PHYS126

Fluids, Fields, and Radiation

3 Credits

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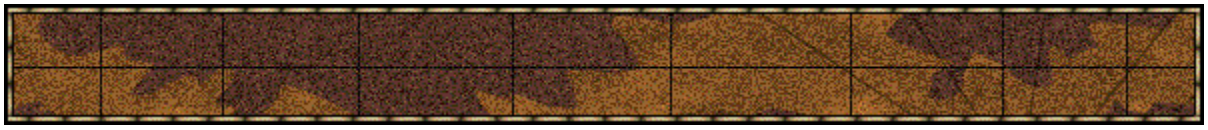

Fluids, Fields, and Radiation

Calendar Description

A continuation of PHYS 124 primarily for students in life, environmental, and medical science. Fluid statics and dynamics, gases, kinetic interpretation; electrostatics; currents and circuits; magnetic field; electromagnetic induction; nuclear radiation, its interaction with matter and applications.

Rationale

This is a required course for students interested in further study in pure science such as physics, chemistry, biology, mathematics and also for those who require a working understanding to achieve their career goals in medicine, engineering, geology, geophysics, agriculture and forestry, and environmental sciences. In addition, introductory physics is useful for non-science majors who enjoy science and look for scientific knowledge to heighten their awareness of the physical and material world.

Physics, as a science, is the study of matter and its motion, as well as their interactions in relation to energy, space and time. It deals with concepts such as mass, energy, charge, temperature, etc. It is an experimental science, and whose systems can be mathematically modeled. It provides a clearer understanding of other aspects of pure sciences. One of the joys of learning physics is the understanding of how the natural world applies in all aspects of our lives, from everyday activities like choosing color and type of material to wear in a given season to more far-reaching matters like information transmission through a wire-less network system. Much of the technological advancements witnessed today, including nanotechnology may be attributed to the theoretical and experimental researches in physics. Farmers, Medical doctors, Engineers, Pharmacists, Geologists, Geophysicists and some other professionals benefit in one way or the other from the study of physics.

Prerequisites

Physics 124

Co-Requisites

None

Course Learning Outcomes

Upon successful completion of this course, students will be able to

1. explain the properties of fluids (static and dynamic), force fields (electrical & magnetic) and radiations, and understand their interactions with matter.
2. apply the concepts related to fluids, fields and radiations in solving simple physical problems including environment and health issues.
3. conduct laboratory experiments that exercise the skills necessary to perform experiments in fluids, fields and radiations, analyze, interpret and report experimental data.
4. develop an appreciation for the basic principles of physics, as well as the appreciation for self confidence and the necessity for team work.

Resource Materials

***Required Texts*:**
Walker, James S. *Physics*. 2nd Custom ed. Pearson Education, 2010.

University Studies Department, Lakeland College. *Physics 124/126 Laboratory Manual*. 2013-2014. Print.

***Reference Texts*:**
Cutnell, John D., and Kenneth W. Johnson. *Physics*. 9th ed. Hoboken: John Wiley & Sons Inc., 2012. Print.

Conduct of Course

This is a 3 credit course with 3 hours of lecture 3 hours of lab per week. (3-0-3).

Physics 126 students attend lectures, participate in discussion, and run experiments in the laboratory. The class meets for a total of three hours (lecture/discussion) per week. An additional hour may be scheduled if necessary. The class also meets once a week for a three hour laboratory and computer assisted learning session. The instructor uses transparencies, videos, and computers as educational aids.

If necessary, students may be asked to provide answers to short quizzes at the beginning and end of some classes to assess the effectiveness of concepts delivery. The results are only to be used to tailor the course to student needs and will not contribute of affect students' grades.

Students are assigned problem sets. The aim is to give students more practice to enhance their skills in problem solving that is so essential to doing well in this course. The results contribute to the final grade. Solution or solution guide to each assigned problem will be provided and discussed in class following assignment due dates.

Laboratory
There will be approximately 10 laboratory sessions (3 hours each), carried out on a session per week. Students are required to study the "theoretical considerations" of every experiment in advance of the laboratory and complete the section entitled "Advance Preparation" or “prelab assignment” where required before coming to the lab. This should be submitted before or at the start of the laboratory period. The "Prelab Assignment" is designed to help students understand the experiment and to give them step-by-step practice with calculations. Marks are given for its completion.

Students must hand-in their lab reports at the completion of the laboratory period. As a consequence, students should fully prepare themselves before their laboratory sessions.

There is a brief lecture (approximately 10 minutes) on experiments that need theoretical background not covered in the lectures as some lectures and labs schedule may not synchronize with one another. This is because it is often not possible to match the pace of lectures to topic changes in the lab.

