DEPARTMENT OF ACADEMIC UPGRADING
COURSE OUTLINE FALL 2020

PC0120(A3) - Physics Grade 11 Equivalent 5 (4-0-2) HS
6 hours / week for 15 weeks 90 hours)

INSTRUCTOR: Sheryl Heikel **PHONE:** Office:
OFFICE: C417 **E-MAIL:** sheikel@gprc.ab.ca

OFFICE HOURS: **(Virtual)** Tuesday and Thursdays 2:30-3:30 pm Or by appointment

CALENDAR DESCRIPTION:

PC0120 - Physics Grade 11 Equivalent 5 (6-0-2) HS
The major concepts to be covered in this course include: Kinematics, dynamics, forces, gravity and Newtons Laws, work-energy theorem oscillatory motion and mechanical waves. Problem solving is highly emphasized throughout the course. Graphs, equations and vectors will be used as problems solving tools.

PREREQUISITE(S)/COREQUISITE:
Sc0110 and MA0090 or MA0110 placement.

REQUIRED TEXT/RESOURCE MATERIALS:
Pearson Physics text
Access to a scanner or camscanner that will allow you to scan multiple pages into a single pdf to be emailed to your instructor. Many of these programs have free versions that will be fine. (They will continually ask you to upgrade and pay money but keep saying "No".)
Scientific calculator (if you need to purchase TI-30X IIS is recommended)
graph paper (fine lined *10 lines/cm* - may be printed from Moodle)
Clear 30 cm ruler, protractor

FALL 2020 DELIVERY:

Remote Delivery. This course is delivered remotely. There are no face-to-face or onsite requirements. Students must have a computer with a webcam and reliable internet connection. Technological support is available through helpdesk@gprc.ab.ca.

COURSE OBJECTIVES: ***Students will:***

Kinematics
- describe motion in terms of displacement, velocity, acceleration and time

Dynamics
- explain the effects of balanced and unbalanced forces on velocity
- explain that gravitational effects extend throughout the universe.

Circular Motion, Work and Energy
- explain circular motion, using Newton's laws of motion
- explain that work is a transfer of energy and that conservation of energy in an isolated system is a fundamental physical concept

Oscillatory Motion and Mechanical Waves
- describe the conditions that produce oscillatory motion
- describe the properties of mechanical waves and explain how mechanical waves transmit energy.

Lab Skill objectives (focus on scientific inquiry)
- Initiate, Plan, Perform, Record, Analyze, Interprete, Communicate and work in a Team

LEARNING OUTCOMES: Please see pages 4-6.

TRANSFERABILITY:
Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability. This course is listed in the Alberta Transfer Guide as equivalent to Physics 20.
**Although 50% (D) is considered a pass for this course, it is strongly recommend that you achieve a mark of 65% (C) to be successful at the next level.

EVALUATIONS: Course final grade will be based on the following components.

3 Unit Tests (equally weighted)	50%	
Labs, Assignments, Quizzes	15%	**Late penalty 20% per day for 2 days.**
Final Exam (Cumulative)	35%	

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 on that test (exam). Only in very specific cases may student be given an opportunity to make up a missed exam (student will be presented with a different version of the exam). Doctor, lawyer or police documentation may be required. The final exam is 3 hours long and is scheduled by the registrars' office during GPRC Exam weeks. **Please make your self familiar with the GPRC exam policy.**

GRADING CRITERIA: Final Grades will be assigned on the Letter Grading System.

Alpha Grade	4-point Equivalent	Percentage Guidelines	Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	90-100	C+	2.3	67-69
A	4.0	85-89	C	2.0	63-66
A-	3.7	80-84	C-	1.7	60-62
B+	3.3	77-79	D+	1.3	55-59
B	3.0	73-76	D	1.0	50-54
B-	2.7	70-72	F	0.0	00-49

COURSE SCHEDULE / TENTATIVE TIMELINE:

Physics 0120 consists of four units (approx. 3 weeks each) Exam dates to be announced.

A. Kinematics (text ch1-2)
B. Dynamics (text ch3-4)
C. Circular Motion, Work & Energy, SHM (text 5-7)

D. Oscillatory Motion & Mechanical Waves (7-8) will be tested on final exam.

Labs: **Note: Labs will be completed virtually. Zoom Lectures are held on on lab days when there is no lab. See course schedule.**

- Attendance is compulsory in all labs.
- Missed labs result in a score of zero. **There are NO make-up labs.**
- If you are late and have missed the lab safety discussion, you will be excluded from participating in the lab and will receive a mark of zero.
- Late lab reports will result in a penalty of 20% per day. Labs over two days late will not be graded without PRIOR approval.
- Download the lab sheets and complete the Pre-lab assignment before the lab period, data tables are completed during the lab and analysis and questions after the lab

STUDENT RESPONSIBILITIES:

Refer to the College Policy on Student Rights and Responsibilities at https://www.gprc.ab.ca/files/forms_documents/StudentRightsandResponsibilities.pdf

The Academic Upgrading Department is an adult education environment. Students are expected to show respect for each other as well as faculty and staff. Students are expected to participate fully in achieving their educational goals.

