge will be to **create something worthy of inclusion as part of the class materials for next semester**! It can be a piece of written work, a video clip, an add-on for one of the software packages we use, a model or demonstration to be used in class, or even a song that you write and record. If you are going to attempt this, you *must* read the "Extra Credit Project Guidelines" section in the Learning Modules on Blackboard for details on what we're looking for in a project, how they'll be graded, etc.

Determining your Letter Grade:

At the end of the semester I'll calculate the sum of your four exam scores, possibly substituting your attendance/participation score for the lowest exam score, giving a highest possible total of 400. Letter grade ranges will be as follows:

380-400: A
360-379: A-
340-359: B+
320-339: B
300-319: B-
280-299: C+
260-279: C
240-259: C-
220-239: D+
200-219: D
180-199: D-
0-179: E

Note: if you submitted an extra credit project, any score earned will be added to your numerical total and this has the potential to boost your letter grade (and with extra credit, it's possible to get a score above 400, obviously still an A). Also note: this end-of-semester curve ***will not change.*** What I may do is introduce a curve on individual exams if the average comes out low. More about this if and when it happens.

When are the exams, and how do I prepare for them?

The dates for the four exams are listed in the schedule of lectures given below. There will be sets of practice questions posted in the Exams section on Blackboard – each set of practice questions will be 50 multiple-choice questions very similar to what will be on each exam.

Strictly speaking, the exams are not cumulative, but you will be expected to retain certain key concepts throughout the semester. The fourth exam will primarily be on Module 4 but will have some questions that harken back to earlier modules.

In the interest of minimizing everyone's potential COVID exposure, ***the exams will be taken remotely on Blackboard*** rather than in person in the lecture center. On the dates when we are scheduled to have exams, we will not meet, but instead you will have the entire 24-hour window that day, from midnight to midnight, to take the exam. You will have 90 minutes to finish, and must finish and submit in one sitting. You are permitted to refer to any materials you like while you're taking the exams – the most useful thing for you to have access to during the exam will be the practice questions!

Our Course on Blackboard

Everything you will need for this course is available via the University's ***Blackboard Learning System (BLS)***. To get to our course's Blackboard page, you can:

1. Go to blackboard.albany.edu
2. Enter your UAlbany Net ID and UNIX Password
3. Click on the link for our course… "Fall 2022 – Exploration of Space"

Online Couse Material: Lectures and Notes

I have posted condensed video versions of my lectures on Blackboard (in the Online Lectures section), which I have used in the fully-online asynchronous version of this course. They are available to you as a way of reviewing what we covered in class.

There is no required textbook. Instead I have written an extensive set of lecture notes which constitute your readings for this course – all available on our course's Blackboard site. Note that they are divided into four ***modules***, or units, corresponding to the four units will be covering in class. You can access them either by clicking on the links at the bottom of the home page, or by clicking on "Learning Modules" in the Course Tools menu.

The notes are highly multimedia in nature, including many images, video clips, and embedded YouTube links. If your internet connection at home is too slow to support some of these features, you may need to view them from one of the public PCs on the university campus.

The lecture notes are intended as a supplement to the lectures. They are not a substitute. Some things that we cover in lecture will not be in the notes, and you may be tested on anything from either the lectures or the notes. Also, the lecture notes are something of a work in progress. I often add images or update the optional material (supplemental reading, links, etc.) Any time I make a *substantial* correction or addition to the notes, I will announce this in class as well as post an announcement.

Contacting The Teaching Staff

Due to short-staffing in the midst of the COVID pandemic, we do not have a TA. If you need to get in touch with me, you can either:

1. Come see me before or after class
2. Join me on Zoom for office hours (listed on Page 1 of this syllabus)
3. Contact me at eawoods@albany.edu
4. Post to the "Ask A Question" discussion group – click on the "Discussion" tool

Use option #4 if you have a question that you think a lot of other students will also have, so our responses can be read by your classmates. Remember, we are here to help! We're friendly, and we rarely bite. You do not need to make an appointment to see us during office hours – just drop by.

Announcements

You should check regularly for announcements from your instructors by clicking on the "Announcement" tool. This will alert you to class cancellations or schedule changes (should there be any), and any other important or interesting tidbits that we feel you should know about.

Downloadable Software (Optional)

During the course of the semester, you will frequently see me making use of all sorts of multimedia tools, including liberal use of YouTube. There are also three amazing pieces of software you'll see me using, all of them downloadable for free! I highly recommend you try them, as they make for great study tools. Here they are:

Celestia (a space simulator): www.shatters.net/celestia
Note: Celestia has lots of cool add-ons to be found at http://www.celestiamotherlode.net/
Stellarium (home planetarium software): http://www.stellarium.org/
Orbiter (a space *flight* simulator): orbit.medphys.ucl.ac.uk
If you decide to try out any of these programs, and need help getting them to work properly, just ask me!

Exploration of Space – Fall 2022
Schedule of Lectures and Examinations

Week of Aug 22:
Introduction/Course Objectives ***(Begin Module 1 on the Basics of Space Travel)***
Natural Orbits: Celestial Motion and Kepler's Laws
The Physics of Space Travel

Week of Aug 29:
Travel Near the Earth
Interplanetary Travel
Rocket Science 101

Week of Sep 5 *(no class Mon Sep 5, Labor Day)*:
Launch Vehicles and Other Types of Rockets
Satellites in Earth Orbit ***(End Module 1)***

Week of Sep 12:
Origin of the Solar System ***(Begin Module 2 on Robotic Exploration of the Solar System)***
Origins of Earth and life on Earth
Exam #1 is on Fri Sep 16 (covers Module 1)

Week of Sep 19:
Origins and importance of the Moon
Tides; Mercury
Venus

Week of Sep 26 *(no class Mon Sep 26, instructor away)*:
Mars
Earth, Venus, Mars – a planetary Goldilocks tale

Week of Oct 3 *(no class Wed Oct 5, instructor away)*:
The Moons of Jupiter and Saturn
The Outer Reaches of the Solar System ***(End Module 2)***

Week of Oct 10 *(no class Mon Oct 10, fall break)*:
Projects Mercury and Gemini ***(Begin Module 3 on Human Spaceflight, Past and Present)***
Project Apollo and Lunar Orbit Rendezvous
Exam #2 is on Fri Oct 14 (covers Module 2)

Week of Oct 17:
The Missions of Apollo
Life Support in Space
Weight and Weightlessness

Week of Oct 24:
The Space Shuttle
The Russian and Chinese human space programs: Soyuz and Shenzhou
Space Stations ***(End Module 3)***

Week of Oct 31:
Next Steps after the Shuttle ***(Begin Module 4 on the Future of Space Exploration)***
The Future of Spaceflight Around the World
Exam #3 is on Fri Nov 4 (covers Module 3)

Week of Nov 7:
Planetary Defense: Protecting Earth from Catastrophic Impacts
Astrobiology and the Search for Habitable Planets
Return to the Moon and on to Mars

Week of Nov 14:
Hazards of Deep Space Missions
Space Colonization, parts 1 and 2

Week of Nov 21 *(no class Wed Nov 23 or Fri Nov 25, Thanksgiving)*:
Interstellar Flight

Week of Nov 28:
Implications of Einstein's relativity for fast starflight
The Search for Extraterrestrial Intelligence (SETI)
Ruminations on long-term future of humanity

Week of Dec 5:
The Science Fiction Connection
Exam #4 will be administered remotely on Blackboard during finals week, precise date TBD

PHY 112 **Fall 2021**

Star Systems (3 credits)

Physics Building Room 224
Tuesdays and Thursdays 10:15pm – 11:35pm
SYLLABUS

Instructor: Dr. Kevin H. Knuth, Associate Professor of Physics and Informatics
Contact: kknuth@albany.edu PH 211, 442 - 4653
Office Hours: Wednesday 2:30pm – 4:00pm, PH 211
Teaching Assistant: Yuan (Alex) Chang
Required Text: *The Essential Cosmic Perspective (5th Ed).* Bennet, Donahue, Schneider, Voit
Required License: *MasteringAstronomy* (see below)
Prerequisite(s): A PHY 105 or A PHY 140 or A PHY 142 or T PHY 141.
Course Description and Learning Outcomes: We will explore our world and our lives in the context of the solar system to which we belong. We will compare our world to the other rocky worlds of the inner solar system, and explore the gas giants and frozen worlds of the outer solar system. We will come to understand our sun as a star, and will learn about the other stars in our galaxy and what we know about those star systems.

Week	Dates		Topics	Chapters	HW	Due .
1	Aug 31		Overview	Ch. 1	#1	Sep 14
		Sep 2	***Cosmos#1: Shores of the Cosmic Ocean***			
2	Sep 7		Celestia and Constellation Activity			
		Sep 9	*No Class*			
3	Sep 14		Motion of the Heavens	Ch. 2	#2	Sep 21
		Sep 16	***Cosmos #3: Harmony of the Words***			
4	Sep 21		Science of Astronomy	Ch. 3	#3	Sep 28
		Sep 23	Gravity and Orbits	Ch. 4		
5	Sep 28		Light / Telescopes and Spectra	Ch. 5	#4	Oct 5
		Sep 30	Science Fiction to Science			
6	Oct 5		Travels to the Moon		#5	Oct 12
		Oct 7	***In the Shadow of the Moon***			
7	Oct 12		***For All Mankind***			
		Oct 13	Formation of Planetary Systems	Ch. 6		
8	Oct 19		MIDTERM			
		Oct 21	Terrestrial Worlds: Moon and Mercury	Ch. 7	#6	Nov 4
9	Oct 26		Earth (Land, Sea, Air)	Ch. 7		
		Oct 28	Venus	Ch. 7		
10	Nov 2		Mars	Ch. 7		
		Nov 4	***Cosmos #6: Traveler's Tales***	Ch. 8	#7	Nov 16
11	Nov 9		Jupiter and its Moons	Ch. 8		
		Nov 11	Saturn and its Moons	Ch. 8		
12	Nov 16		Outer Solar System	Ch. 8, 9	#8	Nov 30
		Nov 18	Sun	Ch. 10		
13	Nov 23		Stars	Ch. 11, 12, 13		
		Nov 25	*Thanksgiving*			
14	Nov 30		Our Place in the Universe	Ch. 14, 15	#9	Dec 7
		Dec 2	Extrasolar Planetary Systems			
15	Dec 7		Life in the Universe	Ch. 18		

Friday **Dec 10** **10:30-12:30** **FINAL EXAM**

Website:
This course has a website that you can check for updates to the schedule or for special announcements.
http://knuthlab.rit.albany.edu/courses/F09/StarSystems/

Homework:
Homework will be assigned weekly. It is due on the due date specified on the assignment, and there are penalties for finishing it late. It will be based on material covered in class.

MasteringAstronomy
Homework will be administered through the MasteringAstronomy website:
http://www.masteringastronomy.com
course ID is: MAKNUTHF10
Tutorial Site: http://www.pearsoncustom.com/us/astronomy_tutorial/
If you have an earlier edition of the text (4th and earlier) you may need to purchase access to MasteringAstronomy from the bookstore.

Quizzes: Periodically, surprise quizzes will be given. Questions will be similar to those on the Homework

Exams: There will be a midterm as well as a comprehensive final exam. Questions will be similar to those on the Homework.

Grading (A-E):

Homework	40%
Quizzes	10%
Mid Term	25%
Final Exam	25%

Grades will be determined according to: 90-100% is A, 80-90 B, etc. (+/-'s added as well)

Internet Requirement: We will rely on the internet to use MasteringAstronomy, as well as to obtain information about NASA and European Space Agency (ESA) Missions, and access to Interactive Sky Maps to assist you in locating objects in the night sky.

Telescope Observing: Our class has access to the University's 12-inch telescope, and we will be going out several nights this semester (times to be announced in class) to observe the moon, planets and stars. Since the observing times will not be during scheduled class time, I cannot make this activity mandatory. However, I will give extra credit by raising your overall grade 3% for one night attended and an additional 1% for every additional night attended (up to a maximum of 5%).

The observatory is in the EARTH SCIENCE building.
I will try to keep the EAST door open... look for the OBSERVATORY sign.
If for some reason you can't get in, try getting into the tunnel and come in through the basement.
The stairs to the Observatory are on the 3rd floor between rooms 316 and 317.
Go up the stairs and follow the signs.

