



Program Planning Guide

Current and past Program Planning Guides are available on the UofL website at www.uleth.ca/ross/ppgs/ppg.html

Calendar Year: 2011/2012

Faculty: Arts & Science

What is Physics?

Physics is the fundamental science, the study of matter and energy at all scales, from the subnuclear to the dimensions of the universe. The student who is interested in observing and understanding natural phenomena will enjoy the study of Physics.

About the Major in Physics

The University of Lethbridge Physics and Astronomy Department offers a comprehensive Physics major program. The foundation is built in the first two years by a study of mechanics, waves, electricity and magnetism, optics, thermal physics, and modern physics. In the third and fourth years, students deepen their understanding of the fundamentals, and study more advanced and specialized areas. Students have the benefit of relatively small classes and easy access to faculty. Students also have the opportunity to participate in the active research programs of the Faculty members through Independent Studies, Applied Studies, the Co-op program, and summer employment.

Major Branches of Physics

For those who will ultimately pursue a physics career, the major branches of physics include

- acoustics
- astrophysics
- atomic and molecular physics
- biophysics
- condensed matter physics
- cosmology
- geophysics
- high-energy physics
- medical physics
- nanoscience
- nuclear and particle physics
- soft matter physics

A Wide Diversity of Career Opportunities

Since physics is so fundamental, a physics major is ideally prepared, not only for employment or further study in physics, but also for advanced study or employment in a wide diversity of other fields. Physicists work in industry, they teach all levels from elementary to university education, and they do research in government labs, industry, and academia. Many people with a B.Sc. in physics find employment in related areas such as

- archaeometry
- chemistry
- computer science
- engineering
- medicine
- meteorology
- remote sensing

Because the critical thinking and analytical skills one is taught in the study of physics can be applied to many other fields, many graduates of physics also work in seemingly unrelated sectors such as

- banking
- finance
- forensics
- law
- oceanography
- patent examination

See the Physics website for more extensive information.

Physics/Science Education

The University of Lethbridge Physics and Astronomy Department offers a physics major and combined degrees with the Faculty of Education and the Faculty of Management.

Co-operative Education

A Co-op option, requiring three work terms, is available. Students interested in the Co-operative Education/Internship program should contact the Coordinator of Co-operative Education in the Career Resources Centre (AH154 | phone: 403-382-7154) for further information.

High School Courses

Several university-level science courses have high school-level courses as recommended background or prerequisites. Students are advised to complete recommended background courses before registering in the university-level course; students must have successfully completed prerequisites before they may register in the university-level course. Students pursuing a Physics major should note the following recommended/required high school courses.

<i>UofL Science course</i>		<i>High School course</i>
Biology	1010	Biology 30 and Chemistry 30**
	1020	<i>Recommended: Biology 30</i>
Chemistry	1000	Chemistry 30** and Mathematics 30-1 or Pure Mathematics 30*
		<i>Recommended: Mathematics 31 and Physics 30</i>
Mathematics	1410	Mathematics 30-1 or Pure Mathematics 30*
	1560	Mathematics 30-1 or Pure Mathematics 30*
		<i>Recommended: Mathematics 31 and a blended grade of at least 75% in Mathematics 30-1 or Pure Mathematics 30*</i>
Physics	1000	Physics 30, and Mathematics 30-1 or Pure Mathematics 30*
	1050	Mathematics 30-1 or Pure Mathematics 30*
		<i>Recommended: One course in the physical sciences at the 20 level or above</i>
	2130	Physics 30, and Mathematics 30-1 or Pure Mathematics 30*

** Instead of Mathematics 30-1, Mathematics 30-2, or Pure Mathematics 30, students may use UofL's Mathematics 0500, or both Applied Mathematics 30 and a minimum grade of 75% in Athabasca University's Mathematics 101.*

*** Instead of Chemistry 30, students may use UofL's Chemistry 0500.*

Program Requirements

The B.Sc. with a major in Physics requires 40 semester courses, including a minimum of 26 courses (18 Physics courses plus eight cognates) in the major. A maximum of 20 courses in Physics (including Astronomy and Engineering) is allowed.

Transfer Credit

Remember that you may use both University of Lethbridge credit and credit transferred from another college or university to meet degree and major requirements. Transfer credit may be either specified or unspecified. Specified credit is indicated on your transcript by the subject name and the specific number of the course, e.g., Physics 1000, Physics 2150, etc. Unspecified credit (1XXX, 2XXX, etc.) is indicated by the subject name and level of the course in parentheses, e.g., Physics (1000 level), Physics (2000 level), etc.

Unspecified Course Credit

Unspecified course credit means that the University of Lethbridge does not offer the same course you transferred in, but we recognize it and treat it as a regular course. An unspecified course would count as one of your maximum of 20 from one department, but it could not meet a specific course requirement. For example, if Physics 2150 is required in your program, you could not use Physics (2000 level) to fulfill that requirement. Students with unspecified transfer credit need to consult an Academic Advisor to establish how the transfer credit fits in the degree program. This should be done as soon as possible after transfer credit is awarded.

