Grande Prairie Regional College

School of Business

Department: Academic Upgrading

COURSE OUTLINE – WINTER 2006

PC0130 5(5-0-1.5)HS Physics Grade 12 Equivalent

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Office Hours	Monday, Tuesday, Thursday, Friday: 11:30 - 12:30 or by appointment		

Prerequisite(s)/corequisite(s):

PC 0120 or equivalent and MA 0120 or equivalent or MA0130 placement.
A sound knowledge of vectors (a module will be provided).

Required Text/Resource Materials:

COLLEGE PHYSICS by WILSON & BUFFA (Fifth Edition)

Credit/Contact Hours:

PC 0130 is a 5-credit course with 5 hours/week lecture and 1.5 hr/week lab component.

Course Description:

The major concepts to be covered in this course include work done by a variable force; momentum and its conservation; electric forces and fields; current electricity; magnetic fields and electromagnetic effects; electromagnetic waves and Maxwell's theory; atomic structure; black body radiation; and nuclear fission and fusion. Problem solving is emphasized.

Attendance and Classroom Decorum:

Regular attendance is expected of all students which is crucial to good performance in the course. Any interruption due to lateness or use of cell phones or otherwise will not

be permitted. You may be debarred from the final exam if your absences exceed 15% (10 days) of class days.

Tests and Exams:

All tests and exams **MUST** be written at the scheduled times unless **PRIOR** arrangements have been made with the instructor. A missed test (exam) will result in a score of **ZERO** in that test (exam).

Labs:

Attendance is compulsory in all labs. A missed lab will result in a score of **ZERO** in that lab. Make-up labs **CANNOT** be guaranteed. Labs reports must be handed in by the deadlines announced. Late lab repots will result in penalties - a one-day delay 2 marks and a two-day delay 3 marks. Labs handed in after two days will not be graded unless PRIOR approval of the Instructor has been secured.

Evaluation:

The final grade in the course will be based on the following components. Normally, evaluation will be grading norm referenced.

4 Tests	=	36%
Midterm Exam	=	24%
Labs	=	15%
Final Exam	=	25%

Grades will be assigned on the Letter Grading System.

Academic Upgrading Department

Grading Conversion Chart

Alpha Grade	4-point Equivalent	Percentage Guidelines	Designation
A⁺	**4**	**90 – 100**	**EXCELLENT**
A	**4**	**85 – 89**	
A⁻	**3.7**	**80 – 84**	**FIRST CLASS STANDING**
B⁺	**3.3**	**76 – 79**	
B	**3**	**73 – 75**	**GOOD**

B⁻	**2.7**	**70 – 72**	
C⁺	**2.3**	**67 – 69**	**SATISFACTORY**
C	**2**	**64 – 66**	
C⁻	**1.7**	**60 – 63**	
D⁺	**1.3**	**55 – 59**	**MINIMAL PASS**
D	**1**	**50 – 54**	
F	**0**	**0 – 49**	**FAIL**

Course Objectives:

The following are the minimum objectives which must be achieved in the course. More objectives may be added later depending upon the rate of progress. The numbers in the parentheses following the objectives or problems/questions are the page numbers of the Text matching the objectives or problems.

UNIT 1: (About 3.0 weeks) Work by a variable force (Chapter 5). Momentum (Chapter 6). Rotational equilibrium (Chapter 8)

On completing this unit, the student should be able to

Chapter 5 (146 -149)

a. Define and explain work done by a variable force
b. Define spring (or force) constant. Determine spring constant, and calculate the work done in stretching (or compressing) a spring. Solve related problems

Problems: 23 - 27, 29 - 31 **(173)** and 97 **(177)**

Chapter 6 (179 - 201)

c. Define and explain momentum, and state its units. Resolve momentum into components
d. Explain conservation of momentum, and apply the principle to solve related problems.
e. Explain how the principle of conservation of momentum can be used to determine the muzzle velocity of a bullet.

f. Define impulse and state its units. Explain the significance of impulse. Solve related problems

g. Define elastic and inelastic collisions. Calculate kinetic energy changes in inelastic collisions. Solve related problems.

