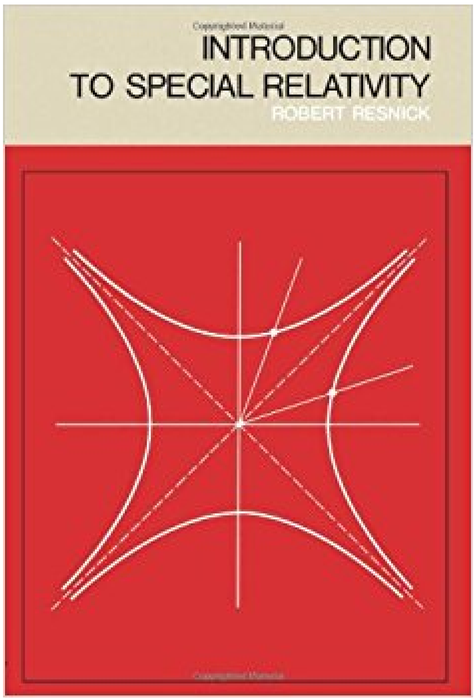
# Introduction To Special Relativity



## Synopsis

This book gives an excellent introduction to the theory of special relativity. Professor Resnick presents a fundamental and unified development of the subject with unusually clear discussions of the aspects that usually trouble beginners. He includes, for example, a section on the common sense of relativity. His presentation is lively and interspersed with historical, philosophical and special topics (such as the twin paradox) that will arouse and hold the reader's interest. You'll find many unique features that help you grasp the material, such as worked-out examples,summary tables,thought questions and a wealth of excellent problems. The emphasis throughout the book is physical. The experimental background, experimental confirmation of predictions, and the physical interpretation of principles are stressed. The book treats relativistic kinematics, relativistic dynamics, and relativity and electromagnetism and contains special appendices on the geometric representation of space-time and on general relativity. Its organization permits an instructor to vary the length and depth of his treatment and to use the book either with or following classical physics. These features make it an ideal companion for introductory courses.

## Book Information

Paperback: 248 pages

Publisher: Wiley; 1 edition (January 15, 1968)

Language: English

ISBN-10: 0471717258

ISBN-13: 978-0471717256

Product Dimensions:  6 x 0.6 x 9.2 inches

Shipping Weight: 15 ounces (View shipping rates and policies)

Average Customer Review:     4.4 out of 5 stars     7 customer reviews

Best Sellers Rank: #279,369 in Books (See Top 100 in Books)   #149 inÃ  Â Books > Science & Math > Physics > Relativity   #11030 inÃ  Â Books > Textbooks > Science & Mathematics

## Customer Reviews

This book gives an excellent introduction to the theory of special relativity. Professor Resnick presents a fundamental and unified development of the subject with unusually clear discussions of the aspects that usually trouble beginners. He includes,for example, a section on the common sense of relativity. His presentation is lively and interspersed with historical, philosophical and special topics (such as the twin paradox) that will arouse and hold the reader's interest.
YouÃ¢â ¬â„¢ll find many unique features that help you grasp the material, such as worked-out

examples,summary tables,thought questions and a wealth of excellent problems. The emphasis throughout the book is physical. The experimental background, experimental confirmation of predictions, and the physical interpretation of principles are stressed. The book treats relativistic kinematics, relativistic dynamics,and relativity and electromagnetism and contains special appendices on the geometric representation of space-time and on general relativity. Its organization permits an instructor to vary the length and depth of his treatment and to use the book either with or following classical physics. These features make it an ideal companion for introductory courses.

This is the best introduction to Special Relativity ever. It is a standard approach (unlike Spacetime Physics by Taylor & Wheeler which also is superb), but a superb one, highly readable. I always recomend this little book to beginners.

Excellent graphics and build-up of theory. Derivation of energy equation is first-rate. Resnick has really constructed meaningful derivations of results instead of using tired arguments that only 'look' plausible.

Excellent Text ... explains key concepts of Special Relativity in an accessible format.

