FLORIDA GULF COAST UNIVERSITY

COLLEGE of ARTS and SCIENCES

Department of Chemistry and Physics

Instructor: Alexander Sakharuk
Semester: Fall 2024
Class Meetings:
        MWF 8:30 – 9:20 am, Seidler Hall 220

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Office Hours: T   8:50 – 11:00 am
                     W 9:25 – 11:25 am

- **COURSE NUMBER AND TITLE, CATALOG DESCRIPTION, CREDITS:**

  PHY 2048 GENERAL PHYSICS I   (4 CREDITS), CRN 84355

  This calculus-based course serves as the first in a two-part series, covering topics like kinematics, dynamics, energy, momentum, rotational motion, fluid dynamics, oscillatory motion, and waves. Designed for science and engineering majors, the course integrates critical thinking, analytical skills, and real-world applications.

- **PREREQUISITES FOR THIS COURSE:**

  MAC 2311 for level UG with min. grade of C

- **GENERAL COURSE INFORMATION:** Topic Outline.

  - Systems of measurement, units, and dimensional analysis
  - Motion in one, two, and three dimensions
  - Newton's Laws and their applications
  - Work, energy, power. Conservation of energy law.
  - Systems of particles. Collisions. Center of mass. Conservation of linear momentum.
  - Rotational motion. Torque. Centripetal acceleration. Conservation of angular momentum.
  - Gravity.
  - Static and rotational equilibrium. Elasticity.
  - Fluids. Archimedes' principle. Bernoulli's equation.
  - Oscillations. Resonance.
  - Temperature. Universal gas law. Kinetic theory of gases.
  - Heat and thermodynamics.
  - Thermal processes. Heat engine.

- **LEARNING OUTCOMES AND ASSESSMENT:**

Student Learning Outcomes:

- Students will solve analytical problems describing different types of motion, including translational, rotational, and simple harmonic motion.

- Students will apply Newton's laws, and conservation laws to solve analytical problems of mechanics.

- Students will identify and analyze relevant information presented in various formats such as graphs, tables, diagrams, and/or mathematical formulations.

- Students will solve real world problems using critical thinking skills and knowledge developed from this course.

GENERAL EDUCATION COMPETENCIES:

General education courses must meet all of the following outcomes.

- Students will explain the ideas that are central to a particular complex topic or problem.

- Students will evaluate information and sources for validity and relevance.

- Students will interpret relevant information or data effectively.

- Students will explain how scientific knowledge is developed within a particular field of inquiry.

- Students will analyze the role of experimental design in building scientific knowledge.

- Students will communicate scientific information effectively.

ADDITIONAL COURSE COMPETENCIES:

At the conclusion of this course, students will be able to demonstrate the following additional competencies:
- Use the principle of dimensional analysis to derive approximate expressions of physical laws.
- Use the SI system of units and understand the differences between base and derived units.
- Interpret the laws of motion (kinematics) and apply them to solve problems in one and two dimensions.
- Understand the significance of the concepts of work, power, energy, and conservation of energy. Examine the applications of these concepts and use them to interpret and explain natural phenomena.
- Use the concept of center of mass to analyze the motion of a system of particles.
- Understand the concept of conservation of momentum, examine its applications, and use it to interpret and analyze natural phenomena.
- Use the concepts of momentum and energy to explain collisions.
- Solve problems utilizing the concept of circular motion.
- Compare and contrast linear motion with the rotational motion by applying the laws of rotational kinematics.
- Describe the law of gravitation and use it to explain natural phenomena; combine this law with the laws of motion to explain planetary and satellite orbits.
- Identify the conditions for static and rotational equilibrium and critically discuss how the concept of torque to relates to natural phenomena.
- Analyze the concepts related to fluid pressure and buoyancy; discuss natural phenomena and its relationship to Bernoulli's equation.
- Understand properties of oscillations, Doppler's effect; analyze how these concepts influence natural phenomena.
- Use the kinetic theory of gases to distinguish between heat and temperature; interpret and apply the concept of energy per degree of freedom.
- Interpret and apply the laws of thermodynamics to explain natural phenomena.
- Recognize thermal properties and processes and use them to explain and interpret thermal phenomena.

