Welcome to the BYU-Idaho Physics Department

Student Handbook

ROM 118
208.496.7730
www.byui.edu/physics

Welcome to the Physics Department

Welcome to BYU-Idaho's Physics Department. We are excited to get to know you and help you discover the world of Physics. Within our department we strive to develop reasoning, mathematical, and communication skills within a rigorous academic program while maintaining a student-oriented environment to prepare students for their chosen profession. Every class is specifically designed to develop those skills while teaching students the principles of physics.

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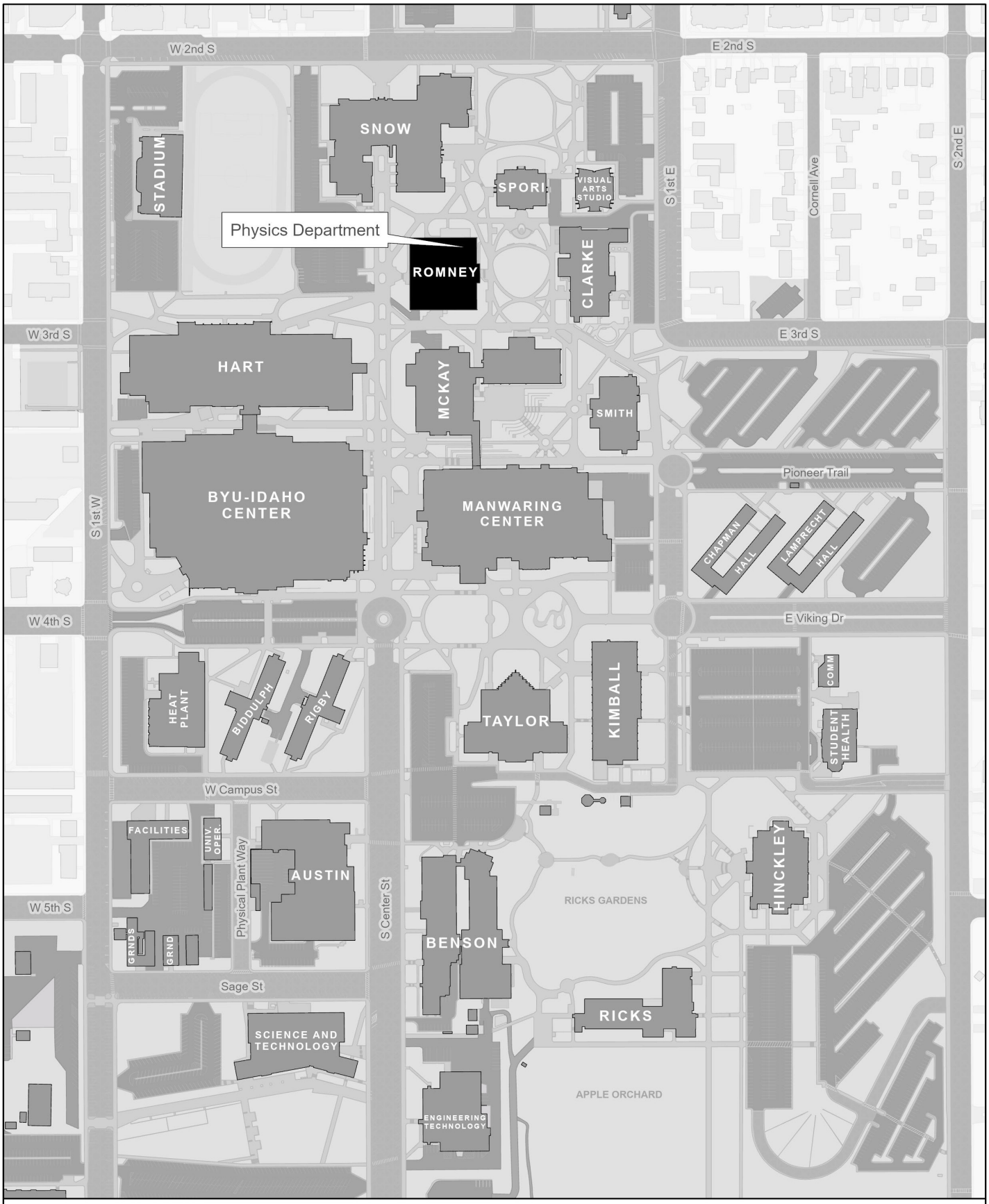
BYU-Idaho Campus Map



What Every Freshman Physics Major Should Know

In speaking with our graduating seniors, we have found a reoccurring theme. Many wished they would have known certain things as freshman instead of as seniors. Below are just a few of the main tips we hope all of our students know, but especially our new freshman.

1- **Ask Questions**: If ever you feel lost or don't know what to do come ask us. The Physics Department is located in ROM 118. Sister Nelson is happy to field your questions, answer what she can, or get you in contact with someone who knows. It's really true, you'll never know unless you ask.

2- **Get to know the Faculty:** Your physics instructors are great resources. Did you know that a physics faculty member should be assigned to you as a faculty mentor? Find out who they are (or come see Sis. Nelson and she can help you) and go introduce yourself. Ask them about a career in physics, or how to set up your grad plan. Make sure they know who you are and that you're a physics major. Too often we don't get to know you until the upper division courses so speak up and make yourself known early.

3- **Get involved**: There are a lot of things going on all the time in our department:

- We have a department I-Learn course in Canvas where all of our upcoming activities and resources are posted. You should be automatically enrolled by virtue of being a physics major. If you're not seeing it, come see Sis. Nelson in ROM 118 to get added.

- Join the Society of Physics Students right away. Get on their email list, Facebook group, and I-Learn site so you can stay up to date on upcoming activities.

- Start asking about and getting involved in some of the research projects we have going on (look on pg 28).

- Be a Grader, TA, or Tutor. Nothing will help you remember and retain the skills you've learned more than having the chance to review them often. And getting paid to do it doesn't hurt either.

- Attend the monthly Colloquium. In the Fall and Winter semesters we host a colloquium each month at 11:30 am in ROM 172. This is a great opportunity to learn about cutting edge research, possible internship and graduate school opportunities, and do a little networking.

- Actively look for and participate in the STEM and Career Fairs sponsored by the College. These are great places to get connected with grad schools, potential employers, and just learn what's available. Seats fill up fast so be proactive.

4- **Educate yourself and plan ahead**: Don't wait until it's too late to find out you can't register because of a hold or prerequisite, or didn't know how to sequence your classes. Visit our college's advising center and speak with Sister Whiting, Bro Crawford, or Sis Shirley. Find out about track adjustments and when to apply for them. Use our Recipe for Success card to help remind you to always be planning ahead, looking forward, and being prepared for what is next.

Recipe for Success

1- Counsel with your Faculty Mentor regularly

2- Maintain a **high GPA** (higher than 3.5)

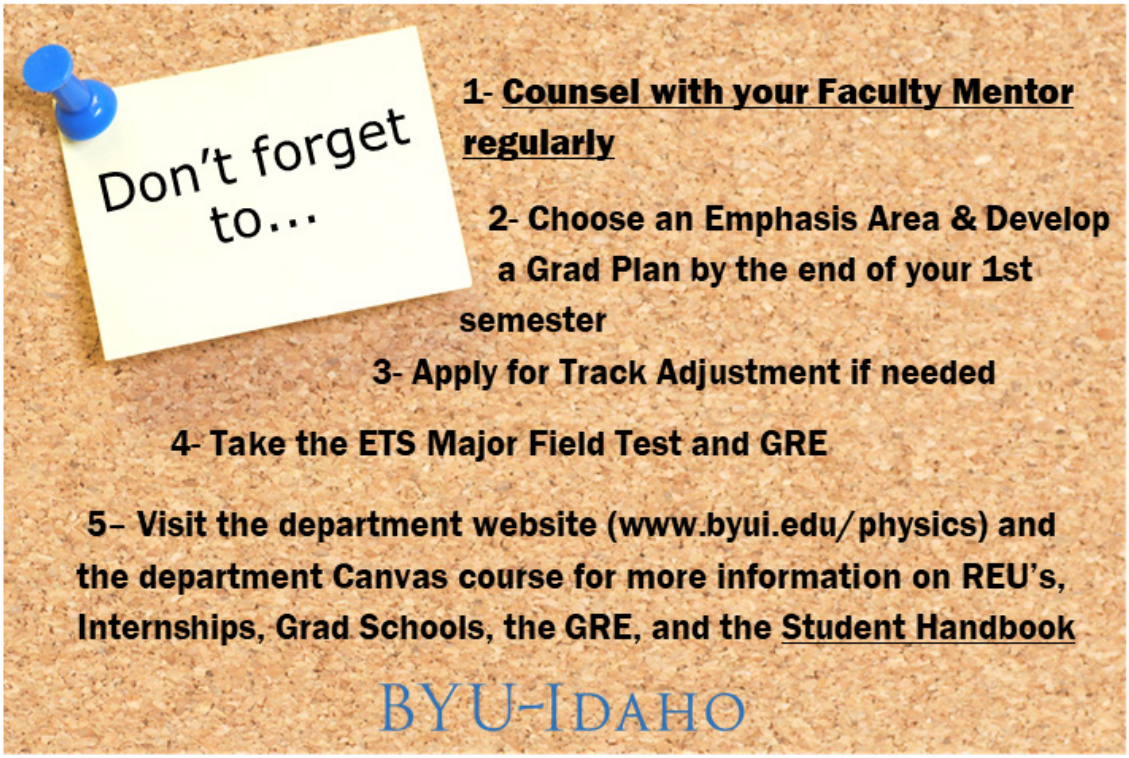
3– Get involved in **SPS** (Society of Physics Students)

4- Get involved in **Research** early

5- Develop relationships with Physics Professionals by attending Colloquia and conferences. (**Network**)

6- Apply for several (12 or more) **internships** as early as the end of your 2nd Physics year

7– Obtain a high **GRE** score



Physics Emphasis and Degree Information

In the Physics Department there are several different emphases that you can select to accompany your physics major. These emphasis areas include astronomy, biophysics, chemistry, computational, engineering, geophysics, mathematical, medical, and pre-med.

The following pages show you the courses required with each emphasis and a recommended graduation plan. It is essential to follow the sequencing shown in this grad plan. In order to graduate in a timely manner, you need to start your own grad plan in accordance with your chosen emphasis as a freshman. Talk with your faculty mentor to ensure you have courses sequenced properly and to help you avoid getting caught in a pickle. Also, as you explore the emphasis areas, be sure to talk with your mentor about possible substitutions and ways to customize an emphasis area to better suit your career goals.

