

Course Syllabus
Physics 489: Senior Seminar

Fall Semester, 2017

Instructor: Dr. Steven Sahyun
Office: 157 Upham Hall
Phone: 262-472-5113
E-mail: sahyuns@uww.edu **Web Site:** <http://sahyun.net>
Course WWW: <http://sahyun.net/courses/physcs489>
Office Hours: M 1:00 pm – 4:30 pm; W 2:00 pm – 3:30 pm
Class Meetings: WF 12 noon – 12:50 pm

Exams: **Final: Monday, Dec 15 12:15-2:15pm**
Required Texts: *Conquering the Physics GRE 2nd Ed*, Kahn and Anderson. Text Rental.

OpenStax University Physics, Ling, Sanny, and Moebis. Vols. 1, 2, and 3. Free PDF available on the course D2L and at
<https://openstax.org/details/books/university-physics-volume-1>
<https://openstax.org/details/books/university-physics-volume-2>
<https://openstax.org/details/books/university-physics-volume-3>

You should also have your introductory physics text available (Moore), to review and compare material (to OpenStax) the relevant sections before each quiz.

Pre-requisites: **PHYSICS 305 AND PHYSICS 344 OR CONSENT OF DEPARTMENT**

Course Description:

The course will train students in making scientific presentations, summarize the concepts and methods taught in the physics major curriculum, and prepare them for the Physics Major Field Test as the final exam in the course. Students will become familiar with physics literature and learn to write abstracts and project proposals. They will demonstrate proper methods of verbal and visual presentation by delivering a graded series of talks, concluding with a satisfactory colloquium on a physics topic. Two one-hour sessions a week.

Course Objectives:

This course has the following objectives:

- *Review topics learned during the entire course of study in physics* and to help you do your best on the Physics Major Field Test (MFT) and the GRE Physics Test (if applying for graduate school) by practicing with tests.
- *Hone public presentation and scientific communication skills.* We will have a workshop on how to give effective presentations and to prepare talks. Every student will present in class and also give a short public talk at the Physics 190 class (Fridays 12:00 – 12:50 pm).
- *Prepare for post graduate professionalization* (job hunting, proposal writing to access resources, improve reading skills from professional physics journals).

These objectives will be reached by assigning research work, making and evaluating presentations and proposals, and working selected homework problems as a review of your overall physics understanding.

Course Structure:

(a) Review of Undergraduate Physics and MFT Preparation

Approximately the first half of the course is a preparation for the MFT and GRE. We will review all the material from undergraduate physics through HW and tests. During that period, every Monday and Wednesday you will be taking in-class tests/quizzes each 20-30 mins. The quiz/HW grades may be curved. Each late assignment (HW or presentations) will lose 25% of the grade.

Each week you will have a homework assignment for the next class (due in class). The solutions should be handwritten, clear and thorough in order to receive full credit. In each class you may be asked to present a random question from your homework. You will be graded based on your presentation of the question. Answers like “have no idea”, will be points deduction from your HW.

MFT Exam:

After completing the review section, a 2-hour block for the Physics Major Field Test (MFT) will be scheduled and conducted. This exam is a multiple choice, standardized exam from Educational Testing Service. The results of this exam help the Physics Department determine curricular and course needs and changes. We rely on your serious attempt at this exam to determine how we teach our courses to our majors.

- **The MFT date is tentatively set for Friday, November 3.**

(b) Public Presentation and Post Graduate Professionalization

You will prepare public presentations during the course of the class. The topics will be on:

- Job hunting and interview skills, elevator speeches (instructor and peer reviewed).
- Proposal writing to access resources such as an application to use a research instrument or access for a government lab, etc.
- Review of a professional physics journal publication.
- Everyone will submit their presentations (submitted to D2L Dropbox) and will orally present at least twice on a specific subject. Presentation topics will be distributed based on student individual research experience and interest and presented at the physics department colloquium—Physics 190 on a Friday!
- There will be a résumé workshop. Your résumé will be updated and peer and instructor evaluated.

Grading:

Course grades will be determined by the percentage of total points assigned for the course. A tentative grading table is the following:

A	92-100
A-	83-92
B+	75-83
B	67-75
F	<67

If you miss a class or turn in your assignment late, you need to provide an official documentation (doctor's note, etc.) in order to claim your missed credits/points.

