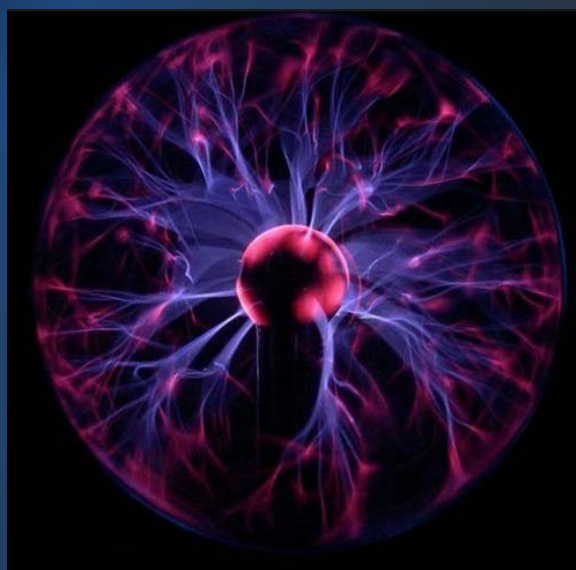
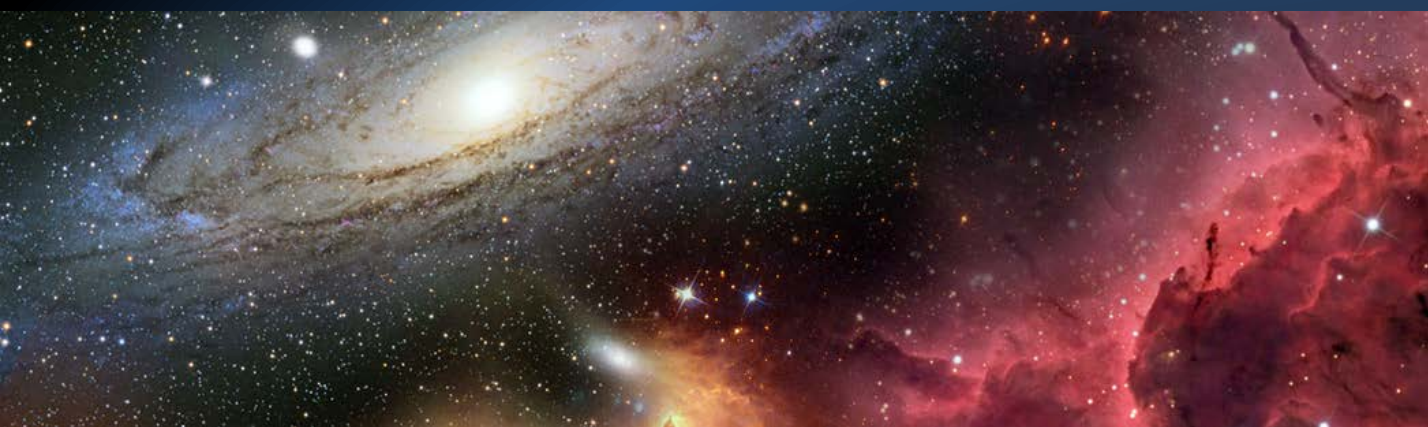
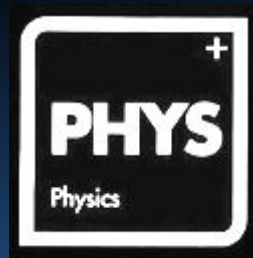