We are fortunate to be able to use these facilities after hours, so please act accordingly.

Academic Integrity
The discovery of cheating on any exam or plagiarism on any homework will result in immediate expulsion from the course with a failing grade and a report to the Dean of Undergraduate Studies.

Class Behavior

While in class, students may not use cell phones, blackberries, computers, tablets, or engage in any other type of disruptive behavior. The risk is being asked to leave the class. All students must be seated on time (that is, before the lecture begins); latecomers may be turned away at the door. Permission ahead of time is required for any student who must leave class early.

APHY 277 – Computers/Programming in Physics

(3 credits)

Fall 2022

Instructor: Prof. Daniel Robbins Office: PH 314
Email (preferred communication method): dgrobbins@albany.edu.

Time and Place: PH 224, MWF 10:35-11:30am
Pre/corequisite(s): A MAT 214; prerequisite(s): A PHY 150 or A PHY 152 or T PHY 151
Office Hours: There will be one period of in-person office hours (on Friday), and one period of virtual office hours over Zoom (on Thursday). If neither possibility works, please let me know and other appointments can be made.

In person (PH 314): F 1:00pm-2:00pm

Online (https://albany.zoom.us/my/dgrobbins): Th 11:00am-12:30pm

Learning Objectives: The purpose of this course is to teach you the basics of coding for physics problems and applications. We will start with Matlab, and follow with a brief introduction with C++. Matlab is used at many large companies and it is widely used in physics, especially for image processing, Monte Carlo simulations and matrix processing. It is a good first coding language to learn since the structure is fairly simple and you can quickly access some powerful tools for computation and data visualization. And once you have mastered any programming language, it becomes much easier to learn additional languages. C++ is universally available and has an even larger use base than Matlab. It is often the language used in APHY 477/577.

Required Textbook: Stormy Attaway, *Matlab A practical introduction to pro-gramming and problem solving*, 5th edition.

Grading: 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.

Grading Rubric: In class problems 30%, Online mini-quizzes 30%, In class quizzes and final 20%, Group projects 10%, Individual project 10%. All quizzes, projects and final exam will be based on material covered in class.

Missed Assignment Policy: In general, the course policies will follow the University's guidelines on excused assignments (see `https://www.albany.edu/undergraduateeducation/92002.php` and `https://www.albany.edu/health_center/medicalexcuse.shtml`). However, we are living in unpredictable times, so I will also try to be reasonably flexible. If you are unable to turn in an assignment, please contact me by email to discuss your options. Once solutions have been posted, assignments cannot be accepted for grading.

Academic Integrity: If you are not already familiar with the University's academic integrity policies, please review them in the undergraduate bulletin (`https://www.albany.edu/undergraduate_bulletin/regulations.html`).

I do encourage you to work together with other students on homework assignments, but you must write up your answers independently. Identical or nearly identical assignments will be considered cheating.

Course Description: This course provides an introduction to the use of computers in physics. Operating systems and programming languages commonly used in physics will be surveyed. Applications of contemporary numerical recipes to problems in physics and graphical displays of results will be practiced with standard software, and object-oriented coding.

Course Calendar (tentative and subject to changes; see Blackboard page for more detailed version as we go):

Date	**Topic**	**Chapter**
Week 1	Intro, arrays, linear equations	1, 2, 3.1-3.2, 14.4-14.5
Week 2	Importing and exporting data, plots	3.3-3.6, some of 9, 12
Week 3	Functions, statistical functions, fitting and data analysis; **Group miniproject**	3.7-3.8, 14.1, 14.3
Week 4	If, loops, vectorizing, program structures; **Quiz 1**	4, 5, 6.1
Week 5	Data structures	8
Weeks 6-7	Cell arrays, anonymous functions, functions with variable numbers of inputs and outputs	8, 10
Week 7	**Group project**	8
Week 8	Integration and differentiation and differential equations	14.7
Week 9	FFT, intro to classes and object-oriented code; **Quiz 2**	11.3.1
Week 10	Image processing and GUIs	13.1, 13.2
Week 11	Strings and text manipulation, symbolic algebra	7, 8.1, 14.6
Weeks 12-13	C/C++ simple introduction; **Individual projects**	
Dec. 9, 10:30am-12:30pm	**Final Exam**	cumulative

APHY300
Introduction to Astronomy and Astrophysics
3 credit hours

Prof. Levy, clevy@albany.edu
Classes meet TBD
Office Hours: TBD

Textbook (mandatory): Foundations of Astrophysics, by Ryden and Peterson
Suggested : Fundamentals of Astrophysics – Stan Owocki – Cambridge University Press
Modern Astrophysics – Bradley Caroll – Cambridge University Press

Pre-requisite: APHY 250 or with permission of instructor

Course Description: This course will enable students to gather information about the science of astronomy and its mathematical and physical underpinnings. After taking this class, students will be able to use basic astronomical jargon in context; perform simple physical calculations of orbital motion, the structure of stars, and the expansion of the Universe; and will be able to describe the evolution of the cosmos.

Course Themes: Kepler's Laws; properties of stars, galaxies and the solar system, cosmology

Course Objectives: Students will be able to use Kepler's Laws to calculate the properties of planetary and binary star orbits, describe the components of the Solar System, explain the electromagnetic spectrum, and its importance to the study of astronomy, describe and calculate the relationships between magnitude, distance, color, temperature, and the Hertzprung-Russell Diagram, describe the physical processes that govern stellar evolution as a function of initial stellar mass, list the types of stars, galaxies, and compact objects (e.g. - pulsars, black holes, and AGN) that have been classified, and describe their characteristics, describe the formation and evolution of the Universe.

Course organization: All class notes and grades will be posted on Blackboard/Brightspace.

Topics **(Each unit will take one to two weeks of lectures)**

Unit 1: Time and distance, history, Kepler's laws
Unit 2: the Earth-Moon system
Unit 3: Radiation and Matter
Unit 4: The Solar System and Exoplanets
Unit 5: Properties of stars – photometry and distances
Unit 6: Atmospheres of stars – stellar spectra
Unit 7: Stellar interiors
Unit 8: The ISM and Formation/Evolution of Stars
Unit 9: Stellar Remnants
Unit 10: The Milky Way, Galaxies
Unit 11: Large Scale Structures, Active Galaxies
Unit 12: Cosmology, The Big Bang and the History of the Universe

Exams: There will be 2 mandatory midterms and 1 mandatory final exam. All exams are mandatory. Problems on exams will be similar in scope and difficulty as the HW assignments

Homework *are based on material covered in class* and will be assigned for most topics listed above, and will be due on the specified dates.
There will be 1 homework due every week for a total of 10 homework sets. The 2 lowest homework grades will be dropped for the final grade count. This accounts for any absence, excused or not, that you may have during the semester. ***Late homework are not accepted*** and will result in a 0 for the late homework. There will *be* ***no make up homework.***

Grade distribution:
Homework: 20%
Midterms: 40% (20% each)
Final exam: 40%

CHEATING POLICY: Anyone caught cheating in any way will be failed from the class.
University's Standards of Academic Integrity: https://www.albany.edu/undergraduate_bulletin/regulations.html

Letter grade distribution

A	93 - 100 %	C	73 - 76.999 %
A-	90 - 92.999 %	C-	70 - 72.999 %
B+	87 - 89.999 %	D+	67 - 69.999 %
B	83 - 86.999 %	D	63 - 66.999 %
B-	80 - 82.999 %	D-	60 - 62.999 %
C+	77 - 79.999 %	E (fail)	<60

There will be no curving of any grades.

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 Prof. Levy of any needed accommodations prior to the end of the second week of classes.
Requests submitted after this time will be more difficult to accommodate given the structure of the class

******** This syllabus is subject to change during the semester if the instructor deems it necessary for the good development of the class. Students will be informed of any change on blackboard and in class. ********

Biophysics and Bioimaging (PHY 404), Fall 2021 - 3 Credits

Time: TBA
Room: TBA

Instructor: Dr. Alexander Khmaladze – akhmaladze@albany.edu

Office hours: PHY111 on TBD; I will be available after each class for as long as you need me. I will also be available by appointment

Prerequisite(s): A MAT 111 or A MAT 112, A MAT 113 or A MAT 119.

Course Objectives: Biophysics is an interdisciplinary science that applies approaches and methods traditionally used in physics to study biological phenomena. This course provides a broad study of biophysics from the perspective of imaging. Students will understand the theory of light, light interaction with biological tissues, cells and molecules, color vision, microscopic image formation, color vision, fluorescence, interference-based imaging, holography, X-Ray imaging, FLIM, FRAP, FRET, spectral imaging, and super-resolution approaches (STORM/STED/PALM/ SIM).

Text: *From Photon to Neuron: Light, Imaging, Vision* by Philip Nelson (ISBN: 9780691175188)

I will also include supplementary materials from scientific journals.

Course materials will be posted on Blackboard: https://blackboard.albany.edu/.

Course organization: The lectures are given in PowerPoint. We will also do some homework/exam problems in class. I will make homework/exam solutions available to everyone via Blackboard.

Reading Assignments: I will assign sections of the books to read. Please take it seriously.

Homework Assignments: Home assignments will be given and are due at the time specified. Submit all assignments when they are due. You are free to ask anyone for help on homework. If you do not hand homework in directly to me during class, **you are responsible to ensure that I get it**. If you are worried about me not getting it should you drop it in my mailbox, please make a scanned copy of it.

Exams: There will be one in-class midterm exams and a final exam (cumulative). All exams are closed book. Calculators are allowed. Laptops and phones are not allowed.

Your grade will be determined as follows:

Home Assignments	20%
First Exam	35%
Second Exam	45%

Grades will be assigned on the following scheme:

% Possible	Grade
90% and up	A
80% - 89%	B
70% - 79%	C
60% - 69%	D
below 60%	E

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.

Academic integrity: As this is an upper level class, most of you are probably familiar with the University's academic integrity policy. If not, please review it in the undergraduate bulletin. The penalties for violating this policy are strict: up to expulsion.

Course Description and Topics to be Covered: This course provides a broad study of biophysics from the perspective of imaging. The course covers the theory of light, light interaction with biological tissues, cells and molecules, color vision, microscopic image formation, color vision, fluorescence, interference-based imaging, holography, X-Ray imaging, FLIM, FRAP, FRET, spectral imaging, and super-resolution approaches (STORM/STED/PALM/ SIM).

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

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: **$a = F/m = 10\ N/\ 0.2\ kg = 50\ m/s^2$**.

Conversions:
Convert **$5.12\ fm/ns^2$** to **m/s^2**: **$5.12\ fm/ns^2 = 5.12 \cdot 1\ fm/(1\ ns)^2 = 5.12 \cdot 10^{-15} m / (10^{-9} s)^2 = 5.12 \cdot 10^{-15} m / (10^{-18} s^2) = 5.12 \cdot 10^{3}\ m/s^2$**

Electronics projects (3 credits)
Phy 416
Spring 2019
Th 2:45-5:45 in Earth Science B-14

Carolyn MacDonald
Lifesci 1145
772-4585
cmacdonald@albany.edu
Office hour T 11-12, or email for appt.

Course description and learning outcome: Independent projects involving laboratory work in the study of electronic circuits using linear and/or digital devices. (Each student is expected to undertake a project that requires originality and broadens knowledge of the area.) Special attention is paid to counters, registers, encoders, decoders, and digital applications. Prerequisite(s): Instructor Permission.

You will be expected to work independently on the projects outside of the meeting hours, as well as coming for each week during the schedule time.

Scheduling notes: I will be at a conference 2/18-22, so we can arrange an extra day on the following week. On 2/7, 3/7 and 4/4 I have department meetings, and we will meet on an alternate day.

Grading:

Introductory labs: 20%.
Group project: 20%
Individual project: design 20%, simulation 10%, working circuit 20%, presentation (including circuit diagrams and explanation) 10%

Your final grade is based on a curve. All contributions, e.g., labs and projects 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.