Good quality lined note paper and 1 cm fine ruled graph paper (some of which is included at the end of the manual) are used for laboratory reports. A small electronic calculator, a small ruler, a pencil and pen, are also necessary.

In order to eliminate accidents in our laboratory, students are required to read and obey the rules of safety outlined in the manual. Potentially dangerous areas will be clearly marked and safety precautions observed.

Federal and Provincial Legislation (WHMIS) recognize the workers "right" to know about hazardous materials in the workplace. Students carrying out experiments in a lab are considered workers, and the lab is their workplace. Therefore, they need to identify dangerous materials/chemicals in the lab and be able to protect themselves. The required information is provided in what is called Material Safety Data Sheets (MSDS). Students are requested to consult the MSDS before running an experiment. Materials Safety Data Sheets (MSDS) of all chemicals used in the Lloydminster campus chemistry lab can be found in two locations:

1. One set is available in the library. Students can find them in the reference books section or ask the librarian for help.

2. The other set is in the Hazard Information Center in Room 1008 (chemistry lab).

Laboratory Schedule
The labs begin a week after classes start. There are about nine experiments and one lab exam as listed in the Course Units/Calendar section of this outline. These follow the same sequence as found in your lab manual.

Evaluation Procedures

The final grade is an aggregate of the following components:

Assignments	10%
Laboratory*	20%
Midterm Exam**	30%
Final Exam**	40%
Total	100%

* A student must obtain a passing grade of 50% or better in the laboratory to receive a passing grade for the course.

** Related dates will be announced during the first class session.

No supplemental assignments or examination re-writes are permitted in this course, unless in cases where a student is medically un-fit to write the examination at the scheduled date.

Grade Equivalents and Course Pass Requirements

A minimum grade of D (50%) (1.00) is required to pass this course.

Letter	F	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Percent Range	0-49	50-52	53-56	57-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	1.00	1.30	1.70	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.

Attendance

Regular attendance is essential for success in any course. Absence for any reason does not relieve a student of the responsibility of completing course work and assignments to the satisfaction of the instructor. Poor attendance may result in the termination of a student from a course(s).

If you do not meet the established attendance requirements, your instructor will recommend that the Registrar withdraw you from the course. A failing grade of RW (Required to Withdraw) will appear on your transcript.

In cases of repeated absences due to illness, the student may be requested to submit a medical certificate.

Instructors have the authority to require attendance at classes.

Course Units/Topics

Session	Topics
I. Fluids	
1	Properties of fluids: Statics – mass density, weight density, pressure
2	Forces acting on fluids
3	Buoyant forces – Archimedes' principle
4	Fluid dynamics, equation of continuity
5	Applications of fluid dynamics
6	Kinetic theory of gases
II. Electrostatics and Current Electricity	
7	Charged objects, Electric force, Coulomb's law
8	Electric fields, Electric field of continuous charge distribution
9	Motion of charged particle in uniform electric field, Gauss's law (descriptive)
10	Electric potential, potential differences in a uniform electric field
11	Potential energy due to point charges, Electric potential due to continuous charge distribution, and a charged conductor
12	Capacitance: Series and Parallel
13	The Millikan Oil-drop experiment, Applications of electrostatics
14	Electric circuit: current, resistance, electromotive force
15	Resistance in series and parallel
16	Kirchhoff's Rules
17	AC Sources
18	RLC Circuit
19	Midterm Exam
20	Review of Midterm exam
III. Magnetic Field, Electromagnetic Induction	
21	Magnetic fields and forces
22	Motion of charged particles in a uniform magnetic field
23	Applications involving charged particles moving in a magnetic field
24	Magnetic force acting on a current-carrying conductor
25	Torque on current loop in a magnetic field
26	Electromagnetic induction
27	Laws of electromagnetic induction: Faraday's law, Lenz's law
28	Ampere's law

29	Applications: Generators
30	Transformers
IV. Radiation	
31	Nature of atom: Bohr's model
32	Line spectra
33	Nuclear structure: Mass Defect, Binding energy
34	Radioactivity
35	Radioactivity: Applications
36	Ionizing Radiation: Exposure and Absorbed dose
37	Biological effects of ionizing radiation
38	Induced nuclear reactions
39	Nuclear fission and fusion
40	**Final Examination**

Laboratory Schedule

Session	Topics
1	Properties of Fluids
2	Terminal Velocity
3	Coulomb's Law
4	Electrostatics Potentials
5	Capacitance
6	Resistance
7	Magnetic Fields
8	Measurement of e/m
9	Detection of Radiation
10	Laboratory Test

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