EASTERN MICHIGAN UNIVERSITY
DIVISION OF ACADEMIC AFFAIRS

REQUEST FOR INCLUSION OF A COURSE IN THE GENERAL EDUCATION PROGRAM: EDUCATION FOR PARTICIPATION IN THE GLOBAL COMMUNITY

DEPARTMENT/SCHOOL: PHYSICS AND ASTRONOMY
COLLEGE: ARTS AND SCIENCES
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1. Subject Code, Number, and Title: PHY 223 Mechanics and Sound
2. Credit Hours 5
3. Course Description:

   A basic, calculus-based course in physics for students majoring in physical science and those on a pre-engineering curriculum. Topics include kinematics, Newton's Laws, work and energy, conservation laws, rotational motion, oscillations, and sound. Laboratory: two-consecutive hours, one day per week.

4. This course is (check one):

   ☒ an existing course with no revisions (need not go through the input system)

   ☐ an existing course with revisions (attach this form to Request for Course Revision form)

   ☐ a new course (attach this form to Request for New Course form)

5. Check the General Education requirement this course is intended to meet. If the course is to be proposed for more than one requirement, submit a separate form for each one.

   ☐ **Effective Communication**

   ☐ **Quantitative Reasoning (*QR designation*)**

   ☐ **Writing Intensive (*WI designation*)**

   ☐ **Perspectives on a Diverse World**

   - ☐ Global Awareness
   - ☐ U.S. Diversity

   ☒ **Knowledge of the Disciplines**

   - ☐ Arts
   - ☐ Humanities
   - ☒ Science
   - ☐ Social Science

   ☐ **Learning Beyond the Classroom (*LBC designation*)**

   - ☐ Self and Well Being
   - ☐ Community Service, Citizenship, and Leadership

- ☐ Cultural and Academic Activities and Events
- ☐ Career and Professional Development
- ☐ International and Multicultural Experience
- ☐ Undergraduate Research

6. Rationale. Provide a concise, clear, jargon-free explanation of why this is a General Education course and how it fits into this specific area of the program. (The rationale should explain to students why they are taking the course. It should address both why it is part of the General Education program and why it fits into the particular category.) This rationale should appear on the general course syllabus provided here and should be included in specific course syllabi given to students.

Rationale for taking PHY 223 as a General Education course for students.

The purpose of this course is to introduce, explore, test and apply the principles of physics that predict the motion of an object. Today when we take a flight from Detroit to Los Angeles, we expect the arrival time to be within five minutes of the predicted time. Such predictions are based on the principles of physics and the tools of mathematics. Other practical applications of these principles include the flight of a baseball, the putting of a golf ball, the motion of the Earth around the sun, the rotation of a bicycle wheel, the setting of bones to allow healing, the building of bridges, the vibration of the string on a violin, and the flow of air across an airplane wing. PHY 223 presents in detail the foundational principles of motion that all scientists use in their research. As such, PHY 223 meets the outcomes of a Natural Science course in the Knowledge of the Disciplines portion of the General Education program.

7. Clearly and concisely explain how this course meets each of the General Education outcomes for the requirement checked in number five (all outcomes should be addressed). To do this, (a) list the General Education outcomes for the requirement and explain how the course meets each outcome; and (b) explain, in general terms, the method(s) of evaluation to be used in the course and how these methods assess the degree to which students have met the General Education outcomes for this requirement.

PHY 223 *Mechanics and Sound* meets all of the General Education outcomes in the Knowledge of the Discipline: Natural Science section. Below we identify each outcome, indicate how that outcome is met with a specific example, and identify the assessment tool.

It is important to note that while we have chosen to show how Lab #3 specifically meets the General Education outcomes, Lab #3 is a *typical* lab. The outcomes met by Lab #3 are also met in Lab #4, 5, 6, 7, 8, 9, and 10 (each in its own context).