Introductory labs
Analog adder: Add two sine waves and use RC filters to separate them
Digital adder: 2 bit adder using simple logic gates

Group project: discuss and pick one
Analog multiplier
555 count down timer

Scientific ethics: It is never too early to start learning about this very important topic. In life, **your personal credibility is of paramount importance**. For instance, if your colleagues feel you are always above board, then when you are presenting new results, people will have an easier time believing them compared to the scenario where you have gained a reputation for playing fast and loose with facts. So, in this class, when you write your paper, do not plagiarize. If you want to include a few sentences from some sources, you can do so, but remember to put them in " ", and give the reference. Never try to pass other people's work as your own. You will eventually get caught.

University's Standards of Academic Integrity: https://www.albany.edu/undergraduate_bulletin/regulations.html

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).

APHY 442– **Introduction to** General Relativity

Spring 2018, 3.0 credit hours

Meeting time and place: MWF 10:25-11:20, PH 225

Professor: Daniel Robbins

email: dgrobbins@albany.edu,

Office: PH 215,

Office hours: T 4:00-5:00, W 11:30-12:30 or by appointment.

Prerequisite: A PHY 320.

Goals of the course:

- Motivate the development of Einstein's theory of general relativity.
- Introduce students to the mathematical ideas and tools of Riemannian geometry.
- Derive the geodesic equation and Einstein's equations which govern how matter and spacetime affect each other.
- Explore applications of these equations, including black holes and gravitational radiation.

The course grade will be determined as follows

- Homework: 50% (based on material covered in class)
- Midterm exam: 25% (problems similar to Homework)
- Final exam: 25% (problems similar to Homework)

This is a shared resource course, so the grade will be determined depending on which variant you have signed up for. Your final grade is based on a curve, which will be handled separately for each variant. 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.

COURSE DESCRIPTION: Review of Special Relativity. Introduction to tensor analysis and the geometry of curved spaces. Einstein's equations. Applications to gravitational waves, black holes and expanding universes.

Course Outline (subject to change):

1. Special Relativity and Flat Spacetime
2. Differential Geometry
3. Curvature and Geodesics
4. Einstein's Equations
5. Black Holes and the Schwarzschild Solution
6. Gravitational Radiation

Textbook: There is no required textbook for this course, but there is a recommended text, *Spacetime and Geometry* by S. Carroll. This text was expanded from a set of lecture notes freely available online at
`https://arxiv.org/abs/gr-qc/9712019`.

There are many other good general relativity textbooks available. A few that I particularly recommend are:

- *A First Course in General Relativity* by B. Schutz. This is an excellent book aimed at undergraduates. It does a great job of emphasizing the physics behind general relativity.
- *General Relativity* by R. Wald. This is a more advanced book, and for more than thirty years has been the standard reference text in this field. Very clear and very rigorous.
- *Gravitation and Cosmology* by S. Weinberg. The oldest book on the list and also one of the only GR textbooks to downplay the geometric approach in favor of careful physical reasoning.

Course policies:

- APHY 320 is a prerequisite for the course.
- There will be homework assigned most weeks, due in class on Wednesday. Homework turned in one day late gets a 25% penalty, and homework turned in two days late (until Friday 5:00 pm) gets a 50% penalty. No credit will be granted for homework turned in later than that. If you must request an exception due to extraordinary circumstances, this must be negotiated with me by email.

- You must show your work to get full credit (on both homework and exams). At the level of this course you are expected to do more than just understand how to solve the problem; you must also be able to communicate that understanding.
- You are welcome to work together on homework assignments, but everybody must write up their own solution to every problem.
- The two exams will be take-home exams. They are open book, but you are absolutely not permitted to work with others (this includes but is not limited to seeking help on internet forums).

Please check the course Blackboard site for more useful information (including copies of the syllabus and homeworks as they are assigned) and updates.

Laser Physics and Applications (APHY 446/446Y)
(3 credits) – Spring 2022

Instructor: Prof. Jon Petruccelli Office: Ph114. E-mail: jpetruccelli@albany.edu
Time and Location: We/Fr 11:40AM – 1 PM, Physics 225
Office Hours: We 3:00-4:30 PM, Fr 10:00-11:30 AM
TA (grader): Shane Carney, sdcarney@albany.edu

Prerequisites: A PHY 250.

Text: *Principles of Lasers (5th ed. 2010)* by Orazio Svelto
Course materials will be posted on Blackboard: https://blackboard.albany.edu/.

Course Description: This course provides a broad introduction to lasers, including theory of spontaneous and simulated emission, design of optical resonators and laser beam propagation. The course will also cover the design of various types of lasers and laser applications, such as holography, microscopy and spectroscopy. *We will mainly focus on material in Chapters 1-2, 5-7 of the textbook.*

Course objectives:

1. To be able to explain and model the processes by which lasers operate (stimulated emission, population inversion, laser cavities, etc.).
2. To be able to describe the differences between coherent laser light and conventional thermal light.
3. Students should develop enough expertise to understand laser specifications provided by manufacturers and match particular lasers to their applications, *e.g.* Holography, spectroscopy, communication, *etc*.

Grading:
For APHY 446, your grade will be determined as follows:

Attendance	15%
Homework	20%
Quizzes	15%
Midterm Exam	25%
Final Exam	25%

For APHY 446Y, your grade will be determined as follows:

Attendance	15%
Homework	20%
Quizzes	15%
Midterm Exam	20%
Final Exam	20%
Special topics presentation	10%

This is a shared resource course, so the grade will be determined depending on which variant you have signed up for. Your final grade is based on a curve, which will be handled separately for each variant. 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.

Attendance in class: I will take attendance at the start of each class. You will be allowed up to 2 unexcused absences from class before it starts to impact your grade. You will lose 2% attendance credit for each additional unexcused absence. If you miss more than 7 total classes without excuse, you will receive a failing grade for the class.

Attendance for exams: The midterm will take place in class and does not count as one of the allowed 2 absences above. If you miss the midterm or final for any other reason than an excused absence (defined below), you will receive a 0.

Excused absences: ***An excusable absence as defined by the university*** includes (a) illness, tragedy, or other personal emergency; (b) foreseeable time conflicts resulting from required appointments; and (c) religious observance. For details on the university policy, see: https://www.albany.edu/undergraduateeducation/attendance.php and https://www.albany.edu/health_center/medicalexcuse.shtml I may allow other excused absences, *e.g.* for winter weather, if you contact me. Please contact me as soon as possible (ideally before) your absence with supporting documentation. I realize that COVID complicates matters, but a COVID diagnosis or mandatory isolation should provide documentation.

Homework: Homework will be due by the end of class on the indicated date. It can be turned in up to 48 hours after the due time with a 50% penalty after which time I will post the solutions online (via BlackBoard). If you hand in homework into my mailbox, under my door or in any way other than handing it to me in class, please make a backup copy as you will be responsible for supplying me with a new copy if I don't receive it. There will generally be 8-9 HW assignments throughout the semester, and they will be based on material covered in class.

Quizzes: The point of quizzes is to get you to read ahead in the text. I will give short quizzes on blackboard based on assigned readings. These will be due on evenings (11:59 PM) throughout the semester and will typically prepare you for material discussed that week. I will drop the lowest quiz grade when determining your final grade. Instructions for each quiz will be posted on blackboard. Typically there are ~9-10 quizzes in the semester.

Exams: There will be an in-class midterm and a final exam. The midterm date will be decided once we cover a portion of the material. Expect it around mid-March. (I will give you at least a full week's warning). You will be allowed to bring a standard 8.5x11 inch sheet of paper with whatever you want written on one side of it for the midterm. Questions on the exams will be of similar scope and difficulty as the Homework.

Final Exam (scheduled by registrar): Tues, May 10, 10:30 AM-12:30 PM, Physics 225. You will be allowed to bring a standard 8.5x11 inch sheet of paper with whatever you want written on both sides of it for the final. Questions on the exam will be of similar scope and difficulty as the Homework. (The final exam schedule for all courses is here: https://www.albany.edu/registrar/final-exam-schedule.php

Special topics presentation: Topics should go beyond the scope of the textbook/lecture and should be approved by the instructor. I will send out reminders later in the class to contact me and decide on a topic. Some previous topics included erbium-doped fiber lasers, diode lasers (both are types of laser not covered in detail in class), and laser cooling. In general, types of lasers not discussed in detail in class or applications of lasers are acceptable topics.. The presentation should cover the topic in sufficient detail to demonstrate to me that you understand it at an introductory level.

For students registered for 446Y, the "Y" designates an oral discourse component, and so you will be require to give the oral presentation (but not to write a short paper). This will be worth 10% of your grade.

PHY 446 students may complete this assignment for extra credit. Please contact me if you want to do this.

Bonus Points: As I will probably have mistakes and typos in my lecture notes or other posted material, I will offer a bonus point bounty. For each mistake you find, I will give you ½ a point onto your final numerical grade (up to a total of 5 points) if you email me to point it out.

Academic integrity: As this is an upper level class, most of you are probably familiar with the University's academic integrity policy. If not, please review it in the undergraduate bulletin. The penalties for violating this policy are strict: up to expulsion. The policy can be found here: https://www.albany.edu/undergraduate_bulletin/regulations.html.

Course Calendar (tentative):

January 26-Feb 11	Introduction: Ch 1
Feb 16-March 2	Light-matter interaction, Ch. 2
March 4-March 18	Laser cavities, Ch. 5
March 23-April 20	Pumping, Ch. 6
April 22- May 4	CW Laser Operation, Ch. 7

Astroparticle Physics: APHY452(Y), Spring 20XX,
Monday - Wednesday - Friday 11:30 - 12:25 P.M. in Physics Building, Room 229

3 credit-hours. Professor Matthew Szydagis, mszydagis@albany.edu,
www.albany.edu/physics/mszydagis.shtml, TA/Grader: FirstName LastName (initiallastname@albany.edu)
Office Hours: Tu and Th 10am–12pm, Physics 312 -or by appointment

Text: None. Detailed lecture notes (PDF presentation slides) will be provided on the course website, which will also include links to current scientific publications, at the cutting edge of this field of research, including review papers, which will be covered throughout the course, serving as direct immersion into this ever-changing field (an internet connection is required).

Course Description and Pre-reqs: An in-depth discussion of precision cosmology: dark matter, dark energy, and the Cosmic Microwave Background radiation, from experimental/technological, observational, mathematical/theoretical, phenomenological, and computational perspectives. Introduction to intragalactic and extragalactic gamma-ray/x-ray astronomy, the study of cosmic rays, and astrophysical neutrinos, as well as experimental searches for extra/higher spatial dimensions and constraints on Lorentz invariance violation via various particle astrophysics detection methods. Prerequisite (if you're an undergraduate student) aPHY 320 or permission of instructor.

Course Objective: Students will by the end know how to read & understand contemporary papers on the topic of astroparticle, as well as seminal/historical. They will learn the underpinnings of various theories and models of exotic particles from space or in it, as well as learn the principles of operation for different basic types of astroparticle detectors, and high-tech telescopes, especially non-optical.

The following is a tentative course plan; it is natural to fall behind or get ahead and adjust topics

	Monday	Wednesday	Friday
1/21,23,25	*class suspended*	Introduction	Introduction
1/28,30,2/1	Dark Matter	Dark Matter	Dark Matter
2/4,6,8	Dark Matter	Dark Matter	Dark Matter
2/11,13,15	Dark Energy	Dark Energy	Dark Energy
2/18,20,22	Dark Energy	Dark Energy	Dark Energy
2/25,27,3/1	CMB	CMB	CMB
3/4,6,8	CMB	CMB	CMB
3/11,13,15	Review for Exam	Review for Exam	MIDTERM EXAM
3/18,20,22	*class suspended*	*class suspended*	*class suspended*
3/25,27,29	X-Ray Astronomy	X-Ray Astronomy	X-Ray Astronomy
4/1,3,5	The Gamma-Ray Sky	The Gamma-Ray Sky	The Gamma-Ray Sky
4/8,10,12	Cosmic Rays	Cosmic Rays	Cosmic Rays
4/15,17,19	Neutrinos	Neutrinos	Neutrinos
4/22,24,26	*class suspended*	Neutrinos	Neutrinos
4/29,5/1,3	Gravitational Waves	Gravitational Waves	Gravitational Waves
5/6,8,10	Multimessenger Astronomy	Review for Final	*class suspended*

See the table at the left for topic or paper for each date for each week.

Please note the final exam is on Monday 05/13, 3:30-5:30 P.M.

