

# PHYSICS 431

## Heat, Waves, Light & Modern Physics

*Physics 431 is a calculus-based introduction to heat, waves, light, and modern physics. It is intended for physics, chemistry, pre-medical and engineering students. Topics include heat, temperature, kinetic theory, waves, sound, light reflection and refraction, optics, interference, diffraction, atomic theory, nuclear theory and quantum mechanics.*

<b>Instructor:</b>	Dr. William Simpson Office: 305 A Telephone: 484-8115 E-mail: William.Simpson@arc.losrios.edu	Office Hours: M - Th: 1:30 – 2:20 PM F: 10:00 – 11:00 AM
<b>Required Textbook:</b>	University Physics, 12 <sup>th</sup> edition (Ch. 15 –20, 32 – 43) by Young & Freedman	
<b>Pre-requisite:</b>	Physics 410, with a grade of C or better.	
<b>Advisory:</b>	Math 402.	

### Course Outline:

The following is a tentative list of the topics covered and estimated dates of exams.

week 1	heat & temperature, calorimetry
week 2	kinetic theory, thermodynamics
week 3	heat & thermodynamics; <b>exam 1</b> ; wave theory
week 4	waves, sound
week 5	sound, electromagnetic waves & light, reflection, refraction, dispersion, polarization
week 6	basic optics, image formation, thin lenses
week 7	advanced optics
week 8	<b>exam 2</b> ; interference & diffraction
week 9	interference & diffraction, spectroscopy
week 10	photoelectric effect, models of the atom
week 11	Bohr model; <b>exam 3</b>
week 12	particle-wave duality, quantum mechanics
week 13	quantum mechanics, atomic theory, periodic table
week 14	nuclear theory; <i>Thanksgiving</i>
week 15	nuclear decay, nuclear reactions
week 16	<b>exam 4</b> ; particle physics
week 17	<i>finals week</i>

**Final Exam: Tuesday, Dec. 14, 8 – 10 am**

**Course Evaluation:**

Your grade in this course is a combination of homework, midterm exams, laboratory work, in-class problem solving, and a final exam. Homework, reading, problem solving, and lab activities are all intended to help you prepare for the exams. The total number of points available in the course is 2000. The point breakdown is given below.

Midterm Exams	There will be 4 midterm exams: <ul style="list-style-type: none"> <li>• heat &amp; thermodynamics – 240 points</li> <li>• waves &amp; sound, light &amp; optics – 350 points</li> <li>• wave nature of light, Bohr model – 350 points</li> <li>• quantum mechanics, nuclear physics – 350 points</li> </ul>	1290 points
Final Exam	The final exam will be comprehensive.	240 points
Homework	There will be 11 homework assignments, worth 20 points each.	220 points
Problem Solving & Labs	There will be a total of 25 in-class problem solving assignments and lab activities, worth 10 points each.	250 points

In general, your letter grade will be assigned using the following scale:

1800 - 2000	A
1600 - 1799	B
1400 - 1599	C
1200 - 1399	D
below 1200	F

**BUT** if you fail to complete the required work, (turn in homework only once in a while, come to class only once in a while, miss exams and labs, etc...), then your letter grade will be determined by the instructor, based on an evaluation of your overall performance in class.

**Student Learning Outcomes:**

Upon successful completion of this course, you will be able to:

- test the validity of a hypothesis using the scientific method.
- identify the basic physical principles that apply in a particular situation (such as interference, diffraction, or energy conservation).
- analyze conceptual problems that require the application of thermodynamics, wave mechanics, optics and modern physics.
- solve problems requiring the application of physics and mathematics up through calculus.
- interpret the results of physics calculations.
- define common physics terms and physical laws.
- compose a well-organized and complete lab report.

## PHYS 431 Attendance & Homework Policy

### Daily Attendance:

Attendance and participation are required in this class. If you miss class, contact me immediately to arrange to make up work. You may turn in an assignment late if you miss class on the day it is due and you have a valid excuse.

