



# General Education Course NMHED Recertification Form

*This form has been designed to guide you through the recertification process for the UNM General Education course in question. Please fill out your contact information below, and then review the information about the course provided to us by the New Mexico Department of Higher Education (NMHED). After this, you will be instructed to fill out three separate narratives concerning the course and its relevance to NMHED's area and skills associated with the course.*

## UNM Course Information

Prefix	<b>PHYS</b>
Number	<b>1310</b>
Name	<b>Calculus-based Physics I</b>

## Contact Information

Name	<input type="text"/>
Title	<input type="text"/>
Phone	<input type="text"/>
Email	<input type="text"/>

# NMHED's Description and Outcomes for the Common Course

*The description and student learning outcomes below come from NMHED's Common Course Catalog, which can be found [here](#), and is meant to designate standard descriptions and outcomes of courses registered as a NMHED Common Course.*

## **PHYS 1310: Calculus-based Physics I**

*A calculus level treatment of classical mechanics and waves, which is concerned with the physical motion concepts, forces, energy concepts, momentum, rotational motion, angular momentum, gravity, and static equilibrium.*

### **Student Learning Outcomes:**

Upon completion of this course, the student will be able to:

1. Describe the relationships among position, velocity, and acceleration as functions of time.
2. Use the equations of kinematics to describe motion under constant acceleration.
3. Analyze linear motion using Newton's laws, force, and linear momentum.
4. Analyze rotational motion using torque and angular momentum.
5. Analyze motion using work and energy.

Optional Topics may include (some schools include these in Physics I, others in Physics II):

1. Oscillations,
2. Waves,
3. Sound,
4. Thermodynamics

Optional Student Learning Outcomes

1. Describe and apply the fundamental properties of waves, oscillations, and periodic motion.
2. Describe and apply the laws of thermodynamics.

## **Institution-specific Student Learning Outcomes**

*Please add additional SLOs of the general education course to the ones provided by NMHED, or if no SLOs are provided by NMHED, input the SLOs used in assessment for the course.*

## Area and Essential Skills

*Below gives information concerning the area and associated skills of the course to be re-certified. The area here matches the General Education Area of UNM; the “Essential Skills” and their respective Component Skills are characterizations of the area determined by NMHED. You will use this information to fill out the narratives below.*

**Area in which *PHYS 1310* resides: Science**

### Essential Skills in the Area:

#### Critical Thinking

**Problem Setting:** Delineate a problem or question. Students state problem/question appropriate to the context.

**Evidence Acquisition:** Identify and gather the information/data necessary to address the problem or question.

**Evidence Evaluation:** Evaluate evidence/data for credibility (e.g. bias, reliability, and validity), probable truth, and relevance to a situation.

**Reasoning/Conclusion:** Develop conclusions, solutions, and outcomes that reflect an informed, well-reasoned evaluation.

#### Personal and Social Responsibility

**Intercultural reasoning and intercultural competence**

**Sustainability and the natural and human worlds**

**Ethical Reasoning**

**Collaboration skills, teamwork and value systems**

**Civic discourse, civic knowledge and engagement -- local and global**

#### Quantitative Reasoning

**Communication/Representation of Quantitative Information:** Express quantitative information symbolically, graphically, and in written or oral language.

**Analysis of Quantitative Arguments:** Interpret, analyze and critique information or a line of reasoning presented by others.

**Application of Quantitative Models:** Apply appropriate quantitative models to real world or other contextual problems.