The following faculty members have been assigned to oversee the emphasis areas. **These may or may not be your personal faculty mentor**, but they can help you understand what's going on in that area and what jobs etc. are available:

Emphasis Areas and the Corresponding Faculty:

Emphasis:	Faculty:	Office:	Phone:
Astronomy	Stephen McNeil	ROM 259	208.496.7741
Biophysics	Jon Johnson	ROM 112	208.496.7759
Chemistry	Stephen Turcotte	ROM 175	208.496.7746
Computational	Lance Nelson	ROM 296	208.496.7736
Engineering	Todd Lines	ROM 180	208.496.7740
Geophysics	Ryan Nielson	ROM 186	208.496.7742
Mathematical	Richard Hatt	ROM 110	208.496.7738
Medical	Kevin Kelley	ROM 184	208.496.7739
Pre-Medical	Richard Datwyler	ROM 298	208.496.7747
Physics Education	Brian Pyper	ROM 116	208.496.7744

Astronomy Emphasis (770-154)

770 Physics Major Core Requirements = 52 credits

All physics majors must take the following core classes as well as select one of the nine emphasis areas to complete the degree requirements.

Course	Credits		Course	Credits		Course	Credits
CSE 110 or PH 135	2		PH 220	3		PH 336	2
MATH 112X	4		PH 228	1		PH 385	3
MATH 215	4		PH 250	1		PH 412	3
MATH 316	4		PH 279	3		PH 433	3
PH 121	3		PH 295	3		PH 398R or PH 406	1
PH 123	3		PH 332	3		PH 488	1
PH 150	1		PH 333	4			

Program Notes:

- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- All majors are required to take the ETS Major Field Test with a minimum score in the 20% percentile or higher in order to graduate.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- PH 121 and MATH 112x double count and fulfills the GE requirement for given area.
- Substitutions may be needed if you are on a previous catalog year. See your faculty mentor for more information.

Astronomy Emphasis Area Requirements = 14 credits

Course	Credits		Course	Credits
Choose one:			Take the following:	
PH 314	3		PH 127	3
PH 323	3		PH 277	2
PH 324	3		PH 374	3
PH 375	3		MATH 472	3
PH 473	3			

Graduation Plan for Astronomy (770-154)

Semester 1		Semester 2		Semester 3		Semester 4		Semester 5	
PH 121	3	MATH 215	4	MATH 316	4	PH 279	3	PH 332	3
PH 150	1	PH 123	3	PH 220	3	PH 295	3	PH 333	4
PH 127	3	CSE 110	2	PH 228	1	GE Breadth	3	GE Breadth	3
MATH 112X	4	ENG 150	3	PH 250	1	REL 250C	2	REL 275C	2
GE 101	1	REL 225C	2	PH 277	2	Elective Credit	4	Elective Credit	3
REL 200C	2			Elective Credit	4				
	14		14		15		15		15

Semester 6		Off-Track		Semester 7		Semester 8		Program Notes
PH 336	2	**Choose		PH 412	3	PH 488	1	*PH 374 is required
PH 385	3	One:	1	PH 433	3	*PH Elective	3	for this emphasis.
*PH 374	3	PH 398R or		Elective Credit	3	MATH 472	3	A different PH
ENG 301	3	PH 406		GE Breadth	3	GE Breadth	3	Elective is required
REL Elective	2			REL Elective	2	REL Elective	2	for the core
Elective Credit	3					Elective Credit	3	requirement.
	16		1		14		15	

Biophysics Emphasis (770-155)

770 Physics Major Core Requirements = 52 credits

All physics majors must take the following core classes as well as select one of the nine emphasis areas to complete the degree requirements.

Course	Credits		Course	Credits		Course	Credits
CSE 110 or PH 135	2		PH 220	3		PH 336	2
MATH 112X	4		PH 228	1		PH 385	3
MATH 215	4		PH 250	1		PH 412	3
MATH 316	4		PH 279	3		PH 433	3
PH 121	3		PH 295	3		PH 398R or PH 406	1
PH 123	3		PH 332	3		PH 488	1
PH 150	1		PH 333	4			

Program Notes:

- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- All majors are required to take the ETS Major Field Test with a minimum score in the 20% percentile or higher in order to graduate.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- PH 121 and MATH 112x double count and fulfills the GE requirement for given area.
- Substitutions may be needed if you are on a previous catalog year. See your faculty mentor for more information.

Biophysics Emphasis Area Requirements = 15 credits

Course	Credits		Course	Credits
Choose one:			Take 12 credits:	
PH 314	3		BIO 180	3
PH 323	3		BIO 180L	1
PH 324	3		BIO 181	3
PH 374	3		BIO 181L	1
PH 375	3		BIO 375	3
PH 473	3		BIO 376	3

Graduation Plan for Biophysics (770-155)

Semester 1		Semester 2		Semester 3		Semester 4		Semester 5	
CSE 110	2	MATH 215	4	Math 316	4	PH 279	3	PH 332	3
PH 121	3	PH 123	3	PH 220	3	PH 295	3	PH 333	4
PH 150	1	BIO 180	3	PH 228	1	BIO 181	3	GE Breadth	3
MATH 112X	4	ENG 150	3	PH 250	1	REL 250C	2	REL 275C	2
GE 101	1	REL 200C	2	REL 225C	2	Elective Credit	4	Elective Credit	3
GE Breadth	3			Elective Credit	4				
	14		15		15		15		15

Semester 6		Off-Track		Semester 7		Semester 8		Program Notes
PH 336	2	**Choose		PH 412	3	PH 488	1	
PH 385	3	One:	1	PH 433	3	PH Elective	3	
GE Breadth	3	PH 398R or		BIO 375	3	BIO 376	3	
ENG 301	3	PH 406		REL Elective	2	GE Breadth	3	
REL Elective	2			Elective Credit	3	REL Elective	2	
Elective Credit	3					Elective Credit	3	
	16		1		14		15	

Chemistry Emphasis (770-156)

770 Physics Major Core Requirements = 52 credits

All physics majors must take the following core classes as well as select one of the nine emphasis areas to complete the degree requirements.

Course	Credits		Course	Credits		Course	Credits
CSE 110 or PH 135	2		PH 220	3		PH 336	2
MATH 112X	4		PH 228	1		PH 385	3
MATH 215	4		PH 250	1		PH 412	3
MATH 316	4		PH 279	3		PH 433	3
PH 121	3		PH 295	3		PH 398R or PH 406	1
PH 123	3		PH 332	3		PH 488	1
PH 150	1		PH 333	4			

Program Notes:

- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- All majors are required to take the ETS Major Field Test with a minimum score in the 20% percentile or higher in order to graduate.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- PH 121 and MATH 112x double count and fulfills the GE requirement for given area.
- Substitutions may be needed if you are on a previous catalog year. See your faculty mentor for more information.

Chemistry Emphasis Area Requirements = 15 credits

Course	Credits		Course	Credits
Choose one:			Take the following:	
PH 314	3		CHEM 105	3
PH 323	3		CHEM 105L	1
PH 324	3		CHEM 106	3
PH 374	3		CHEM 106L	1
PH 375	3		CHEM 351	3
PH 473	3		CHEM 351L	1

Graduation Plan for Chemistry (770-156)

Semester 1		Semester 2		Semester 3		Semester 4		Semester 5	
CSE 110	2	MATH 215	4	Math 316	4	PH 279	3	PH 332	3
PH 121	3	PH 123	3	PH 220	3	PH 295	3	PH 333	4
PH 150	1	CHEM 105	3	PH 228	1	CHEM 106	3	GE Breadth	3
MATH 112X	4	CHEM 105L	1	PH 250	1	CHEM 106L	1	REL 275C	2
GE 101	1	ENG 150	3	REL 225C	2	REL 250C	2	Elective Credit	3
GE Breadth	3	REL 200C	2	Elective Credit	4	Elective Credit	3		
	14		16		15		15		15

Semester 6		Off-Track		Semester 7		Semester 8		Program Notes
PH 336	2	**Choose		PH 412	3	PH 488	1	
PH 385	3	One:	1	PH 433	3	PH Elective	3	
GE Breadth	3	PH 398R or		GE Breadth	3	CHEM 351	3	
ENG 301	3	PH 406		REL Elective	2	CHEM 351L	1	
REL Elective	2			Elective Credit	4	REL Elective	2	
Elective Credit	2					Elective Credit	4	
	15		1		15		14	

Computational Emphasis (770-157)

770 Physics Major Core Requirements = 52 credits

All physics majors must take the following core classes as well as select one of the nine emphasis areas to complete the degree requirements.

Course	Credits		Course	Credits		Course	Credits
CSE 110 or PH 135	2		PH 220	3		PH 336	2
MATH 112X	4		PH 228	1		PH 385	3
MATH 215	4		PH 250	1		PH 412	3
MATH 316	4		PH 279	3		PH 433	3
PH 121	3		PH 295	3		PH 398R or PH 406	1
PH 123	3		PH 332	3		PH 488	1
PH 150	1		PH 333	4			

Program Notes:

- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- All majors are required to take the ETS Major Field Test with a minimum score in the 20% percentile or higher in order to graduate.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- PH 121 and MATH 112x double count and fulfills the GE requirement for given area.
- Substitutions may be needed if you are on a previous catalog year. See your faculty mentor for more information.

Computational Emphasis Area Requirements = 15 credits

Course	Credits		Course	Credits	Course	Credits
Choose one:			Take these courses:		CSE 280	2
PH 314	3		CSE 111	2	MATH 411	3
PH 323	3		CSE 210	2	MATH 412	3
PH 324	3					
PH 374	3		Choose one of the following options:		*Data Science- take 8 credits*	
PH 375	3		*Numerical Modeling- take 8 credits*		CSE 212	2
PH 473	3		CIT 112	2	DS 250	2
			CSE 212	2	DS 350	3
			CSE 220C	1	CSE 450	3
			CSE 251	3	DS 460	3

Graduation Plan for Computational (770-157)

Semester 1		Semester 2		Semester 3		Semester 4		Semester 5	
CSE 110	2	MATH 215	4	Math 316	4	PH 279	3	PH 332	3
PH 121	3	PH 123	3	PH 220	3	PH 295	3	PH 333	4
PH 150	1	Comp Emph	3	PH 228	1	Comp Emph	3	GE Breadth	3
MATH 112X	4	ENG 150	3	PH 250	1	REL 250C	2	REL 275C	2
GE 101	1	REL 200C	2	REL 225C	2	Elective Credit	4	Elective Credit	3
GE Breadth	3			Elective Credit	4				
	14		15		15		15		15

Semester 6		Off-Track		Semester 7		Semester 8		Program Notes
PH 336	2	**Choose		PH 412	3	PH 488	1	
PH 385	3	One:	1	PH 433	3	PH Elective	3	
GE Breadth	3	PH 398R or		Comp Emph	3	Comp Emph	3	
ENG 301	3	PH 406		REL Elective	2	GE Breadth	3	
REL Elective	2			Elective Credit	3	REL Elective	2	
Elective Credit	3					Elective Credit	3	
	16		1		14		15	

Engineering Emphasis (770-158)

770 Physics Major Core Requirements = 52 credits

All physics majors must take the following core classes as well as select one of the nine emphasis areas to complete the degree requirements.

Course	Credits		Course	Credits		Course	Credits
CSE 110 or PH 135	2		PH 220	3		PH 336	2
MATH 112X	4		PH 228	1		PH 385	3
MATH 215	4		PH 250	1		PH 412	3
MATH 316	4		PH 279	3		PH 433	3
PH 121	3		PH 295	3		PH 398R or PH 406	1
PH 123	3		PH 332	3		PH 488	1
PH 150	1		PH 333	4			

Program Notes:

- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- All majors are required to take the ETS Major Field Test with a minimum score in the 20% percentile or higher in order to graduate.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- PH 121 and MATH 112x double count and fulfills the GE requirement for given area.
- Substitutions may be needed if you are on a previous catalog year. See your faculty mentor for more information.