Upon completion of a first (Calculus-based) Physics course, one can hardly do better than perusal of this text.Although my first initiation to Special Relativity proceeded via Taylor and Wheeler's Spacetime Physics,this (226 Page) introduction by Resnick contains much of enduring value (Note: c is retained in all formulas).Perhaps the exceptional quality of this text resides in its Questions and Exercises which end each Chapter.A random sampling of Questions (Of total 80) posed to the reader:(1) "How does the concept of simultaneity enter in to the measurement of the length of a body." (Q#5, Page 44).(2) " Make an argument showing that Relativity is consistent with the existence of Photons." (Q#27,Page 98).(3) "What role does potential energy play in the equivalence of mass and energy? " (Q#16, Page 150).(4) "Show that momentum is analogous to displacement,Show similarly that energy is analogous to time" (Q#18, Page 150).(5) " If magnetic fields are of the second order compared to electrical forces, why is it that we observe magnetic forceswithout great difficulty? "(Q#7, Page 183).A random sampling of Problems ( Of total 131) posed to the reader:(1) Show that the electromagnetic wave equation does not retain its form under the Galilean Transformation.(Page 46).(2) Prove the invariance of the electromagnetic wave equation in Relativity by showing that the correspondingdifferential operator is an invariant. (Page

100).(3) Show that when Force--as defined by equation 3-13--is not zero, then if (for a system of interacting particles) the totalrelativistic momentum changes by an amount dP, this change is equal to the total impulse given to the system.(Page 155).(4) Consider electromagnetic radiation to consist of photons. Show that the Doppler and aberration formula (of chapter two)can be obtained from the transformation laws for the components of momentum and the energy. (Page 155).(5) Show that the Scalar Product, E * B ( that is, Scalar Product of Electric and Magnetic Field Intensities)is an invariant under a Lorentz Transformation. Then argue that if these Fields are perpendicular to one another in one frame,they are perpendicular in all frames. (Page 184).And, we read nuggets of wisdom within:(1) "The proper time interval can be thought of equivalently as the time interval between two events occurring at the same place,or, the time interval measured by a single clock at one place. A nonproper time interval would be a time interval measured bytwo different clocks at two different places." (Page 64).(2) "The Lorentz length contraction is really not a property of a single body by itself, but instead is a relation between two suchrods in relative motion." (Page 94).(3) "The concept of a rigid body is untenable in relativity, for such a body would...transmit signals instantaneously." (Page 94).(4) " The Principle of Relativity is seen, not as a revolutionary step, but, as a natural completion of Newton’s work." (Page 96).(5) " We can choose to regard the mass an an invariant scalar quantity which gives the inertial properties of a body. The originof this factor in collision measurements is kinematic--that is, it is caused by the relativity of time measurements." (Page 119).(6) "When Relativity is put into its four-dimensional form, a four-vector momentum naturally emerges, whose ’time’-componentis the Energy." (Page 146).(7) " All this suggests the great generalizing nature of Relativity Theory, in the relativistic equations both concepts are used---Force as the time rate of change of momentum and Force as the space rate of change of Energy." (Page 148).Chapter One begins in an historical light, culminating in the Two Postulates.Chapter Two derives Transformation Laws in traditional manner; Phase considerations (Page 71) given lucid discussion.Reciprocity and Symmetry considerations are delineated.Chapter Three : Conservation of Energy and Momentum, highlighted. Einstein’s elementary derivation of the equivalenceof mass and energy is discussed (Page 142).Chapter Four : Electromagnetism and the interdependence of the Electric and Magnetic Fields highlighted in exemplary fashion."Electric and Magnetic Fields do not have separate existences." (Page 167)."Notice that throughout we have assumed the invariance of electric charge."(Page 175).The text concludes with Supplementary Material ( Minkowski Diagrams,Twin Paradox,General Relativity).All in all, this is an excellent introductory textbook requiring minimal preparation (One Year of Calculus and Physics).As prelude to more advanced treatments (or, as collateral to Taylor and Wheeler) the text is exceptional.Highly

Recommended.

