Course Number and Title: PHYS 2510: University Physics I

Instructor Name: Dr. Tikhon Bykov

Contact Information:
- Office: S110D,
- Phone: 793-4875,
- Email: tbykov@mcm.edu

Office Hours:
- Monday 2:00 pm-5:30 pm;
- Tuesday 1:00 pm-5:30 pm;
- Thursday 1:00 pm-2:00 pm;
- Friday 9:00 am-12:00 pm
or by appointment.

Catalog Description: This is the first part of a two-part series intended for Physics majors and those intending to pursue an engineering degree. It is also recommended for Math, the sciences, and Computer Science majors, who are comfortable with differential calculus. This course covers the fundamentals of mechanics: motion, vectors, forces, momentum, rotational motion, gravity, mechanical energy, and possibly sound. Emphasis is placed on calculus-based problem-solving skills.

Co-requisites: MATH 2421: Calculus I

Course Overview:

University Physics I (5 cr.: 4 lec. 1 lab) is the first part of a quantitative calculus-based science course revealing the workings of our physical environment through the study of mechanics: different types of macroscopic motion. The objective of the student is to develop the skills necessary to analyze the behavior of mechanical systems based on Newtonian Laws of Motion and Conservation Laws and to learn solving basic physics problems from different areas of mechanics. Physics is a subject suitable for all students preparing for careers in science/engineering as well as for those working in other fields. This is because physics involves seeking out and trying to understand the basic laws of nature, of the surrounding world which all of us are living in, no matter what profession we participate in. Many professions, maybe even your future profession, require the ability to make realistic assessments of physical systems. You can also use knowledge of physics in every-day life. No matter what you do, play football or drive your car, physics is everywhere. University Physics course is especially suitable for students who need an introductory calculus-based knowledge of the subject. It is a fundamental course which provides the basis for many special science-related disciplines. No understanding of applied fields is possible without knowledge and understanding of general principles that can be learned in this course. During this semester you will develop conceptual understanding and practical working knowledge of many of the fundamental principles of classical mechanics which is the basis for all other parts of physics. Moreover, physics itself is a perfect illustration for applications of even more general science of math.

Course Objectives:
- Students will demonstrate the ability to employ the methods of science for inquiry
- Students will demonstrate an acceptable level of skill in using the tools of science.
- Students will demonstrate an acceptable level of understanding of the major principles of a scientific discipline.
- Students will demonstrate the ability to formally communicate scientific findings and interpretations, both in writing and speaking, using formats appropriate to the audience and the discipline.
- Students will demonstrate the ability to critically assess the validity of scientific findings and conclusions.
Course Materials and Support:

Required Course Materials:

Fundamentals of Physics, 10th Edition, by D. Halliday, R. Resnick, and J. Walker (John Wiley & Sons, Inc. 2014), ISBN 978-1-118-23072-5, Volume I: Chapters 1-15. If you are only taking Phys 2510, you may save some money by purchasing Volume 1 only. If you are going to take both Phys 2510 and Phys 2520 you will need the complete edition.

This course is designated as ICT (Information and Communication Technology) enhanced. This means that student PCs are required and will be used during almost every class period.

Class Web Page: login at http://www.mcm.edu/~bykov.tikhon/phys2510/phys2510.html for supplemental information. Most of the course assignments will be available through the course account on Moodle. The access to the Moodle web site is password protected and available through the Student Portal at the main McMurry website (http://www.mcm.edu).

Optional or Recommended Course Materials:

The publisher’s web site to accompany the book: http://bcs.wiley.com/he-bcs/Books?action=index&itemId=1118230728&bcsId=8262

AEC and Other Educational Support Resources:

Your instructor is normally available at the posted office hours or by appointment. You may drop in without an appointment, but may be asked to come back later. You may ask questions by E-mail. This usually works fine for short questions about a specific concept or method, but do not expect that the instructor will do the entire assignment for you. Your instructor and fellow students won’t be much help if they merely provide answers. There are also tutors available at the Academic Enrichment Center (AEC).

Course Policies:

Attendance:

It is understood that attendance is part of the learning commitment — placing oneself in a class setting where effective educational communication and interaction can happen. Students are expected to be regular and punctual in their attendance habits. The students who are late may not be admitted to the class room. Attendance is required and will be noted. Any necessary absence occurring while a student is representing the University in some official way will be considered an authorized absence. Work missed due to such an absence is to be made up as the instructor determines. All the homework which is due prior or on the day of the authorized absence is to be turned in before student’s departure. It is the students’ responsibility to inform the instructor about their authorized absences in advance and arrange the make-ups.