Engineering Emphasis Area Requirements = 15 credits

Course	Credits		Course	Credits	Course	Credits
Choose one:			Choose one of the following options:		*Materials Science - Take these courses*	
PH 314	3		*Electrical Engineering-Take 12 credits*		CHEM 105	3
PH 323	3		ECEN 101	1	ME 201	3
PH 324	3		ECEN 150	3	ME 202	3
PH 374	3		ECEN 160	3	ME 250	3
PH 375	3		ECEN 160L	1	*Thermal Science - Take these courses*	
PH 473	3		ECEN 250	4	ME 322	3
			ECEN 350	3	ME 360	3
					ME 422	3
					ME 423	3

Graduation Plan for Engineering (770-158)

Semester 1		Semester 2		Semester 3		Semester 4		Semester 5	
CSE 110	2	MATH 215	4	Math 316	4	PH 279	3	PH 332	3
PH 121	3	PH 123	3	PH 220	3	PH 295	3	PH 333	4
PH 150	1	Eng Emphasis	3	PH 228	1	Eng Emphasis	3	GE Breadth	3
MATH 112X	4	ENG 150	3	PH 250	1	REL 250C	2	REL 275C	2
GE 101	1	REL 200C	2	REL 225C	2	Elective Credit	4	Elective Credit	3
GE Breadth	3			Elective Credit	4				
	14		15		15		15		15

Semester 6		Off-Track		Semester 7		Semester 8		Program Notes
PH 336	2	**Choose		PH 412	3	PH 488	1	
PH 385	3	One:	1	PH 433	3	PH Elective	3	
GE Breadth	3	PH 398R or		Eng Emphasis	3	Eng Emphasis	3	
ENG 301	3	PH 406		REL Elective	2	GE Breadth	3	
REL Elective	2			Elective Credit	3	REL Elective	2	
Elective Credit	3					Elective Credit	3	
	16		1		14		15	

Geophysics Emphasis (770-159)

770 Physics Major Core Requirements = 52 credits

All physics majors must take the following core classes as well as select one of the nine emphasis areas to complete the degree requirements.

Course	Credits		Course	Credits		Course	Credits
CSE 110 or PH 135	2		PH 220	3		PH 336	2
MATH 112X	4		PH 228	1		PH 385	3
MATH 215	4		PH 250	1		PH 412	3
MATH 316	4		PH 279	3		PH 433	3
PH 121	3		PH 295	3		PH 398R or PH 406	1
PH 123	3		PH 332	3		PH 488	1
PH 150	1		PH 333	4			

Program Notes:

- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- All majors are required to take the ETS Major Field Test with a minimum score in the 20% percentile or higher in order to graduate.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- PH 121 and MATH 112x double count and fulfills the GE requirement for given area.
- Substitutions may be needed if you are on a previous catalog year. See your faculty mentor for more information.

Geophysics Emphasis Area Requirements = 15 credits

Course	Credits		Course	Credits
Choose one:			Take 12 credits:	
PH 314	3		GEOL 111	3
PH 323	3		GEOL 111L	1
PH 324	3		GEOL 112	4
PH 374	3		GEOL 370	4
PH 375	3		GEOL 430	3
PH 473	3			

Graduation Plan for Geophysics (770-159)

Semester 1		Semester 2		Semester 3		Semester 4		Semester 5	
CSE 110	2	MATH 215	4	Math 316	4	PH 279	3	PH 332	3
PH 121	3	PH 123	3	PH 220	3	PH 295	3	PH 333	4
PH 150	1	GEOL 111	3	PH 228	1	GEOL Emphasis	4	GE Breadth	3
MATH 112X	4	GEOL 111L	1	PH 250	1	REL 250C	2	REL 275C	2
GE 101	1	ENG 150	3	REL 225C	2	Elective Credit	3	Elective Credit	3
GE Breadth	3	REL 200C	2	Elective Credit	4				
	14		16		15		15		15
Semester 6		**Off-Track**		**Semester 7**		**Semester 8**		**Program Notes**	
PH 336	2	**Choose		PH 412	3	PH 488	1	Be sure to speak with your faculty mentor about possible substitutions and other available options (i.e. remote sensing, GIS, optics, etc.	
PH 385	3	One:		PH 433	3	PH Elective	3		
GEOL Emphasis	4	PH 398R or	1	GE Breadth	3	GE Breadth	3		
ENG 301	3	PH 406		REL Elective	2	REL Elective	2		
REL Elective	2			Elective Credit	4	Elective Credit	6		
	14		1		15		15		

Mathematical Emphasis (770-165)

770 Physics Major Core Requirements = 52 credits

All physics majors must take the following core classes as well as select one of the nine emphasis areas to complete the degree requirements.

Course	Credits		Course	Credits		Course	Credits
CSE 110 or PH 135	2		PH 220	3		PH 336	2
MATH 112X	4		PH 228	1		PH 385	3
MATH 215	4		PH 250	1		PH 412	3
MATH 316	4		PH 279	3		PH 433	3
PH 121	3		PH 295	3		PH 398R or PH 406	1
PH 123	3		PH 332	3		PH 488	1
PH 150	1		PH 333	4			

Program Notes:

- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- All majors are required to take the ETS Major Field Test with a minimum score in the 20% percentile or higher in order to graduate.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- PH 121 and MATH 112x double count and fulfills the GE requirement for given area.
- Substitutions may be needed if you are on a previous catalog year. See your faculty mentor for more information.

Mathematical Emphasis Area Requirements = 15 credits

Course	Credits		Course	Credits	Course	Credits
Choose one:			Choose one option:		MATH 441	3
PH 314	3		*Statistical Mechanics/Thermodynamics*		Take one course:	
PH 323	3		Take one course:		MATH 443	3
PH 324	3		MATH 221 A, B, or C	3	MATH 463	3
PH 374	3		Take these courses		*Mathematics in Physics*	
PH 375	3		MATH 341	3	MATH 301	3
PH 473	3		MATH 423	3	MATH 461	3
			MATH 424	3	Take 2 courses:	
			Solid State/Quantum Field Theory		MATH 462	3
			MATH 301	3	MATH 463	3
			MATH 341	3	MATH 472	3

Graduation Plan for Mathematical (770-165)

Semester 1		Semester 2		Semester 3		Semester 4		Semester 5	
CSE 110	2	MATH 215	4	Math 316	4	PH 279	3	PH 332	3
PH 121	3	PH 123	3	PH 220	3	PH 295	3	PH 333	4
PH 150	1	ENG 150	3	PH 228	1	MATH	3	GE Breadth	3
MATH 112X	4	REL 200C	2	PH 250	1	Emphasis	2	REL 275C	2
GE 101	1	Elective	3	ENG 301	3	REL 250C	4	Elective Credit	4
GE Breadth	3	Credit		REL 225C	2	Elective Credit			
	14		15		14		15		16

Semester 6		Off-Track		Semester 7		Semester 8		Program Notes
PH 336	2	**Choose		PH 412	3	PH 488	1	Take care to plan out which math courses you choose for the emphasis area as many are only offered once a year or every other year.
PH 385	3	One:	1	PH 433	3	PH Elective	3	
MATH	3	PH 398R or		MATH Emphasis	3	MATH	3	
Emphasis	2	PH 406		GE Breadth	3	Emphasis	3	
REL Elective	5			REL Elective	2	GE Breadth	2	
Elective Credit						REL Elective	4	
	15		1		14	Elective Credit	16	

Medical Emphasis (770-166)

770 Physics Major Core Requirements = 52 credits

All physics majors must take the following core classes as well as select one of the nine emphasis areas to complete the degree requirements.

Course	Credits		Course	Credits		Course	Credits
CSE 110 or PH 135	2		PH 220	3		PH 336	2
MATH 112X	4		PH 228	1		PH 385	3
MATH 215	4		PH 250	1		PH 412	3
MATH 316	4		PH 279	3		PH 433	3
PH 121	3		PH 295	3		PH 398R or PH 406	1
PH 123	3		PH 332	3		PH 488	1
PH 150	1		PH 333	4			

Program Notes:

- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- All majors are required to take the ETS Major Field Test with a minimum score in the 20% percentile or higher in order to graduate.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- PH 121 and MATH 112x double count and fulfills the GE requirement for given area.
- Substitutions may be needed if you are on a previous catalog year. See your faculty mentor for more information.

Medical Emphasis Area Requirements = 15 credits

Course	Credits		Course	Credits
Choose one:			Take these courses:	
PH 314	3		PH 324	3
PH 323	3		PH 375	3
PH 374	3		CHEM 105	3
PH 473	3		Take 1 course:	
			BIO 230	4
			BIO 264	3
			BIO 265	3

Graduation Plan for Medical (770-166)

Semester 1		Semester 2		Semester 3		Semester 4		Semester 5	
CSE 110	2	MATH 215	4	Math 316	4	PH 279	3	PH 332	3
PH 121	3	PH 123	3	PH 220	3	PH 295	3	PH 333	4
PH 150	1	CHEM 105	3	PH 228	1	GE Breadth	3	GE Breadth	3
MATH 112X	4	ENG 150	3	PH 250	1	REL 250C	2	REL 275C	2
GE 101	1	REL 200C	2	REL 225C	2	Elective Credit	3	Elective Credit	3
GE Breadth	3			Elective Credit	4				
	14		15		15		14		15

Semester 6		Off-Track		Semester 7		Semester 8		Program Notes
PH 336	2	**Choose		PH 324	3	PH 375	3	PH 324 and PH 375 are required for the emphasis. A different PH Elective is required for the core requirements.
PH 385	3	One:	1	PH 412	3	PH 488	1	
PH Elective	3	PH 398R or		PH 433	3	BIO Emphasis	3	
ENG 301	3	PH 406		REL Elective	2	GE Breadth	3	
REL Elective	2			Elective Credit	4	REL Elective	2	
Elective Credit	3					Elective Credit	3	
	16		1		15		15	

Pre-Medical Emphasis (770-167)

770 Physics Major Core Requirements = 52 credits

All physics majors must take the following core classes as well as select one of the nine emphasis areas to complete the degree requirements.

Course	Credits		Course	Credits		Course	Credits
CSE 110 or PH 135	2		PH 220	3		PH 336	2
MATH 112X	4		PH 228	1		PH 385	3
MATH 215	4		PH 250	1		PH 412	3
MATH 316	4		PH 279	3		PH 433	3
PH 121	3		PH 295	3		PH 398R or PH 406	1
PH 123	3		PH 332	3		PH 488	1
PH 150	1		PH 333	4			

Program Notes:

- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- All majors are required to take the ETS Major Field Test with a minimum score in the 20% percentile or higher in order to graduate.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- PH 121 and MATH 112x double count and fulfills the GE requirement for given area.
- Substitutions may be needed if you are on a previous catalog year. See your faculty mentor for more information.