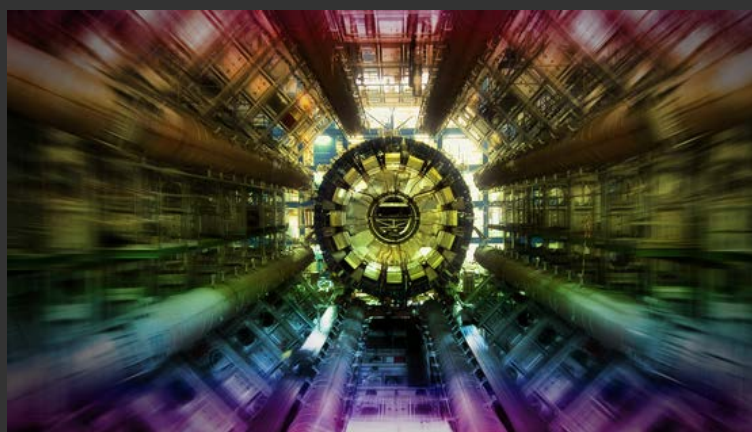
University of Oregon

# PHYSICS

Undergraduate Program



$$\frac{\partial}{\partial a} \ln f_{a, \sigma^2}(\xi_1) = \frac{(\xi_1 - a)}{\sigma^2} f_{a, \sigma^2}(\xi_1) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left[-\frac{(\xi_1 - a)^2}{2\sigma^2}\right]$$
$$\int_{\mathcal{R}_n} \mathcal{T}(x) \cdot \frac{\partial}{\partial \theta} f(x, \theta) dx = M\left(\mathcal{T}(\xi) \cdot \frac{\partial}{\partial \theta} \ln L(\xi, \theta)\right) \int_{\mathcal{R}_n} \frac{\partial}{\partial \theta} \mathcal{T}(x) f(x, \theta) dx$$
$$\int_{\mathcal{R}_n} \mathcal{T}(x) \cdot \left(\frac{\partial}{\partial \theta} \ln L(x, \theta)\right) \cdot f(x, \theta) dx = \int_{\mathcal{R}_n} \mathcal{T}(x) \left(\frac{\partial}{\partial \theta} \frac{f(x, \theta)}{f(x, \theta)}\right) f(x, \theta) dx$$
$$\frac{\partial}{\partial \theta} \int_{\mathcal{R}_n} \mathcal{T}(x) f(x, \theta) dx = \int_{\mathcal{R}_n} \frac{\partial}{\partial \theta} \mathcal{T}(x) f(x, \theta) dx$$



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For question regarding this information, or for Physics  
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## Undergraduate Physics Degree Requirements

As with any major at UO, an undergraduate degree in Physics is comprised of multiple components. The main components are; General Education requirements that must be met by all UO undergraduates; core Physics courses that all Physics majors must take; and a selection of three “major tracks” that allows a Physics major to choose a path that best suits their future educational and professional plans. The three tracks within the Physics major are:

- The **Pure** track – our standard curriculum that is broadly applicable to all Physics majors.
- The **Applied** track – a curriculum that is similar to the Pure track with an emphasis on laboratory work.
- The **Physics Education** track – a curriculum that is geared towards students that will likely pursue a career in teaching. This track contains components of both the Pure and Applied tracks.

The first two years of the tracks are identical. As a student moves into upper division courses the tracks diverge to steer one into more specialized classes. ***All three tracks are viable pathways to graduate school.*** However, the purpose of the tracks is to give Physics majors the ability to fit their undergraduate program to be compatible with their future plans. Entering undergraduate students are encouraged to meet with the Director of Undergraduate Studies to discuss which track is most appropriate for them.

Within this document you will find course titles and numbers, detailed descriptions of the degree tracks, general 4-year curriculum plans, and a list of UO Physics faculty. Questions about the undergraduate Physics program should be directed to:

Ms. Jodi Myers – Undergraduate Program Coordinator – [myers2@uoregon.edu](mailto:myers2@uoregon.edu)

Dr. Scott Fisher – Director for Undergraduate Studies – [rsf@uoregon.edu](mailto:rsf@uoregon.edu)

## Requirements Overview

The courses are categorized and listed with the terms that they are *generally* available. In addition to the listings below, many of the lower level elective courses and required math courses are offered in the summer class sessions.

***For all classes, students must check with the Department of Physics to confirm when each class is offered.***

### Core Physics Classes (28-31 credits)

Every PHYS major must complete the following classes, these core PHYS classes are only offered in the terms listed below:

	Fall	Winter	Spring
Foundations of Physics I	251	252	253
Foundations of Physics Lab	290	290	290*

\* Note: Two terms of PHYS 290 are required. We strongly suggest a total of three terms.

