



Course Syllabus – Fall 2008

Course Number and Title: PHYS 3300: Introduction to Modern Physics

Instructor Name: Dr. Tikhon Bykov

Contact Information:

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

Office Hours:

- Monday, Wednesday, Thursday and Friday 11:00 am-12:00 am;
 - Monday 1:00 pm-4:00 pm;
 - Wednesday 1:00 pm-2:00 pm
 - Tuesday and Thursday 9:00 am-11:00 am;
- or by appointment.

Course Overview

Catalog Description: This is a required course for physics majors. This course is intended to introduce the student to a wide range of areas under the heading of Modern Physics. These areas include relativity theory, atomic and nuclear physics, quantum mechanics, and elementary particle physics. (Fall)

Pre-requisites: PHYS 2520

Course Overview:

Introduction to Modern Physics (3 cr.) is the introductory calculus-based science course primary intended for Physics and Pre-Engineering majors and Physics minors. This course continues the sequence started by the University Physics courses in order to give students the introductory knowledge of all the areas of physics. This course is focused on physics of the 20th century and deals with subjects beyond the framework of so-called "classical physics". It demonstrates that understanding of the surrounding world outside of the every-day experience is not possible in terms of traditional classical (Newtonian) mechanics. At microscopic scales and/or very high speeds one has to use Quantum Mechanics and Theory of Relativity. These are the two main subjects to be covered in this course. Once again these subjects will be considered from different perspectives using variety of mathematical approaches. The objective of the student is to develop the skills necessary to analyze the behavior of various non-classical systems based on these mathematical methods. The skills developed in this class will serve as a passage towards consideration of even more complex problems of engineering physics, quantum mechanics and atomic physics in upper division physics courses.

Course Objectives:

- Students will demonstrate conceptual understanding of the basic principles of modern physics.
- Students will demonstrate the ability to apply these principles towards solutions of various problems, including the problems of 1) special theory or relativity, 2) old quantum mechanics, 3) elementary solutions of the Schrodinger equation

Course Materials and Support:

Required Course Materials:

Modern Physics 5th edition by Paul A. Tipler and Ralph A. Llewellyn (W.H. Freeman and Company) 2008, ISBN-13: 978-0-7167-7550-8

Class Web Page: login at <http://www.mcm.edu/~bykov.tikhon/phys3300/phys3300.html> for supplemental information and assignments--check frequently!

Optional or Recommended Course Materials:

Publisher's web site at <http://bcs.whfreeman.com/tiplermodernphysics5e>

You must register as a student at this web site to get a full access to supplementary materials for the book

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.

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 through activity participation. 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. It is the students' responsibility to inform the instructor about their authorized absences in advance and arrange the make-ups.

Grade Determination:

Homework: Homework is due according to the strict deadlines specified on the schedule and is worth 25% of the course grade. *No late homework will be accepted.*

Reading Quizzes: Reading quizzes are due online before every class period and are worth 5% of the course grade.

In-class discussions: Attendance, participation in in-class discussions or/and quizzes and worksheets (if any) and in-class presentations worth 10% of the class grade.

Exams: Each of the 3 Unit Exams is worth 20% of the total grade and one exam with the lowest grade will be dropped. *The unit exams are given on the regular class days: September 23, October 30, and November 25.* The final exam is comprehensive *and will be given during the final week on December 9th from 10:30 am to 12:30 pm.* It is also worth of 20%of the total grade. No make-up exams will be given unless the important reason takes place. All make-ups must be arranged in advance.

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.* 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-ups have to be authorized by 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 a 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 the 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, located in Old Main Room 102. 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'. 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, chatting with friends and/or any other activities not directly related to the content of the class. In the case if these rules are violated, the student maybe 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 take place during the term. In addition to this syllabus, you have rights and responsibilities described in the *Student Handbook* and *Schedule of Classes*. 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. It is also the policy of McMurry University to not discriminate on the basis of sex, sexual orientation, disability, race, color, religion, national or ethnic origin in its educational programs. This means you should not engage in behavior disruptive to the class or the 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 class is over before packing up your things and leaving. During the 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:

Introduction to Modern Physics is a skills-building course, where every new topic is based on the knowledge of the previous subject, it is particularly important to attend all the lectures and to do all of the assigned homework. Mastery of a subject comes not just from the instructor or the text or the tests, but from the active engagement of every student in consideration of the concepts and methods of physics.

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

- **Reading** the text and **working through** the example problems.
- **Lectures** consisting of explanations, discussions, solving example problems.
- **Homework** exercises on basic concepts and problem solving.
- **Discussions** with peers about main principles of classical mechanics and solving problems in peer groups.
- **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 and posted on the class web site.

Reading: You are required to read the assigned sections of the text *before* the lecture then you can reread them once again after the lecture. The reading quizzes consisting of several short questions will be given online before every lecture. This is needed in order to spend the lecture time in the most efficient way not by repeating again and again the facts which are presented in the book in much more detailed form than any lecture time can possible allow but to concentrate on the most important points of the course and clarify them for students as much as possible.

Lecture: Attendance and participation at all lectures is *required*. Lectures are an *activity* and should not be wasted by *passivity*: listen -- think -- discuss -- **ask questions** -- answer questions. The only way for me as the instructor to know how the class understands the material is by receiving questions and answering those questions, so please do ask them.

Homework: The assignments will be posted on the class web page. The assigned problems will be taken from the book or will be given on handouts. It will be a set problems assigned to the each block of the material. The exact deadlines will be placed on the course web page. Collaboration 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 also open-book open-notes.

Online Materials and Discussions: The online component of this class will be administrated through the software, known as the "Interactive Learning Kit". The ILK web page is assessable through our class web site. It allows posting of handouts, online assignments and organize online forums related to topics discussed in class. Each student will need to create a user account the first time when he/she uses the system and save the login and password information for future uses.

Discussions: There will be in-class discussions and/or quizzes during the semester where you will discuss and solve problems relevant to the most important subjects of the course.

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 to provide more effective learning experience.

Tentative Course Schedule:

The tentative course schedule is published online at
<http://mail.mcm.edu/~bykov.tikhon/phys3300/Physics3300/sec.html>

**Course Objectives/Student Learning Outcomes
and their Linkage to
Program and University Goals and Outcomes.**

Course Number and Title: Physics 3300, Introduction to Modern Physics

Course objectives and goals	Linked to which departmental program goal(s)	Linked to which institutional goal(s)?	Types of evidence that might be used to demonstrate student achievement of objectives & goals
Students will demonstrate conceptual understanding of the basic principles of modern physics.	- 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	Successful completion of the in-class essay questions during the exams.
Students will demonstrate the ability to apply these principles towards solutions of various problems, including the problems of 1) special theory or relativity, 2) old quantum mechanics, 3) elementary solutions of the Schrodinger equation	- 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	Successful solving of appropriate problems during in-class discussions, homework and exams.

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.