The **approximate** distribution of points will be as follows.

HW and Quizzes	30 %
Major Field Test*	20 %
Attendance	10 %
Resume	10 %
Oral presentations	15 %
Final/Colloquium presentation	15 %

*Based on the MFT, your score will be: 100%, if you get above the mean
 90 %, if you get below the mean
 80 %, if your score is very low.

Tentative Schedule and topics:

- **Intro to graduate school**
 What is graduate school, who can apply and how to apply? Application priorities, GRE exams. Tuition and fees in graduate school. Research or teaching assistantship. Student action items.
- **Classical Mechanics - 20%**
 Kinematics, Newton's laws, work and energy, oscillatory motion, rotational motion about a fixed axis, dynamics of systems of particles, central forces and celestial mechanics, three-dimensional particle dynamics, Lagrangian and Hamiltonian formalism, noninertial reference frames, elementary topics in fluid dynamics.
- **Electromagnetism - 18%**
 Electrostatics, currents and DC circuits, magnetic fields in free space, Lorentz force, induction, Maxwell's equations and their applications, electromagnetic waves, AC circuits, magnetic and electric fields in matter.
- **Optics and Wave Phenomena - 9%**
 Wave properties, superposition, interference, diffraction, geometrical optics, polarization, Doppler effect.
- **Thermodynamics and Statistical Physics - 10%**
 Laws of thermodynamics, thermodynamic processes, equations of state, ideal gases, kinetic theory, ensembles, statistical concepts and calculation of thermodynamic quantities, thermal expansion of heat transfer.
- **Quantum Mechanics - 12%**
 Fundamental concepts, solutions of the Schrodinger equation (including square wells, oscillators, and hydrogenic atoms), spin, angular momentum, wave function symmetry, elementary perturbation theory.
- **Atomic Physics - 10%**
 Properties of electrons, Bohr model, energy quantization, atomic structure, atomic spectra, selection rules, black-body radiation, x-rays, atoms in electric and magnetic fields.
- **Special Relativity - 6%**
 Introductory concepts, time dilation, length contraction, simultaneity, energy and momentum, four-vectors and Lorentz transformation, velocity addition.
- **Laboratory Methods - 6%**
 Data and error analysis, electronics, instrumentation, radiation detection, counting statistics, interaction of charged particles with matter, lasers and optical interferometers, dimensional analysis, fundamental applications of probability and statistics.

Related Information:**2017–2018 GRE Subject Test Dates (For testing in the US):**

Test Dates	Regular Deadline	Late Deadline	Supp. Test Center and Monday Administration Deadline	Online score	Score mailing date (approx.)
09/16/17	08/11/17	08/18/17	07/28/17	10/16/17	10/27/17
10/28/17	09/22/17	09/29/17	09/08/17	11/27/17	12/08/17
04/14/18	03/09/18	03/16/18	02/23/18	05/14/18	05/25/18

Please see <https://www.ets.org/gre/subject/about/content/physics> for further/updated information.

Workload: The University sets a minimum level of effort that each student must devote per credit earned for all courses at the university, a minimum found in Section V-C, page 1 (revised 1992 August 1), of the University Handbook. Effectively, you should be spending two to three times as much time on this course outside of class as you do in class, this is approximately four to six hours of work for this two credit class. If you find that you are spending significantly more than that, please discuss it with me to see if I can help you study more effectively.

Special needs statement: Students with special needs should contact the instructor to make appropriate arrangements.

The University of Wisconsin-Whitewater is dedicated to a safe, supportive and non-discriminatory learning environment. It is the responsibility of all undergraduate and graduate students to familiarize themselves with University policies regarding [Special Accommodations](#), [Misconduct](#), [Religious Beliefs Accommodation](#), [Discrimination](#) and [Absence for University Sponsored Events](#). (For details please refer to the Undergraduate and Graduate Timetables; the [Rights and Responsibilities](#) section of the [Undergraduate Catalog](#); the [Academic Requirements and Policies](#) and the [Facilities and Services](#) sections of the [Graduate Catalog](#); and the [Student Academic Disciplinary Procedures](#) [UWS Chapter 14]; and the [Student Nonacademic Disciplinary Procedures](#) [UWS Chapter 17].)