Note: the grading policy has changed!

Grading Policies - Physics 248

Grading: Your grade will be based on a weighted average of your coursework as follows:

- 10% online homework (Mastering Physics)
- 20% laboratories (All labs must be completed to pass the exam. If one is not completed your grade is reduced by 30%. If more than 1 is not completed you fail the Course.)
- 15% midterm exam 1 (Feb. 14)
- 15% midterm exam 2 (Mar. 14)
- 15% midterm exam 3 (Apr. 18)
- 25% final exam (May 14)

We decided, due to your complaints, that Discussions will not be graded. But we would like to remind you the importance of Discussions for learning how to solve problems and to be prepared for your Midterm and Final Exams. In Discussion sessions you will be faced to the kind of problems you will find in Exams. So your attendance is IMPORTANT and it is a REQUIREMENT of the course.
Test of Newton’s law
The force of gravity

\[ F = \frac{Gm_1 m_2}{r^2} \]
An aside ...

(won’t be tested in exams)
Compactification

Consider one additional dimension:

Theodor Kaluza (1919); Oscar Klein (1926)
Gravity is stronger on short distances.
“Table-Top” Experiment

Tests of gravity at short distances (~100 µm) are searches for extra dimensions.
Branes

Open String

“brane”

3-brane
Why haven’t we seen them?
Brane World

- Different particles see different dimensions
- Different branes: different universes (forces, chemistry)

gravitons

graviton

electrons, photons, quarks,...
End of the aside ...
Equivalence Principle

\[ F = \frac{Gm_E m_G}{r_E^2} \]

\[ F = m_I g \]

\[ m_G = \text{“gravitational mass”} \]

\[ m_I = \text{“inertial mass”} \]

We have used the same symbol \( m \) but they can be different.

\[ g = \frac{Gm_E}{r_E^2} \left( \frac{m_G}{m_I} \right) \]
Galileo demonstrated, by dropping objects with different masses from the leaning tower of Pisa, that the free falling acceleration is the same.

Equivalence principle: \[ m_G = m_I \]

This is a principle very important for general relativity: The effects of gravity can be replaced by that of an accelerating frame. Not possible if \( g \) is not universal.