It will be in same room class takes place (229) and is NOT entirely *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 could become a probable outcome then. So, don't even think about it.

your grades will be determined in this rubric (A through E with +'s / –'s in 15% blocks: A=100-85% etc.)

Midterm Exam	25% (exam will consist of similar or identical problems recycled from homework)
Homework	25% (note turning in identical assignments with typos, etc. is considered cheating)
Final Exam	25% (answer equation-based and conceptual questions, similar to homework)
Variable based on course	25% (452: attendance/participation; 452Y: oral presentations)

Extra Credit: You can earn up to 5% in bonus points writing brief summary reports of articles listed as "additional" reading weekly beyond those required. You can also attend physics seminars / colloquia.

Classroom Conduct: While you are in this class, electronic devices will be a necessary part of in-class activities, such as notetaking on a laptop computer or a tablet device, and answering in-class questions online. However, absolutely no texting, e-mailing, or web surfing is allowed, on a laptop, tablet, smartphone, or a comparable device. Leaving early / arriving late is disruptive to everybody.

Outside the classroom, I will be sending important announcements to your UA e-mail, so CHECK IT

Homework: Problem sets, containing problems entirely of my own creation which you cannot find the answers to online, will generally be assigned every week, due at the start of class on the date specified on the homework, usually the following week, and are NOT accepted late under any circumstances, nor electronically such as by scanned e-mail attachment. Every step you take in solving homework problems must be shown. Writing down of only final answers is not considered acceptable – err on the side of caution in detailing what may seem like unimportant steps to you. IN general, HW assignments will be based on material covered in class.

You are very welcome to work with others, as long as you still turn in your **own work.** What this means is that the members of a group should not just be copying all of the steps and answers verbatim from one group "leader." If you plan on doing well in this course, then you must actually attend every single class and download all online PDFs and actually do every single homework problem, on your own, and study guides or practice problems to study. Otherwise do not expect good performance on the two exams, which comprise exactly half of your grade added together. Homework does not only count as much as one exam, but it will enforce lecture and other online material and serve as exam preparation: the test problems will be EXTREMELY SIMILAR to HW. Lastly, a few of the assignments will have optional secondary ways of doing them using computer programming.

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. For greater detail on the university's policies, please see: https://www.albany.edu/undergraduateeducation/attendance.php and https://www.albany.edu/health_center/medicalexcuse.shtml

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. Students are requested and strongly encouraged to report the religious holidays (that one plans to observe) to the instructor during the first week of classes.

Website: Lecture slides and supplements, as well as solution sets to exams and homework, and the homework assignments themselves, will appear on http://www.albany.edu/physics/phy452.shtml

Oral Presentations (for oral competency fulfillment): Students registered for 452Y are required to deliver presentations on a topic within the area of astroparticle physics, based upon a selection of contemporary research papers. The topics and research papers are chosen through consultation with the instructor. The talks will be evaluated by the instructor and by the peers taking this course, and the grade will be given by combining these two inputs. Therefore, it is critical for talks to be given at a level that is appropriate for the audience. All students are required to attend all talks and to complete evaluation sheets that provide feedback to the speaker. The instructor will provide separate feedback.

APHY458/458Y Physics of Radiation Detectors
3 credit hours

Prof. Levy, clevy@albany.edu
Classes meet TBD
Office Hours: TBD

Textbook (required): Physics and Engineering of radiation Detection – Syed Naeem Ahmed – Academic Press
Suggested: Radiation Detection and Measurement - Glenn F. Knoll - Wiley - 4th edition

Prerequisite: PHY 250 or 440 (or equivalent), or Instructor permission

Course Description: Advanced class on the physics of radiation detectors and measurements. The course will cover radiation sources, interactions, statistics, shielding; various types of radiation detectors: ionization, scintillation and solid state detectors; and pulse analysis

Course Objectives: This course spans several fields of physics: nuclear, particle, medical… Students will end the course having a good fundamental theoretical understanding of all types of radiation, how radiation interacts with matter and its effect on the human body. They will also have gained an understanding of many of the experimental techniques used to detect radiation, and learn of the statistical and data analysis methods used in radiation detection.

Course organization:
All class notes and grades will be posted on Blackboard/Brightspace.

Tentative Syllabus (approximate): The plan may need to be adjusted as we progress through the semester, and to account for Fall and Thanksgiving, or Spring breaks.

Topics **(Each unit will take ~ one to two weeks of lectures)**

Unit 1: Radiation Properties
Unit 2: Radiation Sources
Unit 3: Dosimetry
Unit 4: Interactions with matter
Unit 5: Statistics
Unit 6: General Detector Properties
Unit 7: Signal and Pulse Processing
Unit 8: Gas Filled Detectors
Unit 9: Liquid Filled Detectors
Unit 10: Scintillators
Unit 11: Photodetectors
Unit 12: Solid State Detectors

Final Exam slot will be used for class presentations

Grading: This is a shared resource course, so the grade will be determined depending on which variant you have signed up for. 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.
Homework *(based on material covered in class)*: 50% for APHY458, 40% for 458Y

Abstract:	5% for APHY458/458Y
Presentation:	20% for APHY458Y
Proceeding:	20% for APHY458Y, 30% for APHY458
Participation in presentations:	5% for APHY458/458Y
Activities:	10% for APHY458/458Y

Homework will be assigned for most topics listed above, and will be due on the specified dates.There will be 1 homework due every week for a total of 10 homework sets. The 2 lowest homework grades will be dropped for the final grade count. This accounts for any absence, excused or not, that you may have during the semester. ***Late homework are not accepted*** and will result in a 0 for the late homework. There will be ***no make up homework.***
http://www.albany.edu/health_center/medicalexcuse.shtml details the university policy re: missing exams/classes. You are free to ask anyone for help on homework.

Exams:
There will be no exams.

Activities:
There will be 40min of "activity" for about each topic. You will be split into groups, and each group has 30min to research a subject, and then 5 min to give a small "lecture" about the subject. The number of activities will depend on the pace of the class. The grade component will be split equally between the activities. The person to give the "lecture" must rotate every activity.

Writing and Oral component:
Student will be assigned an appropriate subject, and will have to submit an abstract, present a talk, and write a proceeding, conference style. The format of the proceeding will be given in class.
Everyone needs to ask at least 1 question on every talk.
Proceeding is 5 pages max for APHY458Y, 3 pages max for APHY458.

Class Participation: This will include attendance, engaging in class (or during office hours), asking questions during activities, and help judging oral presentations.

CHEATING POLICY: Anyone caught cheating in any way will be failed from the class.
University's Standards of Academic Integrity: https://www.albany.edu/undergraduate_bulletin/regulations.html

Letter grade distribution

A	93 - 100 %	C	73 - 76.999 %
A-	90 - 92.999 %	C-	70 - 72.999 %
B+	87 - 89.999 %	D+	67 - 69.999 %
B	83 - 86.999 %	D	63 - 66.999 %
B-	80 - 82.999 %	D-	60 - 62.999 %
C+	77 - 79.999 %	E (fail)	<60

There will be no curving of any grades.

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 Prof. Levy of any needed accommodations prior to the end of the second week of classes.

Requests submitted after this time will be more difficult to accommodate given the structure of the class.

A PHY471/471Y - Introduction to Neutrino Astronomy
3 credit hours

Prof. Vivek Jain, vjain @albany.edu, Google "vivek jain particle physics"

Office Hrs: TBD – in-person and via Zoom

Required: "Introduction to High Energy Physics", Donald H. Perkins, 4th Edition (2000) – it is available as an e-book through the library, i.e., limitless copies
Suggested: (1) "The Ideas of Particle Physics", Coughlan, Dodd and Gripaios – also available as an e-book through the library, **(2)** "Introduction to Elementary Particles", David Griffiths, **(3)** Papers published in scientific journals

Prerequisite: PHY 240 or 440 (or equivalent), or Instructor permission

Course Description: This course covers the burgeoning field of Neutrino Astronomy, and will give a broad overview of the underlying physics, detection techniques and results. Neutrinos are one of the most abundant particles in Nature, and are produced in a variety of extra-terrestrial sources, e.g., interaction of cosmic rays with the earth's atmosphere, our Sun, Supernovae, Active Galactic Nuclei, the Big Bang; all of these give complementary information.

Administrative stuff: All information is on Brightspace

Tentative Syllabus (approximate): The plan may need to be adjusted as we progress through the semester, and to account for Fall and Thanksgiving, or Spring breaks.

Topics	**(Each unit will take one to two weeks of lectures)**
Unit 1:	Introductory lecture, Relativistic Kinematics/other basics
Unit 2:	Interactions and Fields
Unit 3:	Invariance Principles and Conservation Laws
Unit 4:	The Standard Model – quarks, leptons, force carriers and the Higgs boson
Unit 5:	Neutrino properties – mass, flavor, oscillations, implications for Cosmology
Unit 6:	Neutrino interactions and detection techniques
Unit 7:	Atmospheric Neutrinos
Unit 8:	Solar Neutrinos
Unit 9:	Neutrinos from Supernova
Unit 10:	Neutrinos from Blazars, Active Galactic Nuclei
Unit 11:	Neutrinos from the Big Bang
Unit 12:	Multi-messenger astronomy – Conventional, Cosmic Rays, Gravitational Waves

Final Exam slot will be used for class presentations

Grading: This is a shared resource course, so the grade will be determined depending on which variant you have signed up for. Your final grade is based on a curve, which will be handled separately for each variant. 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.

Homework	*(based on material covered in class)*
	30% for PHY 471
	20% for PHY 471Y
Class Participation	20% *for PHY 471*
	10% *for PHY 471Y*
Research Paper	50% - *(Will suggest topics)*
Oral presentation of paper	20% - *for APHY 471Y*

Homework will be assigned for most topics listed above, and will be due on the specified dates. Late assignments are not accepted without prior approval of instructor. http://www.albany.edu/health_center/medicalexcuse.shtml details the university policy re: missing exams/classes. You are free to ask anyone for help on homework.

Class Participation: This will include attendance, engaging in class (or during office hours), and help judging oral presentations.

Research Paper: Students registered for *PHY 471/471Y* will write a 8-10 page paper. Potential topics will be suggested. You are free to choose from this list or come up with a different topic. Come talk to me and I'll help you choose.

Oral Presentations: Students registered for *PHY 471Y* should plan for a 12-15 min. presentation.

I will have reasonable expectations for you. From my perspective, a well-organized talk is more important than delivering a polished one. I want you to get in the habit of organizing a talk, pitching it a level that is appropriate for your audience, etc.

I will supply a sample of a well-prepared talk, so you know how to go about writing yours. The talk will be based on a set of slides, e.g., made using Power Point or similar software, and you will deliver the talk from the front of the classroom.

I will give you suggestions on how to engage the audience and hold their interest, e.g., how to face the audience while talking and not just reading verbatim what is on your slide.

Learning Objective: Students will learn about the new field of Neutrino Astronomy. They will gain a broad understanding of the underlying physics, detection techniques and results, as well as the variety of ways that Neutrinos are produced.

All students are required to attend all talks. I will be handing evaluation sheets, so that all of us can provide feedback to the speaker, including specific suggestions, e.g., don't wave the laser pointer, or stand to the side of the screen, speak clearly, etc. (a sampling from the last time I taught this course)

Scientific ethics: It is never too early to start learning about this very important topic. In life, **your personal credibility is of paramount importance**. For instance, if your colleagues feel you are always above board, then when you are presenting new results, people will have an easier time believing them compared to the scenario where you have gained a reputation for playing fast and loose with facts. So, in this class, when you write your paper, do not plagiarize. If you want to include a few sentences from some sources, you can do so, but remember to put them in " ", and give the reference. Never try to pass other people's work as your own. You will eventually get caught.

University's Standards of Academic Integrity:
https://www.albany.edu/undergraduate_bulletin/regulations.html

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.

