Three Rivers Community College
PHY 114 Mechanics
Course Outline
Fall 2009

Credit Hours: 4 August 28-December 16, 2009
Lecture: 2.5 hours on Friday at 9:30 am-noon Lab: 1.5 hours on Wednesday at 8:30-10:00 am

Instructor	eMail Addresses	Phone	Office Hours
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Course Description: This course deals with the fundamental principles of classical mechanics. Topics covered include vectors, kinematics, translational and rotational equilibrium, torque, Newton's laws of motion, gravitation, work, power, energy, impulse momentum and rotational motion.
Lecture Textbook (required): College Physics, 7th edition, by Wilson, Buffa and Lou
Lab Manual (required): Departmental Lab Experiment Book for Mechanics
Graphing Calculator (required): same as Precalculus course (TI-83, TI-84, TI-89 or TI-Nspire)
Prerequisite: High school algebra or MATH 095 **Co-requisite:** MATH 137
Vista blackboard: http://my.commnet.edu/ for course information and communication
Homework: Homework will be assigned each lecture, due at the beginning of the next lecture (I will check off that you completed it, and return it). Ongoing preparation is the key to learning the material and to preparing for the tests. You are encouraged to ask questions about the homework at the beginning of class. You may work together on your homework, but the final product (written homework) must be prepared individually.
Lab Reports: You may work together, but you must each prepare your own lab report, due at the beginning of the next lab period. Late lab reports will have 2 pts per week (a letter grade) deducted (2 pts if turned in during the first week after it is due, 4 pts if turned in during the 2nd week, etc.). Each of the 14 lab reports is worth 15 points. The lab reports will contribute a total of 180 points to your total grade. Completion of all 14 lab reports will therefore give you as much as 30 points extra credit towards your overall final grade points for the course.
Attendance: Attendance will be recorded for both lectures and labs; these will be reviewed by the Electric Boat apprenticeship administrators to ensure compliance with this program. Attendance for scheduled tests is mandatory; make-up exams will be provided to the student if approved by both the Electric Boat apprentice program administrators and the instructor. Quizzes can also be made up if absence from the class is approved by both the EB apprentice program administrators and the instructor.
Grading Policy: *On all tests and homework problems, use the **GECCA** format (described on page 3) to show the details of each step in solving the problem.* This supporting work demonstrates understanding, reinforces learning, and will provide partial credit if your final result is incorrect. You will not receive full credit if you just write the answer, and do not show how you obtain the result.

Grade equivalents:

A 93-100	B 83-86	C 73-76	D 63-66
A- 90-92	B- 80-82	C- 70-72	D- 60-62
B+ 87-89	C+ 77-79	D+ 67-69	F 59 or less

Grade Point Totals: *Four exams worth 100 points each. Final exam worth 150 points. Five unannounced quizzes (based on the homework due the period the quiz is given) worth 10 points each. Lab reports are worth 180 points (2 of the 14 labs count as extra credit). Your average is determined by the sum of all of these, divided by 780.*
Questions? I will stay after class to answer questions. You can phone, email or IM me with questions or to schedule a meeting. We can use the Vista blackboard for "public" questions, answers or discussions that may benefit all in the class.
Disabilities: If you have a hidden or visible disability which may require special classroom or testing modifications or special accomodations, please see me as soon as possible.

Lecture Course Outline (subject to change)

Date	Topics (chapters)
28-Aug	Metric and English Systems; Dimensional Analysis; Problem Solving (ch 1)
4-Sep	Motion in One Dimension: Distance, Speed; Velocity (ch 2)
11-Sep	**Test 1 (ch 1 & 2);** Acceleration; Free Fall (ch 2)
18-Sep	Vector Components; Vector Addition; Motion in Two Dimensions (ch 3)
25-Sep	Projectile motion (ch 3)
2-Oct	Review for test; Forces; Mass vs Weight; Newton's 1st Law: Inertia (ch 4)
9-Oct	**Test 2 (ch 2 & 3);** Newton's 2nd Law: Force and acceleration; Newton's 3rd Law: Action and Reaction (ch 4)
16-Oct	Friction: Static and Kinetic (ch 4)
23-Oct	Review for test; Work Done by Constant and Variable Force (ch 5)
30-Oct	**Test 3 (ch 4);** Work-Energy Theorem; Kinetic Energy; Gravitational Potential Energy (ch 5)
6-Nov	Linear Momentum; Impulse; Conservation of Momentum (ch 6); Elastic and Inelastic Collisions (ch 6)
13-Nov	Review for test; Angular Measure, Speed and Velocity (ch 7)
20-Nov	**Test 4 (ch 5 & 6);** Centripetal Acceleration; Newton's Law of Gravitation; (ch 7)
27-Nov	**Holiday**
4-Dec	Torque; Rotational Equilibrium; Center of Gravity; Moment of inertia; (ch 8)
11-Dec	Rotational Work & Kinetic Energy; Angular Momentum; Conservation of Angular Momentum (ch 8)
Dec 16	**Final Exam (during lab period on Wednesday)**