Grade Determination:

This course has a modular structure where each of the 8 modules corresponds to the major subject-area to be covered. Every module is worth certain number of points, depending on the importance and the scope of the material to be covered inside of the module. The points to be earned in each module add up as a result of different activities, such as homework, reading quizzes, lab reports, discussion worksheets and others. The exact number of points you can earn for each activity can be found in the course schedule at the class schedule web page. Total number of points available in all of the modules is 1900.
In addition to that:

- The pre-test will be given during the first week of classes. This pre-test is designed to determine your preparation level, and the full credit of 60 points will be given for participation, not for answering questions right or wrong.
- The final exam will be given during the final week. It is comprehensive and it is worth of 160 points.
- There will be 100 points available for attendance and 100 available for participation in the in-class activities.

Overall the total number of points you can earn in this course is 2320, which constitutes 100%.

The scale for the letter grades is the following:
- A=93-100
- A-=90-92
- B+=87-89
- B=83-86
- B-=80-82
- C+=77-79
- C=73-76
- C-=70-72
- D+=67-69
- D=63-66
- D-=60-62

In addition to that if you fail (have a score of less than 60%) any 4 of the 8 modules, regardless of your total grade in class, you fail the entire course.

No grade less than C counts towards physics major.

Grades are final and cannot be negotiated unless an error has occurred. Although great care is taken in the recording of grades, errors do occur, so, please do make sure that the recorded scores are correct!

Make-up Work:

All make-up work has to be authorized by the instructor and arranged in advance.

+/- Grade System:  See the grade scale above.

Academic Dishonesty:

Every student is fully responsible for the work which he/she submits as his/her own. Some of the class activities are designated as group work. In these cases every group member should have the complete understanding and active participation in the group work. In some designated cases collaboration between the students is encouraged, but every student should keep in mind that this collaboration is not possible for other activities, especially during exams. For individual assignments, presenting other people’s work as your own automatically leads to the assignment failure and may have even harder consequences up to expelling from the University.

ADA Compliance:

McMurry University abides by Section 504 of the Rehabilitation Act of 1973, which stipulates that no otherwise qualified student shall be denied the benefits of an education “solely by reason of a handicap”. If you have a documented disability that may impact your performance in this class and for which you may be requesting accommodation, you must be registered with and provide documentation of your disability to the Disability Services Office. Arrangements will be made for students needing special accommodations.

Cell Phones, Calculators, and other Electronic Devices:

You must disable all audible communication devices and anything else that goes 'beep' or 'ding'. Tablet PCs are to be used during the class periods strictly according to the instructor's directions. They shall not be used for browsing internet, playing videogames, charting with friends and/or any other activities not directly related to the content of this class. In the case if these rules are violated, the student may be asked to leave the classroom until the end of the current class period and the missed class activities will be counted as unexcused absence.
Other Course Policies:

This syllabus spells out specific policies concerning attendance, participation, assignments, deadlines and examinations; however, it is subject to change according to particular circumstances which may occur during the semester.

In addition to this syllabus, you have rights and responsibilities described in the Student Handbook and University Catalog.

It is also the policy of McMurry University to not discriminate on the basis of sex, sexual orientation, disability, race, color, religion, and national or ethnic origin in its educational programs. Violation of this policy towards your fellow students may lead to expelling from this class.

Of particular importance are maintaining academic honesty and personal conduct. It is the responsibility of all members of McMurry University scholarly community to conduct themselves in a professional manner. This means you should not engage in behavior disruptive to the class or learning experience of other students. You must fully participate in class which includes being seated and ready to participate in all class activities and waiting until the class is over before packing up your things and leaving. During class periods you may not read material and participate in any discussions not directly connected with the course content as well as you may not comment loud on any other subjects but physics.

Major Projects, Required Activities, and Assignments:

As any scientific course, Phys 2510 requires a student to have working knowledge of basic algebra and trigonometry. Calculus I is a co-requisite for this course. Make sure that you have already had or enrolled in the appropriate math class. If this is not the case or you are not sure, talk to your instructor and/or academic advisor to determine if this class is appropriate for you. You should examine Appendix E of the course’s text. You should be comfortable with the material on page A-9 at the beginning of the semester and should learn most of the material on pages A-10 and A-11 as the semester progresses. Review the topics and exercise skills which you feel not quite comfortable with. Physics problems themselves are the perfect exercises to improve your mathematical skills, but you have to spend certain (sufficient) amount of time to first learn the material and then understand how to work problems out. Do not expect everything to be easy. This is not just because physics is a complicated science, but because it reflects the real world which is far from being simple.