CSI 333: System Fundamentals (4 credits)

Lecture Time/Location
Tuesday/Thursday 1:30pm–2:50pm, Lecture Center 4

Labs Time/Location

- Monday 8:25am–9:20am, Humanities 114
- Monday 11:40am–12:35pm, Social Science 131
- Friday 8:25am–9:20am, Humanities 111
- Friday 11:40am–12:35pm, Earth Science 328

Instructor
Amir Masoumzadeh (amasoumzadeh@albany.edu)

- Office Hours: Tuesday/Thursday 4pm–5pm (Zoom link on Blackboard), or by appointment

Teaching Assistants
Omkar Kulkarni (onkulkarni@albany.edu)

- Office Hours: Monday 10:30am–11:30am (SS 131), Wednesday 1:30pm-–2.30pm (UAB 412B), or by appointment

Kazi Kibria (kkibria@albany.edu)

- Office Hours: TBA, or by appointment

Course Overview

Machine representation of numbers (two's compliment and floating point). Concepts of system level programming including dynamic memory management, hardware-software interface, storage management, compilation and linkage, multi-processing, and terminal I/O.

Student Learning Objectives / Outcomes

At the completion of this course, the student will:

1. Be able to convert between number systems, including two's complement.
2. Be able to write idiomatic C code using various data types, loops, branches, arrays, and structs, and programs that manage memory using dynamic memory allocation functions and variables that contain a memory address (pointers).
3. Be able to code, test, debug and internally document computer programs in C language so they follow given functional specifications, using appropriate software tools and practices.
4. Be able to understand and articulate what system software does.
5. Be able to write software for POSIX systems using system calls.
6. Be able to read and understand research papers in the systems area.

Prerequisites

- Grade of C or better in ICSI/IECE 213.

Readings

No textbook is required for this class. Instead, we rely on online resources that are listed as readings for each week. If you prefer to read books for learning C programming, I recommend:

- C Programming Language, 2nd edition by Kernighan and Ritchie (ISBN: 0131103628)
- C Programming: A Modern Approach, 2nd edition by N. N. King (ISBN: 0393979504)

- Effective C by Robert C. Seacord (ISBN: 1718501048)

Communication and Submissions

The course syllabus and schedule is available on the course webpage. Most of the tasks in this class will be handled via course GitHub organization including the distribution of notes, assignments, assignment submission, and feedback. You will be invited to join the organization in the first week of classes. We will also use Blackboard for communication and for your grades.

Assessment and Grading

The course is A-E graded based on the following categories and corresponding weights. Conversion from the final numerical grade to the letter grade is based on cutoffs determined according to the grade distribution in the class. This results in more flexible and favorable grades compared to using a fixed conversion scale, e.g., in a hypothetical case, if the class average is 65%, and the standard deviation is 15, then a B- corresponds to the range 65-70%, A- to 80-85%, and C- to 50-55%, etc.

In-Class Exercises (5%)
: You will work on small in-class exercises either individually or in teams. Submissions are only accepted at the designated time during class. Missing submissions (including due to absence) will result in not receiving the grade for the associated exercises. Up to 10% of exercises will be dropped from your grade calculation to accommodate unforeseen situations.

Labs (15%)
: You will work on one lab assignment every week during your registered lab session. The first lab session of the class meets on Friday, following by Monday sessions in the week after that. Labs are relatively simple, and you should be able to finish them during the lab session. The lab deadlines are usually the Wednesday following your lab session. Your two lowest lab grades will be dropped from your grade calculation.

Programming Projects (40%)
: You will work on four (mini) programming projects during the semester. These are more substantial programming assignments compared to the labs. You will usually have about two weeks to finish each project. These will be based on material covered in class.

Exams (40%)
: You will take a midterm exam (taken during regular class sessions) and a final exam. Each exam is worth 20% of your total grade. These will be based on material covered in class.

General Education Competency

While studying this course students will also develop such general education competencies as Advanced Writing, Critical Thinking, Information Literacy and Oral Discourse; first, through working on the programming project assignments.

It is required that all programming code be well documented, thus, clear and laconic written descriptions are necessary. In the written report, students will not only demonstrate increasingly sophisticated writing according to the conventions of computer science, but also able to communicate clearly in writing, employing fundamental rules of usage, style, and mechanics in the context of computer science (Advanced Writing).

To solve programming problems students need formulate complex problems clearly and precisely and apply familiar and new computer science concepts in developing solutions and conclusions (Critical Thinking).

Through the programming project work, students will learn to organize and access information from open sources such as GitHub; select the most appropriate strategies, search tools (such as Google or StackOverflow sites), and resources for each unique information need relevant to their project, and evaluate the dynamic online content as per their need. While using the publicly available (online) information in the project, students must conduct ethical practices keeping in view of intellectual property and personal privacy. As a part of team, they must produce, share, and evaluate information with other

team members in a variety of participatory environments (Information Literacy).

Team programming project will require students to communicate with their teammates in the forms of discussion and brainstorming, thus they need communicate ideas effectively appropriate to a context of programming problem and according to a specific set of criteria given by the instructor (Oral Discourse).

Schedule

The following schedule is tentative and will be regularly updated. It is your responsibility to check the schedule regularly. The plus sign (+) means optional reading.

Day	Topic/Reading	Assignment
Module 1: Shell/Git		
Aug23	Course Introduction, Git • Pro Git: ch1–ch2 • + Pro Git: ch3, ch6 • + Atlassian Git Tutorial	No Lab
Aug30	Unix Files, Shell Basics • The Linux Command Line: ch1–ch11 • + The Linux Command Line: ch17, ch19 • + RegexOne Exercises • + Advanced Bash-Scripting Guide: ch20	lab01 (Setup)
Module 2: C Programming		
Sep06	Shell Basics (cont.), C Basics, Number systems • Essential C: sec1, sec2, sec4 • + Beej's Guide to C Programming: sec2–sec4, sec8, sec10, sec13–sec14	lab02 (First Program)
Sep13	Memory: Pointers, Strings, Arrays • Essential C: sec3, sec6 • + Beej's Guide to C Programming: sec5–sec7	lab03 (Bitwise)
Sep20	Memory Management • Essential C: sec6 • Beej's Guide to C Programming: sec11–sec12	lab04 (Pointers)
Sep27	Developing Modular C Programs • Essential C: sec5 • GCC and Make Tutorial • + Beej's Guide to C Programming: sec19	lab05 (Strings)
Oct04	C File I/O • Beej's Guide to C Programming: sec9	lab06 (Linked Lists), project1
Oct06	Midterm Exam	

Day	Topic/Reading	Assignment
Module 3: POSIX/Linux Programming		
Oct11	No Class (Fall Break)	
Oct11	System Calls • System Calls Make the World Go Round • + The Definitive Guide to Linux System Calls	
Oct18	File I/O • The Linux Programming Interface: ch4	lab07 (C Files)
Oct25	Processes, Executing Programs • Beej's Guide to Unix IPC: sec2 • System Programming Wikibook: "2. Processes"	lab08 (POSIX Files)
Nov01	Signals, Pipes, FIFOs • Beej's Guide to Unix IPC: sec3–sec5 • + System Programming Wikibook: "10. Signals"	lab09 (Processes), project2
Nov08	Networking • Beej's Guide to Network Programming: sec2–sec7 • + System Programming Wikibook: "8. Networking"	lab10 (Signals/Pipes)
Nov15	Threads • POSIX pthreads Tutorial • + System Programming Wikibook: "4. Intro to Pthreads"	lab11 (Networking), project3
Nov22	Shared Memory Segments, Memory Mapped Files • Interprocess communication with shared memory • Beej's Guide to Unix IPC: sec10	lab12 (Threads)
Nov24	No Class (Thanksgiving Break)	
Module 4: Misc. Topics & Recap		
Nov29	Rust, Recap & Review • The Rust Programming Language: ch1–ch2	lab 13 (Shared Memory), project4
Dec13	Final Exam (Dec13, 1:30pm-2:50pm)	

Policies

No Late Submission

Assignments will be released at least a week before their due date. You are highly recommended to study an assignment as soon as it becomes available. There will be ample opportunities to benefit from office hours and communication with me and the TAs before the due date. Assignments are due

at 11:59pm on the day of their deadline. Submissions after due time will receive no points.

Review of Grades

Any issue regarding your grade in a specific assignment must be communicated to us no later than 5 business days after the posting day of the grades. There will be no re-grading after the 5-day period has passed.

Attending Classes

Class attendance is required for successful completion of this course.

Attending Exams

The midterm exam is given in regular hours of the class. The final exam will be during the final exam period. Tentative exam dates are given in the course schedule, and there will be usually reminders about them in the lectures. Makeup exams will be given only for valid and verifiable extenuating circumstances (e.g., a major medical situation). It is the student's responsibility to contact the instructor at least a week ahead of the exam date and arrange to take a makeup exam at an alternate date/time. Makeup exams are not guaranteed and will be generally harder than the regular exams.

Academic Integrity

It is every student's responsibility to become familiar with the standards of academic integrity at the University. Claims of ignorance, of unintentional error, or of academic or personal pressures are not sufficient reasons for violations of academic integrity. Any incident of academic dishonesty can result in *(i)* no credit for the affected assignment, *(ii)* report to the appropriate University authorities (e.g., Dean of Undergraduate Education or Graduate Studies), and/or *(iii)* a failing grade for the course. For all assignments and papers, you must submit your own work, except where collaboration is explicitly permitted or required. Also, you must properly cite any resources from which you borrow ideas and clearly distinguish them from your contributions.

Use of Electronic Devices

Computers or other electronic devices may be only used during class for note-taking, in-class exercises, or other class-related activities. You are not allowed to perform any unrelated tasks during class.

Students with Disabilities

Reasonable accommodation will be provided for students with documented disabilities. If you believe you have a disability requiring accommodation in this class, please notify the Disability Access and Inclusion Student Services (DAISS) (Campus Center 130, 518-442-5501). That office will provide me with verification of your disability, and will recommend appropriate accommodations. In general, it is your responsibility to contact me at least one week before the relevant activity to make arrangements.

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 https://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).

Health and Safety Protocols

The university health and safety protocols including face mask guidelines will be strictly followed. See the university's basic safety protocols for details.

UNIVERSITY AT ALBANY
State University of New York

College of Engineering and Applied Sciences
Department of Computer Science

ICSI 401 (3 credits)

Numerical Methods

(Fall 2021)

Class Meeting Time: Tues/Thurs 9:00a.m.-10:20a.m.

Location: Earth Science 241

INSTRUCTOR

Instructor's name	Abram Magner
Instructor's title	Assistant professor
Office location	Zoom (see Blackboard).
Office hours	T,Th 10:30-11:30 a.m.
E-mail address	amagner@albany.edu

TEACHING ASSISTANTS / PEER EDUCATORS (AND LAB/DISCUSSION SCHEDULE, if any)

TA's / Peer educators	Amith Kumar Singh
TA's office location	TBD
TA's office hours (if any)	TBD
TA's email addresses	asingh20@albany.edu

REQUIRED TEXTBOOK

Text/Reference Book(s):
Title: Numerical Methods: Design, Analysis, and Implementation of Algorithms, 3.2.2012 edition
Authors: Anne Greenbaum and Timothy Chartier
Published by: Princeton University Press, ISBN: 9780691151229

Other reading material may be posted on Blackboard.

COURSE DESCRIPTION

Study of practical methods for the numerical solution of a variety of problems on a digital computer. Topics include roots of equations, numerical interpolation, numerical integration and differentiation; the evaluation of mathematical functions, least squares curve fitting; the solution of simultaneous linear equations, and matrix inversion.

PREREQUISITES

Grade of C better in both I CSI/I CEN 213 and A MAT 220.

STUDENT LEARNING OUTCOMES (SLOs)

At the completion of the course the student will:

SLO 1. Understand the importance and subtleties of computations with floating point numbers.
SLO 2. Gain experience in implementing numerical methods in Matlab.
SLO 3. Understand various fundamental numerical methods for problems such as root finding, function approximation, numerical linear algebra, quadrature, numerical solutions to differential equations, etc.

The topics that will be covered in this course are provided at the end of the syllabus.

COURSE WEBSITE AND BLACKBOARD

Blackboard will be used to provide essential course materials, the most current syllabus, and assignment documents. No separate course website will be maintained.

ASSESSMENT AND POLICIES

The accomplishment of course objectives will be assessed by solving conceptual/mathematical problems related to the course material and writing Matlab code. Specifically, grading will be based on homework (based on material covered in class), two exams, and possible Blackboard quizzes.