Pre-Medical Emphasis Area Requirements = 15 credits

Course	Credits		Course	Credits
Choose one:			Take these courses:	
PH 314	3		BIO 180	3
PH 323	3		BIO 180L	1
PH 324	3		CHEM 105	3
PH 374	3		CHEM 105L	1
PH 375	3		CHEM 106	3
PH 473	3		CHEM 106L	1

Graduation Plan for Pre-Medical (770-167)

Semester 1		Semester 2		Semester 3		Semester 4		Semester 5	
CSE 110	2	MATH 215	4	Math 316	4	PH 279	3	PH 332	3
PH 121	3	PH 123	3	PH 220	3	PH 295	3	PH 333	4
PH 150	1	GE Breadth	3	PH 228	1	BIO 180	3	CHEM 105	3
MATH 112X	4	ENG 150	3	PH 250	1	BIO 180L	1	CHEM 105L	1
GE 101	1	REL 200C	2	REL 225C	2	REL 250C	2	REL 275C	2
GE Breadth	3			Elective Credit	3	Elective Credit	3	Elective Credit	3
	14		15		14		15		16

Semester 6		Off-Track		Semester 7		Semester 8		Program Notes
PH 336	2	**Choose		PH 412	3	PH 488	1	Use your elective credit wisely as there are several prereq courses to get into Medical School that are not required in the Physics Major.
PH 385	3	One:	1	PH 433	3	PH Elective	3	
CHEM 106	3	PH 398R or		GE Breadth	3	ENG 301	3	
CHEM 106L	1	PH 406		REL Elective	2	GE Breadth	3	
REL Elective	2			Elective Credit	4	REL Elective	2	
Elective Credit	4					Elective Credit	3	
	15		1		15		15	

870 Physics Education
Major Core Requirements = 66 credits

Course	Credits		Course	Credits		Course	Credits
Education Core			*Physics Education Core*				
ED 200	2		PH 121	3		PH 277	2
ED 304	3		PH 123	3		PH 279	3
ED 361	3		PH 127	3		PH 314	3
ED 461	3		PH 135	3		SCIED 305	2
ED 492	12		PH 150	1		SCIED 405	3
SPED 360	2		PH 205	4		MATH 112X	4
			PH 220	3		MATH 113	3
			PH 250	1			

Program Notes:
- No Grade Less Than C- in Major Courses, and No Double Counting Major Courses.
- Some upper division courses are offered on a rotating schedule, so please plan accordingly.
- All Education majors are also required to have an Education Minor. Please see Bro Pyper with any questions regarding the major/minor requirements.

Graduation Plan for Physics Education (870)

Semester 1		Semester 2		Semester 3		Semester 4	
PH 121	3	MATH 113	3	PH 220	3	PH 279	3
PH 150	1	PH 123	3	PH 250	1	SCIED 305	2
PH 127	3	PH 135	3	ED 304	3	ED Minor	2
MATH 112X	4	ED 200	2	PH 205	4	GE Breadth	3
GE 101	1	ENG 150	3	ED Minor	3	ENG 301	3
REL 200C	2	REL 225C	2	REL 250C	2	REL 275C	2
	14		16		16		15
Semester 5		**Semester 6**		**Semester 7**		**Semester 8**	
PH 277	2	PH 314	3	SCIED 405	3	ED 492	12
ED 361	3	PH 461	3	ED Minor	3	Elective Credit	2
SPED 360	2	ED Minor	3	ED Minor	4		
ED Minor	3	ED Minor	2	GE Breadth	3		
GE Breadth	3	GE Breadth	3	REL Elective	2		
REL Elective	2	REL Elective	2				
	15		16		15		14

Course Descriptions and Availability

PH 101 Fundamentals of Physics (3:3:0:0)

This course covers the principles of classical and modern physics as they relate to current concepts of the physical environment.

(Fall, Winter, Spring)

PH 105 Introductory Applied Physics I (4:3:4:0)
Prerequisites: MATH 109 or MATH 110X or MATH 112X or ALEKS score of 85

This is an introductory general physics course, including a lab component. Also, target students for this course include those interested in pre-med, dental, physical therapy, construction management, and so on.

(Fall, Winter, Spring)

PH 106 Introductory Applied Physics II (4:3:4:0)
Prerequisites: PH 105

This is the second course in an introductory physics sequence that targets students who are interested in pre-med, dental, physical therapy, construction management, and so on. This course contains a lab component.

(Fall, Winter, Spring)

PH 121 Principles of Physics I (3:2:3:0)
Co-requisite: FDMAT 112

This course is the first semester of the calculus-based Principles of Physics sequence. The course is designed for students majoring in physics, engineering, chemistry, and mathematics. The course centers on mechanics, the study of forces and motion as described through Newton's three laws of motion and the concept of energy.

(Fall, Winter, Spring)

PH 123 Principles of Physics II (3:2:3:0)
Prerequisite: PH 121
Co-requisites: MATH 112X
This course is the second semester of the calculus-based Principles of Physics sequence. It is designed for students majoring in physics, chemistry, geology, civil engineering, and mathematics. The course covers topics in waves, thermodynamics, and optics.
(Fall, Winter, Spring)

PH 127 Introduction to Astronomy (3:2:2:0)

Astronomy is the study of the heavens and the Earth as a planet. This course introduces students to the wonders of the heavens and the fundamental observations, concepts, and theories of modern astronomy. Students also learn how scientists discover this information in a historical context.

(Fall, Spring)

PH 135 Physics Career Exploration and Preparation (2:1:2:0)
This course consists of a series of projects drawn from a variety of sub-fields of physics. The projects will focus on contemporary issues at some of the frontiers of physics. For example, students may explore protein folding in the area of biophysics, gravitational waves in astronomy, earthquake modelling in geophysics, and Gradient-index (GRIN) lenses in optics. Students will work in groups to complete the projects. They will be taught computational and problem solving skills that will be utilized in this and subsequent physics courses.

(Fall, Winter, Spring)

PH 150 Beginning Physics Lab (1:0:3:0)
Co-requisite: PH 121

This course introduces students to the basics of experimental physics. It is designed to help students learn to think analytically and to gain experience in doing common experiments in physics. It teaches students how to analyze data and numerically model common physics problems.

(Fall, Winter, Spring)

PH 205 Physics By Inquiry (4:3:3:0)

This hands-on course addresses selected topics in physics with emphasis on the depth of understanding and developing skills essential to the scientific process. These skills include observation, interpretation, reasoning, generalizing predicting, questioning, and related communication skills. It provides an experience in education by inquiry and background for teaching as a process of inquiry.
(Fall odd years)

PH 220 Principles of Physics III (3:2:3:0)
Prerequisite: PH 121
Co-requisites: MATH 113 or MATH 215

This course is third of a four semester sequence. Principles of electricity and magnetism with emphasis on combining intuition and past experience with mathematics to understand the laws of electricity and magnetism.

(Fall, Winter, Spring)

PH 223 Engineering Physics (4:3:2:0)
Prerequisites: PH 121 and (MATH 113 or MATH 215)

This course is designed for students majoring in mechanical engineering. It is a one semester calculus based physics course covering topics in waves, electricity, magnetism, and optics.

(Fall, Winter, Spring)

PH 228 Physics Career Development (1:0:3:0)
Prerequisites: PH 121 and FDENG 101
This course acquaints students with possible career tracks in physics. It introduces topics with becoming a member of a professional community, including presentation and other written communication. Students begin developing skills for job or graduate school applications and interviews. This course introduces students to the research process in physics by beginning the senior thesis or internship process.
(Fall)

PH 250 Intermediate Physics Lab (1:0:3:0)
Pre requisite: PH 150
Corequisite: PH 220

This Intermediate Physics Laboratory is for Physics and Physical Science teaching majors, as well as experimental investigations into electricity and magnetism.

(Fall, Winter, Spring)

PH 277 Contemporary Issues in Astronomy (2:2:0:0)
Pre requisite: PH 127

This 2 credit course explores areas of current research in astronomy. It builds on the principles of astronomy learned previously in PH 127. A working knowledge of college algebra is assumed.

(Fall)

PH 279 Modern Physics (3:2:3:0)
Prerequisite: PH 123
Corequisite: PH 220

This course is the fourth in the Principles of Physics sequence. It is an introductory course dealing with the fundamental topics of modern physics, including special relativity, elementary quantum mechanics, nuclear physics, and some particle physics.

(Winter, Spring)

PH 290R Special Problems in Physics (1-3:1:2:0)
Requirement: Instructor Approval Required
This special topics course is a one to three credit, repeatable course that can be tailored to learning in areas that are not currently part of the required physics program. It is an elective course for those who express interest in learning more about a specific topic in physics or astronomy. Topics will be chosen by the professor. The course will be most often be a lecture type experience, but may include student projects.
(Winter, Spring)

PH 295 Mathematical/Computational Methods (3:2:2:0)
Corequisite: PH 279 and MATH 316

This course is designed to prepare students for the mathematical rigors of upper division physics and help them apply computational programming skills to modeling physics phenomenon and solving physics equations.

(Winter, Spring)

PH 332 Classical Mechanics (3:2:3:0)
Prerequisites: PH 220 and MATH 316

This is a junior level course applying Newton's Laws of Motion in a wide variety of applications.

(Fall)

PH 314 History and Philosophy of Science (3:3:0:0)
Course equivalent to PHIL 314
Pre requisite: FDENG 101

Discusses the philosophical assumptions of modern science, criteria for theory selection, and traces their historical development. Describes the historical development of basic ideas in science.

(Fall, Winter)

PH 333 Electricity and Magnetism (4:4:0:0)
Prerequisites: PH 220 and MATH 316

This is a junior level course which covers electromagnetic theory.

(Fall)

PH 323 Solid State Physics (3:3:0:0)
Pre requisites: MATH 316 and PH 279

This course introduces the basic mathematical and conceptual tools necessary to study the structural, electrical, thermal, and mechanical properties of matter in the solid state.

(Fall odd years)

PH 336 Advanced Physics Lab (2:0:6:0)
Prerequisites: PH 250

This course prepares students to do experimental work for their internship and/or research. It focuses on analyzing experimental data, but also covers other aspects of experimental design in common equipment used in physics experiments.

(Winter)

PH 324 Nuclear and Particle Physics (3:3:0:0)
Pre requisite: PH 279

This is a junior level survey course which introduces the physics of atomic nuclei and elementary particles.

(Fall even years)

PH 374 Astrophysics (3:3:0:0)
Pre requisite: PH 127
Corequisites: PH 279

A junior level mathematically based course designed to introduce students to the field of astrophysics.

(Winter even years)

PH 375 Principles of Optics (3:3:0:0)
Prerequisites: PH 333
This course covers the fundamental principles of optics. Beginning with Maxwell's Equations, the electromagnetic theory of light is studied. Fundamentals of geometric optics are revisited using electromagnetic theory. Phenomena such as lens aberrations, polarization, interference, diffraction, and coherence are discussed.