In his book, ÃƒÂ¢Ã â ¬Ã Å“Introduction to Special Relativity (1968)ÃƒÂ¢Ã â ¬Ã Â•, page 31, Robert Resnick states, ÃƒÂ¢Ã â ¬Ã Å“For yellow sodium light in water, for example, the speed increase (or decrease) is 0.565vw.ÃƒÂ¢Ã â ¬Ã Â• This number does not appear in either the Fizeau paper or the Michelson/Morley paper (we credit modern day internet access). It is not referenced. Nor is there a confidence interval reported. My own analysis calculates the speed of light change as
DcwÃƒÂ Ã â ¬Ã Â =ÃƒÂ Ã â ¬Ã Â (0.8477ÃƒÂ Ã â ¬Ã Â +/-ÃƒÂ Ã â ¬Ã Â 0.2632)ÃƒÂ Ã â ¬Ã Â Dvw (from FizeauÃƒÂ¢Ã â ¬Ã â„¢s data) and
DcwÃƒÂ Ã â ¬Ã Â =ÃƒÂ Ã â ¬Ã Â (0.8794ÃƒÂ Ã â ¬Ã Â +/-ÃƒÂ Ã â ¬Ã Â 0.0747)ÃƒÂ Ã â ¬Ã Â Dvw (normalized consolidation of three series from the Michelson/Morley data). It is [erroneously] assumed that one fringe shift equals one phase shift.How was 0.565vw determined? Resnick later states ÃƒÂ¢Ã â ¬Ã Å“The experiment was later repeated by Michelson and Morley in 1886 and by P. Zeeman and others after 1914 ... ÃƒÂ¢Ã â ¬Ã Â•. I confess I have not accessed the latter papers, but the Fizeau experiment was the context of discussion. Also, whenever a confidence interval is not reported, then likely neither is the mean. The 0.565vw value is central to the book and to the veracity of relativity. I sent a letter to Rensselaer Institute (where Resnick was employed when he authored the book) regarding this matter, but they have not yet responded (itÃƒÂ¢Ã â ¬Ã â„¢s been over six months).Resnick also repeats the original calculations of the Michelson/Morley optical interferometer experiment (pages 18 to 26), which overlooks a variable interference angle (in a flowing aether) that includes parallel rays, which would cause an infinite fringe width in two positions of interferometer rotation (when properly calibrated). The theory persists given the many assumptions in its foundational experiments, like the aether should flow through the atmosphere (even though air is assigned an index of refraction), or that the brass water tubes were subject to thermal expansion (19th century environmental control), etc..EinsteinÃƒÂ¢Ã â ¬Ã â„¢s two [chronic] assumptions are: no preferred inertial (reference) system exists, and the speed of light is constant in all inertial systems. Combined, this means that light departs a source at the speed of light, transits space at the speed of light, and strikes a target at the speed of light, regardless how source and target move relative to each other and to space. Why are we expected to believe this, given these assumptions were never measured, and given experiments (measuring ÃƒÂ¢Ã â ¬Ã Å“effectsÃƒÂ¢Ã â ¬Ã Â•) that fail to distinguish special relativity from classical mechanics? Is there any relativity experiment that is free of assumptions, or

distinguishes itself from classical mechanics? Any relativistic claim should address these two questions.Resnick also displays a chart comparing EinsteinÃƒÂ¢Ã â ¬Ã â„¢s relativity to other theories (page 37), like a product comparison chart, omitting contradictory observations (RoemerÃƒÂ¢Ã â ¬Ã â„¢s more direct observation of JupiterÃƒÂ¢Ã â ¬Ã â„¢s eclipsing moon Io contradicts the twins paradox as well as null radial frequency aberration ÃƒÂ¢Ã â ¬Ã â œ the amateur astronomer can repeat the Roemer experiment).Resnick derives and evaluates the Lorentz transformation (pages 56 to 84), given the subtle assumption of contracted ballistic motion. It is a clever presentation. This is important because recognizing assumptions is an essential discipline when presented with any relativity problem (like the reflecting flashlight beam on a moving train problem that presumes ballistic motion), and they are numerous. Just one assumption renders results inconclusive (e.g. the null result interpreted as a nonexistent aether rather than full dragging in the atmosphere, where the speed of light is constant in all directions).

I used this book as an undergrad many years ago in honors first-year physics (along with Purcell's excellent E&M book from the Berkeley Physics Series), and have referred to it from time to time since. It's a clear, patient, matter-of-fact introduction to the subject which takes the time to clarify many of the obscure and seemingly contradictory aspects of special relativity. It's written about at the level of the famous Halliday and Resnick university physics books. I found the book to be very useful as an introduction. If you already know the subject, and need an advanced reference, this will be too basic, but as the title says, it's an "Introduction".

This book was recommended for my Modern Physics class. Even though it's old, the book is in very nice condition. The text is easy to follow.

Theoretical Particle Physics for Beginners (UNITEXT for Physics) Theoretical Physics 4: Special Theory of Relativity Newton to Einstein: The Trail of Light: An Excursion to the Wave-Particle Duality and the Special Theory of Relativity Special Relativity Special Relativity: For the Enthusiastic Beginner Special Relativity (M.I.T. Introductory Physics) Relativity: The Special and General Theory [Illustrated] REVEL for Exceptional Children: An Introduction to Special Education with Loose-Leaf Version (11th Edition) (What's New in Special Education) Gravity: An Introduction to Einstein's General Relativity Relativity, Gravitation and Cosmology: A Basic Introduction (Oxford Master Series in Physics) An Introduction to Riemannian Geometry: With Applications to Mechanics and Relativity (Universitext)