Phys109-MECHANICS

Altuğ Özpineci

METU

PHYS109

Department of Physics Fizik Bölümü 1960

Your Lecturer

- **Title and Name:** Prof. Dr. Altuğ Özpineci
- **Administrative Duty:** Vice to Dept. Chair. responsible for the courses given by the department
- **Specialization:** High Energy Physics, Hadron Physics (properties of quarks and gluons)
- **e-mail:** ozpineci@metu.edu.tr
- **Prefered method to contact:** through e-mail
- **Web Page:** `http://www.metu.edu.tr/~ozpineci`
  Course Web Page: Course Material -> Phys109

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Syllabus

- Text Book: “Physics for Scientists & Engineers,” 4^{th} Edition, C. Giancoli
- Subjects to be covered:
  - Physics as a Science (≈1. week)
  - Describing Motion-Kinematics (≈1. and 2. weeks)
  - Causes for Changes in Motion - Dynamics (≈2. and 3. weeks)
  - Applications of Newton’s Laws (≈3.-10. weeks)
  - (?)Probability in Physics - Thermodynamics (≈ 11. week till the end of semester)
- 20 Chapters in 14 weeks (?)

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Applications of Newton's Laws:

- Friction
- Circular Motion
- Gravitation
- Work and Energy
- Systems of Particles
- Collisions
- Rotation
- Statics
- Fluids
- Oscillations and Waves
- ...

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Supplamentary Material and References

- H. C. Ohanian, “Physics”
- R. P. Feynman “Lectures on Physics, Vol. 1”
  http://www.feynmanlectures.info
- Open Courseware Project (OCW)
  - MIT OCW (http://ocw.mit.edu) (in particular see Physics I: Classical Mechanics, Prof. Walter Lewin, Turkish translation is also available)
  - TÜBA OCW (in Turkish) (http://www.acikders.org.tr)
  - METU OCW (http://ocw.metu.edu.tr)
- “Feynman’s Lost Lecture: The Motion of Planets Around the Sun ”
- Any other related book in the **library**

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Grading

Grades are **NOT** the aim of studying! They are only means of measuring how much you have learned!

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- 15% Lab
- 5% Pop Quizes
- 20% each midterm (two midterms in total)
- 20% Final Exam
- 5% Term Report
- 15% Homework
- Bonus: Can increase your grade upto half a letter
  - Translate 5 items from English wikipedia to Turkish wikipedia(or your mother tongue if different). You have to let us know in a month which items you are planning to translate
  - Ask good questions on piazza! (signup at http://piazza.com/metu.edu.tr/fall2013/phys109)

Piazza

- Piazza is an open platform to manage class Question and Answers
- Similar to LMS or METUOnline but students can ask questions **anonymously**!
- Can collaborate to find answers!

Pop Quizes

- The purpose is to encourage you
  - to attend the lectures
  - to study regularly,
- Will be simple question that can be easily done if you have payed attention to the lecture
- Their time and number will not be announced! They can be any day, and any time during the lecture

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Reports:

- The purpose of the report is
  - Encourage you to work on your own
  - Encourage you to work in groups
  - Practice presenting your findings to your colleagues

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Reports:

- Reports should be prepared by a group of three students
- You are allowed to determine your own group until October 3, 2013.
- If you do not inform me about your group until the deadline, I will form groups from the remaining students

Reports:

- Reports should be about any subject related with the course material
- Subject of the report should be chosen *before* October 24, 2013.
- Preferable, your group should choose your own report subject based on your own interest. After the deadline, the instructor or the assistants will assign your group a subject
- It should be aimed at teaching somebody else who does not know anything about the subject
- A mid report should be handed in *before* November 24, 2013.

Reports:

- At the end of the semester, Each group will present their report
- The instructor/assistants will choose which member of the group will present which part of the report
- **(PARTIALLY) HANDWRITTEN REPORTS WILL NOT BE ACCEPTED**

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HOMEWORK

- Their purpose is to encourage you to study regularly and to practice
- You can discuss the solutions in groups
- The homework you hand in should be what **YOU** understand

Final Exam

Conditions under which you will **NOT** be allowed to take the final exam:

- Failing the lab
- Being absent in more than 20% of Pop Quizes
- Not taking any of the midterms without any excuse
- Not completing the term report

Ethics

- You should never claim the work to be yours if you have not done it
  - Handing in somebody else's (from your friends, from internet, or from some other source) solutions in homework/midterms (cheating/plagiarism)
  - Claiming that your data/solution is correct even if you know that they are not (falsification/data fabrication)
- If you quote somebody else's work, make sure that you cite him/her so that the reader understands that you do not claim to be the owner of your work
- According to discipline regulation of committee of higher education, cheating is punished by sending the student away for at least one semester (YOK Öğrenci Disiplin Yönetmeliği)