(Winter odd years)

PH 385 Numerical Modeling in Physics (3:2:3:0)
Pre requisites: PH 279 and PH 295

A lab course that applies numerical modeling and methods to a variety of modern topics in physics. One or more of the following program languages will be used in this course: MATLAB, PYTHON, C , or FORTRAN

(Winter)

PH 390R Special Topics in Physics (1:0:2:0)
Repeatable Course: May earn maximum of 2 credits Prerequisite: PH 121

This special topics course is one credit, repeatable course that can be tailored to student mentored research projects. It is an elective course for those who express interest in learning more about a special topic in physics or astronomy.

(Fall, Winter, Spring)

PH 398R Physics Internship (1:0:0:0)
Repeatable Course: May earn maximum of 2 credits Internship Fees: $81.50 (LDS) $163 (non-LDS) per credit Exempt from tuition, but charged this independent course fee.

This course consists of a professional internship providing the student with job experience in a physics-related field.

(Fall, Winter, Spring)

PH 406 Physics Senior Research (1:1:0:0)
Course Requirement: Instructor Approval Required

In this course students propose, develop the background for, and execute a research project culminating in production of a thesis (written in PH 488), either individually or in cooperation with other students. This project is in lieu of (or in addition to with approval) a professional internship.

(Fall, Winter, Spring)

PH 412 Thermal and Statistical Physics (3:3:0:0)
Prerequisite: PH 279 and PH 295

This is a senior level course covering classical thermodynamics and statistical mechanics. This course builds upon and expands some of the material that was covered in PH 123.

(Fall)

PH 433 Quantum Mechanics (3:3:0:0)
Prerequisites: PH 279 and PH 295

This is a senior-level course which covers an introduction to the theory of quantum mechanics.

(Fall)

PH 473 Atomic Physics (3:3:0:0)
Prerequisite: PH 433

This is a senior-level course which covers applications of the theory of quantum mechanics to atomic and solid state physics topics.

(Winter)

PH 488 Senior Thesis (1:1:0:0)
Prerequisite: PH 406 or PH 398R
Course Requirement: Instructor Approval Required

This is a course focused on bringing a student's research experience to conclusion by writing the formal thesis and presenting its contents to the faculty and other students.

(Winter)

Professional Development Plan

Freshman		Sophomore		Junior		Senior	
Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
1. Contact an Alumni Mentor 2. Find your Faculty Mentor 3. Select an emphasis area - 1st semester 4. Take College Success course 5. Complete & Approve Graduation Plan 6. Attend monthly Colloquia 7. Join Society of Physics Students		1. Take PH 228 - Physics Career Development course 2. Research Graduate Schools (Deadlines & Requirements) 3. Join a research group 4. Submit track adjustment - 4th Semester 5. Attend monthly Colloquia		1. Career Workshop - Succeeding in your Internship, Grad School, and Career 2. Prepare to take the GRE 3. Discuss internship with faculty mentor 4. Explain senior thesis requirement 5. Submit internship applications 6. Attend BYU-Provo STEM fair 7. Attend monthly Colloquia		1. Submit Job Applications 2. Submit Grad School Applications 3. Discuss grad school/career opportunities 4. Major Field Test- 8th semester 5. Attend BYU-Provo STEM fair 6. Attend monthly Colloquia 7. Exit interview 8. Attend Professional Conference 9. Become an Alumni mentor	

OFF TRACK ⬇ OFF TRACK ⬇ OFF TRACK ⬇

Off Track	Off Track	Off Track
Internship/Volunteer Experience	Internship/Research Experience	PH 398R Internship/PH 406 Research

Student Semester Checklist

Hello Physics Majors,

In an effort to better assist you with your educational plan, we're asking that you fill out this form and return it to your faculty mentor. In exchange, the registration hold on your student account will be lifted.

Name: I-Number:

I am currently a ◯ Freshman ◯ Sophomore ◯ Junior ◯ Senior

I have an approved Grad plan ◯ Yes ◯ No

If no, explain why not:

I am interested or involved in the following research area(s):

Below are requirements/activities we ask you to accomplish in each respective semester. Please find the matching semester you are registering for below and check the box that you have read the requested items and will fulfill them to the best of your ability.

Semester One	Semester Two	Semester Three	Semester Four
1: Review the Student Handbook at www.byui.edu 2: Begin developing grad plan 3: Attend Colloquia ◯	1: Confirm an emphasis area 2: Complete/submit a grad plan 3: Get involved with SPS 4: Become familiar with research opportunities 5: Attend Colloquia ◯	1: Become involved in research 2: Submit track adjustment form (if necessary) 3: Attend Colloquia ◯	1: Attempt early to secure an internship 2: Develop a resume and have it reviewed (Career Workshop) 3: Switch track to Fall/Winter 4: Attend Colloquia ◯

Semester Five	Semester Six	Semester Seven	Semester Eight
1: Research internships 2: Attend STEM Fair 3: Attend Colloquia ◯	1: Apply for 12 or more internships 2: Research graduate school and/or career opportunities 3: Practice interview skills (Career Workshop) 4: Attend Colloquia ◯	1: Understand the senior thesis requirements 2: Begin Graduate school and/or career applications 3: Take GRE if graduate school bound 4: Attend Colloquia ◯	1: Senior thesis and defense 2: Do exit survey 3: Join our Facebook and LinkedIn groups 4: Attend Colloquia ◯

Internships Info

Getting an internship can be a daunting task, but hopefully the following links can help get you started. For more detailed information see Bro. Brian Tonks or the Internship office at http://www.byui.edu/internships.

NSF's list of physics REUs: http://www.nsf.gov/crssprgm/reu/list_result.jsp?unitid=69
(without the unitid=69 query *you'll get all programs like chemistry, physics, math, etc.*)

APS physics list of internships: http://www.aps.org/careers/employment/internships.cfm#undergrad

AAPT/SPS The Physics Nucleus (includes a forum to discuss internships, scholarships, etc.): http://www.compadre.org/student/

Grad School and GRE Info

Are you looking to go on to Graduate School after finishing your degree at BYU-Idaho? Here are some websites you might be interested in.

AIP's physics graduate school finding website (a paper copy of their catalog is kept in the physics majors room): http://www.gradschoolshopper.com/

GRE preparation suggestions from ETS for the general test: https://www.ets.org/gre/revised_general/prepare/

GRE preparation suggestions from ETS for the physics subject test: http://www.ets.org/gre/subject/about/content/physics

OSU's physics GRE preparation page with many past practice exams: http://www.physics.ohio-state.edu/undergrad/ugs_gre.php

Frequently Asked Questions

This is just a sample of the most frequently asked questions. For other questions or more in depth answers please feel free to contact the Physics Department Office at (208) 496-7730. Also please visit the BYU-Idaho Physics Department web page for more links and information.

Why can't I (a physics major) register for next semester?
All physics majors are required to meet with their faculty mentor each semester in order to be granted clearance to register. This meeting can be in person, via email, or by phone. The purpose behind it is so we can help you stay on track, know your long-term goals, etc so we can help you get into the right classes, in the right sequence, and ready to graduate. Please come see Sis Nelson in ROM 118 if you need help finding your assigned faculty mentor.

What can I do with a degree in Physics?
A background in Physics opens up a wide variety of career opportunities. Nearly 90 percent of all "physicists" are working in medicine, education, industry, or other professions. Physicists are in demand for their analytical skills in many financial, fund management and research roles, in law, as weather forecasters, computer programmers, and as physics and science teachers. So in short, pretty much anything you want!

I am a Physics Major and was accepted to the Winter/Spring or Spring/Fall track.
We accept any track up through your sophomore year. In general, at the end of your sophomore year or at the beginning your junior year you will need to apply for a track adjustment so you can take the majors courses offered in the fall and winter semesters.

Where do I go to change my major or change my track?
The Academic Advising Center for our college is located in MC 103. They can be contacted at 208.496.9880 or e-mailed at cpseadvising@byui.edu. You can also visit their website at www.byui.edu/advising. Their team can help you fill out all the forms, get you on the right track, and answer any questions about graduation and requirements.

Where do I go to get a course substitution?
The department chair can approve all physics course substitutions. If you have career goals that don't quite fit in the emphasis areas, course subsitutions are an option to make those goals a reality. Come to ROM 118A and talk with the chair for guidance and options.

What are PH 406 (Physics Senior Research) and PH 398R (Physics Internship)?
All physics majors are required to have an experience applying their learning in an on-the-job or in-the-lab setting. PH 398R is usually a paid applied or research experience away from campus. PH 406 is an unpaid on-campus faculty-mentored research experience. PH 398R is the preferred course and permission to add PH 406 is restricted to those that have exhausted every possible avenue for an internship and have completed 400 hrs of research.

What are PH406 and PH398R?

What is PH398R?

All physics majors are required to have an experience applying their learning in an on-the-job or in-the-lab setting. PH398R fulfills this requirement via an off-campus experience. This can be a research experience (think national labs and research-focused universities) or an applied experience (think Boeing, Northrop Grumman, and Intel but not McDonalds or Burger King). It needs to be an organization other than this school and the work needs to be of the skilled variety, requiring the use of your newly-acquired technical skills.

You should start applying for internships during your sophomore year and consider applying again during your junior year, whether you've done one before or not. (Two internships are better than one) These internships provide a nice paycheck, prepare you for your future role in the workforce, and build your professional network, likely opening up lucrative and rewarding future opportunities. Internships for physics students are usually paid experiences. It is expected that an internship will be a high priority on your educational checklist and that you will exhaust every avenue in your endeavor to obtain one.

Well then what is PH406?

If after honestly exhausting all avenues you are unable to obtain an away-from-campus internship experience you may become eligible to register for PH406 and fulfill the internship requirement via an on-campus faculty-mentored research experience. You can qualify for PH406 if

1. You can provide proof that you have made every effort to obtain an away-from-campus experience. This usually means that you have applied for at least 20 positions,

and

2. You have already completed at least 200 hours of research with your on-campus faculty research adviser or you are able to commit to the research project full-time (40 hours per week) for one full semester.

Only when both of these conditions have been met will you be allowed to register for PH406 as a substitute for PH398R.

Why not just take PH406 instead of PH398R?

The majority of physics students do not qualify for PH406. For those who do qualify, there are several significant drawbacks and/or challenges associated with replacing PH398R with PH406 that you should know about:

1. You will not be paid for the on-campus research experience.

2. The on-campus research experience must be equivalent to an internship experience (roughly 400 hours of work). This means that you will have to either i) engage in research part-time for 3 consecutive semesters (while you carry a full course load) or ii) engage in research full-time during your off-semester, thus forfeiting the opportunity to work for pay elsewhere during that time.

3. If you plan poorly and try to register for PH406 in the same semester that you begin your on-campus research experience (i.e. you fail to meet condition #2 from above), you will find that you will not be allowed to register at all. This scenario could delay your graduation for a full year.

4. You will not build your professional network and will miss out on building a bridge to a post-graduation position. This will make the post-graduation job search more difficult.

Please note that we are not discouraging you from engaging in research here on campus. In fact, we encourage your involvement in on-campus, faculty-mentored research as it will strengthen your applications for jobs and internships. However, we strongly discourage substituting a valuable, network-building, away-from-campus professional experience (PH398R) with a faculty-mentored, on-campus experience (PH406). Planning to do this will limit your post-graduation opportunities and put you at a disadvantage relative to your peers.