## Narrative Input

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

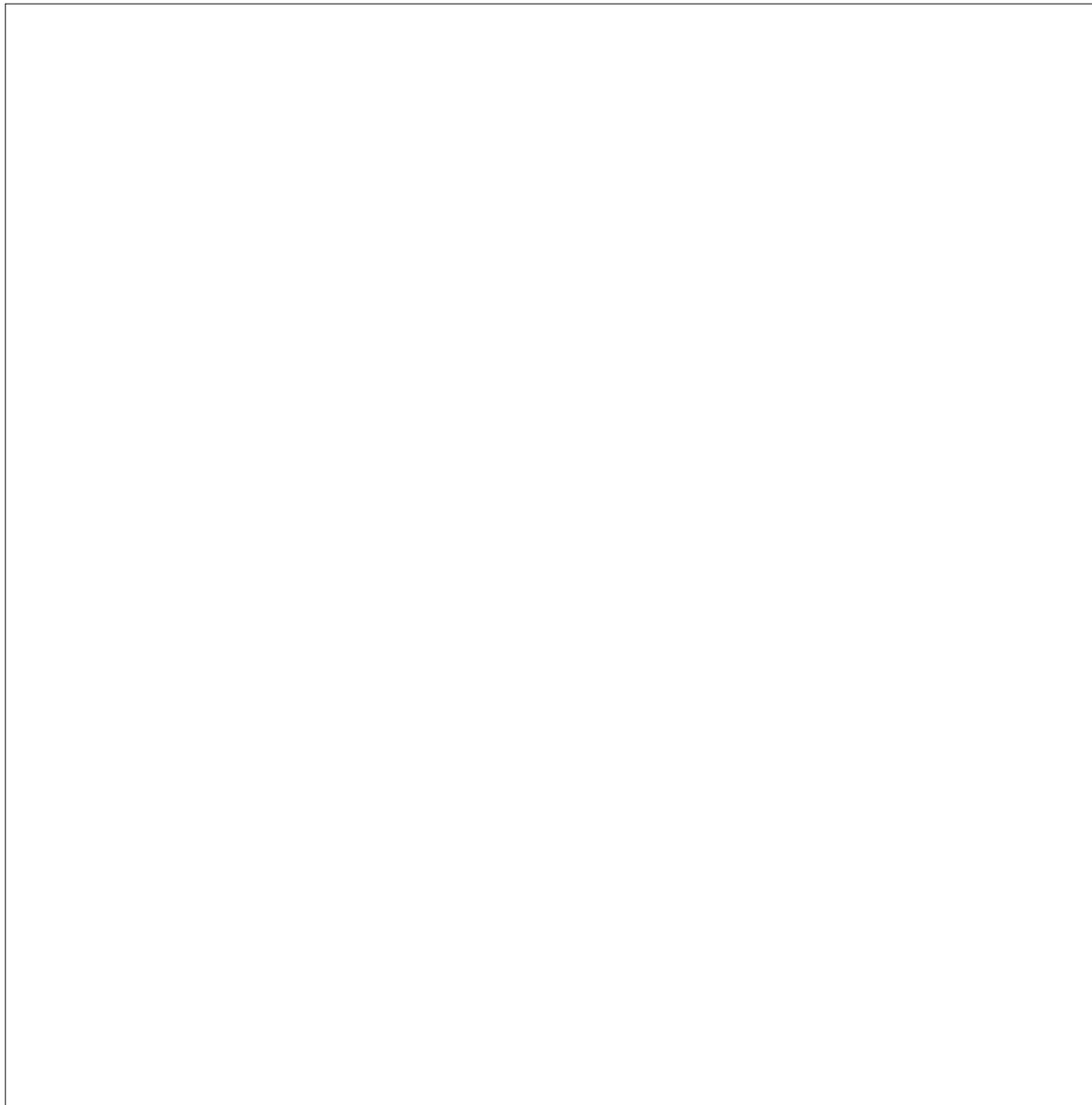
*Be sure to address the component skills listed next to each essential skills. The number of component skills that must be addressed by your narrative is listed.*

**Critical Thinking:** *Problem Setting; Evidence Acquisition; Evidence Evaluation; Reasoning/Conclusion.*

**Personal and Social Responsibility:** *Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical Reasoning; Collaboration skills, teamwork and value systems; Civic discourse, civic knowledge and engagement -- local and global.*



**Quantitative Reasoning:** *Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; Application of Quantitative Models.*



## **Additional Information**

### **Course Materials**

*NMHED requires that both a syllabus and a sample course assignment (project, paper, exam, etc.) from the course in question to be attached to the recertification form. Be sure and pick an assignment that correlates with the descriptions provided in the narratives above.*