Problems: (211 - 218) 6, 7, 10, 11, 13, 15, 17, 18, 19, 20, 22, 30, 31, 32, 36, 37, 39, 48, 49, 51, 54, 55, 56, 57, 66, 67, 70, 72, 74, 76, 101, 104, 105, 108

Chapter 8 (264 - 270)

h. Define torque, and state its units. Explain the significance of torque, and state conditions which are necessary to produce a torque

i. Calculate torque produced by a force

j. Explain rotational equilibrium, and state conditions necessary for a rotational equilibrium. Solve related problems

Problems: (295 - 297) 22, 27, 28, 29, 33, 34, 35, 39, **(303 - 304)** 116, 117

NOTE: (1) Perform labs on SPRING CONSTANT, MOMENTUM, and ROTATIONAL EQUILIBRIUM

(2) WRITE UNIT 1 TEST

UNIT 2: (About 4.0 weeks) Electric Charges; Electric Fields (Chapter 15). Electric Potential; Capacitors (Chapter 16). Electric Current; Ohm's Law (Chapter 17).

On completing this unit, the student should be able to

Chapter 15 (513 - 537)

a. Explain the two kinds of charges, and state their units. State the charge on the electron and the proton

b. Explain conductors and insulators. Explain charging by friction, by induction, and by polarization.

c. Describe the working of an electroscope, and explain how charges can be detected by it

d. Define Coulomb's Law and apply it to determine force between different charge configurations. Solve related problems.

e. Define electric field, and state its units. Describe the characteristics of electric lines of force

f. Calculate electric fields in different situations. Solve related problems

Problems: (539 - 544) 1,11, 30, 31, 33, 34, 35, 38, 51, 53, 54 - 58, 60, 62, 64, 86, 88, 89, 91, 99

Chapter 16 (545 - 570)

g. Explain electrical potential energy, and potential (difference), and give their mathematical expressions. Calculate electric potential energy in different charge configurations. Define electron-volt. Solve related problems

h. Define capacitor, and capacitance. State units of capacitance. Calculate the capacitance, the potential difference, the charge, and the energy stored in a capacitor. Solve related problems.

i. Define dielectric materials, and state their effect on the capacitance of a capacitor. Solve related problems

j. Determine the capacitance of a combination of capacitors connected in series and/or in parallel. Solve related problems

Problems: (572 - 576) 10 - 13, 17, 20 - 25, 27, 28, 31, 47 - 50, 58, 67 - 69, 71, 72, 78, 82, 88 - 90, 93, 95, 102, 103

Chapter 17 (577 - 593)

k. Label the parts of a battery, and explain its working. Define charge, current, and rift velocity.

l. Define electromotive force (EMF), and potential difference, and state their respective units. State the relation between EMF and potential difference

m. Define resistance; give its units, and state factors that affect the resistance of a wire. Solve related problems

n. Define an electric circuit, and be able to draw it showing all the parts. State Ohm's law and apply it to electric circuits. Solve related problems.

o. Define electric power and state its units. Explain Joule heat, and efficiency. Solve related problems.

Problems: (596 - 600) 15, 16, 31, 32, 35, 37, 38, 41, 48, 50, 61, 62, 65, 66, 69, 70, 73,75, 79, 93, 99, 100

NOTE: (1) Perform labs on ELECTROSTATICS and OHM'S LAW

(2) WRITE UNIT 2 TEST

(3) WRITE MIDTERM EXAM

UNIT 3: (About 3.5 weeks) Basic electric circuits (Chapter 18). Magnetism (Chapter 19) Electromagnetic Induction; (Chapter 20)

On completing this unit, the student should be able to

Chapter 18 (601 - 610, 619 - 626)

a. Explain series and parallel circuits as also the combination circuits, and draw diagrams as appropriate to represent them. Calculate voltage, current and resistance in such circuits. Perform appropriate calculations
b. Analyze a given circuit, and determine the resultant resistance, and the current in each part of the circuit
c. Describe the functioning of the ammeter and the voltmeter. Explain how they can be converted into each other. Solve related problems
d. Explain safety in household circuits. Be able to identify safety problems, if any, and be able to fix them

Problems: (627 633) 10, 11, 13, 15, 18, 19, 21, 22 - 27, 29, 30, 33, 35, 36, 37, 76, 78, 80, 91, 93, 97, 106