- **<u>COLLEGE-WIDE POLICIES:</u>**

Attendance policy from FGCU Academic Catalog

Regular and punctual attendance and participation are expected. Although students are graded on intellectual effort and performance rather than attendance, absences may lower the student's grade when the instructor deems class attendance and class participation as essential. In those classes where attendance is considered part of the grade, the instructor must inform students at the beginning of the term in the syllabus. Any instructor who informs students in writing about the necessity of class attendance may request Records & Registration to drop a student from the class. The instructor will need to indicate the student's last date of attendance in their request to Records & Registration. A grade of W will be posted to the student's record if Records & Registration is notified prior to the deadline for withdrawal without academic penalty. After that date, the instructor may assign a punitive letter grade for any student who does not abide by attendance requirements. Colleges have the authority to establish college-wide, program-wide, or course-wide policies on attendance in accordance with the above guidelines.

Core Syllabus Policies:

FGCU has a set of central policies related to student recording class sessions, academic integrity and grievances, student accessibility services, academic disruption, and religious observances that apply to all courses at FGCU. Be sure to review these online at: https://www.fgcu.edu/about/leadership/officeoftheprovost/core-syllabus-policy-statements

- **REQUIREMENTS FOR THE STUDENTS:**

Computers: You are not allowed to bring any computers (laptop, notebook, etc.) to the exams. In case of violation, you will be asked to leave. **Your grade for the exam will be zero.** Report will be sent to the Dean of Students office.

Cell Phones: You must turn off your cell phones before coming to the class. No talk and no text are allowed during the class. In case of violation, you will be asked to leave. **Your grade for the exam will be zero if you will use cell phone.** Report will be sent to the Dean of Students office.

Reading the Textbook:

The course textbook is a good one, written by a physics professor who knows his physics *and* teaching physics. I will be assigning regular reading from the text that I expect you to read before class. It is crucial that you read what I expect you to read. Only by actually doing this reading and any assignments I give will you be prepared to learn during the next class. If you do not prepare, you will be lost and frustrated during class. Furthermore, any learning you do will be rushed and more damage control than actual progress.

Homework:

The purposes of the homework are so that you can gain some practice solving problems, and so that I may assess your grasp of the material before you are tested on it. We will use the LON-CAPA website for most homework. The online homework assignments will be frequent. "Copying" homework from a friend or working with them online may result in a higher homework grade for you, but it almost guarantees lower test scores. The online homework will only be available for a limited time, so plan your time carefully when the assignments are announced. I can occasionally assign problems to be handed in on good old-fashioned paper, too.

For all quizzes and exams, relevant "equation sheets" will be provided. The memorization of formulas is less important than knowing *when and how to use* the formulas. I will provide you with copies of these equation sheets for studying. Thus, you should become familiar with the equation sheets and use them when doing your homework.

In addition to graded homework, I will probably give you lists of practice problems for each chapter. I will never collect and grade these problems, but they will be a valuable tool for test preparation.

Quizzes:

The quizzes are based upon recent homework and reading. I plan on having 17 online quizzes, each of which will take about 10 minutes of time. You can work with the particular quiz anytime during the announced day but you will have only one attempt to finish quiz. Missed quizzes will be counted as zeroes. Quiz contribution to the final score is 5%.

Exams:

The exams will be composed primarily of problems which must be solved. Problem solving is a skill. Like riding a bicycle or cat juggling, it must be practiced. Therefore, the homework is an essential part of your test preparation. You cannot "cram" for a physics test. Do practice early and practice often. The exam dates are given in the course schedule.

Everyone can have a bad day, and this can happen on an exam day. If you "bomb" a test there is still hope. Some of exams you will participate in could have a few extra problems (usually a little bit more difficult than the mandatory problems) and you can raise your score. Extra problems will be included or not based on the average performance of the class. If you miss an exam, you will be given a zero grade for that exam. Make-up exams will be given only in situations where you have special circumstances of which **1**. *I am notified in advance and 2. You provide an appropriate medical/legal documents with valid justification of your absence at exactly exam time, name and phone of the office issued that document.* Final exam is c**omprehensive and mandatory** though I reserved the right to release student from final exam due to high cumulative score.

Please note that the cheating during exam will automatically lead to zero score for that exam. Report will be sent to the Dean of Students office as well. You can not leave the room before the end of exam.

- **ATTENDANCE POLICY:**

I suggest very strongly that you attend every class. Missing class will have a significant negative impact upon your understanding of the material and consequently your grade. Solutions to most typical or difficult problems will be covered in lecture sections. In general, students who attend lectures will be far better prepared for the course examinations.