### **Assessment Plan**

*When it is submitted to NMHED, each general education course will also have attached the assessment plan that is used for General Education Assessment at UNM. For more information on this process, please visit this [page](#) from UNM's Office of Assessment.*

## Master Syllabus Physics 1310

**Course Title:** Calculus-based Physics I

**Course Number:** PHYS 1310

**Credit Hours:** 3

**Instructor:**

**Office Location:**

**Office Hours:**

**Email:**

**Contact Phone Number:**

**Class Meeting Day(s):**

**Class Location/Room:**

**Class Time:**

**Term/Semester:**

### Course Description:

*At a minimum enter the description listed in the UNM course catalog. Alternatively, describe the course content, purpose, contributions, etc and what the learner may expect if enrolled in the course.*

*Course Catalog Description:* Mechanics, sound. Credit for both this course and PHYS 1230 may not be applied toward a degree program. Meets New Mexico Lower-Division General Education Common Core Curriculum Area III: Science. Pre- or corequisite: MATH 1512.

### Course Goals:

A calculus-level treatment of classical mechanics and waves, which is concerned with the physical motion concepts, forces, energy concepts, momentum, rotational motion, angular momentum, gravity, and static equilibrium. The overall objective is that the students can describe these physical phenomena using a variety of models and develop certain analytical skills associated with problem solving.

### Student Learning Outcomes (aka Objectives):

*Listed are both the state and UNM-specific outcomes. Instructors are free to add any specific outcomes of their own.*

### NMHED's Description and Outcomes for the Common Course

Upon completion of this course, the student will be able to:

1. Describe the relationships among position, velocity, and acceleration as functions of time.
2. Use the equations of kinematics to describe motion under constant acceleration.
3. Analyze linear motion using Newton's laws, force, and linear momentum.
4. Analyze rotational motion using torque and angular momentum.
5. Analyze motion using work and energy.

Optional Topics may include (some schools include these in Physics I, others in Physics II):

1. Oscillations,
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4. Thermodynamics

Optional Student Learning Outcomes

1. Describe and apply the fundamental properties of waves, oscillations, and periodic motion.
2. Describe and apply the laws of thermodynamics.

### **UNM Specific SLO's**

SLO 1: Motion with Constant Acceleration. Students will be able to solve problems involving motion with constant acceleration. Many practical events will be modeled as problems of this type. These include both horizontal motion (for example, an aircraft taking off on the runway, an automobile coming to a stop) and vertical motion near Earth's surface where the acceleration of gravity can be considered constant (for example, a ball thrown straight up in the air). Projectile motion problems also fall into this category; these involve objects experiencing vertical and horizontal motion at the same time (for example, a baseball hit at an angle of 30 degrees above the horizontal).

Addresses UNM/HED Area III, Competencies, 2, 4, 5 2.

SLO 2: Newton's Second Law. Students will be able to solve a variety of problems with Newton's second law. This law, which deals with forces, inertial mass and acceleration, is a foundation of Newtonian Mechanics and has wide application to science and engineering. Problems of various types (possible examples include effects of forces on objects, circular motion, orbits of planets, inclined planes and motion with friction) will be analyzed.

Addresses UNM/HED Area III, Competencies 2, 4, 5 3.

SLO 3: Newton's Universal Law of Gravity. Students will be able to solve problems involving Newton's Universal Law of Gravity. Gravity is one of the four fundamental forces in the universe and is therefore one of the most important foundation topics for the future physics and engineers who take this course. Possible examples may include planetary orbits, calculation of the acceleration of gravity on a planet, derivation of Kepler's 3rd law and calculation of forces where masses attract each other.

Addresses UNM/HED Area III, Competencies, 2, 4, 5 4.

SLO 4: Conservation of Energy and Momentum. Students will be able to solve problems involving the Conservation of Energy and Momentum. These two laws enable introductory students to solve a wide variety of practical problems. Possible examples of problems include elastic and inelastic collisions and the basic concepts of impulse, momentum, kinetic energy, gravitational potential energy and elastic potential energy.

Addresses UNM/HED Area III, Competencies 2, 4, 5 5.