#### Valid Excuses for Missing Class:

- Death (*yours, or an immediate family member*)
- Dismemberment
- Hospitalization or Illness Requiring Doctor's Visit (*if you show me a doctor's note*)
- Auto Accident (*if you show me a police report*)

#### Invalid Excuses for Missing Class:

- Oversleeping
- Transportation Problems (*e.g., ran out of gas, got stuck in traffic, couldn't find parking*)
- Illness Not Requiring Doctor's Visit (*e.g., bad cold, bad sushi, hangover*)
- Non-Emergency Appointments (*e.g., dentist, counselor, parole officer*)

Athletes may miss a regular class to attend an athletic event if they bring a note from their coach and arrange to make up the work ahead of time. However, athletes may not miss an exam to attend an athletic event.

Since everyone has an occasional issue arise that causes them to miss class, you are allowed up to three unexcused absences throughout the semester. More than three unexcused absences will result in the lowering of your grade at the end of the semester.

There are no make-up labs in this course. If you are absent during a lab, you will receive zero credit for the lab report even if you have a valid excuse for your absence.

### Exam Attendance:

You are responsible to be in class on time and ready to go on exam days. Showing up late or missing an exam will affect your grade significantly. Plan ahead on exam days. Expect bad traffic. Expect to find no parking on campus. Get to campus early and show up to class early to get settled before the exam starts.

If you miss an exam because of a valid excuse, call me on the same day to arrange a make-up time. Do not wait until next class to tell me you missed the exam and want to make it up. Make up exams will only be given with prior approval and are not guaranteed, even if you have a valid excuse.

**Tardiness:**

Class starts on time. You are expected to show up sufficiently early to be in your seat and ready to go by the start of class. If you arrive to class late, please enter quietly to minimize the disruption. If you are chronically late to class, your grade may be lowered at the end of the semester.

**Homework:**

Homework will be collected at the start of class on the day it is due, and the answers will be discussed in class. Your homework score will be reduced by 1 point for every minute you are late to class, and **NO LATE HOMEWORK** will be accepted after the first 20 minutes of class, so come to class early and turn your homework in on time. Turn your homework in early if you know you will be missing class the day it is due.

**Labs:**

This class has one or two lab activities per week. Each lab activity will require you to fill out a lab report and hand it in. Lab reports are due on the day of the lab. Late lab reports will be docked points. There are no make-up labs.

**In-Class Problem Solving:**

This class has one or two problem-solving activities per week. Each problem-solving activity will require you to work through a set of problems and check their answers. You get credit for working on the problems throughout the time allotted for the activity. If you leave class early, without completing all of the assigned problems, you will not receive full credit for the activity.

## PHYS 431 General Information

### Keys to Success:

- Attend every class. This course covers a lot of material very quickly. You cannot afford to miss a single day of class.
- Study everyday, not just on the weekends. The class moves very fast. Do not fall behind!
- Do all of the homework. Start working on homework as soon as it is assigned.
- Do not give up if you do not understand a concept or how to solve a particular problem. Ask questions, in class or during office hours.
- Study with friends. Form study groups to help each other clarify and organize the material. Do not fall in the trap, however, of just copying somebody else's work.
- Concentrate on understanding concepts rather than memorizing formulas. Concentrate on setting up a problem rather than on getting an exact numerical answer. .

### The Importance of Communication:

In this class, you will be evaluated on your ability to:

1. understand the questions I ask you,
2. determine the appropriate answers to those questions, and
3. communicate your answers in a clear and concise manner.

The last point is very important, but often overlooked. You cannot demonstrate that you understand a question and can answer it correctly if you do not communicate your answer clearly. This applies to in-class discussion, homework, quizzes, labs and exams.

### Guidelines for Handing in Homework:

1. **Clearly identify the problem** being answered, and write up the solutions in the order the problems were assigned.
2. **Make a diagram** to illustrate the situation. This is the best way to understand what the problem is asking before trying to solve it. In the diagram, label the known quantities and assign a symbol to the unknowns.
3. **Show all your work.** Be reasonably detailed. Explain your reasoning. Clearly state any assumptions made in the problem or in the formulas. For some of the problems assigned you can verify the answer in the back of the book. Note: the main purpose of the homework is to see how you set up and solve the problem, not to show just final answer. **No credit will be given for homework problems that only report an answer with no process shown.** (The same will be true in exams, so practice here first!) And, partial credit will be given if you follow the correct process but fail to get the correct answer at the end.
4. A complete numerical calculation must follow at least these three steps:
  - Step 1: Write the formula, in symbols.
  - Step 2: Show the numbers plugged into the formula, with units. Carrying units in a calculation is the best way to avoid giving absurd answers.
  - Step 3: Report the answer, with units and correct significant figures.
5. Write in neat, legible print. **Messy homework will not be graded.**