Laboratory Outline (subject to change)

Date	Topics (chapters)
2-Sep	Measurement
9-Sep	Graphing
16-Sep	Vectors
23-Sep	Velocity in One Dimension
30-Sep	Projectiles – Spring Gun
7-Oct	Newton's Second Law – Air Track
14-Oct	Newton's Second Law – Atwood's Machine
21-Oct	Friction
28-Oct	Force Equilibrium (The Bird on the Wire)
4-Nov	Static Moment Equilibrium
11-Nov	**Holiday**
18-Nov	Energy Conservation (Freefall)
25-Nov	Momentum Conservation
2-Dec	Rotational Motion
9-Dec	Rotational Kinetic Energy
16-Dec	**Final Exam (for course)**

GECCA

(***Use GECCA for all tests and homework problems***)

Given: If possible, draw a picture. List the variables and constraints provided in the problem.

Equation: Write the equation(s) to be used to solve the problem. Include the units.

Conversions: Convert any given values needed so that all units are consistent with the equation.

Calculations: Work through the calculations

Answer: Write the final answer

Measurable Objectives

The student will be able to:

- Use the SI system of measurements in solution of physics problems.
- Perform unit conversions and cancel units correctly during computations.
- Round measurements, using the concepts of accuracy and precision.
- Solve right triangles using the Pythagorean Theorem and trigonometry.
- Draw vectors and find their components using trigonometry.
- Add vectors graphically and by using components.
- Identify in a one-dimensional kinematics problem the known quantities and the unknown, choose the correct equation to solve for the unknown, and perform the algebraic manipulations needed to solve the equation.
- Solve problems involving free fall in one dimension and basic projectile problems.
- Draw a free body diagram, and state the cause of each of the forces.
- Resolve the forces of the free body diagram into components along given coordinate axes.
- Calculate mass from weight and the reverse in both SI and English units.
- Apply the first condition of equilibrium and solve the resultant equations for the unknowns.
- Find the resultant force on an object, and apply Newton's Second Law.
- Calculate the friction force for an object from the coefficient and the normal force.
- Claculate the work done on an object and relate it to the change in kinetic energy.
- Apply the conservation of mechanical energy (KE and GPE) to solve for initial or final speeds, or change in height.
- Apply the conservation of energy to calculate work done by friction.
- Apply the impulse-momentum equation to impact problems.
- Use momentum conservation to solve one-dimensional collision and explosion type problems.
- Compute angular velocity and acceleration in degree, radian and revolution units.
- Use the equations of circular motion to calculate initial or final angular velocities, angular acceleration or displacement.
- Calculate tangential velocity and acceleration from the angular quantities.
- Calculate centripetal acceleration and centripetal force, and apply the concepts to familiar situations (e.g., cars going around curves, twirling a yoyo on a string).
- Explain the source of "centrifugal force".
- Calculate torque on a beam subjected to more than one force.
- Apply the second condition of equilibrium to solve problems with noncurrent forces.
- Given moment of inertia, calculate angular acceleration from net torque.
- Given moment of inertia, calculate rotational kinetic energy.
- Use energy conservation to predict which of two same-radius objects will reach the bottom of an incline first.
- Given moment of inertia, calculate angular momentum.
- Use the conservation of angular momentum to explain demonstrations using rotating table, hand weights, and bicycle wheel.

The student will be able to do the following:

- Read and follow instructions
- Assemble and use lab equipment peculiar to mechanics, including but not limited to force tables, air tracks, rotational motion apparatus and various computer-interfaced sensors (photogates, “smart pulleys”, motion sensors, laser switches, etc.) as well as video motion analysis tools.
- Collect data in an organized fashion, noting precision of measurement and unit labels.
- Analyze data by creating graphs (by hand and by computer, with slope and intercept, if needed) and by correctly inserting data into equations.
- State results to the correct accuracy.
- Calculate % error, where applicable.
- Explain sources of error in an experiment based on the limitations of the equipment used.
- Draw conclusions by relating their results to the appropriate physics principles.