Certain activities are disruptive and not conducive to an atmosphere of learning. In addition to the *Student Rights and Responsibilities* as set out in the College calendar, the following guidelines will maintain an effective learning environment for everyone. We ask the cooperation of all students in the following areas of classroom deportment.

1. **Attendance**: Regular attendance and class participation is expected of all students and is crucial to good performance in the course. Class interruption due to habitual late arrival or leaving early will not be permitted. You may be debarred from the final exam if your absences exceed 15% of class days (10 lecture classes).
2. Check **Moodle** as well as **GPRC email** on a regular basis.
3. **Once in class** – remain in class. Leaving to get a coffee is disruptive for others.
4. Assignments must be submitted on time.
5. Exams must be written on the days announced in class.
6. If an emergency prevents attendance on an exam day, students must contact me before the end of the exam (as soon as possible) via phone or email, and may be asked to provide documentation to justify their absence.
7. No unspecified electronic devices will be permitted during exams.
8. Complete daily homework. **At least 1.5** hours of study per day outside of class time is required.
9. Behaviors that interfere with learning are not acceptable.
10. Take responsibility for your learning.
11. **Communicate all requests regarding appointments, etc via email**.

STATEMENT ON PLAGIARISM AND CHEATING:

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, refer to the Student Conduct section of the College Calendar at http://www.gprc.ab.ca/programs/calendar/ or the College Policy on Student Misconduct: Plagiarism and Cheating at https://www.gprc.ab.ca/about/administration/policies
**Note: all Academic and Administrative policies are available on the same page.

PC0120 Learning Outcomes (adapted from Alberta Learning Physics 30 curriculum http://education.alberta.ca/media/654853/phy2030_07.pdf)

Unit A: Kinematics

Key Concepts:
- vector quantities
- uniform motion
- uniformly accelerated motion
- two-dimensional motion

General Outcome: Students will:

1. Describe motion in terms of displacement, velocity, acceleration and time.
   - define, qualitatively and quantitatively, displacement, velocity and acceleration
   - define, operationally, and compare and contrast scalar and vector quantities
   - explain, qualitatively and quantitatively, uniform and uniformly accelerated motion when provided with written descriptions and numerical and graphical data
   - interpret, quantitatively, the motion of one object relative to another, using displacement and velocity vectors
   - explain, quantitatively, two-dimensional motion in a horizontal or vertical plane, using vector components.

Unit B: Dynamics

Key Concepts:
- Newton's laws of motion
- inertia
- vector addition
- static and kinetic friction
- gravitational force
- Newton's law of universal gravitation
- gravitational field

General Outcome: Students will:

1. Explain the effects of balanced and unbalanced forces on velocity.
   - explain that a nonzero net force causes a change in velocity
   - apply Newton's first law of motion to explain, qualitatively, an object's state of rest or uniform motion
   - apply Newton's second law of motion to explain, qualitatively, the relationships among net force, mass and acceleration
   - apply Newton's third law of motion to explain, qualitatively, the interaction between two objects, recognizing that the two forces, equal in magnitude and opposite in direction, do not act on the same object
   - explain, qualitatively and quantitatively, static and kinetic forces of friction acting on an object
   - calculate the resultant force, or its constituents, acting on an object by adding vector components graphically and algebraically
   - apply Newton's laws of motion to solve, algebraically, linear motion problems in horizontal, vertical and inclined planes near the surface of Earth, ignoring air resistance

2. Explain that gravitational effects extend throughout the universe
   - identify the gravitational force as one of the fundamental forces in nature
   - describe, qualitatively and quantitatively, Newton's law of universal gravitation
   - explain, qualitatively, the principles pertinent to the Cavendish experiment used to determine the universal gravitational constant, G
   - define the term "field" as a concept that replaces "action at a distance" and apply the concept to describe gravitational effects
   - relate, qualitatively and quantitatively, using Newton's law of universal gravitation, the gravitational constant to the local value of the acceleration due to gravity
   - predict, quantitatively, differences in the weight of objects on different planets.