Likewise, while we have chosen to focus on the labs, the labs are an extension of the lecture portion of the course. The lecture portion of the course will also meet similar outcomes that the labs meet through the introduction of the material itself, interactive lecture demonstrations, in-class computer simulations, reading assignments, homework assignments, quizzes, recitation sessions, examinations, and many other activities. However, no two instructors approach the lecture material the same way.

Currently, the PHY 223 labs do not include a presentation. The presentation is replacing a current lab in order to meet the General Education requirements. Such a change does not require a "Course Revision form". The laboratory schedule indicated in the syllabus includes this change.

Finally, it is Department policy that a student cannot pass the course if they do not pass the lab portion of the course. By focusing on the labs, we can guarantee that every student who has passed the course must have passed the lab, and therefore has met the General Education outcomes in the Natural Sciences portion on multiple occasions.

The prerequisite for PHY 223 is MATH 120 Calculus I. Technically a student in high school who has completed AP Calculus and scored well on the AP examination could receive credit for MATH 120.

General Education Outcomes	**Meeting the Outcome**	**Evaluating the Outcome**
Knowledge of the Disciplines: Natural Science *Students will……*		
1) acquire introductory knowledge about the discipline	1) As stated in the rationale, PHY 223 is an introduction to the basic principles of motion as applied to our daily experiences. The course covers a wide range of topics encompassing these principles, as indicated in the course syllabus. These basic principles are the same principles used by scientists to model natural phenomenon.	1) Examinations Examinations in this course typically use short-answer- and problem-solving-type questions. Demonstrating an understanding of the basic physical principles of a problem is most important, and hence partial credit is awarded when a student displays knowledge of the basic physical principles used to solve a problem or answer a question.
2) develop questions for inquiry that reflect an understanding of the discipline(s) in which they are asked	2) As stated in the rationale, the purpose of PHY 223 is to explore, test and apply the laws governing many practical aspects of motion. Most of the laboratories in this course are discovery-based laboratories. The students have been introduced to the material in class and have even seen a demonstration of the basic principles. They have passively learned the principles. In lab they are actually doing the experiment; they are actively learning the principles. To successfully complete the labs the students must pose the proper questions and then carry out their investigation.	2) Written lab reports All lab reports must include a conclusion where students demonstrate knowledge of the basic physical principles. In their lab reports, they are expected to explain the basic principles, demonstrate an understanding of the basic principles as applied to the particular laboratory experiment, answer questions about experiment versus theory, and apply that knowledge to the various applications in our modern world. Lab reports are graded on a 10 point scale. The grading scale is provided in the syllabus.

3) learn how knowledge is developed and disseminated in particular disciplines	3) PHY 223 includes a laboratory section. Each lab is limited to 18 students. Students complete laboratory experiments that highlight the development of the basic principles of motion. Students write laboratory reports to learn how scientists disseminate their results. Students make presentations at the end of the lab section to learn how scientists disseminate information.	3) Written lab reports and lab presentation. Lab reports are required to be written in a scientific manner. For example, each report must include the details for completing each procedure, the equipment used, the data gathered and the results determined. Each report must include a conclusion. Lab concludes with an oral presentation. The students are expected to speak scientifically in their presentation.
Natural Sciences *Students will …..* 4) Apply the scientific method and its assumptions to pose and answer questions…		
4a) make observations, develop appropriate classifications, and infer trends	4a) In Lab #3 “The Acceleration due to Gravity” students measure the amount of time it takes for a cart to move a particular distance down an inclined plane. The particular distance is varied. Students are asked to infer the general trend.	4a) Written lab report #3. It is important to note that in these physics labs, the student spend the entire 2 hour periods collecting data. Most analysis is done outside the lab period. A lab report is written outside the lab period. The lab reports are typed and the use of spreadsheet programs is strongly encouraged. It is important to note that the trend discovered by the students in Lab #3 is non-linear. Doubling the particular distance does not lead to a doubling of the amount of time required to cover that distance. Students are unaware of this trend before analyzing their data and creating a graph. Lab reports are graded based on recognizing trends, collecting good data, and making appropriate classifications.