Exams: Two exams will be given, based on material covered in class and on HW assignments. A portion of the class period preceding each exam will be utilized for a review session. There is a final exam during finals week. All exams are open book, open note. However, **students must work on their solutions on their own, and they may not solicit answers to the questions or closely related questions from any source.**

Grading Scale (Lower limits of intervals are inclusive, and upper limits other than 100 are exclusive. So a 95 is an A, not an A-; a 90 is an A-, not a B+; etc.)

A: 100-95 points A-: 95-90 points
B+: 90-87 points B: 87-84 points B-: 84-80 points
C+: 80-76 points C: 76-70 points
D: 70-60 points
E: 60 points and below

An extension on a homework assignment may be granted in case of exceptional circumstances (e.g., relating to the health of a student or of a student's dependents). Students should contact the instructor in advance of the due date of the assignment and should be prepared to show evidence of the exceptional circumstance.

The lowest grade among homeworks will be dropped.

Students must complete all requirements in order to pass the course. A grade of incomplete will be given only when circumstances beyond the student's control cause a substantial amount of course work to be unfinished by the end of the semester. Whenever possible, the student is expected to make extra efforts to prevent this situation from occurring. The instructor will be the sole judge of whether an incomplete is warranted. Finalgradesarecomputed basedontheaboveformulasandareNOTnegotiable. Per department policy, "…students may not submit additional work or be re-examined for the purpose of improving their grades once the course has been completed and final grades assigned."

ATTENDANCE/LATENESS/USE OF COMPUTERS IN CLASS

Students are expected to attend every lecture. However, attendance will not be taken.

If some schedule conflicts are possible because of your religious observance, please plan your work adequately and notify the instructor of record in a timely manner according to New York State Education Law (Section 224-A).

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 https://www.albany.edu/caps/ for hours of operation and additional information.

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MASK MANDATE

The university health and safety protocols including face mask guidelines will be strictly followed. **All students must wear masks** while inside any campus building, including inside classrooms. Students not wearing a mask in class will be asked to leave. Students who forgot a mask may obtain one at the Campus Center Help Desk and the Academic Support Center in LI36. See the university's basic safety protocols.

RESPONSIBLE COMPUTING

Students are required to read the University at Albany Policy for the Responsible Use of Information Technology (https://www.albany.edu/its/its_policies.htm). Students will be expected to apply the policies discussed in this document to all computing and electronic communications in the course.

STUDENTS WITH DISABILITIES

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 the Disability Resource Center (Campus Center 130, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations. For further information refer to the University's Disclosure Statement regarding Reasonable Accommodation found at the bottom of the document at the following website: http://www.albany.edu/disability/docs/RAP.doc. This website can be reached by following the link under "Reasonable Accommodation Policy" at the following webpage http://www.albany.edu/disability/faculty-staff.shtml.

ACADEMIC HONESTY AND OVERALL REGULATIONS

Every student has the responsibility to become familiar with the standards of academic integrity at the University. Faculty members must specify in their syllabi information about academic integrity, and may refer students to this policy for more information. Nonetheless, 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, and UAlbany faculty are responsible for teaching, modeling and upholding them. Anything less undermines the worth and value of our intellectual work, and the reputation and credibility of the University at Albany degree. Plagiarism and other acts of academic dishonesty will be punished. Read the Standards of Academic Integrity and policies in the University Bulletin (https://www.albany.edu/undergraduate_bulletin/regulations.html).

CAUTION AND A STRONG WORD OF WARNING!!!! Plagiarism and other acts of academic dishonesty will be punished. Students are expected to submit original work. While you may discuss a problem with another student, the work you submit must be your own. Any

student who submits copied work or any student that provides work for copying will earn a zero grade for that assignment. If there is more than one copying incident, the student will be graded an E for the class. As per college policy, cheating activity, including cheating in exams, quizzes, projects, etc., WILL be written up in a Violation of Academic Integrity Report (VAIR) reported to the college administration, which includes the Computer Science Chair, the College of Engineering and Applied Sciences Dean, and the Vice Provost of Undergraduate Studies. This will become a part of your permanent record. Multiple incidents will result in being expelled from the college.

TENTATIVE LIST OF TOPICS TO BE COVERED

1. Sources of numerical error. Absolute and relative error.
2. Asymptotic notation. Rates of convergence of numerical methods.
3. Floating point arithmetic.
4. Taylor series
5. Basics of Matlab
6. Solutions of a single nonlinear equation in one unknown via bisection search, Newton's method, fixed point methods, etc.
7. Conditioning of numerical problems and stability of algorithms.
8. Direct methods for solving systems of linear equations
9. Polynomial interpolation
10. Numerical differentiation and integration
11. Numerical solutions of ordinary differential equations

There is not a specific list of topics in this course; however, the following schedule is adopted. Note, however, that the assessment dates and weights are tentative and subject to change.

Date	Course Topics and Deliverables	Assessment	Grading Weightage
8/24	Introduction to the course, sources of numerical error		
8/26	Asymptotic notation, Taylor's theorem		
8/31	Introduction to Matlab	Homework #1 (due 9/14)	7%
9/2	Floating point arithmetic		
9/7	Solving a single nonlinear equation in one unknown; bisection search		
9/9	Newton's method and variants		
9/14	Fixed-point iteration, conditioning and stability	Homework #2 (due 9/28)	7%
9/16	Introducing linear algebra		
9/21	Gaussian elimination with partial pivoting		
9/23	Conditioning of linear systems		
9/28	Least squares problems and linear regression	Homework #3 (due 10/7)	7%
9/30	Eigenvalue problems; power method; Midterm exam review		
10/5	Interpolation by polynomials; Lagrange interpolation		
10/7	Newton's form of the interpolating polynomial	Homework #4 (due 10/21)	7%
10/12	Chebyshev points; piecewise polynomial interpolation		
10/14	Splines		

10/19	Numerical differentiation		
10/21	Richardson extrapolation	Homework #5 (due 11/4)	7%
10/26	Numerical integration		
10/28	Numerical integration (continued)		
11/2	Numerical solutions of initial value problems for ordinary differential equations; Euler's method		
11/4	ODE methods based on quadrature formulas		
11/16	Two-point boundary value problems		
11/18	Partial differential equations		
11/23	Final exam review		
	In-class quizzes		**5%**
	Midterm (date TBD)		**30%**
	Final exam (date TBD)		**30%**
	TOTAL		**100%**

ICSI 410 (3 crs.)
Database Systems
(Fall 2022)
Class Meeting Time: MW 1:10-2:30
Location: LC 22

INSTRUCTOR

Instructor's name	Shaghayegh (Sherry) Sahebi
Instructor's title	Assistant Professor
Office location	UAB 425
Office hours	Mondays 4 – 5:30 pm on zoom
E-mail address	ssahebi@albany.edu (email subject: "F22CSI410 - …")

TEACHING ASSISTANTS / PEER EDUCATORS (AND LAB/DISCUSSION SCHEDULE, if any)

TA's / Peer educators	Evangeli Silva
TA's office location	Humanities 25
TA's office hours	Thursday 4:30 – 5:30 pm
TA's email addresses	esilva2@albany.edu (email subject: "F22CSI410 - …")

Office hours link:

https://albany.zoom.us/j/91082245741?pwd=d3lzTGkyVC8yU2dqT3pRbmViNEwwZz09

PREFERRED TEXTBOOK

Text/Reference Book(s): Elmasri, R., & Navathe, S. (2016). Fundamentals of database systems. Pearson. (7th edition)

COURSE DESCRIPTION / OVERVIEW

This course covers the fundamentals and concepts of design, implementation, and use of databases. Topics include data modelling, principles of correct database design, the SQL language for querying relational databases, and developing a small-scale database application using MySQL.

Prerequisite(s): Grade of C or higher in both I CSI/I ECE 210 and I CSI/I ECE 213.

LEARNING OBJECTIVES / OUTCOMES

At completion of this course, students will be able to:

- Explain database systems and data management concepts
- Analyze, extract and structure information system requirements from a variety of organizational contexts.
- Give examples of the issues that are specific to the efficient implementation of database systems.
- Explain basic concepts of data models and the operations of each data model.

- Use Entity Relationship Diagrams to create conceptual data models.
- Reason with the foundations of the relational data model to correctly undertake relational database design.
- Express queries using the SQL language to provide correct and secure retrieval of data from relational databases.
- Construct a small-scale information system in a relational database management system.

COURSE WEBSITE AND BLACKBOARD

Blackboard will be used to provide essential course materials, the most current syllabus, and assignment documents. Additionally, RiPPLE will be used as a part of in-class and out of class instruction and assessment. However, this is not an online course and class attendance and participation is essential and required.

ASSESSMENT AND POLICIES

Exams: The class includes two in-class exams and one final exam, based on material covered in class and HW assignments. If you have any questions regarding exam grading, you should contact the instructor or TA within one week after grades are returned.

- Exam 1: 10/3/22, in class
- Exam 2: 11/9/22, in class
- Final: 12/12/2019, 1:00pm – 3:00pm

Homework: This class has three major homework assignments and four rounds of RiPPLE assessments, all based on material covered in class. Homework assignment requirements will be fully described on Blackboard. You MUST COMPLETE THE earlier assignments in order to complete the later assignments. If your earlier assignment has deficiencies, you must correct them, or they may impact your later assignments.

- Questions about assignment grading must be resolved with the TA or the instructor within one week after it is returned.
- Assignments are due at midnight (11:59 pm) on the day indicated. If you hand in your homework later than 11:59 pm, it will count as one day late (subject to the late days described next).
- You will receive 20% off per day on any assignment handed in late up to the 3 days. However, after 3 late days on any given homework you will receive no credit for the assignment.
- Late days apply to the entire assignments, so that handing in one problem late counts as a late day towards the whole assignment.
- The students who want to use their late day policy for an assignment should notify the instructor and the TA via email AND put a note in their assignment via blackboard.
- Remember that incomplete homework is better than turning in no homework.

RiPPLE assessments will be evaluated according to your studying and contribution to the online learning tool, RiPPLE. These assessments are also fully described on blackboard.

ATTENDANCE

Class attendance is required and checked by tutorial and RiPPLE in-class activities. However, it is understandable to miss classes due to unavoidable situations, such as illness. So, each student is allowed to miss up to three classes, given providing proper explanations. After three absences, each case of missing class will cause 20% less from your in-class activity grade.

If you miss a class, it is your responsibility to email the instructor and the TA with proper explanations and to find out the material covered in the class. Examples for which the students are allowed to excuse absences from class: 1) personal emergencies, including illness of the student or of a dependent of the student, or death in the family; 2) participation in university-sponsored activities; and 3) government-required activities, such as military assignments, jury duty, or court appearances.

Grading: Your final score would be computed as the max of two values computed using the following two assessment rubrics:

Assessment Task	Due date	weighting
At Home RiPPLE	Various due dates	10%
In-Class	Every class	5%
Quiz 1	Oct 3	15%
Assignment 0	Sep 28	10%
Assignment 1	Nov 2	10%
Quiz 2	Nov 9	15%
Assignment 2	Nov 28	10%
Final exam	Dec 12	25%

Assessment Task	Due date	weighting
At Home RiPPLE		0%
In-Class	Every class	5%
Quiz 1	Oct 3	15%
Assignment 0	Sep 28	10%
Assignment 1	Nov 2	10%
Quiz 2	Nov 9	15%
Assignment 2	Nov 28	10%
Final exam	Dec 12	35%

Total possible points = 100
Per department policy, "…students may not submit additional work or be re-examined for the purpose of improving their grades once the course has been completed and final grades assigned."

Your final grade is based on a curve. All contributions, e.g., attendance, HW, mid-terms, quizzes, 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.

ELECTRONICS POLICY

You are encouraged to bring your laptop to class for access to tutorials, RiPPLE website, reading assignments, and note taking. Please refrain from emailing, gaming, surfing, and activities unrelated to the class. No use of cellphones, except for accessing RiPPLE, is allowed in class.

RESPONSIBLE COMPUTING

Students are required to read the University at Albany Policy for the Responsible Use of Information Technology (https://wiki.albany.edu/display/public/askit/Responsible+Use+of+Information+Technology+Policy). Students will be expected to apply the policies discussed in this document to all computing and electronic communications in the course.

STUDENTS WITH DISABILITIES

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 the Disability Resource Center (Campus Center 130, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations. For further information refer to the University's Disclosure Statement regarding Reasonable Accommodation found at the bottom of the document at the following website: http://www.albany.edu/disability/docs/RAP.doc. This website can be reached by following the link under "Reasonable Accommodation Policy" at the following webpage http://www.albany.edu/disability/faculty-staff.shtml.