Get Involved

Planetarium

The planetarium offers an opportunity to explore our universe through several different shows. See the stars, planets, and recognize constellations as they appear above you, just as if you were gazing at the night sky. We currently feature 17 shows in our planetarium. Most shows average 30 minutes in length. Public shows are offered every Thursday evening at 7:00 pm. Tickets go on sale at 6:30 pm at the door, first come, first served. Cost is $2.00 per person.

For more information or if you would like to get involved with the planetarium contact:
Stephen McNeil at mcneils@byui.edu or via phone at (208) 496-7741.

Observatory

We have a public telescope available on top of the Romney building, ROM 301. While the days and times it is open vary depending on the semester, in general the Observatory is:

- Closed on cloudy/overcast nights
- Open to the public
- Free of charge
- Operators are on duty to answer questions, point out constellations, and operate the telescope.

For further information regarding the Observatory contact:
Stephen McNeil at mcneils@byui.edu, or via phone at (208)496-7741.

Society of Physics Students

The Society of Physics Students (SPS) is a professional association explicitly designed for students. Membership, through collegiate chapters, is open to anyone interested in physics. The only requirement for membership is that you be interested in physics. The SPS exists to help students transform themselves into contributing members of the professional community. Course work develops only one range of skills. Other skills needed to flourish professionally include effective communication and personal interactions, leadership experience, establishing a personal network of contacts, presenting scholarly work in professional meetings and journals, and outreach services to the campus and local communities.

For more information or if you would like to get involved with this society contact:
Jon Johnson at johnsonjo@byui.edu, or via phone at (208)496-7759.

Student Research Opportunities

There are many exciting areas of research in the field of physics. Here are a few examples of research projects currently going on in our department. When in doubt ask your favorite physics teachers what's going on and how you can get involved.

Acoustics

For further information, please contact Bro Johnson at johnsonjo@byui.edu
or via phone at (208)496-7759

Astronomical Observations

For further information, please contact Bro McNeil at mcneils@byui.edu,
or via phone at (208) 496-774.

Atmospheric Optics

For further information, please contact Bro Lines at linest@byui.edu
or via phone at (208)496-7740.

Carbon Nanaotubes

For further information, please contact Bro Hansen at hansenev@byui.edu
or via phone at (208)496-7737.

High Altitude Research Team (HART Balloon Project)

For further information, please contact Bro Nielson at nielsonr@byui.edu
or via phone at (208)496-7742.

High Performance Computing

For further information, please contact Bro Lines at linest@byui.edu
or via phone at (208)496-7740.

Materials Simulation- Grain Boundaries

For further information, please contact Bro Hansen at hansenev@byui.edu
or via phone at (208)496-7737

Materials Simulation

For further information, please contact Bro Nelson at nelsonla@byui.edu
or via phone at (208)496-7736.

Meteorology

For further information, please contact Bro Turcotte at turcottes@byui.edu
or via phone at (208)496-7746.

Microwave Scattering

For further information, please contact Bro Lines at linest@byui.edu
or via phone at (208)496-7740.

Nuclear reaction and reaction network modeling

For further information please contact Bro Kelley at kelleyk@byui.edu
or via phone at (208)496-7739.

Optics

For further information, please contact Bro Turcotte at turcottes@byui.edu
or via phone at (208)496-7746.

Physics Education Research

For further information, please contact Bro Pyper at pyperb@byui.edu
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Positron Annihilation

For further information, please contact Bro Hansen at hansenev@byui.edu
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Surface Physics/X-Ray Difraction

For further information, please contact Bro Oliphant at oliphantd@byui.edu
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Know your Faculty

Richard Datwyler - Datwylerr@byui.edu

Richard Datwyler completed his Ph.D. at Utah State University in the field of Plasma physics, specifically computational plasma containment. In conjunction with this he also has interest in atmospheric plasma, kinetic theory of plasma and other computational physics, including solar energy.

Evan Hansen – Department Chair - Hansenev@byui.edu

Evan Hansen received his BS in Physics and graduated with Honors from BYU. He received his MS and PhD in Physics from the University of Illinois at Urbana-Champaign. Prior to coming to BYU-Idaho he spent seven years in research and development in the semiconductor industry.

Richard Hatt – Hattr@byui.edu

Richard Hatt received his BS and Ph.D. in Physics at Brigham Young University. He taught at Southern Oregon University for two years before coming to BYU-Idaho and has taught here since 2002. His interests include Quantum Physics and Solid State Physics.

Joseph Hill –Hilljo@byui.edu

Joseph Hill earned his BS in Physics from BYU-Idaho and a Ph.D in Mechanical Engineering from the University of Arkansas for his work on Directed Self-Assembly Methods in Di-block Co-polymer Thin-Films. His current interest areas span a wide array of topics including, astrophysics, data science, energy storage, fluid dynamics, materials science, micro-electromechanical systems, multi-scale computational modeling, robotics, sustainable energy, and thermodynamics.

Jon Johnson – Johnsonjo@byui.edu

Jon Johnson completed his Ph.D. at the University of Utah and studied materials science, specifically materials for semiconductor devices. Br. Johnson's interests include microscopy (AFM, SEM), acoustics, electronics, and condensed matter physics. As more of a hobby he is interested in optics and photography.

Kevin Kelley – Kelleyk@byui.edu

Kevin Kelley completed his Ph.D. at the University of California-Davis in computational nuclear physics. He has also conducted research in high energy phenomenology and nuclear astrophysics and radiochemistry at Lawrence Livermore National Laboratory.

Todd Lines – Linest@byui.edu

Todd Lines completed a BS in Physics from BYU, and received his MS and PhD in Physics from New Mexico State University. He has worked for the Army Research Laboratory and for several major defense companies. He is currently involved in atmospheric optics research.

Stephen McNeil – McNeils@byui.edu

Stephen McNeil received his Ph.D. from BYU-Provo in Physics and Astronomy. His research dealt with looking for evidence of supermassive black holes at the center of galaxies. Currently he is involved in student research using telescopes at the BYU-Idaho Observatory and is the Planetarium Director. Bro. McNeil is also the advisor for the BYU-Idaho Astronomical Society.

Lance Nelson – Nelsonla@byui.edu

Lance Nelson graduated with his Bachelors from BYU-Idaho, and completed his Ph.D. from BYU with emphasis in computational solid state physics/materials science. He has interests in computational physics, thermodynamics, and energetics of materials.

Ryan Nielson – Nielsonr@byui.edu

Ryan Nielson's master thesis was about the ionosphere and the effect the wind has on the height of layers in it. Since then he has entertained an interest in acoustics and inquiry education. He has a hobby of lapidary (stone cutting), and has a de-facto interest in the optical properties of materials as well.

David Oliphant – Oliphantd@byui.edu

David Oliphant began teaching physics at BYU-Idaho in the fall of 2000. He completed his BS and MS at BYU. He is interested in the way x-rays and electrons interact with matter. He is also interested in computer modeling, particularly in developing methods that can extract more information from the given set of measured data.

Brian Pyper – Pyperb@byui.edu

Brian Pyper is the Director of Physics Education – Advisor and Supervisor of pre-service physics teachers. Bro. Pyper is very active in Physics Education Research and has been a professor at BYU-Idaho since 1999. He received his BS in Physics from BYU, his MS from the University of Utah, and Ph.D. from Utah State University.

Stephen Turcotte – Turcottes@byui.edu

Stephen Turcotte completed his Ph.D. in the area of laser spectroscopy. Before coming to BYU-Idaho, he worked as an optical engineer at Space Dynamics Laboratory in Logan, UT. He has interests in computational physics, protein folding, and weather measurements.

Matt Zachreson – Zachresonm@byui.edu

Matt Zachreson completed his Ph.D. at BYU in plasma physics, with an emphasis on computation and statistical modeling. Prior to joinging the physics faculty, Matt worked for BYU-Idaho's office of Institutional Research and Assessment doing education research, data science, and program evaluation. His interests include making cool graphs (data visualization), using statistics to get further insight into data, and baking.

Degree Opportunities

What Can You Do With a College Degree in Physics?

The answer most appropriate for this question is: anything you want to do. However, while some physics majors go on to become professional physicists, the majority pursue careers in fields where they can put their knowledge to more practical applications. With their skills in problem-solving, mathematical reasoning, computer programming, and organizing and interpreting scientific data, physics grads can move into government and industrial jobs that require an ability to think logically and creatively. Physics majors are well-suited to jobs that require step-by-step problem solving using math skills and good observational and communication skills.

A wide range of industries seeks physics graduates: telecommunications, industrial physics, hospital physics, electronics, computing, quality control testing, banking, insurance, teaching, management, technical sales and the armed forces, for starters. Students who become physicists tend to specialize in one or more areas of physics, such as:

- **Nuclear physics**. Nuclear physics involves the study of the components, structure, and behavior of the nucleus of the atom. It has a number of practical applications in developing nuclear energy, archeological dating, smoke detectors and nuclear medicine. Nuclear diagnostic techniques have revolutionized medicine by providing ways to "see" inside the body without surgery. (Emphasis area(s): Mathematical/Computational)

- **Geophysics**. Geophysicists apply physical theories and measurements to discover the properties of the earth. Geophysics includes the branches of seismology, geothermometry (heating of the earth), hydrology (ground and surface water), and gravity and geodesy (the earth's gravitational field). Some of its applications are used in building highways and bridges, studying earthquakes, urban planning and archaeology. (Emphasis area(s): Geophysics)

- **Atomic, molecular and optical physics.** In this field, physicists study matter and light interactions at the level of the atom. The three are usually grouped together because of their interrelationships, the similarity in methods used, and their related energy scales. Atomic physics is more concerned with the study of the atom than with the forces studied in nuclear physics. Molecular physics focuses on multi-atomic structures and their internal and external interactions with matter and light. Optical physics manipulates light to gain insight into the fundamental properties of light. (Emphasis area(s): Mathematical/Computational/Chemistry)

- **Astronomy**. Astronomy is considered a subfield of physics. Astronomers observe and collect data used to explain relationships between stars and planets as well as other phenomena occurring in the universe. Astronomers, in conjunction with other types of physicists, might be called upon to solve problems connected with space flight navigation and satellite communications. (Emphasis area(s): Astrophysics)

• **Astrophysics**. Astrophysics is the part of astronomy that deals with the physics of stars, star systems and interstellar material. Astrophysicists apply the laws of physics to understand how astronomical bodies are formed, how they interact, and how they die. Astrophysics might be used to figure out how to get to other planets, how to build things in new and safer ways, or to examine how the human body adapts to new situations. (Emphasis area(s): Astrophysics)

• **Space physics.** Space physics is the study of the space environment from the uppermost reaches of the earth's atmosphere to deep space, especially the environment in which satellites must survive. It has important applications as society becomes increasingly dependent on satellites for communication, broadcast, weather monitoring, remote sensing, positional information and military uses. Space exploration has led to the creation of several products such as new types of ceramics, high-performance materials, and even microwave ovens. (Emphasis area(s): Astrophysics)