Foundations of Physics II	351	352	353
Physics Experimentation Data Analysis Lab	391	391*	

\* Note: only one term of PHYS 391 is required; it can be taken in the Fall or Winter

### Interdisciplinary Science Classes (ISC) (8 credits)

Every PHYS major must select and take two classes from the following list:

General Chemistry 1	CH 221
Honors Chemistry 1	CH 224H
General Chemistry 2	CH 222
Honors Chemistry 2	CH 225H
General Biology 1: Cells	BI 211
General Biology 2: Organisms	BI 212
General Biology 3: Populations	BI 213
Computer Science 1	CIS 210
Computer Science 2	CIS 211

Computer Science 3	CIS 212
Earth's Interior Heat and Dynamics	GEOL 201
Evidence, Inference, and Biostatistics	HPHY 212

**Mathematics Core (24 credits)**

Calculus	251	252	253
OR			
Honors Calculus	261	262	263
Differential Equations	256		
Several Variable Calculus	281	282	

Once these core courses are taken and passed, a student will choose which of the Physics degree tracks to pursue. The three tracks are shown in detail below.

<b>Pure Physics Track</b>	<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Electricity, Magnetism	412	413	
Mechanics		411	
Quantum Physics I, Quantum Physics II	414	415	
Topics in Quantum Physics			417
AND			
6 credit hours of upper division labs***			

<b>Applied Physics Track</b>			
Electricity, Magnetism	412	413	
8 credit hours of Core lab from			
Analog Electronics, Digital Electronics		431	432
Modern Optics		425	
6 credit hours of upper division labs***			

<b>Physics Teaching Track</b>			
Topics in Astrophysics	321		
Biological Physics	362		

Physics Demonstrations	420		
Analog Electronics, Digital Electronics	431	432	
Research Projects	491	492	493
<i>NOTE: to a total of 8 credits</i>			
Supervised Tutoring	409	409	
<i>NOTE: to a total of 6 credits</i>			

**\*\*\*Upper Division Lab Options**

Modern Optics Lab		425	
Research Projects ( <i>Advanced Projects Lab</i> )	491	492	493
<i>NOTE: Research Projects can be taken for either 2 or 4 credits</i>			
Analog Electronics*, Digital Electronics*		431	432
<i>*Listed as an option for the Pure track only, these courses are required for the Applied and Physics Education tracks</i>			

<b>Physics Electives:</b>	Fall	Winter	Spring
Astr: The Solar System	121	121	121
Astr: Birth and Death of Stars	122	122	122
Astr: Galaxy and the Expanding Universe	123	123	123
Astr: Astrophysics		321	
Hist: Early Modern Science		361	
Hum: Ancient Science and Culture		361	
Essentials of Physics	101	101	101
Physics of Sound and Music	152		
Light, Color, and Vision			153
Physics Behind the Internet		155	
Scientific Revolutions	156M		
Information, Quantum Mechanics, & DNA		157M	
Physics of Energy and the Environment		161	
Solar and Renewable Energies	162		
Nanoscience and Society		163	
The Physics of Life		171	171
Modern Science and Culture	361		
Biophysics		362	

Math Methods (for E&M)		410	
Math Methods (for Quantum)			410
Atmospheric Dynamics			410
Physics Demonstrations		420	
Electromagnetism			422
Modern Optics		425	
Research Projects	491	492	493
Transfer Seminar	399		
Research	401	401	401
Thesis	403	403	403
Reading	405	405	405
Field Studies	406	406	406
Student Electronics Shop	408		
Supervised Tutoring	409	409	409