ACADEMIC HONESTY AND OVERALL REGULATIONS

Every student has the responsibility to become familiar with the standards of academic integrity at the University. Faculty members must specify in their syllabi information about academic integrity, and may refer students to this policy for more information. Nonetheless, 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, and UAlbany faculty are responsible for teaching, modeling and upholding them. Anything less undermines the worth and value of our intellectual work, and the reputation and credibility of the University at Albany degree. Plagiarism and other acts of academic dishonesty will be punished. Read the Standards of Academic Integrity and policies in the University Bulletin (https://www.albany.edu/undergraduate_bulletin/regulations.html).

CAUTION AND A STRONG WORD OF WARNING!!!! Plagiarism and other acts of academic dishonesty will be punished. Students are expected to submit original work. While you may discuss a problem with another student, the work you submit must be your own. Any student who submits (partially) copied work or any student that provides work for copying will earn a zero grade for that assignment. If there is more than one copying incident, the student will be graded an E for the class. As per college policy, plagiarism or cheating activity, including cheating in exams, quizzes, projects, etc., WILL be written up in a Violation of Academic Integrity Report (VAIR) reported to the college administration, which includes the Computer Science Chair, the College of Engineering and Applied Sciences Dean, and the Vice Provost of Undergraduate Studies. This will become a part of your permanent record. Multiple incidents will result in being expelled from the college.

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 https://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).

TENTATIVE SCHEDULE AND LIST OF TOPICS TO BE COVERED

The following schedule of lecture topics and reading assignments is preliminary and not linear in time (i.e. some of these topics would require multiple lectures) and may be changed as the semester progresses.

Date	Topic	Reading	Assignment	RiPPLE	Tutorial	Exam
8/22/22	Introduction + ER Model	Chapter 3 & 4				
8/24/22	ER Model	Chapter 3 & 4				
8/29/22	ER Model	Chapter 3 & 4				
8/31/22	ER Model	Chapter 3 & 4			ER Model Tutorial	
9/5/22	No Class					
9/7/22	Relational Model	Chapter 5				
9/12/22	Relational Model	Chapter 5				
9/14/22	ER-Relational Mapping	Chapter 9		Round 1	Relational Model Tutorial	
9/19/22	ER-Relational Mapping	Chapter 9				
9/24/22	ER-Relational Mapping	Chapter 9			ER-Relational Mapping Tutorial	
9/26/22	FDs and Normalization	Chapter 14 & 15				
9/28/22	FDs and Normalization	Chapter 14 & 15	Assignment 0			
10/3/22	Quiz 1					Quiz 1
10/5/22	FDs and Normalization	Chapter 14 & 15				
10/10/22	No Class					
10/12/22	FDs and Normalization	Chapter 14 & 15		Round 2		
10/17/22	SQL	Chapter 6 & 7			FDs and Normalization Tutorial	
10/19/22	SQL	Chapter 6 & 8				
10/24/22	SQL	Chapter 6 & 9				
10/26/22	SQL	Chapter 6 & 10				
10/31/22	SQL	Chapter 6 & 11			SQL Tutorial 1	
11/2/22	SQL	Chapter 6 & 12	Assignment 1			
11/7/22	SQL	Chapter 6 & 13		Round 3	SQL Tutorial 2	
11/9/22	Quiz 2					Quiz 2
11/14/22	Transaction Processing	Chapter 21				
11/16/22	Transaction Processing	Chapter 21			Transaction Processing Tutorial	
11/21/22	Data Mining	Chapter 28				
11/23/22	No Class					
11/28/22	Data Mining	Chapter 28	Assignment 2		Data Mining Tutorial	
11/30/22	NOSQL Databases					

12/5/22	NOSQL Databases			Round 4		
12/12/22	Final exam (1:00-3:00)	1:00-3:00				Final exam

Course (3 credits):

Time: Wed/Fri 4:30pm – 5:50pm

Room: Physics 123

Blackboard: The course uses the Blackboard Learning System. All materials and assignments will be handled there. Login at https://blackboard.albany.edu

Instructor:

Instructor: Ming-Ching Chang (mchang2@albany.edu)
Office: UAB 424A
Office Hours: Wed 2:15 - 4:15pm or by appointment

TA:

TA: Abhineet Pandey apandey@albany.edu
Office Hours: Wed afternoon
Email: **Please use Blackboard mailing system**, usually you can rely on a 24-hour turnaround on your questions, as the account will be checked daily.

Course Topics

- Data analysis (DA) foundations: data types, dimensionality and preprocessing
- Frequent patterns: item sets, sequences and graphs
- Clustering: representatives, hierarchical, density and spectral methods
- Classification: probabilistic, decision trees, SVM

Reading assignments will be posted on Blackboard and announced in class. Reading for the class will be from:

- BOOK: **DATA MINING AND ANALYSIS: Fundamental Concepts and Algorithms, M. J. Zaki and W. Meira Jr.** (PDFs available at the book's webpage: http://www.dataminingbook.info/pmwiki.php).

Goals: By the end of this course, you will:

- Be familiar with the fundamental data mining (DM) and DA problems
- Acquire working knowledge with data preparation and analysis
- Have working knowledge of main algorithmic solutions and their application to different data types

Grading and Evaluation

50% - Homework *(based on material covered in class)*
15% - Exam I
15% - Exam II - *(all exams will be based on material covered in class, and HW assignments)*
15% - Exam III
5% - Attendance and class participation
Extra Credit: up to 5% for Blackboard participation (Extra Credit Game)

Your final grade is based on a curve. All contributions, e.g., HW, attendance, homework, exams, 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.

Homework Assignments

There will be 5 homework assignments. Each assignment will involve some theoretical aspects as well as programming and data analysis assignments. The problems will aim to provide hands-on experience with the topics covered in the class. You can think of the homeworks as mini-projects.

Assignment submission: All students should submit their homework solutions in Blackboard. The submissions should involve two files:

1) Solution.pdf - Containing the homework solutions or project report, and
2) Code.zip - An archive of code for programing assignments and project code

The format for solutions is PDF. If you are using a word processor such as those in MS Word or Open Office, save the final solution as a PDF and submit **only the pdf**. Students can also scan their hand-written homework and submit them again as PDF, **although illegible writing and low-quality scans that prevent the understanding of the submission may result in lower than desired grades**. In Code.zip separate code for individual questions into a single nested archive.

Policies

Late Turn-ins: homework turned in before or on the specified due date and time through Blackboard are eligible for 100% of the grade. If you choose to turn in after the due date and time passes, for the first 24 hour period after the due date and time, your assignment will be eligible for 67% of the full grade; for the second 24 hour period after the due date and time, your assignment will be eligible for 33% of the full grade; for the third 24 hour period or later after the due date and time, your assignment will be eligible for 0% of the full grade. **No exceptions to these rules.**

Students with Disabilities: Students who feel that they have disabilities that require special arrangements for them to take the course must register with the Disability Resource Center (http://www.albany.edu/disability/index.shtml) Students are eligible for special services to which both the Center and the professor agree. In general, it is the student's responsibility to contact the professors at least one week before the relevant assignment to make arrangements.

Academic Integrity:
Homework exercises and programming assignments are meant to be individual exercises (unless otherwise stated); you must do these by yourself. Cheating in a homework exercise or programming assignment will result in a ZERO for that homework or program for all the students involved. Students who cheat in two or more homeworks/programming assignments will receive an E grade for the course. The names of such students will also be forwarded to the Dean's office for disciplinary action. The university's policies on academic integrity are listed here: http://www.albany.edu/undergraduate_bulletin/regulations.html. **You will be held to these policies VERY STRICTLY WITHOUT EXCEPTIONS.**

Prerequisites A MAT 220 and I CSI 213 and A MAT 370

Students are expected to have the following background:

- Familiarity with basic probability theory
- Familiarity with writing rigorous proofs
- Familiarity with linear algebra
- Familiarity with algorithmic analysis (213/503 respectively)

Note: We will refresh on Linear Algebra and Probability in the first few lectures (also covered in the DA foundations chapter of the book.)

Important:

- Log in the Blackboard system and access the class space

Course Calendar

CSI-431 Data Mining				
Fall 2022				
WeFr 4:30pm-5:50pm Physics 123				
Instructor: Ming-Ching Chang				
Office Hour Wed 2:15pm - 4:15pm or by appointment, TA Hour: TBD or by appointment				
Class dates: 8/22 - 12/5				
Text Book: **Zaki Data Mining and Analysis 2014**				
Weeks	Date	Topic	Readings	Notes
1	8/24	**0 - Course Intro (Syllabus)**	**0 - Course Intro.pptx**	
	8/26	**1 - Linear Algebra Refresher**	Ch.1 DM Analysis	
2	8/31	**1 - Probability Refresher**	Ch.1 DM Analysis	
	9/2	Python Refresher		Announce HW0
3	9/7	**2 - Numeric Attributes**	Ch.2 Num Attributes	
	9/9	**2 - Numeric Attributes II**	Ch.2 Num Attributes	
4	9/14	**3 - Dimensionality Reduction**	Ch.7 Dim Reduction	**HW0 due**
	9/16	**3 - Dimensionality Reduction - SVD**	Ch.7 Dim Reduction	Announce HW1
5	9/21	**4 - PCA, Kernel Methods, Kernel PCA**	Ch.5, Ch.7.3 Kernel PCA	
	9/23	**5 - Linear Discriminant Analysis**	Ch.20 LDA	
6	9/28	**6 - Decision Trees**	Ch.19 DT Classifier	**HW1 due**
	9/30	**Review for Exam 1**		Announce HW2
7	10/5	**Exam 1**		
	10/7	**Discuss Exam 1**		
8	10/12	**7 - Bayes**	Ch.18 Prob. Classifier	
	10/14	**8 - Support Vector Machines**	Ch.21 SVMs	
9	10/19	**8 - Support Vector Machines II**	Ch.21 SVMs	**HW2 due**
	10/21	**9 - Classifier Evaluation**	Ch.22 Classif. Assess	Announce HW3
10	10/26	**9b - Classifier Ensemble**	Ch.22 Classif. Assess	
	10/28	**10 - K-means**	Ch.13 Repre-b Clust.	
11	11/2	**11 - Hierarchical Clustering**	Ch.14 Hiera. Clust.	**HW3 due**
	11/4	**Review for Exam 2**		
12	11/9	**Exam 2**		
	11/11	**Discuss Exam 2**		
13	11/16	**12 - Density Clustering**	Ch.15 Density-b Clust.	
	11/18	**13 - Spectral Clustering**	Ch.4 Graph	Announce HW4
14	11/23	Thanksgiving		
	11/25	Thanksgiving		
15	11/30	**14 - Frequent Itemsets**	Ch.8 Itemset Mining	
	12/2	**Review for Exam 3, Class Summary**		**HW4 due**
16		**Exam 3 (Final Exam)**		

Course Description: A course on data mining (finding patterns in data) algorithms and their application to interesting data types and situations. We cover algorithms that address the five core data mining tasks: prediction, classification, estimation, clustering, and associations. Course projects will involve advanced topics such as algorithm developments for handling large data sets, sequential, spatial, and streaming data.

University at Albany
CSI-436 Machine Learning (3 credits)
Spring 2022 Syllabus

Meeting Time: Tuesday and Thursday 10:30 – 11:50am
Class Dates: Jan 24, 2022 – May 4, 2022
Credits: 3
Classroom: Lecture Center 3A
Note: Facial mask is required to enter the classroom!