Because University Physics is a skills-building course, where every new module of the material is based on the knowledge of the previous subjects, it is particularly important to attend all the lectures, labs and discussions, and to do all of the assigned homework. Past experience shows that mastery of a subject comes not just from the instructor or the text or the tests, but from an active engagement of every student in the consideration of the concepts and methods of physics.

The specific methods designed to achieve this mastery of the subject are:

- **Reading** the text and working through the sample problems.
- **Lectures** consisting of explanations, demonstrations, discussions, solving sample problems.
- **Homework** exercises on physics concepts and problem solving.
- **Discussions** with peers about physical principles and solving context rich problems in peer groups.
- **Laboratory**, where you can see how physics works in reality.
- **Exams** on concepts and problem solving!

Course Activities:

**Class Preparation:** You are responsible for all material in the assigned reading, in handouts and exercises, presented in lecture, during discussions, in the lab manual and posted on the class web page and/or Moodle.

- **Reading:** You are required to read the assigned sections of the text before the lecture, discussion or lab. Reading quizzes will be given to make sure you have read the assigned material. It is a good idea to reread the assigned sections once again after the lecture. Since so much material will be covered, some of the subjects are presented in the book with much more detailed explanation than any lecture time can possibly allow. Some not so important material maybe left for student’s individual study. Pre-lecture reading quizzes will be due online through Moodle. The specific deadlines for these quizzes will be published on Moodle. They are usually due one hour before the lecture time. The book sections to be read are noted in the course schedule. Since a lot of material has to be studied for some lectures, you should probably start the readings far in advance.
Interactive Lecture: Attendance and participation in all the lectures is required. Lecture is an activity and should not be wasted by passivity: listen -- think -- discuss -- ask questions -- answer questions. The only way for me, as your instructor, to know how the class understands the material is by receiving questions and answering those questions, so please do ask them. The lecture is not the instructor's monolog. The book and various online resources could probably do much better job if that was the case. The lecture is a conversation between the instructor and all the students in class, not just the instructor and one outstanding student.

Homework: There will be one homework assignment inside of each module. It will be administered through Moodle. The assignments will become available at the beginning of each module when the coverage of the material is started in class and will remain available until several days after the module's completion. Exact information on the material covered in each assignment, the time allowed for each try and its due dates will be posted on Moodle. The online assessment engine allows randomization of problems and parameters of a given problem. Thus, there will be several different possible questions and each will have different numbers every time. Collaboration and use of additional materials is encouraged on the homework. However, each student should have a full understanding of any work that he/she submits as his/her own. The assignments are open-book and open-notes. However, a student should keep in mind that these resources will not be available during the exams. Homework is due according to the strict deadlines specified and no late homework will be accepted, unless a significant reason has occurred.

Discussions: There will be in-class discussions inside of almost every module, where you will discuss in small peer groups and solve problems relevant to the most important subjects of the course. These will often involve work with your Tablet PCs. During each of the discussions you will have to complete a worksheet, which will determine your discussion grade.

Laboratory: There will be one or two laboratory sessions inside of almost each module, where you will do real physics experiments to get practical knowledge relating physics concepts to the real-world experience. The Laboratory Lab Manual is published on Moodle for each module. You are expected to read the Lab Manual before coming to the lab. The short online pre-lab quizzes will be given to assure your reading of the material. You can only start the lab if you have completed the pre-lab assignment.

Exams: There will be no specifically designated midterm exams in this course. However, mini exams will take place inside of some of the modules. These mini exams will have to do with the material of each particular module and may include essay questions as well as problems. See the course schedule for exact dates of the mini exams inside of each module. The final exam will be given during the final week. The final exam is comprehensive. All exams will be closed books and notes but you will be allowed to bring a sheet with formulae for each block of the material. No make-up exams will be given unless an important reason takes place. All make-ups must be arranged in advance.

Online Activities: A series of additional online questions/assignments, discussions/forums may be offered. Some of these activities are optional and some will be incorporated into lectures and will constitute your lecture participation grade. Active participation in the optional activities may be counted as an extra credit, which sometimes is needed to improve the final grade. It will be no any other extra credit offered at the end of the semester. So, if you feel that you might need one, please start your participation as soon as possible.