**Additional University Requirements: (38-46 credits)**

## Physics: B.S. Degree Checklist

<u>Core Physics</u>		<u>Core Math</u>	
<input type="checkbox"/> PHYS 251	<input type="checkbox"/> PHYS 351	<input type="checkbox"/> MATH 251 or 261	<input type="checkbox"/> MATH 256
<input type="checkbox"/> PHYS 252	<input type="checkbox"/> PHYS 352	<input type="checkbox"/> MATH 252 or 262	<input type="checkbox"/> MATH 281
<input type="checkbox"/> PHYS 253	<input type="checkbox"/> PHYS 353	<input type="checkbox"/> MATH 253 or 263	<input type="checkbox"/> MATH 282
<input type="checkbox"/> PHYS 290 (x2)	<input type="checkbox"/> PHYS 391		
		<u>Interdisciplinary Science Core (Choose 2)</u>	
		<input type="checkbox"/> CH 221 or 224 – required prior to Fall 2017	
		<input type="checkbox"/> CH 222 or 225 – required prior to Fall 2017	
		<input type="checkbox"/> CIS 210	<input type="checkbox"/> BI 211
		<input type="checkbox"/> CIS 211	<input type="checkbox"/> BI 212
		<input type="checkbox"/> CIS 212	<input type="checkbox"/> BI 213
		<input type="checkbox"/> GEOL 201	<input type="checkbox"/> HPHY 212
<u>Pure Physics Track</u>			
<input type="checkbox"/> PHYS 412	<input type="checkbox"/> PHYS 414		
<input type="checkbox"/> PHYS 413	<input type="checkbox"/> PHYS 415		
<input type="checkbox"/> PHYS 411	<input type="checkbox"/> PHYS 417		
<input type="checkbox"/> 6 cr. upper div. lab*			
<u>Applied Physics Track</u>		<u>Physics Teaching Track</u>	
<input type="checkbox"/> PHYS 412	<input type="checkbox"/> PHYS 413	<input type="checkbox"/> ASTR 321	<input type="checkbox"/> PHYS 362
<input type="checkbox"/> PHYS 424	<input type="checkbox"/> PHYS 425	<input type="checkbox"/> PHYS 431	<input type="checkbox"/> PHYS 420
OR		<input type="checkbox"/> PHYS 432	<input type="checkbox"/> 6 cr. PHYS 409
<input type="checkbox"/> PHYS 431	<input type="checkbox"/> PHYS 432	<input type="checkbox"/> 8 cr. PHYS 491, 492, 493	
<input type="checkbox"/> PHYS 481			
<input type="checkbox"/> 6 credits of upper division lab*			



## Sample Physics Major Four-Year Plan

These are sample plans. Some classes are offered in multiple terms. This allows for flexibility in your schedule. Always check the most recent course offerings to confirm what classes are offered.

### Pure Physics Track:

Pure	Fall	Credits	Winter	Credits	Spring	Credits
Freshman	Physics 251	4	Physics 252	4	Physics 253	4
	<i>PHYS Lab 290</i>	1	<i>PHYS Lab 290</i>	1	<i>PHYS Lab 290</i>	1
	Math 251	4	Math 252	4	Math 253	4
Total Credits		9		9		9
Sophomore	Physics 351	4	Physics 352	4	Physics 353	4
	Math 256	4	PHYS Lab 391	4	Math 282	4
	ISC 1	4	Math 281 (ISC 2)	4 4	(ISC 2)	4
Total Credits		12		12(16)		8(12)
Junior	Physics 412	4	Physics 413	4	Physics 493	2
			Physics 411	4		
Total Credits		4		8		2
Senior	Physics 414	4	Physics 415	4	Physics 417	4
	Physics 491	2	Physics 492	2		
Total Credits		6		6		4

### Applied Physics Track:

Applied	Fall	Credits	Winter	Credits	Spring	Credits
Freshman	Physics 251	4	Physics 252	4	Physics 253	4
	<i>PHYS Lab 290</i>	1	<i>PHYS Lab 290</i>	1	<i>PHYS Lab 290</i>	1
	Math 251	4	Chemistry 222	4	Math 253	4
			Math 252	4		
Total Credits		9		12		8
Sophomore	Physics 351	4	Physics 352	4	Physics 353	4
	Math 256	4	PHYS Lab 391	4	Math 282	4
			Math 281	4		
Total Credits		8		12		8
Junior	Physics 412	4	Physics 413	4	Physics 432	4
			Physics 431	4	Physics 491	2
Total Credits		4		8		6
Senior	Physics 481	4	Physics 492	2	Physics 493	2
Total Credits		0		2		2

**Physics Teaching Track:**

Applied	Fall	Credits	Winter	Credits	Spring	Credits
Freshman	Physics 251	4	Physics 252	4	Physics 253	4
	<i>PHYS Lab 290</i>	1	<i>PHYS Lab 290</i>	1	<i>PHYS Lab 290</i>	1
	Chemistry 221	4	Chemistry 222	4	Math 253	4
	Math 251	4	Math 252	4		
Total Credits		12		12		8
Sophomore	Physics 351	4	Physics 352	4	Physics 353	4
	Math 256	4	PHYS Lab 391	4	Math 282	4
			Math 281	4		
Total Credits		8		12		8
Junior	Astronomy 321	4	Physics 362	4	Physics 491	4
			Physics 431	4	Physics 432	4
Total Credits		4		8		8
Senior	Physics 420	4	Physics 409	3	Physics 409	3
			Physics 492	4	Physics 493	2
Total Credits		6		7		5

