

$E = mc^2$ and the Speed of Light

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Concepts adapted by *Albert Einstein, T.M. Helliwell, and Alex
Filippenko*

Syllabus

I would first like to thank Splash at Berkeley, Berkeley admin, and Dr. Alex Filippenko for their kind support of this seminar. I would also like to thank Dr. Mark Ilton and Dr. Elizabeth Connolly at Harvey Mudd College for their early support of my academic journey. A majority of the concepts in this seminar were adapted from “Special Relativity” by Thomas M. Helliwell.

S1317 seeks to explore Einstein’s Theory of Special Relativity at its most fundamentally algebraic core. Students will become familiarized with the following equations of time and length contraction

$$t' = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$L' = L_0 \sqrt{1 - \frac{v^2}{c^2}}$$

along with familiarization of “leading clocks lag” and a short derivation of Einstein’s famous equation

$$E = mc^2$$

utilizing basic principles of grade school energy and physical intuition. We will also explore the very real implications of relativity and experiments which prove the notion of time dilation, where the dimension of time is “expanding” due to traveling near the speed of light. As a bonus tidbit of fun, the class will also detail the physics behind the film *Interstellar* (2014) and will measure the speed of light using chocolate and a microwave. And...

Go Bears!