4b) gather original data to verify the validity and reliability of accepted scientific principles	4b) In Lab #3 "The Acceleration due to Gravity" students measure the amount of time it takes for a cart to move a particular distance down an inclined plane, and compare their results with the principles of motion (that predict the time to move a particular distance down the inclined plane is proportional to the square root of distance). They also measure the amount of time it takes for the cart to pass through a gate at that particular distance. They then determine the instantaneous velocity (length of the cart divided by the time to pass through the gate), and compare their results with the principles of motion under constant acceleration (that predict the instantaneous velocity as equal to the product of acceleration and time if the object started from rest).	4b) Written lab report #3 The lab report will contain data tables and the analysis of these data, including graphs. Lab reports are graded based on collecting good data. The data collection in the labs is straight-forward *if* the student uses good data collection techniques. Therefore, large percentage errors are not expected.
4c) analyze and solve a scientific problem by drawing conclusions based on original data gathered using appropriate experimental techniques 4f) analyze and solve problems by identifying and utilizing appropriate data and methodology	4c) and 4f) In Lab #3 "The Acceleration due to Gravity" students are asked to analyze, solve, and predict the motion of an object down an inclined plane. They calculate the instantaneous velocity of a cart as it moves down an inclined plane based on their measurements of distance and time. They collect enough data to create graphs of instantaneous velocity versus time. By calculating the slope of this graph, they determine the acceleration of the cart. By measuring the angle of the inclined plane they can solve for the acceleration due to gravity.	4c) and 4f) Written lab report #3 The lab report will contain data tables and the analysis of these data. Lab reports are graded based on the proper analysis of data. Students are expected to use the proper scientific models and mathematics. The lab report will include a conclusion. Evaluations are based on the conclusions described in the lab reports.

4d) use the processes and methods of science to demonstrate how reproducible experimental observations give rise to fundamental laws and theories 4e) demonstrate an understanding of the ways in which theories may evolve with time	4d) and 4e) In Lab #3 "The Acceleration due to Gravity" students determine the instantaneous velocity of a cart as it moves down an inclined plane. They create graphs of velocity versus time. By calculating the slope of this graph, they determine the acceleration of the cart. They measure the angle of the inclined plane. Using this measurement and their experimentally determined acceleration, they can determine the acceleration due to gravity and compare that answer to the measured value for Ypsilanti, Michigan. After completing the measurements described in 4a) on the inclined plane, they are expected to discuss how this experiment caused Galileo to re-write the laws of Aristotle in their lab report. They should identify the shortcomings of Aristotle's explanation from their experiment.	4d) and 4e) Written lab report #3 The lab report will include a conclusion. Evaluations are based on the conclusions described in the lab reports. Lab reports will be graded on the scientific content and the scientific manner in which the report is written.
5) Attain a basic knowledge of the current scientific understanding of the universe and the laws that govern it 5a) Demonstrate a core knowledge base of facts and information	5a) As stated in the rationale, PHY 223 is an introduction to the basic principles of motion that describe the world we live in as applied to our daily experiences. The course covers a wide range of topics encompassing these principles, as indicated in the course syllabus. The course introduces the basic principles of motion: acceleration, velocity and displacement. It introduces the fundamental forces of the universe: the forces of gravity, the push or pull, tension, the normal force, friction, Hooke's law forces, and buoyancy. Understanding these forces allows students to predict motion (translational and rotational). Newton's Laws serve as the foundation of the principles of motion. The conservation of energy and momentum are described in detail.	5a) Examinations Examinations in this course typically use short-answer- and problem-solving-type questions. Demonstrating an understanding of the basic physical principles of a problem is most important, and hence partial credit is awarded when a student displays knowledge of the basic physical principles used to solve a problem or answer a question.