Instructor	Ming-Ching Chang
Instructor Title	Assistant Professor
Office Location	UAB-424A
Office hours	Wed 1:00-2:30pm on Zoom or by appointment
E-mail Address	mchang2@albany.edu
TA's / Peer Educators	TBD Office hour: TBD or by appointment

Textbooks:
We do not use a textbook; all should be based on the lecture slides from the instructor. There are several standard textbooks for Machine Learning:

Pattern Recognition and Machine Learning
By Christopher Bishop, 3rd edition (2009)
http://aima.cs.berkeley.edu/

Machine Learning, A Probabilistic Perspective
By Kevin P. Murphy (2012)

Ian Goodfellow, Yoshua Bengio, Aaron Courville – Deep Learning (2016)
http://www.deeplearningbook.org/

Additional Textbooks:

Pattern Classification, 2rd edition (2000)
By Richard O. Duda and Peter E. Hart

Reinforcement Learning: An Introduction
https://www.amazon.com/Reinforcement-Learning-Introduction-Adaptive-Computation/dp/0262193981

COURSE DESCRIPTION / OVERVIEW

Machine learning is an important and rapid growing branch of artificial intelligence. The aim of machine learning is to design algorithms that can extract information from environment automatically and improve their ability to perform the intended task. This course starts with a high level overview of general problems in machine learning, followed by a review of mathematical backgrounds and numerical optimization methods that are essential for machine learning algorithms, after that several important topics in machine learning will be covered.

Attending the lectures, Q&A with the lecturer and the TA, successful completion of homework, exam, and course project implementation and presentation are the important requisite of this course.

Detailed topics include:

- Mathematical Backgrounds
  - Review of Linear Algebra (1) -- solving linear equation
  - Review of Multivariate Calculus
  - Review of Linear Algebra (2) -- eigenvalue problems
  - Gradient descent and Newton method
- Unit 1: Linear Least Squares -- solving linear equations
  - Regression and Linear Least Squares
  - Robust learning and Reweighted Linear Least Squares
  - Online learning and Recursive Linear Least Squares
  - Model selection for LLSE
  - Regularized LLSE
  - LLSE for Classification
  - LLSE for Ranking
  - Multi-modal LLSE and k-means clustering
- Unit 2: Eigenvalue-based Methods
  - Total LLSE
  - Principal Component Analysis (PCA)
  - Multi-dimensional Scaling and ISOMAP
  - Spectral Clustering
- Unit 3: Classification Methods
  - Fisher Linear Discriminant
  - Classification metrics
  - Logistic regression
  - Support Vector Machines (SVM)
    - Theory
    - Algorithm
    - Kernel SVM
- Unit 4: Neural Networks
  - Basic Neural Networks
  - Deep Learning
- Course Project
  - Python Programming
  - Machine Learning Applications
  - Project Presentations:
    - Mid-term Presentation
    - Final Presentation

PREREQUISITES

The prerequisite to this class is very important, and lack of knowledge of these subjects will make difficult to make positive progress in the class. Make sure you are confident with these courses and techniques.

- Linear Algebra (AMAT 220 or equivalent)
- Multivariate calculus (AMAT 214 or equivalent)

- Discrete probability (AMAT 367 or equivalent)
- Numerical methods (CSI 401 or equivalent)

Permission of the instructor (specifically on the sufficient background skills to work on the course project) is required for taking this course.

LEARNING OBJECTIVES / OUTCOMES:

At the completion of the course the student will:
- understand key concepts and algorithms in machine learning;
- develop a fundamental understanding of machine learning algorithms and tools;
- be able to apply such algorithms to practical applications.

The topics that will be covered in this course are provided at the end of the syllabus.

COURSE WEBSITE AND BLACKBOARD:

Blackboard will be used to provide essential course materials, the latest syllabus, and assignment documents. No separate course website will be maintained. Active class participation is essential. Attendance is required and will affect the students' final grading.

ASSESSMENT AND POLICIES:

The accomplishment of course objectives will be assessed by applying the concepts and tools for engineering design in a combination of team and individual assignments/labs/projects, tests, and a final project that includes research and design, a written component, and an oral presentation.

Homework Assignments: There will be 5 homework assignments, based on material covered in class, due as the course progress. Each homework will count 6% toward your final grading. Students should submit homework on time in order to get full credits.

Late Homework Turnins: Homework turned in before or on the specified due date and time, in class or submitted through Blackboard, depending on the circumstance, are eligible for 100% of the grade. If you choose to turn in after the due date and time passes, for the first 24 hour period after the due date and time, your assignment will be eligible for 50% of the full grade; after that, your assignment will be eligible for 0% of the full grade.

Exams: A mid-term and a final exam (both closed book) will be given. They will be based on material covered in class and on the HW assignments.

Course Projects: Projects will be assigned and graded based on a written proposal and two scheduled presentations. Project topic selection will be guided and approved by the instructor. Student will learn hands-on skills and presentation skills in the course project.

Grading
A final grade will be determined as a weighted average of these scores using the following measures:

Homework 30%
Mid-Term Exam 20%
Project Proposal 5%

Mid Project Presentation 10%
Final Project Presentation 10%
Final Exam 25%
Total possible points = 100

Grading Scale

A: 95-100 points
A-: 90-94 points
B+: 85-89 points
B: 80-84 points
B-: 75-79 points
C+: 70-74 points
C: 65-69 points
C-: 60-64 points
D: 55-59 points
E: < 54 points, FAILED

Students must complete all requirements in order to pass the course. A grade of incomplete will be given only when circumstances beyond the student's control cause a substantial amount of course work to be unfinished by the end of the semester. Whenever possible, the student is expected to make extra efforts to prevent this situation from occurring. The instructor will be the sole judge of whether an incomplete is warranted. Final grades are computed based on the above formulas and are NOT negotiable. Per department policy, "…students may not submit additional work or be re-examined for the purpose of improving their grades once the course has been completed and final grades assigned."

Attendance

Attendance and participation will be measured by student involvement and engagement as outlined in assignments and course activities.

Withdraw Without Penalty

Please pay attention to the drop date, which is the last date you can drop this course with no financial consequence. After that, you should consult the university's liability schedule (http://www.albany.edu/studentaccounts/liability.php) to consider dropping from this class. This may happen when you have to miss many assignments for unforeseeable scenarios. IMPORTANT: It is your responsibility to take such an action by this date, and don't wait until it's too late to see us when you get in trouble.

Incomplete and Extra Credit Policy

As per the Undergraduate Bulletin, the grade of Incomplete (I) will be given "only when the student has nearly completed the course requirements but because of circumstances beyond the student's control the work is not completed." A student granted an incomplete will make an agreement specifying what material must be made up, and a date for its completion. The incomplete will be converted to a normal grade on the agreed upon completion date based upon whatever material is submitted by that time. The instructor will be the sole judge of whether an incomplete is warranted. IMPORTANT: Incomplete will not be given to students who have not fulfilled their classwork obligations, and who, at the end of the

semester, are looking to avoid failing the course. There will be no extra credit work. All students will be expected to complete, and be graded on, the same set of assignments.

Non-class Related Use of Technology

Use of electronic devices (cell phone, tablets, personal laptop computers) for non-class purposes while the class is in session is not allowed. If this is violated in a consistent manner after initial warning is issued by the instructor, the student involved will be treated as unexcused missing the day's class

Responsible Computing

Students are required to read the University at Albany Policy for the Responsible Use of Information Technology (http://www.albany.edu/its/policies_responsible_use_of_IT.htm). Students will be expected to apply the policies discussed in this document to all computing and electronic communications in the course.

Students With Disabilities

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 the Disability Resource Center (Campus Center 137, 442-5490). That office will provide the course instructor with verification of your disability, and will recommend appropriate accommodations. For further information refer to the University's Disclosure Statement regarding Reasonable Accommodation found at the bottom of the document at the following website: http://www.albany.edu/disability/docs/RAP.doc. This website can be reached by following the link under "Reasonable Accommodation Policy" at the following webpage http://www.albany.edu/disability/faculty-staff.shtml.

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Engineering and Applied Sciences Dean, and the Vice Provost of Undergraduate Studies. This will become a part of your permanent record. Multiple incidents will result in being expelled from the college.

Title IX

The University at Albany recognizes that an in order to maintain a healthy, safe, and vibrant living and learning community, it must continue to foster an environment free from gender inequality and sexual violence. In furthering its commitment to that cause, the University has appointed a full time administrator to ensure our realization of this important agenda. Further information can be found at the following U Albany url: http://www.albany.edu/titleIX/indexmain.php

Timely Assessment

Patterns of testing, assignments, and examinations vary widely across departments and courses. It is important, however, that students in all courses be provided with assessment of their progress in a timely way. Students will receive some formal assessment of their progress well before the last date to withdraw from a course.

Student Code of Conduct

Student and staff/faculty interactions in the class room and other on-campus environments are expected to be professional and cordial. Disruptive behavior in the class room may be treated by the instructor as a violation of the U Albany Student Code of Conduct, and subject to a formal Student Conduct Referral.

COURSE OUTLINE AND READINGS:

The following schedule of lecture topics and reading assignments is preliminary and may be changed as the semester progresses. The final schedule and specific assignments will be provided in Blackboard. Students are expected to have read the listed material before it is covered in class.

Course Calendar

CSI-436 Machine Learning

Spring 2022

TuTh 10:30AM to 11:50AM LC 3A

Instructor: Professor Ming-Ching Chang

Office Hour MW 1pm - 2:30pm or by appointment, TA Hour: TBD

Class dates: 1/24 - 5/4

Weeks	Date	Topic	Course Units	Notes
1	1/25	**Course Intro**		
	1/27	**Review of Linear Algebra**	Math Background	Announce HW1
2	2/1	**Review of Multivariate Calculus**		
	2/3	**Review of Eigenvalue Problems**		Project Selection
3	2/8	**Gradient Descent and Newton Method**		
	2/10	**Python Programming**		**HW1 due (6%)**
4	2/15	**Regression, Linear Least Squares**	Unit 1: Linear Least Squares	Announce HW2
	2/17	**Robust Learning, Reweighted LLS**		
5	2/22	**Online Learning, Recursive LLS**		**Project Proposal Due (5%)**
	2/24	**Model Selection for LLSE**		
6	3/1	**Regularized LLSE**		**HW2 due (6%)**
	3/3	**LLSE for Classification**		
7	3/8	**Multi-Model LLSE, K-Means Clustering**		
	3/10	**Mid Project Presentation**		**Mid Present Slides (10%)**
8	3/15	Spring Break		
	3/17	Spring Break		
9	3/22	**Mid-Term Exam**		**Mid-Term Exam (20%)**
	3/24	**Total LLSE**	Unit2: Eigenvalue-based Methods	
10	3/29	**PCA**		Announce HW3
	3/31	**Multi-Dim Scaling, ISOMAP**		
11	4/5	**Spectral Clustering**		
	4/7	**Fisher LDA**	Unit 3: Classsification Methods	Announce HW4
12	4/12	**Evaluation Metric, AUC**		**HW3 due (6%)**
	4/14	**Logistic Regression**		
13	4/19	**SVM Theory**		Announce HW5
	4/21	**SVM Algorithms**		**HW4 due (6%)**
14	4/26	**Kernel SVM**		
	4/28	**Intro to Deep Learning**	Unit 4: Deep NN	
15	5/3	**Neural Network**		**HW5 due (6%)**
	5/1	**Loss, Backpropagation, CNN**		
16	5/4	**Final Project Presentation**		**Final Present Slides (10%)**
	5/5	**Reading Day**		
Final	5/6	**Final Exam**		**Final Exam (25%)**

Syllabus

ACHM 115 General Chemistry 1 and Lab (4 credits)

INSTRUCTOR INFO: Halimah Sayahi
OFFICE HOURS: TBA

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. Course fee applies. Consult the Schedule of Classes.

GENERAL INFORMATION FOR STUDENTS

This sheet contains information about the organization of CHM 115. It should be carefully read and retained, together with the course schedule, for future reference by each student taking the course. IF YOU ATTEND THE FIRST EXAMINATION, IT WILL BE ASSUMED THAT YOU HAVE READ THE FOLLOWING COURSE GUIDELINES AND AS A CONSEQUENCE, YOU WILL BE HELD TO THEM.

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%

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, Gases
13	Gases

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

ACHM 116 General Chemistry II and Lab (4 credits)

INSTRUCTOR INFO: Halimah Sayahi
Office Hours: TBA

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.

GENERAL INFORMATION FOR STUDENTS

This sheet contains information about the organization of CHM 116. It should be carefully read and retained, together with the course schedule, for future reference by each student taking the course. IF YOU ATTEND THE FIRST EXAMINATION, IT WILL BE ASSUMED THAT YOU HAVE READ THE FOLLOWING COURSE GUIDELINES AND AS A CONSEQUENCE, YOU WILL BE HELD TO THEM.

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**.

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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

Lab

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- 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