Chapter 19 (634 - 640, 644 - 655)

e. Define magnetism, magnetic poles, and the law of poles. Explain magnetic fields and their direction.
f. Calculate the force experienced by a moving charge in a magnetic field and state the rule to determine its direction. Apply the Rule to determine the direction of the force. Solve related problems
g. Explain electromagnetism, and the strength of a magnetic field in terms of the force experienced by a moving charge. Solve related problems
h. State the relationship between the magnetic field and electric current in (I) a straight wire (ii) in a closed loop (iii) in a solenoid. Solve related problems
i. Calculate the force and the strength of the magnetic field between two current-carrying wires. Determine the direction of the force and the field. Solve related problems
j. State the relation between the force on a current-carrying wire and the strength of the magnetic field in which it is held. State also the relation between the torque on a current -carrying loop and the strength of the magnetic field in which it is rotated. Solve related problems
k. Explain the construction and working of a (i) galvanometer, (ii) a d-c motor

Problems: (662 - 668) 14, 15, 17, 19, 24, 26, 38, 39, 41 - 45, 49, 52, 54, 56, 63, 65, 67, 69, 71, 73, 75, 77, 86, 92, 93, 95, 96, 97, 99

Chapter 20 (669 - 687)

l. Explain magnetic flux, and electromagnetic induction. State and explain Faraday's and Lenz's laws. State the mathematical relation between the induced EMF and the magnetic flux. Solve related problems

m. Describe the construction and working of an AC generator. Explain back EMF in motors. Solve related problems

n. Explain the construction and working of transformers. Explain how power is transmitted. Calculate losses in power. Solve related problems

Problems: (696 - 701) 10 - 21, 24, 25 - 27, 36, 37, 40, 43, 46, 47, 55 - 59, 63, 64, 66, 68, 69, 83, 85, 86, 88, 89, 91, 93, 94, 95

NOTES: (1) WRITE UNIT 3 TEST
(2) PERFORM LABS ON RESISTORS IN SERIES, AND RESISTORS IN PARALLEL

UNIT 4: (About 2.5 weeks) Quantum Physics - Black body radiation, photoelectric effect (Chapter 27). The Nucleus - Nuclear Structure; Radioactivity; Nuclear Stability (Chapter 29). Nuclear Fission and Fusion (Chapter 30)

On completing this unit, the student should be able to:

Chapter 27 (875 - 885)

a. Explain black body (thermal) radiation. State Wien's law and apply it to solve problems

b. State and explain Planck's hypothesis and its importance. Define Planck's constant. Solve related problems

c. Explain photoelectric effect, and the dual nature of light. Describe some applications of photoelectric effect

d. Explain stopping potential, and state the relation between stopping potential and electron speed. Solve related problems

e. Explain threshold frequency, and state the relation between threshold frequency and the wavelength. Solve related problems

f. Explain Compton's effect as applied to scattering of X - rays. Solve related Problems

g. Explain de Broglie's hypothesis and its significance as applied to subatomic particles

Problems: (898 - 901) 6, 9, 11, 12, 20, 21, 23, 25, 28 - 32, 34, 36, 44 - 46, 48, 49, 82, 84, 85

Chapter 29 (928 -949)

h. Explain radioactivity, and describe alpha, beta and gamma modes of radioactive decay giving examples. Balance radioactive decay equations

i. Explain decay rate, and half-life period, and give mathematical relation between them. Solve related problems

j. Explain radioactive dating. Solve related problems

k. Explain nuclear stability, and discuss general characteristics of a stable nucleus. Explain mass defect and binding energy. Solve related problems

Problems: (958 - 962) 17 - 19, 22, 23, 27, 31a, 34, 35, 37, 40, 41, 42, 44, 45, 46, 48, 57, 58, 59, 61, 62, 65, 69, 83, 84, 87, 91, 94, 96

Chapter 30 (967 - 969, 972 - 974)

l. Explain nuclear fission, and write equations involving chain reactions during fission

m. Explain nuclear fusion, and explain the fundamental difference between fission and fusion. Solve related problems

n. Write fusion equations, and calculate energy released in fusion reactions. Solve related problems

o. Discuss the possibility of fusion reactions as future source of energy

Problems: (989) 34, 35, 36

NOTES: (1) WRITE UNIT TEST
(2) WRITE FINAL EXAM

Statement on Plagiarism:

The instructor reserves the right to use electronic plagiarism detection services.