• **Physics Education**. Physics grads with bachelor's degrees can become elementary or high school teachers. There is almost always a shortage of teachers in the sciences. Technical schools will also hire physics majors who have some professional experience. Public schools require a certification to teach, but not all private schools or technical schools do. (Emphasis area(s): Physics Education)

• **Engineering Physics.** Engineering is another outlet for the physics major. It is one of the most demanding professions, because it often deals with decisions that affect the safety of individuals. Building bridges, skyscrapers, airplanes, and electrical systems requires a solid foundation in physics. Some students will earn a degree in physics and then go on to graduate school for a master's degree in engineering. Others will double-major in physics and engineering. A few other industries that require a solid physics background are construction, chemical, food, aerospace, agriculture, energy, fuel, metallurgy, textiles and clothing, computers and transportation. (Emphasis area(s): Engineering/ Mathematical)

• **Computer Science**. Computer science offers careers for the physics major in graphics and software, artificial intelligence, data processing and computer games. Computer hardware is the result of applied physics. (Emphasis area(s): Computational)

• **Medical Physics**. Medical Physics is the application of physics concepts, theories and methods to medicine or healthcare. Medical Physicists are often found in the following healthcare specialties: medical imaging, nuclear medicine, and radiation oncology. University departments are of two types. The first type are mainly concerned with preparing students for a career as a hospital medical physicist and research focuses on improving the practice of the profession. A second type (increasingly called 'biomedical physics') has a much wider scope and may include research in any applications of physics to medicine from study of biomolecular structure to microscopy and nanomedicine. (Emphasis area(s): Medical)

• **Biophysics**. Biophysics is an interdisciplinary science that applies the approaches and methods of physics to study biological systems. Biophysics covers all scales of biological organization, from molecular to organismic and populations. Biophysical research shares significant overlap with biochemistry, nanotechnology, bioengineering, computational biology and systems biology. (Emphasis area(s): Biophysics/Chemistry/Computational)

A student with an interest in physics and communications might consider telecommunications, television, image analysis, video recording, photography, laser technology, journalism, scientific writing and publishing. Other non-technical careers in which physics majors have found success are law, business administration, sports, marketing and business management.

Besides astronomy, space and earth science careers for physics majors include space technology, atmospheric sciences, energy and resources and ocean sciences. Openings in environmental sciences and physics would include positions studying noise control, pollution control, conservation, radiation protection, and environmental monitoring.

Despite the important and intriguing specialties available to physicists, the vast majority of physics majors enter other professions. They may teach high school physics, perform research and development in private industry or in government labs, or lend their expertise to medical imaging, scientific book publishing, and scientific reporting. Physics careers can come from unexpected places. Insurance companies, for example, hire physicists to study the performances of the products they insure and make recommendations for reducing injuries and property loss.

A graduate with a master's degree in physics can do most of the above jobs but usually with a higher degree of responsibility and pay. They also have the opportunity to teach at community colleges. A PhD holder is more likely to become a university professor or researcher. Industries will also hire PhDs to oversee research projects for their companies and design new scientific instruments.

Skills, Interests and Qualities

To be a physicist you should have:

- good scientific and mathematical knowledge
- an enquiring mind
- clear and logical thinking, with good problem solving skills
- a methodical approach to work, with a high level of accuracy
- good communication and presentation skills
- report writing skills
- the ability to work both as part of a team and on your own
- team leadership and project management skills
- a good understanding of statistics and relevant computer packages
- a willingness to work flexibly and adapt to change.

How Much Can You Make With a College Degree in Physics?

The salary you can make with a physics degree varies with the level of education (bachelors, master, PH.D) and location. However, the following are the latest statistics from https://www.aip.org/statistics.

Field of Graduate Study for Physics Bachelors One Year After Degree, Classes of 2019 & 2020 Combined

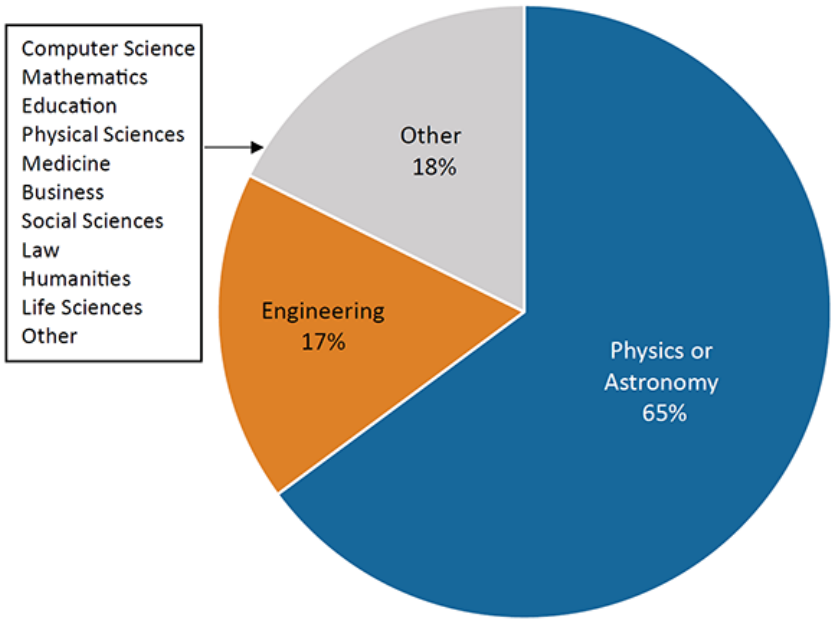
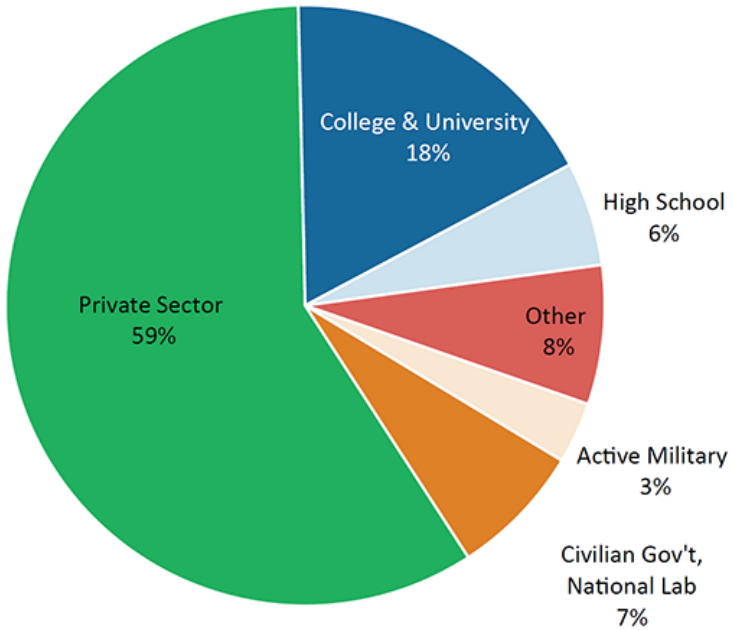
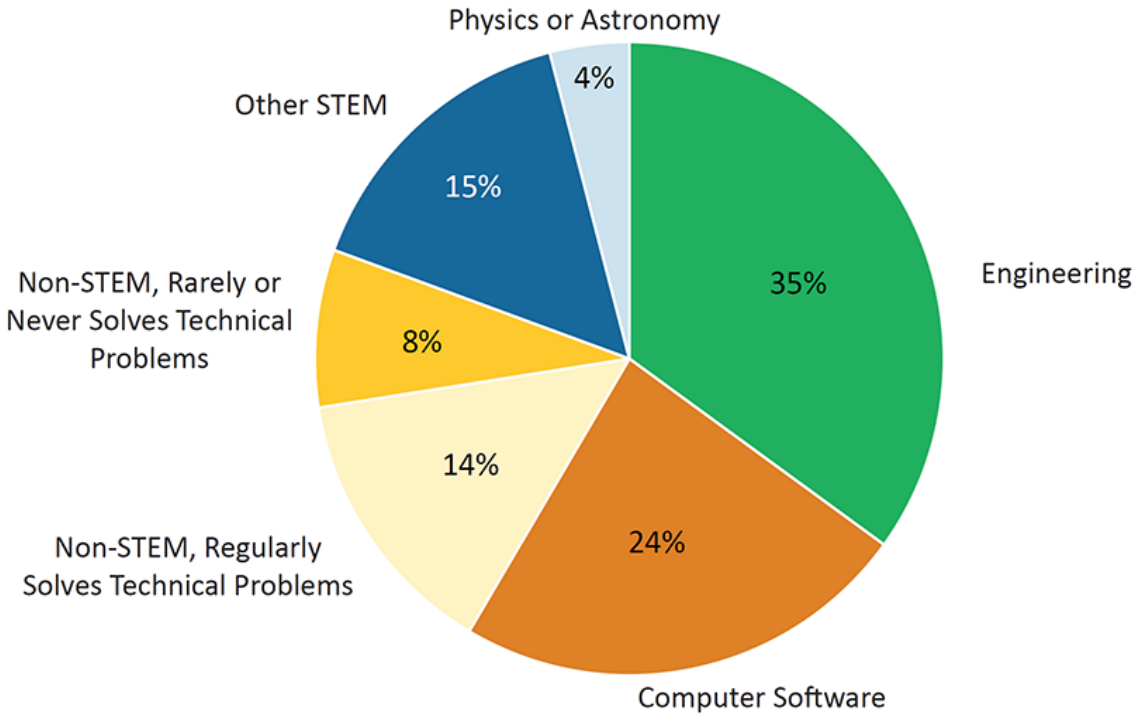


Figure based on responses from 2,593 physics bachelors degree recipients who indicated that they continued into graduate study.