- **GRADING POLICY:**

Your final grade will be comprised of the following

Area	Grade
Homework	**20%**
Online Quizzes	**5%**
6 in Class Exams	**60%**
Final Exam	**15%**

The overall grading scale will be as follows:

Total Score [%]	Grade
88.0 - 100.0	A
84.0 - 87.9	A-
80.0 - 83.9	B+

76.0 - 79.9	B
72.0 - 75.9	B-
68.0 - 71.9	C+
60.0 - 67.9	C
55.0 - 59.9	D
Below 54.9	F

Note: For a required course in your major, a C- is an unacceptable grade! The "incomplete" grade ["I"] should be given only when unusual circumstances warrant. An "incomplete" is not a substitute for a "D," "F," or "W." Refer to the policy on "incomplete grades.

- **REQUIRED COURSE MATERIALS:**

Text: You do not have required textbook assign for that class. But you can use one of the following options in addition to the resources posted in Canvas files folder:

1. Open source OpenStax University Physics Volume I (https://openstax.org/details/books/university-physics-volume-1) and University Physics Volume II (https://openstax.org/details/books/university-physics-volume-2). You can freely download these books in a few formats.

2. You can any standard University textbooks, for example, Physics for Scientists and Engineers with Modern, Hybrid, 8th Edition, by Raymond A. Serway and John W. Jewett, published by Cengage, ISBN-10: 113310360X ISBN-13: 9781133103608 You can use either hard copy or e-text book.

Calculator: You should have at your disposal a scientific calculator. Required functions are; $\sqrt{x}$, x^2, log, natural log, e^x, sin, cos, tan, y^x. If do you not already own one, expect to pay $1 to $200, depending on how fancy you want to get. Oh, and once you've spent the bucks, bring it to class.

Webassign : You do not have to obtain webassign access code in my class.

- **WEB LINKS:**

Canvas: Login with your FGCU email login and look for your CRN. You will find there the syllabus, class schedule and all other essential course documents, like the equation sheet (for exams) lab procedures and so forth. http://canvas.fgcu.edu/ . Use the following link to explore Canvas: https://fgcu.instructure.com/courses/7692 . This is also where you will turn in electronic copies of your lab reports. See the Lessons tab. Paper copies must be handed in in class. The purpose of the electronic submission here is so that the reports can be checked for plagiarism and other naughtiness. It is your job to make sure that you submit both your electronic copy and your paper copy and to make sure that they are the SAME file. (Your paper copy may contain handwritten items not present in the electronic copy.)
LON-CAPA: http://orion.cas.fgcu.edu
    User ID : your UIN (on your FGCU ID card…9 digits starting with 814)
    Password : also your UIN (initial password ; you can change it later)
LON-CAPA course management system will be used for all HW assignments. Log in ASAP and let me know if there are any problems.
Formular sheet: http://ruby.fgcu.edu/courses/asakharu/2010spring/GP1.pdf

- **CLASS SCHEDULE:**

The following is a very tentative schedule! I reserve the right to change or add requirements at any time. These changes will be announced/discussed in class and you can find them on the class Angel page. There is generally one homework for each chapter. The Homeworks will be due on LON-CAPA unless otherwise specified (there may be some on Webassign, especially later in the semester.)

In light of the six days of missed instruction due to Hurricane Milton, we will make up for the lost instructional time through asynchronous options. Specific details regarding the make-up materials and assignments will be announced in class and posted on CANVAS LMS. Please attend the class and check CANVAS regularly for updates.

Date	What we're doing	Due	Comments
August **M 19** **Session 1**	Course overview, *Physics and Measurement*		Introduction to the web-based homework (HW) service.
W 21 **Session 2**	*Motion in One Dimension*		Term wait lists shut down at 5 pm
F 23 **Session 3**	*Motion in One Dimension*		Last Day to Add/Drop (in-person & Gulfline) Ends at 5 pm
M 26 **Session 4**	*Vectors*	*Quiz 1*	Cancellation for nonpayment
W 28 **Session 5**	*Motion in Two Dimensions*		
F 30 **Session 6**	*Motion in Two Dimensions*	*Quiz 2*	
September **M 2**	**Labor Day Observed**	**No Classes**	
W 4 **Session 7**	**Exam 1**	**HW1, HW2,HW3**	Don't forget to have your own calculator!
F 6 **Session 8**	*The Laws of Motion*		
M 9 **Session 9**	*The Laws of Motion*		
W 11 **Session 10**	*The Laws of Motion*	*Quiz 3*	
F 13 **Session 11**	*The Laws of Motion,* *Circular Motion and Other Applications of Newton's Laws*	*Quiz 4*	
M 16 **Session 12**	*Circular Motion and Other Applications of Newton's Laws*		
W 18 **Session 13**	*Circular Motion and Other Applications of Newton's Laws*	*Quiz 5*	
F 20 **Session 14**	**Exam 2**	**HW4, HW5**	Don't forget to have your own calculator!
M 23 **Session 15**	*Energy of a System*		
W 25 **Session 16**	*Energy of a System*		Reinstate after Cancelation for Non-