**General Information:**

- This class uses Desire2Learn (<http://d2l.losrios.edu>) as a class bulletin board. Announcements, assignments, handouts, answers, and grades will be posted to the D2L website.
- Cell phones and other electronic devices must be turned off and put away during class. Points will be deducted from your attendance and participation grade if your cell phone rings during class or if you are seen using your cell phone during class.
- Any students requiring accommodation for disabilities should contact me during the first few days of class so there is sufficient time to make the necessary arrangements.
- There are a number of campus resources available to help you succeed in this class.

**LRC:** The Learning Resource Center is a well-equipped, professionally staffed facility that offers students a personal approach to academic success through independent study, individualized tutoring, and alternate modes of instruction. (<http://www.arc.losrios.edu/LRC.htm>)

**MESA:** MESA is a learning community for students pursuing four-year degrees in the fields of mathematics, science, or engineering. MESA helps students achieve in the classroom, progress academically, and develop professionally. Eligible students have experienced educational and financial disadvantage. (<http://web.arc.losrios.edu/~mesa>)

**DSPS:** Disabled Students Programs and Services provides specialized services and academic accommodations to meet the needs of students with disabilities. ([http://www.arc.losrios.edu/Support\\_Services/DSPS.htm](http://www.arc.losrios.edu/Support_Services/DSPS.htm))

**Science Skills Center:** Work at your own pace on modules designed to help you improve your skills in note taking, paraphrasing, graphics reading, concept mapping, test preparation and test taking for science classes. ([http://web.arc.losrios.edu/~biology/science\\_skills\\_center.htm](http://web.arc.losrios.edu/~biology/science_skills_center.htm))

- This class is math and language intensive. You will use algebra, trigonometry, geometry and calculus to solve problems on a regular basis. You will also be expected to read and understand questions written in technical English, and communicate in English with your fellow classmates and your instructor. If your math skills or English language skills are not up to speed then you will not succeed in this class, and you should consider taking the appropriate courses to prepare yourself for this challenging course.

# Academic Misconduct Policy

## Academic Misconduct:

Academic misconduct is an act of deception in which the student claims credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work. It occurs whenever students fraudulently attempt to show possession of a level of knowledge or skill that they do not possess.

## Campus Policy:

Academic misconduct is a violation of the ARC "Student Standards of Conduct" and will not be tolerated. Ignorance of these academic and behavioral standards will not absolve any student from being held responsible for them or from any disciplinary action that may result. (Please see the ARC website or the current printed class schedule for the full details of campus policies.)

Academic sanctions and penalties may be applied in cases of academic misconduct depending on the seriousness of the infraction and those grading guidelines specified by the instructor of the class.

You may:

- receive a failing grade on a test, paper or exam.
- have your course grade lowered or possibly fail the course.

In addition to these academic sanctions, disciplinary action may be taken in any case of academic misconduct. Such action will be conducted by referral to the college Disciplinary Officer. You may:

- receive a warning that continued misconduct will result in further disciplinary action.
- be placed on disciplinary probation for a specific period of time.
- be removed from the class.
- be suspended from the college for a specific period of time.
- be expelled from the college permanently.

## Instructor Policy:

Collaboration is encouraged in this class, but you must do your own work.

Students who cheat on homework assignments – by copying solutions from another student, a solutions manual, the internet, or any other source of information – will receive no credit for that assignment and will receive a warning from the instructor. Repeated cheating will result in the lowering of a student's course grade at the end of the semester.

Students who cheat on an exam – by copying from another student, by illicitly obtaining information regarding test questions prior to taking the exam, or through the use of unauthorized materials during the exam – will receive no credit for that exam and will receive a warning from the instructor. Information regarding the student's misconduct will be passed on to the college Disciplinary Officer for further action. Repeated cheating on exams may result in a failing grade or the removal of the student from the class.