Feedback: At several points in the course, you will be asked to provide feedback in the form of surveys and course evaluations to complement class discussion, assignments, and exams. Please take the surveys seriously, as they will help me and university to provide more effective learning experience.

Tentative Course Schedule:

The tentative course schedule is published online at http://mail.mcm.edu/~bykov.tikhon/phys2510/Physics2510/sec.html
### Course Objectives/Student Learning Outcomes and their Linkage to Program and University Goals and Outcomes.

**Course Number and Title:** Physics 2510, University Physics I

<table>
<thead>
<tr>
<th>Course objectives and goals</th>
<th>Linked to which departmental program goal(s)</th>
<th>Linked to which institutiona l goal(s)?</th>
<th>Types of evidence that might be used to demonstrate student achievement of objectives &amp; goals</th>
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| Students will demonstrate the ability to employ the methods of science for inquiry. | - to enhance non-physics science majors’ understanding of science through the application of the scientific process into disciplines that overlap their interests, but view the material from a different perspective, thereby providing a richer understanding of the interconnectedness of their discipline to other fields;  
- to prepare physics graduates for a wide range of career opportunities including not only graduate study in physics, engineering, pre-med, or other sciences; but also, science teaching and careers in industry and science-related business | 1, 2, 3, 4, 8 | Students will show the ability to formulate rational approaches to problem-solving both as conceptual situations and in hands-on experiments. Students will be successful, working on discovery-based classroom assignments and discovery-based lab exercises. |
| Students will demonstrate an acceptable level of skill in using the tools of science. | - to enhance non-physics science majors’ understanding of science through the application of the scientific process into disciplines that overlap their interests, but view the material from a different perspective, thereby providing a richer understanding of the interconnectedness of their discipline to other fields;  
- to prepare physics graduates for a wide range of career opportunities including not only graduate study in physics, engineering, pre-med, or other sciences; but also, science teaching and careers in industry and science-related business | 2, 3, 8 | Students will show the proper use of lab equipment, though supervised lab experience. Students will be able to explain the precision involved in any measurement and the use of uncertainty in calculations of their results. Students will be able to use the mathematical and logical tools of science as it can be seen through their success on in-class homework assignments. |
| Students will demonstrate an acceptable level of understanding of the major principles of a scientific discipline. | - to enhance non-physics science majors’ understanding of science through the application of the scientific process into disciplines that overlap their interests, but view the material from a different perspective, thereby providing a richer understanding of the interconnectedness of their discipline to other fields;  
- to prepare physics graduates for a wide range of career opportunities including not only graduate study in physics, engineering, pre-med, or other sciences; but also, science teaching and careers in industry and science-related business | 1, 2, 3, 8 | Students will show this ability through their success on the quizzes and exams questions that pertain to the major principles of the field. |
| Students will demonstrate the ability to formally communicate scientific findings and interpretations, both in writing and speaking, using formats appropriate to the audience and the discipline. | - to enhance non-physics science majors’ understanding of science through the application of the scientific process into disciplines that overlap their interests, but view the material from a different perspective, thereby providing a richer understanding of the interconnectedness of their discipline to other fields;  
- to prepare physics graduates for a wide range of career opportunities including not only graduate study in physics, engineering, pre-med, or other sciences; but also, science teaching and careers in industry and science-related business | 2, 3, 4, 8 | Students will demonstrate their ability to present their work formally through writing and revision of the laboratory reports.  
Students will demonstrate their ability for formal speaking during formal oral presentation in the laboratory and active participation in in-class discussions. |
| Students will demonstrate the ability to critically assess the validity of scientific findings and conclusions. | - to enhance non-physics science majors’ understanding of science through the application of the scientific process into disciplines that overlap their interests, but view the material from a different perspective, thereby providing a richer understanding of the interconnectedness of their discipline to other fields;  
- to prepare physics graduates for a wide range of career opportunities including not only graduate study in physics, engineering, pre-med, or other sciences; but also, science teaching and careers in industry and science-related business | 1, 2, 3, 4, 8 | Students will demonstrate their ability to critically assess the validity of scientific findings and conclusions through the process of the peer review of the lab reports and participation in peer group problem solving. |

Institutional Goals:

1. Students acquire an education shaped by Christian values.
2. Students are equipped for successful careers and post-graduate education.
3. Students acquire an enthusiasm for lifelong learning through expanded intellectual and cultural experiences.
4. Students, in a community where leadership is cultivated, acquire a solid basis for future lives of leadership.
8. The institution will engage in an ongoing pursuit of excellence in curricula, programs, and policies.