5b) Demonstrate a working knowledge of the hierarchical structure of natural science	5b) PHY 223 builds a hierarchical structure for understanding how objects in our universe move, and how we as human beings have used this understanding to advance our civilizations. The hierarchy begins with an introduction to motion and forces. Next, the motion of an object can be predicted using Newton's Laws, energy, and/or momentum. Predicting and understanding motion leads to the next level of the hierarchy – invention and application. An example of this is illustrated in the placement of a GPS satellite in orbit around the Earth. The force due to gravity must be determined, and the resulting acceleration evaluated from Newton's laws. Knowing the desired period of revolution, a relationship between period and altitude above the Earth can be determined. This relationship is Kepler's Law of Periods and was discovered experimentally *before* the work of Galileo and Newton (early 1600s). The amount of energy needed to place the satellite in the orbit necessary to orbit the Earth with a period of 24 hours is then calculated.	5b) Examinations The layout of the course builds this hierarchical structure and the examinations test student learning at various levels in the structure. The first examination focuses on demonstrating an understanding of the basic principles of motion: acceleration, velocity, and displacement. Next the fundamental forces of the universe are introduced and tested. Then energy and momentum are defined and tested. Subsequent examinations in static equilibrium, gravity, rotational motion, fluids, waves, sound, and harmonic motion all focus on the application of the basic principles to predicting the motion of these particular applications.
6) Become a scientifically literate citizen		
6a) acquire and apply an appropriate technical vocabulary	6a) At the end of lab, as a conclusion, students present the basic physical principles of a topic of their choosing. They are expected to acquire and apply the proper scientific terminology in discussing their topic. For example, a student might describe the tuning of a guitar. The student would be expected to explain that increasing the tension in the string increases the speed of the waves on the string, and since the wavelength of the note is fixed by the length of the string, the frequency must increase.	6a) Lab presentation In this course students are introduced to the scientific definitions of work, energy, power, torque and momentum. These words have very different meanings in our everyday world. In their presentations they are expected to use such terms properly.

6b) interpret, analyze, and critically evaluate data and reports in the media relating to the natural sciences	6b) At the end of lab, as a conclusion, students present the basic physical principles of a topic of their choosing. They must gather, read, analyze, interpret, and critically evaluate information from print or online sources in order to present the material to their classmates.	6b) Lab presentation In their written summary of their presentation they must indicate their sources of information. They must be aware that the world around them does not understand the scientific definitions of many scientific terms. For example, in this course they will learn that an astronaut in the space shuttle is not "weightless". Being "weightless" does not mean the effects of gravity have vanished.
6c) engage in informed discussions about the validity of the conclusions from reports in the media relating to the natural sciences	6c) At the end of lab, as a conclusion, students present the basic physical principles of a topic of their choosing. They lead informed discussions about their topics as presented in the material they have gathered, recognizing that all media reports do not correctly describe/use basic physical principles.	6c) Lab presentation By previewing the topics, the instructor can guarantee that there will be 18 different presentations in the lab. The students will be exposed to 18 different media reports on 18 different topics.
6d) employ available resources to find relevant scientific or technical information	6d) At the end of lab, as a conclusion, students present the basic physical principles of a topic of their choosing. They must gather information from scientific sources to properly describe their topic.	6d) Lab presentation In their written summary of their presentation they must indicate their sources of information. To properly describe their topic, they will need to access and evaluate scientific information.
6e) make informed decisions about scientific issues in daily life	6e) At the end of lab, as a conclusion, students present the basic physical principles of a topic of their choosing. They lead discussions about their topics as they apply the basic principles discussed in this class to a variety of modern applications they encounter in their daily lives.	6e) Lab presentation By previewing the topics, the instructor can guarantee that there will be 18 different presentations in the lab. The students will be exposed to 18 different everyday examples of the basic physical principles.

8. Attach a syllabus (1-inch margins and 10-12 pt. font). The syllabus must include the rationale from #6 above and clearly reflect the outcomes and methods of evaluation detailed in #7 above.

