

## PHYS1105 Syllabus

### Course Description and Prerequisites

This course, Mechanics Laboratory (PHYS1105), provides training in instrumentation and offers in-depth understanding of physics concepts and laws that are discussed in PHYS1303 (Introductory Mechanics) and PHYS1307 (General Physics - Mechanics). This is achieved through observation, measurement, data acquisition and analysis in each lab. The lab sessions are grouped into modules, with each module focusing on one specific topic, such as Newton's laws of motion or gravity and dark matter. Each module may contain one, two or three lab sessions. In each module, there are two (sometimes three) documents, the *pre-lab* and the *instructions* (the third one: *instruments*), that students need to read before coming to the lab. The *pre-lab* document describes the physics and its connection to the real world. The *instructions* offer detailed information about how to set up the instruments and perform the measurements. The purpose of the document regarding the instruments is to broaden the knowledge of the tools that will be used in the module.

The 3-hour lab session is organized in two parts: the 1-hour co-operative problem solving session and the 2-hour lab. The class is divided into groups of 3 students each and assigned a role: Manager, Scribe, and Skeptic. Each group will work on the co-op problem. The Manager will direct the solution, the Skeptic will question it, and the Scribe will record it. One person is selected in the group to complete and submit the solution form in Canvas. This solution will be graded and the grade distributed to the group members. This grade comprises 10% of the final grade. The roles will be changed for the next 3 week, after which the groups will be reconstituted. These same groups will work as lab partners during the lab portion of the lab period. The 2-hour lab part begins with a quiz to check on your readiness for the measurement part. This quiz is open-book and discussion in your group is allowed. Students must answer all questions in this quiz correctly before being given the instruments to conduct the measurements. Those who fail to score 100% will have to read the documents in the lab and re-take the quiz, at the expense of the lab time of your whole group. The score of this particular quiz will not go into your final grade.

There is one report for each module. A template of the report is provided. Students are encouraged to write the report during each lab session when discussion in your group and with the TAs is possible. At the end of the last lab of a module, students must submit the lab report (in PDF). The deadline to submit the report in Canvas is the end of the day (11:59 PM) of the last lab in the module. To help provide in-depth understanding of the physics in the module, a list of questions (often open questions) in a file called *Q\_and\_D* that students need to download from Canvas. Please download this file before the start of the measurements and read the questions. Try to find the answers to the questions in the measurements and

through discussions in your group. You will need to upload your answers to the *Q\_and\_D* (as a PDF file) together with the lab report. The answers to the *Q\_and\_D* will be graded.

There is no prerequisite to this course but basic knowledge and skills of a college student are assumed. These include math (algebra, trigonometry, calculus), computer and computing (install and run a program, document editing, excel-like spreadsheet level data processing and graphing, curve fitting and histogram).

The lab sessions will be run by TAs. The course instructors are professors Richard Guarino ([rguarino@smu.edu](mailto:rguarino@smu.edu)) and Jingbo Ye ([yejb@smu.edu](mailto:yejb@smu.edu)).

### **Learning objectives and lab manuals**

**Learning outcomes** At the conclusion of this lab course, devoted students will receive training on basic instruments with data acquisition software in measurements of time, distance, velocity, acceleration, mass and force. Students will understand measurement uncertainties (errors) and verify or re-discover laws in mechanics. Students will also learn how to research for information that is not provided in the lab manual, to analyze and present (with plots and tables) observations and measurements, and finally to write lab reports in a scientific way.

**Lab manuals** The lab manuals are provided to students in Canvas.

### **Course Format and Information**

This is a lab course. Students should read the documents *pre-lab* and *instructions* posted in Canvas and understand the requirements before coming to the lab. After discussions with the TAs and the lab instructors, and a thorough understanding of the problem in the lab, students will set up the instruments and perform the measurements. Students should start to analyze the acquired data and start to write the lab report immediately after the measurement, and discuss with the TAs about issues in the lab. Students should finish the lab report and upload it to Canvas at the end of each module.

Class attendance is required. Lab make-up can be arranged for those with a formal sick leave from a physician or a formal leave request from your academic supervisor on family emergency or other excused absence following strictly the SMU policy. No other requests for lab make-up will be accepted. All make-up must be finished before the final week.