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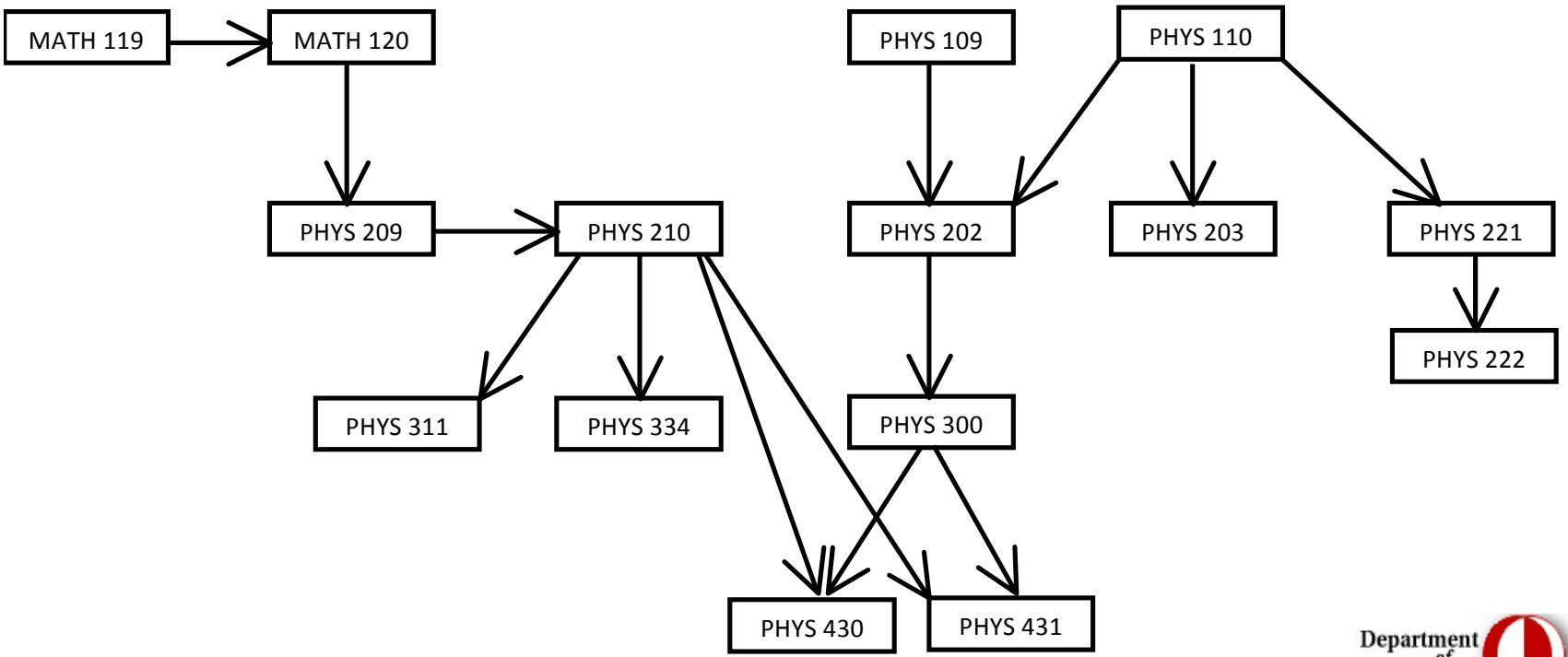
Prerequisite Courses

- Phys109/110 and MATH119/120 are prerequisites to the higher level courses
- If you fail them, most probably, you can not graduate in four years.



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Special Physics Group

- Students are required to work harder
- They learn more subjects in more detail
- A small group (15-20) of students selected at the beginning of second year
- Selected based on the success in the first year

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Learning/Lecturing Physics

- Watch: *Confessions of a Converted Lecturer, by Eric Mazur*
- Main lessons:
  - *"Traditional lecturing is nothing but the transfer of lecture notes from the notes of the lecturer to the notes of the student without passing through the brains of neither" by XXX YYY*
  - In a traditional lecture, students only learn 22% of what they know no matter what the lecturer does/doesn't do
  - It can increase to 44% on average if the students participate in the class

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“LECTURING”

- **Lecture:** late 14c., "action of reading, that which is read," from M.L. lectura "a reading, lecture," from L. lectus, · · ·
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Source: http://www.etymonline.com

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Source: http://www.etymonline.com
The way we lecture did not change since 14^{th} century.

Learning

- When do you think that you have *LEARNED* a subject?
- I think that I have learned a subject if I can
  - carry out derivations without looking at any other reference
  - repeat the reasonings

  starting from the first principles
- Learning physics is **NOT** about memorizing formulas and applying them (you will be given formulas in all the exams)

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Pay Attention To Answers That are Not Answers

- Not all answers are really answers.
- Why the leaves are green?
- Because they reflect green light.
- Rephrase the question: Why leaves reflect green light?
- Because the contain chlorophyll.
- Rephrase the question: Why does chlorophyll reflect light?
- ...

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Best Teachers:

Your best teachers are (in order of importance):

1. Yourself: learn to learn on your own. (use the library!) You are the only person that will know when you have really learned a subject.
2. Your friends: Collaborate. Your professors will not have a clue why you do not understand things that are obvious for them.
3. Your professor. Even if you think that a professor *does not know anything*, s/he still knows more physics than you, and has more experience.

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What is Physics?

- Student participation is crucial for students to learn.
- Not so easy in large classrooms with $\approx$ 150 student
- Optimum number of students in a class $\approx$ 17 (PHED graduate students)
- Try the SMS system: send your answers to 4660 (Turkcell, Avea, or Vodafone free of charge)

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Physics

- Physics is about everything around you!
- Physics tries to find relationship between observations.
- Measurement is a crucial part of physics

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- Physics is about everything around you! **Look around yourself!**
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MEASUREMENT

- Has to be repeatable by anybody (that has necessary equipment)
- Units and errors are a crucial part of the measurement!

- Precision: how well repeated measurements yield similar results
- Accuracy: how close the measurement is to the real value

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- Accuracy: how close the measurement is to the real value **How can one know the real value without measurement? How is it possible to be sure that a given measurement is accurate?**

Certain quantities are **defined**, not measured!

- 1 m: Length that light travels in 1/299,792,458 second
- 1 s: Time required for 9,192,631,770 periods of radiation emitted by cesium atoms

Speed of light is **exactly** 299,792,458 m/s!

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- Platinum cylinder in International Bureau of Weights and Measures, Paris

These are the **fundamental units** (in SI system). Everything else is measured relative to these units.

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Q: How to measure learning?