Unit C: Circular Motion, Work and Energy

Key Concepts
- uniform circular motion
- planetary and satellite motion
- Kepler's laws
- mechanical energy
- conservation of mechanical energy
- work-energy theorem
- isolated systems
- power

General Outcome: Students will:

1. Explain circular motion, using Newton's laws of motion.
   - describe uniform circular motion as a special case of two-dimensional motion
   - explain, qualitatively and quantitatively, that the acceleration in uniform circular motion is directed toward the centre of a circle
   - explain, quantitatively, the relationships among speed, frequency, period and radius for circular motion
   - explain, qualitatively, uniform circular motion in terms of Newton's laws of motion
   - explain, quantitatively, planetary and natural and artificial satellite motion, using circular motion to approximate elliptical orbits
   - predict the mass of a celestial body from the orbital data of a satellite in uniform circular motion around the celestial body
   - explain, qualitatively, how Kepler's laws were used in the development of Newton's law of universal gravitation.
2. Explain that work is a transfer of energy and that conservation of energy in an isolated system is a fundamental physical concept
   - define mechanical energy as the sum of kinetic and potential energy
   - determine, quantitatively, the relationships among the kinetic, gravitational potential and total mechanical energies of a mass at any point between maximum potential energy and maximum kinetic energy
   - analyze, quantitatively, kinematics and dynamics problems that relate to the conservation of mechanical energy in an isolated system
   - recall work as a measure of the mechanical energy transferred and power as the rate of doing work
   - describe power qualitatively and quantitatively
   - describe, qualitatively, the change in mechanical energy in a system that is not isolated

Unit D: Oscillatory Motion and Mechanical Waves

Key Concepts:

- oscillatory motion
- simple harmonic motion
- restoring force
- oscillating spring, pendulum
- mechanical resonance
- mechanical waves—longitudinal, transverse
- universal wave equation
- reflection
- interference
- acoustic resonance
- Doppler effect

1. Describe the conditions that produce oscillatory motion.
   - describe oscillatory motion in terms of period and frequency
   - define simple harmonic motion as a motion due to a restoring force that is directly proportional and opposite to the displacement from an equilibrium position
   - explain, quantitatively, the relationships among displacement, acceleration, velocity and time for simple harmonic motion, as illustrated by a frictionless, horizontal mass-spring system or a pendulum, using the small-angle approximation
   - determine, quantitatively, the relationships among kinetic, gravitational potential and total mechanical energies of a mass executing simple harmonic motion
   - define mechanical resonance.
2. Describe the properties of mechanical waves and explain how mechanical waves transmit energy.
   - describe mechanical waves as particles of a medium that are moving in simple harmonic motion
   - compare and contrast energy transport by matter and by waves
   - define longitudinal and transverse waves in terms of the direction of motion of the medium particles in relation to the direction of propagation of the wave
   - define the terms wavelength, wave velocity, period, frequency, amplitude, wave front and ray as they apply to describing transverse and longitudinal waves
   - describe how the speed of a wave depends on the characteristics of the medium
   - predict, quantitatively, and verify the effects of changing one or a combination of variables in the universal wave equation ($v = f\lambda$)
   - explain, qualitatively, the phenomenon of reflection as exhibited by mechanical waves

- explain, qualitatively, the conditions for constructive and destructive interference of waves and for
- acoustic resonance
- explain, qualitatively and quantitatively, the Doppler effect on a stationary observer of a moving source.

Lab Skills and objectives are included in labs and assignments in each unit of the course.

Specific Outcomes for Skills (focus on scientific inquiry)

Initiating and Planning

Students will :

• identify, define and delimit questions to investigate
• design an experiment, identifying and controlling major variables
• state a prediction and a hypothesis based on available evidence or background information or on a theory
• evaluate and select appropriate procedures, including appropriate sampling procedures, and instruments for collecting evidence and information

Performing and Recording

Students will :

• research, integrate and synthesize information from various print and electronic sources regarding a scientific question
• select and use appropriate instruments for collecting data effectively, safely and accurately
• carry out procedures, controlling the major variables, and adapt or extend procedures where required
• compile and organize findings and data by hand or computer, using appropriate formats such as diagrams, flowcharts, tables and graphs
• apply Workplace Hazardous Materials Information System (WHMIS) standards to handle and dispose of materials

Analyzing and Interpreting

Students will :

• apply appropriate terminology, classification systems and nomenclature used in the sciences
• interpret patterns and trends in data and predict the value of a variable by interpolating or extrapolating from graphical data or from a line of best fit
• estimate and calculate the value of variables, compare theoretical and empirical values, and account for discrepancies
• identify limitations of data or measurements; explain sources of error; and evaluate the relevance, reliability and adequacy of data and data collection methods
• identify new questions or problems that arise from what was learned
• state a conclusion, based on data obtained from investigations, and explain how evidence gathered supports or refutes a hypothesis, prediction or theory

Communication and Teamwork

Students will :

• work collaboratively to develop and carry out investigations
• select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions
• evaluate individual and group processes used in planning and carrying out investigative tasks