## Grading policy:

The final grade will be the simple average of the scores of each co-op (10% weight), *Q\_and\_D* (20% weight) and the report (70% weight). There will be no written tests and exams in this course. The Numerical grade and letter grade conversion is based on:

Letter	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
Numerical (%)	90.0	85.0	80.0	75.0	70.0	66.6	63.3	60.0	56.6	53.3	50.0	

## Other policies:

### Disability Accommodations

Students needing academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit <http://www.smu.edu/Provost/SASP/DASSto> to begin the process. Once approved and registered, students will submit a DASS Accommodation letter to faculty through the electronic portal DASS Link and then communicate directly with each instructor to make appropriate arrangements. Please note that accommodations are not retroactive and require advance notice to implement.

### Sexual Harassment

All forms of sexual harassment, including sexual assault, dating violence, domestic violence and stalking, are violations of SMU's Title IX Sexual Harassment Policy and may also violate Texas law. Students who wish to file a complaint or to receive more information about the grievance process may contact Samantha Thomas, SMU's Title IX Coordinator, at [accessequity@smu.edu](mailto:accessequity@smu.edu) or 214-768-3601. Please note that faculty are mandatory reporters. If students notify faculty of sexual harassment, faculty must report it to the Title IX Coordinator. For more information about sexual harassment, including resources available to assist students, please visit [www.smu.edu/sexualmisconduct](http://www.smu.edu/sexualmisconduct).

### Pregnant and Parenting Students

Under Title IX, students who are pregnant or parenting may request academic adjustments by contacting Elsie Johnson ([elsiej@smu.edu](mailto:elsiej@smu.edu)) in the Office of the Dean of Students, or by calling 214-768-4564. Students seeking assistance must schedule an appointment with their professors as early as possible, present a letter from the Office of the Dean of Students, and make appropriate arrangements. Please note that academic adjustments are not retroactive and, when feasible, require advance notice to implement.

- Religious Observance** Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence.  
(<https://www.smu.edu/StudentAffairs/ChaplainandReligiousLife/ReligiousHolidays>).
- COVID-19 and Other Medical-Related Absences** Students who test positive for COVID-19 and need to isolate, or who are notified of potential exposure, must follow [SMU's Contact Tracing Protocol](#). To ensure academic continuity and avoid any course penalties, students should follow the same procedures described by their instructors as they would for any other medical-related absence in order to be provided with appropriate modifications to assignments, deadlines, and exams.
- Excused Absences for University Extracurricular Activities** Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (See SMU Undergraduate Catalog under "Enrollment and Academic Records/Enrollment Policies/Excused Absences.")
- Final Exams** Final course examinations shall be given in all courses where appropriate, and some form of final assessment is essential. Final exams and assessments must be administered as specified in the official examination schedule. Exams cannot be administered or due during the last week of classes or during the Reading Period. Syllabi must state clearly the form of the final exam or assessment, and the due date and time must match the official SMU exam schedule. Final exams are not required to be provided online.

**Schedule:** See details listed in Canvas. Below is a list of the modules and labs in each week

Module # and name	Lab	Week
0, Introduction	Introduction to the lab	Aug. 24 – Aug. 27
1, Error Analysis	Error Analysis	Aug. 31 – Sep. 3
2, Kinematics	Coordinate systems	Sep. 7 – Sep. 10
	Velocity and acceleration	Sep. 14 – Sep. 17
3, Forces and Dynamics	Free-body force diagram and the equilibrium condition	Sep. 21 – Sep. 24
	Newton's 1 <sup>st</sup> and 3 <sup>rd</sup> Laws of motion	Sep. 28 – Oct. 1
	Newton's 2 <sup>nd</sup> Law of motion	Oct. 5 – Oct. 8
4, Motion Periodic and in 2-dimensions	Simple harmonic motion	Oct. 13 – Oct. 19
	Projectile motion	Oct. 20 – Oct. 26
	Uniform circular motion	Oct. 27 – Nov. 2
5, Energy and Momentum Conservation Laws	Elastic and inelastic collisions	Nov. 3 – Nov. 9
	Kinetic and potential energy transfer	Nov. 10 – Nov. 16
6, Gravity and Free-fall	Measure gravity $g$ with the $g$ -ball and a pendulum	Nov. 17 – Nov. 23
	Newton's Law of universal gravitation in the solar system and a remote galaxy, dark matter	Nov. 30 – Dec. 3

Masks are required in this course. This masking requirement is subject to change during the semester, and any changes will be announced in class, posted clearly in Canvas, and updated in the syllabus.