University of Lethbridge

Name: _____ ID: _____

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: 2010/2011

Faculty: Arts & Science/Education

Department of Physics

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 seemly unrelated sectors such as

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

See the Physics website for more extensive information (www.uleth.ca/fas/phy/).

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.

Bachelor of Science/Bachelor of Education

Physics/Science Education

Co-operative Education in the Sciences

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 (B610 | phone: 403-382-7154) for further information.

Faculty of Education

Choosing an Education Major

The Faculty of Education offers 11 different majors that correspond to teaching subjects in Alberta schools (see p. 163 in the 2010/2011 University of Lethbridge Calendar for a listing). In highly competitive teaching majors, the GPA for admission may be above the minimum requirements.

How to Choose a Major

Students generally begin by thinking about which subjects they enjoyed and did well at in school. Students are also encouraged to conduct additional research regarding their interests and aptitudes. Students who are uncertain about their major should try taking introductory courses in several areas.

Choosing Courses Outside the Major

Students sometimes find that their initial objective to teach only at the elementary level or only at the secondary school level is later modified—or even completely changed. Students are therefore encouraged to select courses that will prepare them for teaching in a variety of situations. Moreover, students should select courses that not only provide breadth and richness for the classroom but also provide the basis for the development of a teaching minor or specialization.

Choosing an Education Minor

The Faculty of Education offers 19 minors (see p. 167 in the 2010/2011 University of Lethbridge Calendar for a listing). A minor consists of five non-Education courses (excluding those used in the major) and one curriculum and instruction Education course. Students may use the same courses to fulfill the minor and the General Liberal Education Requirement (GLER).

Choosing an Education Specialization

The Faculty of Education offers three specializations:

- Early Childhood Education
- Special/Inclusive Education
- Technology in Education

The specializations consist of four courses and corresponding Professional Semester III focus.

Advantages of Completing a Minor and/or Specialization

Completing a minor and/or a specialization allows students to develop expertise in a second area of teaching and be more versatile and marketable as a graduating teacher. For more information, see the 2010/2011 University of Lethbridge Calendar, Part 8 - Education, Sections 7. Education Minors (p. 167) and 8. Education Specializations (p. 172).

Where to Get Help

You can start career research at your school counselling centre, at your local library, or on the Internet, including websites like Alberta Advanced Education and Technology (www.advancededucation.gov.ab.ca). There are also many programs and people at the University of Lethbridge to assist you with a choice of major. Career and Employment Services (CES) assists students and alumni with their career exploration needs (in particular, see "What Can I Do With a Major in...?" at www.uleth.ca/ross/ces/majors.html). Students may also contact an Academic Advisor in Student Program Services in the Faculty of Education (email: edu.sps@uleth.ca | phone: 403-329-2254) or in the Faculty of Arts and Science (email: artsci.advising@uleth.ca | phone: 403-329-5106).

Program Requirements

The B.Sc./B.Ed. combined degrees program with a major in Physics/Science Education requires a minimum of 50 courses, including 30 in Arts and Science and 20 in Education. A minimum of 16 courses (10 courses in Physics plus six cognates) is required in the Physics major. A maximum of 17 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, 2120, 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 17 from one department, but it could not meet a specific course requirement. For example, if Physics 2000 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 Include:

_____ 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.*

_____ 2. Physics 2000 - Introduction to Physics II

_____ 3. Physics 2020 - The Physics of Everyday Life

_____ 4. Physics 2120 - Introduction to Physics III

_____ 5. Physics 2130 - Waves, Optics and Sound

_____ 6. Physics 2150 - Quantum Mechanics I

_____ 7. Physics 2900 - Studies in Experimental Physics (Series)

_____ 8. Physics 3750 - Contemporary Physics

_____ 9. ONE of:

- _____ Astronomy 2020 - Modern Astronomy
- _____ Astronomy 2070 - The Solar System

_____ 10. ONE other course (3.0 credit hours) offered by the Department of Physics and Astronomy, including courses in Astronomy or Engineering

_____

Required Cognates:

_____ 11. ONE of:

- _____ Biology 1010 - Cellular Basis of Life
- _____ Biology 1020 - Diversity of Life

_____ 12. ONE of:

- _____ Chemistry 1000 - General Chemistry I
- _____ Chemistry 1110 - Chemistry for Life Sciences I

_____ 13. Mathematics 1410 - Elementary Linear Algebra

_____ 14. Mathematics 1560 - Calculus I

_____ 15. Mathematics 2560 - Calculus II

_____ 16. Mathematics 2570 - Calculus III

Note: *Students wishing to include 3000-level Physics courses in their program must take Mathematics 2580 (Calculus IV) which is a prerequisite for such courses except Physics 3750 and some offerings of the Physics 3900 Series.*

It is recommended that Physics majors in Combined Degrees include courses in Biology, Chemistry, Computer Science, and Mathematics.

Since a number of senior-level Physics courses are offered only in alternate years, students are advised to plan carefully to include the desired courses. Consequently, students who intend to pursue a degree program with a major in Physics are strongly advised to seek help in planning their program from the Department of Physics and Astronomy.

The major in Physics for the Combined Degrees program provides a strong foundation in Physics, but it is not normally sufficient, in the absence of further study in the field, for pursuing graduate studies in Physics at a Canadian university.

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 five 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.

Year 1, Fall	***Year 1, Spring***
Chemistry 1000 or Chemistry 1110 *(required cognate)*	Biology 1010 or Biology 1020 *(required cognate)*
Mathematics 1410 *(required cognate)*	Mathematics 2560 *(required cognate)*
Mathematics 1560 *(required cognate)*	Physics 2000
Physics 1000 or Physics 1050	Physics 2130
GLER course	GLER course
Year 2, Fall	***Year 2, Spring***
Physics 2020	Astronomy 2020[2]
Education 2500[1]	Physics 2150
Mathematics 2570 *(required cognate)*	Physics 2900
Physics 2120	GLER course
GLER course	GLER course
Year 3, Fall	***Year 3, Spring***
Professional Semester I	Physics 3750
	GLER course
	Science elective 3000/4000 level
	Science elective 3000/4000 level
	Elective 3000/4000 level
Year 4, Fall	***Year 4, Spring***
GLER course 3000/4000 level	Professional Semester II
GLER course	
Science elective 3000/4000 level	
Science elective 3000/4000 level	
Elective 3000/4000 level	
Year 5, Fall	***Year 5, Spring***
Professional Semester III	Education Foundation course
	Education elective
	Education elective
	Education elective
	Physics elective 3000/4000 level[3]

Elementary Education and Special/Inclusive Education students will reverse the Fall and Spring semesters in Year 5 and complete PS III in the Spring.

[1] *Education 2500 may also be taken in Spring or Summer semester.*

[2] *Students require one of Astronomy 2020 or Astronomy 2070. Alternatively, students may complete a GLER course in Spring, Year 2 and Astronomy 2070 in Fall, Year 2.*

[3] *Physics electives may be chosen from Physics, Astronomy, or Engineering.*

Note: *Students wishing to include 3000-level Physics courses in their program must take Mathematics 2580 (Calculus IV) which is a prerequisite for most Physics courses at the 3000/4000 level.*

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 2010/2011 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 2010/2011 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 17 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.