Below is a typical syllabus for PHY 223. The dates are specific to the Fall 2006 semester. They are used to give the reader a sense of the pace of the course. Obviously the specific dates change every semester, however the spacing and the order do not change. As well, the syllabus is that used by Dr. James Carroll, however all instructors use the same required text, cover the same topics and follow a similar examination structure. All PHY 223 students are required to take lab and all students complete the same labs.

Sample Syllabus for PHY 223

Fall 2006 PHY 223 - Mechanics and Sound

COURSE SUMMARY

Instructor: Dr. James Carroll **Office:** 311 Strong Hall
Telephone: 487-8796 **Email:** jcarroll@emich.edu

Lecture: MTWThF 10:00-10:50 AM in 339 Strong

Text: *Physics for Scientists and Engineers*, 6th Edition, Serway and Jewett

Pre-requisites: MATH 120 Calculus I

Office Hours: MTWThF 11 AM - 1 PM (right after class)

General Education Rationale: The purpose of this course is to introduce, explore, test and apply the principles of physics that predict the motion of an object. Today when we take a flight from Detroit to Los Angeles, we expect the arrival time to be within five minutes of the predicted time. Such predictions are based on the principles of physics and the tools of mathematics. Other practical applications of these principles include the flight of a baseball, the putting of a golf ball, the motion of the Earth around the sun, the rotation of a bicycle wheel, the setting of bones to allow healing, the building of bridges, the vibration of the string on a violin, and the flow of air across an airplane wing. PHY 223 presents in detail the foundational principles of motion that all scientists use in their research. As such, PHY 223 meets the outcomes of a Natural Science course in the Knowledge of the Disciplines portion of the General Education program.

Course Layout: The semester will be divided into 6 sections as follows:
SECTION 1 - CHAPTERS 1, 2, 3, 4 – BASICS OF MOTION: VECTORS, POSITION, VELOCITY, ACCELERATION
SECTION 2 - CHAPTERS 5, 6 – USING NEWTON'S LAWS TO PREDICT MOTION
SECTION 3 - CHAPTERS 7, 8, 9 – USING ENERGY AND MOMENTUM TO PREDICT MOTION
SECTION 4 - CHAPTERS 10, 11 – ROTATIONAL MOTION AND ROLLING
SECTION 5 - CHAPTERS 12, 13, 14, 15 – EQUILIBRIUM, GRAVITY, FLUID MOTION, SIMPLE HARMONIC MOTION
SECTION 6 – CHAPTERS 16, 17, 18 – WAVE MOTION AND SOUND

Course Requirements:
Your grade will be determined based on your success in completing the following tasks:

1) **Homework assignments** - Delivered, collected, and graded via an online system called WebAssign (WebAssign is located at "http://www.webassign.net"). There will be at least one assignment in each section. Note: Homework assignments include bonus points! In order to use WebAssign you must purchase a student access code from the bookstore or online! (30 pts each)

2) **Quick Quizzes** – Given during the first 2 minutes of class almost EVERY day (except Quiz and Test days). These quick quizzes will be closed notes and no formula sheet. They will cover material discussed during the previous class period or a reading assigned from the previous class period. Each quick quiz is worth 3 points. (100 pts)
3) **Quizzes** - Actually these are homework quizzes given the day the homework is due. (30 pts each)
4) **Laboratory** - The lab instructor determines your grade. You MUST pass lab with a 60% or better to pass this course. This is department policy. (200 pts total)
5) **Examinations** - Each section will have a 50-minute examination. (100 pts each)

6) **Homework Reviews** - The class period before an examination will be used to review the concepts discussed in that section. You and your classmates will split into groups and work various problems, complete tasks and/or take measurements for discussion and review. This is a chance for you to ask me one-on-one questions to prepare for the upcoming exam. Points will be deducted if you are late to the reviews! If you miss the review, you lose the points (10 pts each)

7) **Projects** - Here's your chance for you to learn physics hands-on. You will be given a task to accomplish as a group of 2 students. You will build a device of your choosing within the guidelines provided to accomplish the task. You will analyze your device in detail to understand how it works. You will create a Technical Instruction Poster (TIP) that completely describes your device. Then we will test your device. Your grade will be based on accomplishing the task, the TIP you create, and the outcome of the device test. Everyone in the group will receive the same grade. You will need to form groups that can meet outside of class! A grading scheme will be included in the project hand-out. The project is worth 100 points.

