

Spring 2020

PHYS 420-002: Special Relativity (Revised for Remote Learning)

Slawomir Piatek

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Phys 420-002, Special Relativity
Course Outline
Spring 2020

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Lecture: Tuesday & Thursday, 1:00 PM – 2:20 PM, FMH 205

Office Hour: T & R, 2:30 PM – 3:30 PM, other times by appointment

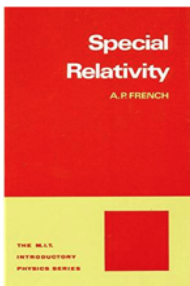
Course Website: www.physics.rutgers.edu/~piatek/class/Phys420/S20/Syllabus.pdf

Textbooks:

1. *Introduction to Special Relativity* by Robert Resnick, John Wiley & Sons, ISBN: 0-471-71725-8. This textbook will be referred to as **R**.



2. *Special Relativity* by A. P. French, The M.I.T. Introductory Physics Series, ISBN: 978-0-393-09793-1. This textbook will be referred to as **F**.



Lecture Quizzes: Starting on January 28, a lecture quiz will be given by the end of every Tuesday class. The quiz will contain 1 – 5 problems depending on the level of difficulty. The quiz will be graded and discussed in the following lecture. The quizzes will be “open textbooks” but “closed notes.”

Midterm: There will be a midterm exam on Thursday, March 10, covering chapters 1– 3. The exam will contain six open-ended problems.

Homework: No formal homework will be assigned; however, the syllabus lists suggested practice problems that a student should attempt to solve. Problems for the lecture quizzes, midterm, and final may be (but do not have to be) selected from the suggested problems.

Grading:

Lecture quizzes 40%

Midterm 30%

Final 30%

Cutoffs for letter grades:

85% – A

80% – B+

70% – B

65% – C+

50% – C

40% – D

Below 40% – F

Students with disabilities:

If you need accommodations due to a disability please contact Chantonette Lyles, Associate Director of Disability Support Services, Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

Honor Code and Etiquette:

NJIT has a zero-tolerance policy for cheating of any kind and for student behavior that disrupts learning by others. Violations will be reported to the Dean of Students. The penalties range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT. Avoid situations where your own behavior could be misinterpreted as dishonorable. **Students are required to agree to the NJIT Honor Code on each exam, assignment, quiz, etc. for the course.**

Turn off all cellular phones, wireless devices, computers, and messaging devices of all kinds during classes and exams. Please do not eat, drink, or create noise in class that interferes with the work of other students or instructors. Creating noise or otherwise interfering with the work of the class will not be tolerated.

Class Calendar

Lecture	Topic	Reading Material	Suggested Problems
1. T, 1/21	Introduction to special relativity: Galilean Transformations	R 1.1-4; F. 1	R:Ch.1: 2, 3, 4, 7, 8
2. R, 1/23	Michelson-Morley experiment (and others)	R. 1.5-8; F. 2	R: Ch.1: 9, 10, 12, 14, 15
3. T, 1/28	Postulates of special relativity; Lorentz Transformations	R.1.9-10; R. 2.1-2; F. 3	R: Ch. 2: 1
4. R, 1/30	Derivation of Lorentz Transformations	R. 2.2; F. 3	R: Ch. 2: 2, 3, 4, 5, 6, 7
5. T, 2/4	Consequences of Lorentz Trans.	R. 2.3-5; F. 4	R: Ch. 2: 8, 9, 12, 13, 18, 19, 22
6. R, 2/6	Exercises using Lorentz Trans.	R. 2.3-5, F. 4	R: Ch. 2: 23, 24, 25, 26, 27, 28, 32
7. T, 2/11	Relativistic velocity addition	R. 2.6, F. 5	R : Ch. 2: 35, 36, 37
8. R, 2/13	Exercises on velocity addition	R. 2.6, F. 5	R : Ch. 2: 38, 41, 43
9. T, 2/18	Stellar aberrations and Doppler effect	R. 2.7-8, F. 5	R: Ch.2: 44, 47, 48, 49, 50
10. R, 2/20	Minkowski space-time diagrams	R. pg. 188-200; F. pg. 82-84	R: pg. 199: 3, 4, 5, 6
11. T, 2/25	Minkowski space-time diagrams, cont'd.	R. pg. 188-200; F. pg. 82-84	R: pg. 199: 3, 4, 5, 6
12. R, 2/27	Twin paradox	R. pg. 201-209; F. pg. 154-159	R: pg. 208: 1, 2, 3, 4
13. T, 3/3	Relativistic Dynamic	R. 3.1-4	R: Ch. 3: 1, 2
14. R, 3/5	Relativistic Dynamics	R. 3.5	R: Ch. 3: 3, 4
15. T, 3/10	Midterm		
16. R, 3/12	No class		
17. T, 3/24	Motion under relativistic force	R. 3.5	R: Ch. 3: 5, 6, 11, 12, 13, 14, 18
18. R, 3/26	Conservation laws: energy and momentum	F. 6	F: Ch. 6: 2, 3, 4, 5, 7
19. T, 3/31	Conservation laws: energy and momentum	F. 6	F: Ch. 6: 10, 11, 12, 13, 14
20. R, 4/2	Compton scattering and Doppler effect (2 nd look)	F. 6	F: Ch. 6: 16, 17, 18, 19, 20
21. T, 4/7	Lorentz transformations for energy and momentum.	F. 7	F: Ch. 7: 1, 2, 3, 4, 5, 6, 7
22. R, 4/9	Lorentz transformations for energy and momentum.	F. 7	F: Ch. 7: 1, 2, 3, 4, 5, 6, 7
23. T, 4/14	Problem solving		
24. R, 4/16	Lorentz transformations for force	F. pg. 214-225	TBA
25. T, 4/21	Four vectors		TBA
26. R, 4/23	Relativity and electromagnetism	R. 4.1-5; F. 8	TBA
27. T, 4/28	Relativity and electromagnetism	R. 4.6; F. 8	TBA
28. R, 4/30	Relativity and electromagnetism	R. 4.7-8; F. 8	TBA