				Payment ; Deadline at 5 pm
F 27 **Session 17**	*Hurricane Helene (no classes)*		***Quiz 6***	
M 30 **Session 18**	*Conservation of Energy*			
October **W 2** **Session 19**	*Linear Momentum. Collisions*		***Quiz 7***	
F 4 **Session 20**	*Linear Momentum. Collisions*			
M 7 **Session 21**	*Hurricane Milton (no classes)*		***Quiz 8***	
W 9 **Session 22**	*Hurricane Milton (no classes)*			
F 11 **Session 23**	*Hurricane Milton (no classes)*			
M 14 **Session 24**	*Rotation of a Rigid Object About a Fixed Axis,*		**HW6, HW7, HW8**	
W 16 **Session 25**	***Exam 3***			Don't forget to have your own calculator!
F 18 **Session 26**	*Rotation of a Rigid Object About a Fixed Axis, Angular Momentum, Static Equilibrium and Elasticity*		***Quiz 9***	
M 21 **Session 27**	*Static Equilibrium and Elasticity*		***Quiz 10***	
W 23 **Session 28**	*Universal Gravitation*		***Quiz 11***	
F 25 **Session 29**	*Universal Gravitation*		***Quiz 12***	F25 - Last Day to Drop/Withdraw without Academic Penalty
M 28 **Session 30**	**Exam 4**		**HW9,HW10,HW11,HW12**	Don't forget to have your own calculator!
W 30 **Session 31**	*Fluid Dynamics*			
November **F 1** **Session 32**	*Fluid Dynamics*			
M 4 **Session 33**	*Fluid Dynamics*			
W 6 **Session 34**	*Oscillatory Motion*		***Quiz 13***	
F 8 **Session 35**	*Oscillatory Motion*		***Quiz 14***	
M 11	**Veteran's Day Observed**		**No Classes**	
W 13 **Session 36**	***Exam 5***		**HW13, HW14**	Don't forget to have your own calculator!
F 15 **Session 37**	*Temperature*			

M 18 **Session 39**	*Temperature*		
W 20 **Session 40**	*Heat and the First law of Thermodynamics*	***Quiz 15***	
F 22 **Session 41**	*Heat and the First law of Thermodynamics*		
M 25 **Session 42**	*Heat and the First law of Thermodynamics, The Kinetic Theory of Gases*	***Quiz 16***	
W 27	**Thanksgiving Observed**	**No Classes**	
F 29	**Thanksgiving Observed**	**No Classes**	
December **M 2** **Session 43**	*Heat Engines, Entropy, and the Second law of Thermodynamics*		
W 4 **Session 44**	*Heat Engines, Entropy, and the Second law of Thermodynamics*	***Quiz 17***	
F 6 **Session 45**	**Exam 6**	**HW15, HW16, HW17, HW18**	Don't forget to have your own calculator!
M 9 **Session 46**	**Conceptual Exam**		
W 11	**Final Exam Seidler Hall 220 07:30am - 09:45am**		Don't forget to have your own calculator!

- **ANY OTHER INFORMATION OR CLASS PROCEDURES OR POLICIES:**

Center for Academic Achievement Syllabus Statement:

The Center for Academic Achievement (CAA) offers academic support services for any FGCU student. The services are at no extra charge to students and include: peer tutoring, Supplemental Instruction, Student Success Workshops, and individualized academic coaching. If you would like to participate in or learn more about these services, please visit the CAA in Library 103. You may also email the CAA at caa@fgcu.edu or call at (239) 590-7906. The CAA website is www.fgcu.edu/caa.