8) **Final Examination** - A comprehensive examination scheduled for Friday December 16 at 9:30 AM.

Bonus Points: 3 bonus points will be awarded for each Physics-related seminar you attend (these will be announced in class). You must submit bonus points using the "Bonus Points" assignment on WebAssign to receive credit. There is no limit to the number of bonus points!

Course Grading: Late homework assignments will not be accepted and make-up quizzes and exams will not be given. If you miss a quiz or an exam because of a documented emergency, you must speak to me immediately. Your final grade will be determined by:

5 test scores	500 points
6 quiz scores	180 points
7 HW scores	210 points
Laboratory	200 points
Quick Quizzes	100 points
Review Sessions	60 points
Projects	100 points
Final Examination	250 points
Total:	1600 points

Letter Grades: >93% = A, 90-92% = A-,
87-89% = B+, 83-86% = B, 80-82% = B-,
77-79% = C+, 73-76% = C, 70-72% = C-,
67-69% = D+, 63-66% = D, 60-62% = D-,
< 60% = E (or if the lab score is less than 60%)

Laboratory Information (inserted from the PHY 223 Lab Manual)

Faculty Coordinator:
Dr. James Carroll, 311 Strong Hall. His office hours are posted outside of room 311. You should always talk to your lab instructor *first* before seeing Dr. Carroll regarding issues related to this laboratory. His email address: jcarroll@emich.edu

Web Page:
There is a web page dedicated to lab. You may consult this page for news, office hours, schedules, and other miscellaneous information. The url will be announced in class.

Lab Instructor: _____
Your lab instructor's office hours will be given at the first laboratory meeting.

Lecture Professor: _____
Your Lecture Professor will determine exactly how the lab scores will affect your overall course grade. The only general rules are that lab should count for about 20% and that you must pass the lab with 60% or higher to pass the course.

First Laboratory meeting
During the first laboratory meeting your Lab Instructor will introduce you to the lab and its requirements. There will be forms to fill out and we will complete all of the necessary paperwork to begin lab. It is your responsibility to make sure your name is on the attendance sheet. If you do not attend the First Laboratory meeting, you will have 3 points deducted from your overall laboratory grade.

Last Laboratory meeting

At the last laboratory meeting, we will fill out all of the necessary paperwork to complete the course. The last lab report will be returned to you during this meeting. It is your responsibility to make sure your name is on the attendance sheet. If you do not attend the Last Laboratory meeting, you will have 3 points deducted from your overall laboratory grade.

Required Materials (required to bring to EVERY lab)

* this laboratory manual
* a lab notebook that is solely dedicated to this laboratory (it may be collected for a week). Any single-subject notebook is fine, however you must have graph paper.
* If your lab notebook includes graph paper, you are fine.
* If your lab notebook does not include graph paper in it already, then you must purchase and bring graph paper; the Engineering Forms by National Brand (4 or 5 squares per inch) will suffice. This paper should be available at the bookstores.
* 12" clear plastic ruler
* a scientific calculator

Before each Lab Period

* Read through the experiment in your lab manual.
* Fill out a new page in your lab notebook describing the experiment you will be doing, measurements you will be making and the first data table.
* Perform any preparatory duties suggested in the lab manual and write them on this page.
* You should show this page to your lab instructor during the first 5 minutes of lab. Failure to do so will result in a 1 point deduction from your score for that experiment. If you are more than 5 minutes late to lab, you automatically will lose the 1 point. DO NOT interrupt the lab instructor after he/she has begun the introduction to the experiment.