SLO 5: Rotational Motion. Students will be able to solve problems involving Rotational Motion. Many concepts and their application can be included in rotational motion; possible examples include angular momentum, moment of inertia, conservation of angular momentum, angular velocity, angular acceleration and torque.

Addresses UNM/HED Area III, Competencies 2, 4, 5

## **Textbooks/Supplies/Materials/Equipment/ Technology or Technical Requirements:**

*List the required and/or recommended textbooks as well as any other supplies, materials or equipment needed to successfully complete the course. List the technology to which students must have access and the technical requirements of that technology. Courses requiring specific computer hardware and software should include product specifications needed for student success within the syllabus. These should include minimum computer and software requirements and internet configurations, or a link to a detailed reference document.*

*The syllabus for a courses requiring student-owned laptops should contain a reference or link to any requirements. An example is shown below.*

*You are required to bring your laptop to this class to follow along with or complete our in-class research exercises. UNM Law School requires that all entering students own a laptop computer. The law school does not require a particular brand but has determined a minimum hardware configuration. For more information please go to the Law School's IT Services page at: <http://lawschool.unm.edu/students/it/laptop-program.php>*

## **Course Requirements:**

*List and describe all assessments which contribute to course score. May include exams, portfolios, participation, attendance, papers, oral reports, group projects, assignments, etc. Include possible point (percentage) value of each. NOTE: for dual listed courses (undergrad and graduate) list requirements for each separately.*

## **Grading:**

*Indicate how a final course grade (including credit/no credit) will be assigned, calculated, or otherwise determined. UNM uses a fractionalized final course grade system—see catalog.*

## **Course Schedule:**

List all relevant dates – lecture titles/topics; academic holidays; Spring break, exams, assignment due dates etc. An exact listing in full detail is not necessary – a representative listing is adequate.

NOTE: A disclaimer about change in syllabus is wise. For example; The Schedule of Activities is subject to change. Minor changes will be announced in class, major ones provided in writing.

## **Accommodation Statement:**

*An Accommodation statement is required for all syllabi. There is no specifically required wording. Listed below are two options acceptable to Accessibility Resource Center. NOTE: HSC, Law and distant campuses have/may have alternative and acceptable wording.*

“In accordance with University Policy 2310 and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor’s attention, as he/she are not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Resource Center at 277-3506 for additional information.”

## **OR**

Accessibility Resources Center (Mesa Vista Hall 2021, 277-3506) provides academic support to students who have disabilities. If you think you need alternative accessible formats for undertaking and completing coursework, you should contact this service right away to assure your needs are met in a timely manner. If you need local assistance in contacting the Accessibility Resources Center, see the *<enter your academic program office and/or contact information here>*.

## **Title IX Statement:**

*There is no University specific language nor is there a requirement that Title IX be included in the syllabus. Please check for your department, school, college or campus requirements a preferred wording. Two options are listed below.*

In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered “responsible employees” by the Department of Education (see pg 15 <http://www2.ed.gov/about/offices/list/ocr/docs/ga-201404-title-ix.pdf> ). This designation requires that any report of gender discrimination which includes sexual harassment, sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the

Title IX Coordinator at the Office of Equal Opportunity (oeo.unm.edu). For more information on the campus policy regarding sexual misconduct, see: <https://policy.unm.edu/university-policies/2000/2740.html>.

## **OR**

A Note about Sexual Violence and Sexual Misconduct: As a UNM faculty member, I am required to inform the Title IX Coordinator at the Office of Equal Opportunity (oeo.unm.edu) of any report I receive of gender discrimination which includes sexual harassment, sexual misconduct, and/or sexual violence. You can read the full campus policy regarding sexual misconduct at <https://policy.unm.edu/universitypolicies/2000/2740.html> . If you have experienced sexual violence or sexual misconduct, please ask a faculty or staff member for help or contact the LoboRESPECT Advocacy Center

## **Academic Integrity Statement:**

*There is no University specific language or requirement that an Academic Integrity Statement be included in the syllabus although many recommend it. Departments, schools, colleges or campuses may require different wording. Listed below is the statement listed in the UNM Student Handbook*

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in course work may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

## **Other Items:**

*Each course, program, department, school/college, campus may have other specific requirements beyond those listed above. Feel free to include such topics at your discretion while recognizing that inclusion of such is not a requirement for review by the Faculty Senate Curriculum Committee.*

## Critical Thinking

**Problem Setting:** Delineate a problem or question. Students state problem/question appropriate to the context.

**Evidence Acquisition:** Identify and gather the information/data necessary to address the problem or question.

**Evidence Evaluation:** Evaluate evidence/data for credibility (e.g. bias, reliability, and validity), probable truth, and relevance to a situation.