Program Worksheet

Name: _____ ID: _____

Required courses:

- _____ 1. ONE of:
- _____ Physics 1000 - Introduction to Physics I
 - _____ Physics 1050 - Introduction to Biophysics
 - _____ *Engineering 2060 - Engineering Mechanics

** Engineering 2000 and Mathematics 1560 are prerequisites for Engineering 2060.*

Note: *Students are advised that Physics 1000 is the preferred first course in Physics for majors, but students may enter the major through Physics 1050 or Engineering 2060, providing they have acquired the necessary mathematical background to complete Physics 2000 successfully.*

- _____ 2. Physics 2000 - Introduction to Physics II
- _____ 3. Physics 2120 - Introduction to Physics III
- _____ 4. Physics 2130 - Waves, Optics and Sound
- _____ 5. Physics 2150 - Quantum Mechanics I

- ___ 6. Physics 2800 - Methods in Mathematical Physics
- ___ 7. Physics 2900 - Studies in Experimental Physics (Series)
- ___ 8. Physics 3150 - Quantum Mechanics II
- ___ 9. Physics 3175 - Electricity and Magnetism
- ___ 10. Physics 3200 - Mechanics
- ___ 11. Physics 3400 - Thermal and Statistical Physics
- ___ 12. Physics 3750 - Contemporary Physics
- ___ 13. Physics 3800 - Methods of Theoretical Physics
- ___ 14. ****Physics 3900 - Intermediate Experimental Physics (Series) (Experimental Physics)**
- ___ 15. Physics 4175 - The Electromagnetic Interaction
- ___ 16. ONE of:
 - ___ Physics 4150 - Quantum Mechanics III
 - ___ Physics 4200 - Advanced Mechanics
- ___ 17-18. TWO of:
 - ___ Physics 3650 - Optics
 - ___ Physics 3840 - Introduction to Computational Physics
 - ___ ****Physics 3900 - Intermediate Experimental Physics (Series)**
 - ___ Physics 4000 - Advanced Studies in Physics (Series)
 - ___ Physics 4100 - Nuclear and Particle Physics
 - ___ Physics 4250 - Solid State Physics
 - ___ Physics 4650 - Physics of Remote Sensing

***The offering in the Physics 3900 Series entitled Experimental Physics is specifically required in the Physics Major. Another offering in the Physics 3900 Series (which will be indicated by a distinct title) may be used to meet a requirement in the "Two of" list.*

Note: Offerings in Physics 3850 (Topics in Physics) and Physics 4850 (Topics in Physics) and either Physics 4150 or Physics 4200 (if not used above) may be used to satisfy this requirement.

Required cognates:

- ___ 19. ONE of:
 - ___ Biology 1010 - Cellular Basis of Life
 - ___ Biology 1020 - Diversity of Life
- ___ 20. Chemistry 1000 - General Chemistry I
- ___ 21. Mathematics 1410 - Elementary Linear Algebra
- ___ 22. Mathematics 1560 - Calculus I
- ___ 23. Mathematics 2560 - Calculus II
- ___ 24. Mathematics 2570 - Calculus III
- ___ 25. Mathematics 2580 - Calculus IV
- ___ 26. ONE of:
 - ___ One course (3.0 credit hours) in English (at the 1000 level or higher)
 - ___ Writing 1000 - Introduction to Academic Writing

Note: It is recommended that students majoring in Physics include courses in Biology, Chemistry, Computer Science, and Mathematics.

It is strongly recommended that a student attain a grade of 'C' or higher in any course used to satisfy prerequisites for courses offered by the Physics and Astronomy Department.

Sample Sequencing Plan

Shown below is a sample sequence of courses for your degree. If you follow this plan, you should be able to graduate in four years, provided you complete five courses per semester. This is just one example of how you could complete your major and degree requirements; you may find that a different sequence works as well as this one.

<p>Year 1, Fall Biology 1010 or Biology 1020 <i>(required cognate)</i> Mathematics 1410 <i>(required cognate)</i> Mathematics 1560 <i>(required cognate)</i> Physics 1000 <i>(preferred)</i> GLER course</p>	<p>Year 1, Spring Chemistry 1000 <i>(required cognate)</i> Mathematics 2560 <i>(required cognate)</i> Physics 2000 Physics 2130 GLER course</p>
<p>Year 2, Fall English 1900 or Writing 1000 <i>(required cognate)</i> Mathematics 2570 <i>(required cognate)</i> Physics 2120 Physics 2800 GLER course</p>	<p>Year 2, Spring Mathematics 2580 <i>(required cognate)</i> Physics 2150 Physics 2900 GLER course GLER course</p>
<p>Year 3, Fall Physics 3200 Required Physics 3000/4000 level Required Physics 3000/4000 level GLER course Elective</p>	<p>Year 3, Spring Physics 3750 Required Physics 3000/4000 level Required Physics 3000/4000 level GLER course Elective</p>
<p>Year 4, Fall Required Physics 3000/4000 level Required Physics 3000/4000 level Required Physics 3000/4000 level Elective Elective Elective</p>	<p>Year 4, Spring Required Physics 3000/4000 level Required Physics 3000/4000 level Elective Elective Elective</p>

Note: Students are strongly advised to consult with the Department of Physics and Astronomy regarding the sequencing of courses.

All 3000- and 4000-level Physics courses are offered in alternating years, except for Physics 3200 and Physics 3750

Terms Used

GLER course: A course that could count toward the General Liberal Education Requirement. You may use courses in your major towards this 12-course requirement. See the 2011/2012 University of Lethbridge Calendar, Part 4 - Academic Regulations (p. 85) for complete information.

The Faculty of Arts and Science offers Liberal Education 1000 and 2000, specifically designed to introduce first-year students to the wide scope of human knowledge and teach essential university success skills, critical thinking, and integrative thinking (see the 2011/2012 University of Lethbridge Calendar, Part 14 - Courses, p. 306). LBED 1000 and 2000 may be used toward satisfying the GLER.

Elective: A course that you may choose freely from all those available and applicable to your program. Use courses inside or outside your major, bearing in mind any restrictions that may apply (e.g., a maximum of 20 courses from any one department).

Cognate: A course from a related discipline deemed to complement the chosen area of study and to encompass knowledge and skills essential to that area.