During the Lab Period

* You should keep detailed lab notes in your lab notebook so that when you write your report your notes will contain all of the needed information.
* Record data in orderly tables.
* Carefully perform all steps in the "procedures" section of the manual. In general you should utilize all of the lab period.
* Go to your lab instructor to have your data in your lab notebook signed/initialed.
* You will usually be required to work with a single lab partner (in groups of two). No one works alone unless your TA instructs you to.

*Every lab notebook must be signed by your lab instructor before you leave the lab. It is **your** responsibility to obtain the signature.*

After the Lab Period

* Prepare your lab report according to the guidelines below. Clearly label the different sections of your report (except cover page). The reports are due at (or before) the beginning of the next lab period. Your TA has one week to grade the reports. If your TA does not return your reports to you on time please inform Prof. Carroll.
* If you are well prepared before lab, use all of the lab period to obtain good results and fully understand the calculations, you should require no more than two hours to write the reports if you start the report within a couple days of doing the experiment.

Late Reports

* All reports are due by the beginning of the following laboratory session. A five minute cushion is granted. Reports handed in after the 1st five minutes are late one day.
* Late reports are penalized 2 points per day. Sat. and Sun. are counted as late days.
* If you absolutely cannot attend a lab turn in your report from the previous lab ***early***, directly to your TA during his/her office hours, at some privately arranged meeting, or send it to lab with a friend. It is your responsibility to make sure your TA received the lab report. **Placing your reports in a mailbox or on a desk or under a door are *not* acceptable ways to hand them in. Do not fax or email lab reports!**

Lab Grading Policy

Each lab report and the presentation are worth 10 points. The lowest lab report score is dropped. Your grade will then be based on your best nine lab report scores and your presentation score.

>93% = A, 90-92% = A-,
87-89% = B+, 83-86% = B, 80-82% = B-,
77-79% = C+, 73-76% = C, 70-72% = C-,
67-69% = D+, 63-66% = D, 60-62% = D-,
< 60% = E (this means you automatically fail the course too)

To ensure fairness across the different lab sections taught by different Lab Instructors, grades awarded by each Lab Instructor will be monitored. The average lab report grade (across all sections) for each Lab Insructor must be an 85% at the end of the semester. If your Lab Instructor's average is below 85% at the end of the semester, all final lab report grades will be curved upward to reflect an 85% average. Likewise, if your Lab Instructor's average is above an 85% at the end of the semester, all final grades will be curved downward to reflect an 85% average. This policy will protect you from a Lab Instructor who grades harshly or from a Lab Instructor in another section who grades too easily.

Note: Points lost due to attendance, poor preparation for the lab, and late or missing labs will not be reflected in the 85% average. This average is based only on the scores awarded to the lab reports.

Make-Up Policy
There will be no make-ups labs. However, the lowest of your lab report scores will be dropped. Therefore, if you miss only one of the labs it will not affect your overall lab performance. You cannot miss the lab presentation.

Extra Credit
If you submit **complete** lab reports for each of the 10 labs, hand each of them in **on time**, complete the lab presentation, and have participated in the first and last lab meetings, you will receive extra credit points equal to one-half of your lowest score (the one that was dropped) on lab reports.

GUIDELINES FOR LABORATORY REPORTS

Each lab report is worth 10 points. Your lab grade is based on earning 100 points.

Cover Page (up to a 1 point deduction if information is missing)
For your report to be complete the cover page must contain **all** of the following information:
* title and number of the experiment,
* your name & student number; your lab partner's name(s),
* the course you are taking (e.g. Phy 22x),
* the day and time of your lab and your lab instructor's name,
* your lecturer's name,
* an abstract. An abstract is a brief description of the experiment and your main conclusions.

Introduction (1 point)
A brief (one to two paragraphs) discussion of the general principles, laws, equations, and/or concepts related to the experiment. Any equipment that plays an especially important role in the results should be briefly discussed in this section. Essentially, this section should put your experiment in its proper general context.