**Reasoning/Conclusion:** Develop conclusions, solutions, and outcomes that reflect an informed, well reasoned evaluation.

Sample Assessment Questions (Open-ended questions could be given as homework, on an exam, or in a student survey. Multiple-choice questions could be given on an exam or as a clicker question in class.):

1. Can an automobile with a velocity towards the north simultaneously have an acceleration towards the south? Explain your answer.
2. Initially two trains are 500 m apart. The first train is going 20 m/s while the second is going 15 m/s. If the first train decelerates at  $0.6 \text{ m/s}^2$  while the second train accelerates at  $0.9 \text{ m/s}^2$ , do the two trains collide? For full points, you must justify your answer with the proper calculations and include an explanation of how you reached your conclusion.
3. A ball is pulled upward with a constant speed using a rope. If the weight of the rope itself is small enough to ignore, what can we conclude about the tension force exerted by the rope and the weight of the ball?
  - a. The tension must be smaller in magnitude than the weight.
  - b. The tension must be equal in magnitude that the weight.
  - c. The tension must be greater in magnitude than the weight.

## **Personal and Social Responsibility - Address 2 of the 5 component skills**

**Intercultural reasoning and intercultural competence**

**Sustainability and the natural and human worlds**

**Ethical Reasoning**

**Collaboration skills, teamwork and value systems**

**Civic discourse, civic knowledge and engagement -- local and global**

Sample Assessment Questions (Open-ended questions could be given as homework, on an exam, or in a student survey. Multiple-choice questions could be given on an exam or as a clicker question in class.):

1. Every time a moving car stops at a stoplight, its kinetic energy is released into the environment as heat. Should we be worried that this additional heat is contributing to climate change? Explain why or why not.
2. Through the use of a solar panel, the energy of the sun is used to charge the battery of a woman's cell phone. What type of energy conversion is this?
  - a. Kinetic energy is being converted into a different type of kinetic energy.
  - b. Kinetic energy is being converted into potential energy.
  - c. Potential energy is being converted into kinetic energy.
  - d. Potential energy is being converted into a different type of potential energy.

## Quantitative Reasoning

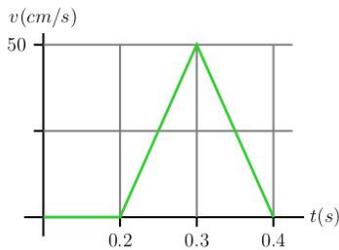
**Communication/Representation of Quantitative Information:** Express quantitative information symbolically, graphically, and in written or oral language.

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Sample Assessment Questions (Open-ended questions could be given as homework, on an exam, or in a student survey. Multiple-choice questions could be given on an exam or as a clicker question in class.):

1. A train, initially traveling at 5 m/s, has a constant acceleration of  $1.2 \text{ m/s}^2$  for 30 s. The train then travels another 1500 m as it slows down (with a constant acceleration) until its speed is again 5 m/s.
  - a. Make a graph of the train's velocity versus time. For full points, you must show all of your calculations and both axes must be labeled with the correct time and position values.
  - b. Make a graph of the train's position versus time. For full points, you must show all of your calculations and both axes must be labeled with the correct time and velocity values.
2. If the speed of the blood flowing through a vein during one heartbeat is given by this graph, how far does the blood travel during one beat?



- a. 5 cm
  - b. 7.5 cm
  - c. 10 cm
  - d. 15 cm
  - e. 20 cm
3. Three blocks are sitting atop of each other as shown. A pulling force is applied to the middle block, but due to static friction, none of the blocks move. Sketch three free-body diagrams, one for each block.