**Comparison of All Tracks:**

	Fall			Winter			Spring		
	PURE	APP.	TEACH.	PURE	APP.	TEACH.	PURE	APP.	TEACH.
Fresh.	PHYS251 <i>PHYS290</i> Chem221 Math251			PHYS252 <i>PHYS290</i> Chem222 Math252			PHYS253 <i>PHYS290</i> Math253		
Soph.	PHYS351 Math256			PHYS352 PHYS391 Math281			PHYS353 Math282		
Junior	PHYS412		Astro321	PHYS411	PHYS431		PHYS493	PHYS491	
				PHYS413		PHYS362		PHYS432	
Senior	PHYS414	PHYS481	PHYS420	PHYS415	/	PHYS409	PHYS417	/	PHYS409
	PHYS491	PHYS354		PHYS492				PHYS493	

University Requirements:

- WR 121                       WR 122 or 123
- Two Multicultural Courses (check two):  AC  IP                       IC
- Arts & Letters Group (15 cr. - must double up in one subject)
- Social Science Group (15 cr. - must double up in one subject)
- 180 Credits
- 62 Upper Division Credits
- UO Residency Requirement (After completing 120 cr., at least 45 cr. must be taken at UO)
- 168 ABCDP\* credits (ABCDP\* = graded or P if the course is taught P/N only)
- 45 ABCD credits at UO (ABCD = graded credits)

### Index of Physics Courses

<b>Course #</b>	<b>Course Name</b>
Astr 121	The Solar System
Astr 122	Birth and Death of Stars
Astr 123	Galaxies and the Expanding Universe
Astr 321	Astrophysics
Hist 361	Early Modern Science
Hum 361	Ancient Science and Culture
PHYS 101	Essentials of Physics
PHYS 102	Essentials of Physics
PHYS 152	Physics of Sound and Music
PHYS 153	Light, Color, and Vision
PHYS 155	Physics Behind the Internet
PHYS 156M	Scientific Revolutions
PHYS 157M	Information, Quantum Mechanics, and DNA
PHYS 161	Physics of Energy and Environment
PHYS 162	Solar and Renewable Energies
PHYS 163	Nanoscience and Society
PHYS 171	The Physics of Life
PHYS 201	General Physics
PHYS 202	General Physics
PHYS 203	General Physics
PHYS 204	Intro Physics Lab
PHYS 205	Intro Physics Lab
PHYS 206	Intro Physics Lab
PHYS 251	Foundations Physics I
PHYS 252	Foundations Physics I
PHYS 253	Foundations Physics I
PHYS 290	Foundations Physics Lab
PHYS 351	Foundations Physics II
PHYS 352	Foundations Physics II

PHYS 353	Foundations Physics II
PHYS 361	Modern Science and Culture
PHYS 362	Biophysics
PHYS 391	Experimental Data Analysis Lab
PHYS 399	Transfer Seminar
PHYS 401	Research
PHYS 403	Thesis
PHYS 405	Reading
PHYS 406	Field Studies
PHYS 408	Student Electronics Shop
PHYS 409	Supervised Tutoring
PHYS 410	Math Methods
PHYS 410	“Special Topics” – this course number is used for classes that are offered under special circumstances.
PHYS 411	Mechanics
PHYS 412	Electrodynamics I
PHYS 413	Electrodynamics II
PHYS 414	Quantum Physics I
PHYS 415	Quantum Physics II
PHYS 417	Topics in Quantum Physics
PHYS 420	Physics Demonstrations
PHYS 422	Electromagnetism
PHYS 424	Classical Optics (also offered as PHYS 410)
PHYS 425	Modern Optics
PHYS 431	Analog Electronics
PHYS 432	Digital Electronics
PHYS 481	Design of Experiments
PHYS 491	Advanced Projects Lab – first enrollment
PHYS 492	Advanced Projects Lab – second enrollment
PHYS 493	Advanced Projects Lab – third enrollment

### Physics Faculty

Last Name	First Name	Field of Specialization	Office	Email
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