Results & Interpretation (6 points)
Discuss and analyze your data (qualitatively and quantitatively). Calculations should properly handle significant figures, and correct units should accompany all numerical values. You should re-copy your data from your lab notebook to a separate data sheet that is attached to the report. Using a spreadsheet program to present your data in the report is encouraged! All graphs must be on graph paper or created using a spreadsheet program. Do not change (fudge) the data. It is also important to discuss the sources of error in this section.

Conclusions (3 points)
Briefly discuss (one to two paragraphs) what conclusions you can reach from your analysis. Consider the conclusion as the place where you relate the specific (your data/results) to the general (your introductory discussion). You should answer all the "Questions for Thought" in the Conclusion. These questions should be answered in paragraph-form and not numbered 1,2,….You should re-phrase these questions into a discussion.

Miscellaneous Comments
In our modern world, you must type your reports. Your future employer will require all communication to be typed. The library and McKenny Union have word processing facilities available. Your data sheets and graphs may be neatly done by hand, however to maximize your score you should use word processors and spreadsheet programs.

Laboratory reports must "stand alone". The reader should not have to refer to the lab manual to figure out what you are discussing. You should include all information from the lab manual to support your analysis.

The reports should be predominantly free of spelling errors and grammatical mistakes.

It is important that your lab reports be complete. However, they need not be lengthy. A clear, crisp, and concise style of writing is always preferred over excessive wordiness. You will not be graded based on the thickness of your report.

Lab Presentation
The objective of this activity is for you to describe the basic principles of motion which underlie a subject of your choice related to this course. You are expected to give an oral presentation to the class on some cultural aspect which interests you ***and*** is based on the principles covered in class. In the real world, you will generally have only 5 minutes to make a favorable impression on an employer or client. It is essential you learn the skill of speaking scientifically now when your job and career are not on the line. Write a one or two paragraph summary of your talk to submit with the lab cover sheet on the day of your presentation. Be sure to indicate your sources of information. Criteria for the grade:

1. Prior approval of the instructor is required – topics awarded on a first come-first serve basis
2. Cultural aspect must be relevant to this course
3. State the physical principles that apply as part of your presentation
4. Visual aids are expected
5. Length of the talk should be 5 minutes – no more, no less – in order to allow for 1-2 minutes of questions
6. A well-rehearsed presentation is necessary to communicate the information in 5 minutes.
7. You should be ready to go when it is your turn (be on time!)
8. Submission of written summary with sources identified.

The presentation counts as 10 points. It cannot be dropped.

Typical PHY 223 Lab Schedule during Fall semester

Week	*Lab number*	*Lab Title*
1	No lab	
2	First Lab Mtg.	Pre-testing, intro to lab
3	Lab 01	Measurements and Experimental Error
4	Lab 02	The Addition and Resolution of Force vectors
5	Lab 03	The Acceleration of Gravity
6	Lab 04	Newton's Second Law
7	Lab 05	Work and Energy
8	Lab 06	Elastic and Inelastic collisions
9	Lab 07	Centripetal Acceleration

10	Lab 08	Rotational Kinematics
11	Lab 09	Simple Harmonic Motion
12	No lab	
13	Lab 10	Standing Waves and Resonance
14	Lab 11	Presentations
15	Last Lab Mtg.	Post-testing
16	Finals week	

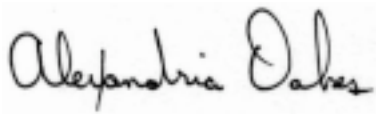
Note: In the PHY 223 lab students take pre-tests and post-tests as part of the Department's assessment program. These tests are nationally-recognized surveys of physics content and student attitudes towards physics.

Please submit all materials in electronic form.

Action of the Department/College

1. Department

. Vote of department faculty: For **__10_____** Against **___0_____** Abstentions **___1_____**



_____ Nov. 7, 2006
Department Head Date

2. College

_____ _____
College Dean Date

Action of General Education Advisory Committee

Vote of General Education Committee: For _____ Against _____ Abstentions _____

_____ _____
Chairperson, General Education Advisory Committee Date

Approval

_____ _____
Associate Vice-President for Undergraduate Studies and Curriculum Date