Initial Employment Sectors of New Physics Bachelors, Classes of 2019 & 2020 Combined

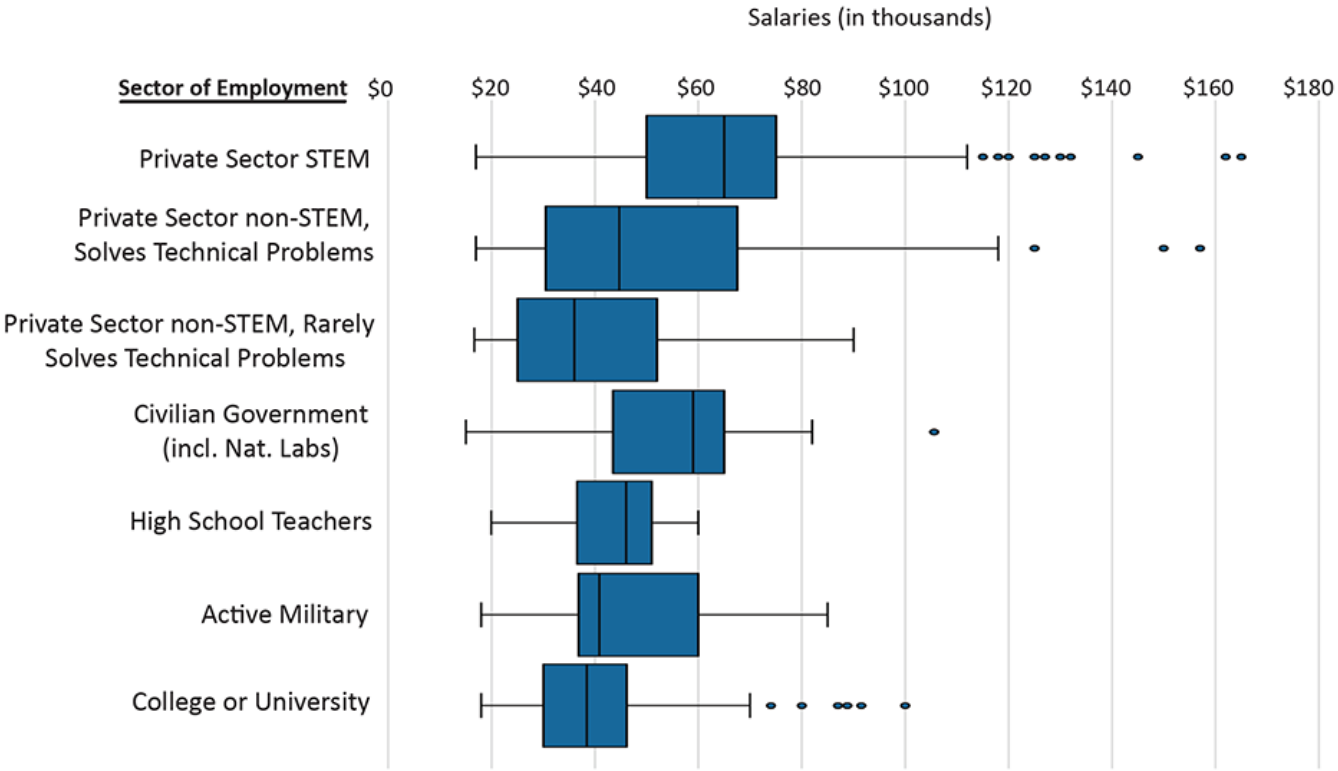


Field of Employment for New Physics Bachelors in the Private Sector, Classes of 2019 & 2020 Combined



STEM refers to natural science, technology, engineering and mathematics. Regularly solving technical problems refers to respondents who selected "Daily", "Weekly", or "Monthly" on a four-point scale that also included "Rarely or Never".

Starting Salaries for New Physics Bachelors, Classes of 2019 & 2020 Combined

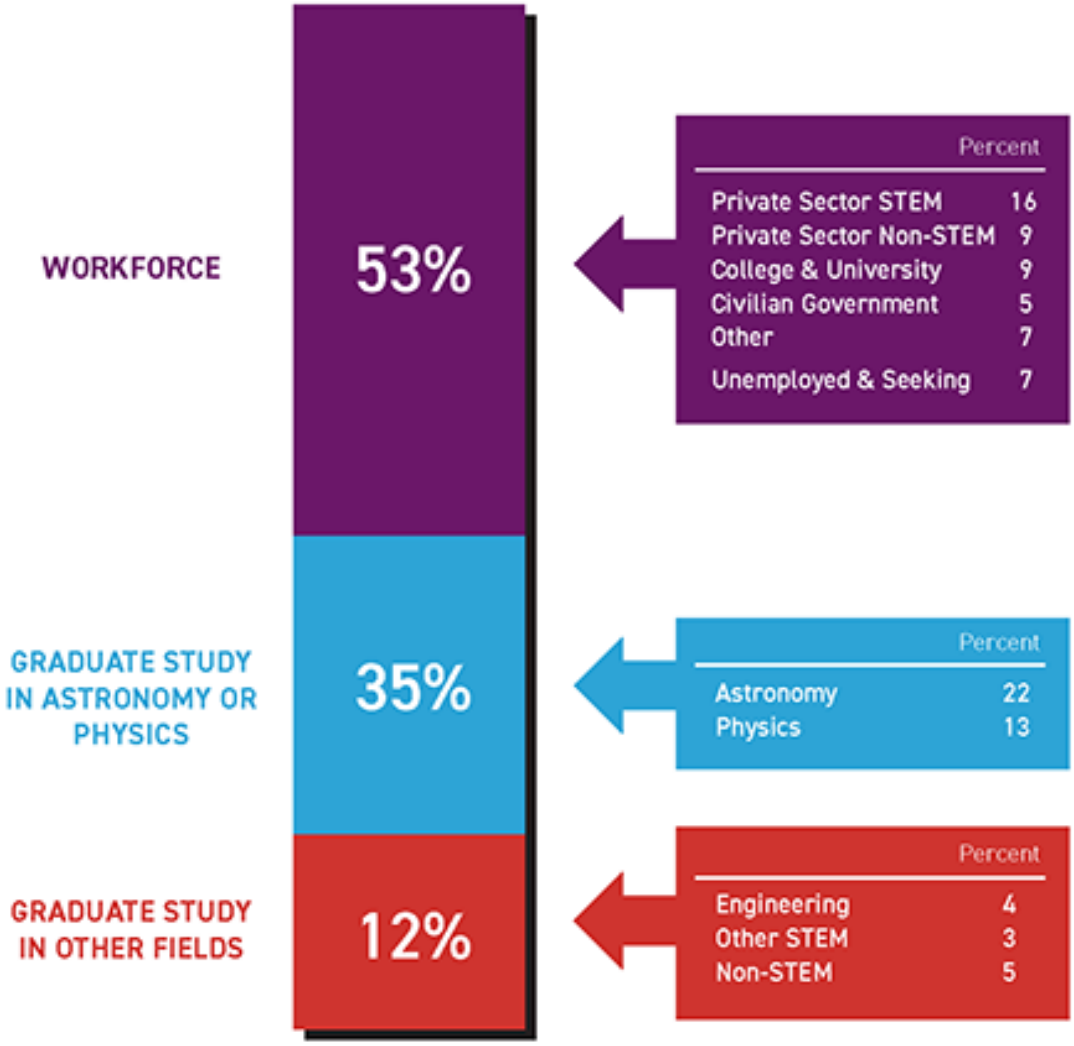


AIP American Institute of Physics

PHYSICS TRENDS

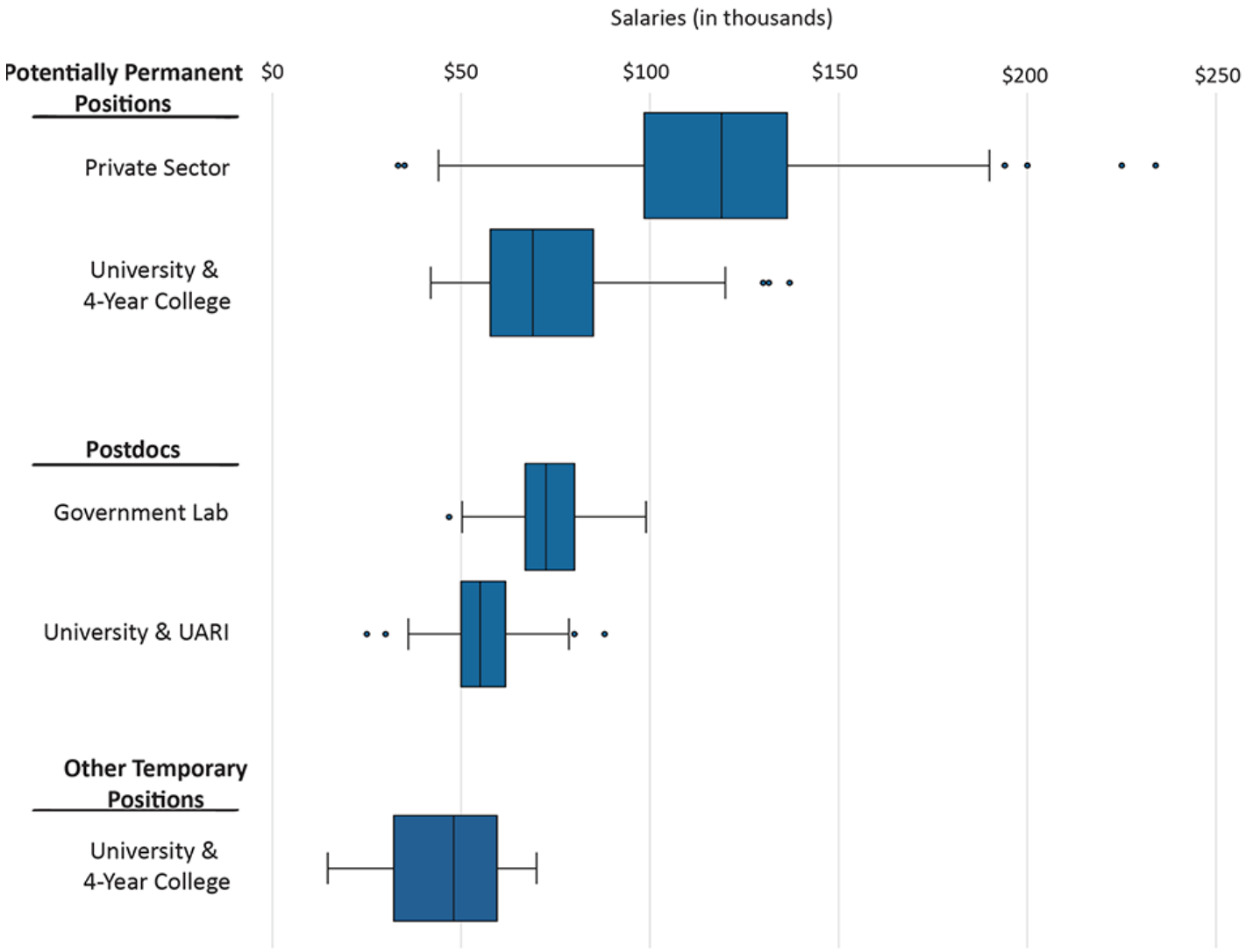
Spring 2022

Astronomy Bachelors 1 Year Later



The data in this figure are from the AIP Statistical Research Center's annual Astronomy Bachelors Follow-up Survey, classes of 2018, 2019, and 2020 combined. The three degree classes had 596, 666, and 820 degree recipients, respectively. Three percent of respondents to the survey indicated that they had left the US to pursue employment or graduate study and are not included in the figure.

Starting Salaries for New Physics PhDs, Classes of 2019 & 2020 Combined



Data represents only US-educated PhDs who remained in the US after earning their degrees. The full starting salary range, excluding outliers, is represented by the lines extending to each side of the box. The box represents the middle 50% (25th to 75th percentile) of the salaries. The vertical line within the box represents the median starting salary for the sector. The dots outside of the bars are statistical outliers. Government Lab includes federally funded research and development centers, e.g., Los Alamos National Laboratory. UARI is university affiliated research institute. The data for PhDs holding potentially permanent positions in academia include salaries based on 9-10 and 11-12 month commitments and have not been adjusted. Data are based on respondents holding potentially permanent positions in the private sector (192) and in universities and 4-year colleges (37), postdocs in government labs (101) and universities and UARIs (277), and "other temporary positions" in universities and 4-year colleges (17).

aip.org/statistics