

1. Record Nr.	UNISA996472039003316
Autore	Rahaman Farook
Titolo	The special theory of relativity : a mathematical approach // Farook Rahaman
Pubbl/distr/stampa	Singapore : , : Springer, , [2022] ©2022
ISBN	9789811904974 9789811904967
Edizione	[Second edition.]
Descrizione fisica	1 online resource (339 pages)
Collana	Unitext ; ; v.136
Disciplina	530.11
Soggetti	Mathematical physics Relativitat especial (Física) Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di contenuto	Intro -- Preface to the Second Edition -- Preface to the First Edition -- Contents -- About the Author -- 1 Pre-relativity and Galilean Transformation -- 1.1 Failure of Newtonian Mechanics -- 1.2 Galilean Transformations -- 1.3 Galilean Transformations in Vector Form -- 1.4 Non-inertial Frames -- 1.5 Galilean Transformation and Laws of Electrodynamics -- 1.6 Attempts to Locate the Absolute Frame -- 2 Michelson-Morley Experiment and Velocity of Light -- 2.1 Attempts to Locate Special Privileged Frame -- 2.2 The Michelson-Morley Experiment (M-M) -- 2.3 Phenomena of Aberration: Bradley's Observation -- 2.4 Fizeau's Experiment -- 2.5 The Relativistic Concept of Space and Time -- 3 Lorentz Transformations -- 3.1 Postulates of Special Theory of Relativity -- 3.2 Lorentz Transformations -- 3.2.1 Lorentz Transformation Between Two Inertial Frames of Reference (Non-axiomatic Approach) -- 3.2.2 Axiomatic Derivation of Lorentz Transformation -- 3.2.3 Lorentz Transformation Based on the Postulates of Special Theory of Relativity -- 3.3 The General Lorentz Transformations -- 3.4 Thomas Precession -- 4 Mathematical Properties of Lorentz Transformations -- 4.1 Length Contraction (Lorentz-Fitzgerald Contraction) -- 4.2 Time Dilation -- 4.3 Relativity

of Simultaneity -- 4.4 Twin Paradox in Special Theory of Relativity --
4.5 Car-Garage Paradox in Special Theory of Relativity -- 4.6 Real
Example of Time Dilation -- 4.7 Terrell Effects -- 5 More Mathematical
Properties of Lorentz Transformations -- 5.1 Interval -- 5.2 The
Interval Between Two Events Is Invariant Under Lorentz Transformation
-- 6 Geometric Interpretation of Space-Time -- 6.1 Space-Time
Diagrams -- 6.2 Some Possible and Impossible World Lines -- 6.3
Importance of Light Cone -- 6.4 Relationship Between Space-Time
Diagrams in S and S1 Frames.
6.5 Geometrical Representation of Simultaneity, Space Contraction and
Time Dilation -- 6.5.1 Simultaneity -- 6.5.2 Space Contraction -- 6.5.3
Time Dilation -- 7 Relativistic Velocity and Acceleration -- 7.1
Relativistic Velocity Addition -- 7.2 Relativistic Velocity
Transformations -- 7.3 Relativistic Acceleration Transformations -- 7.4
Uniform Acceleration -- 7.5 Relativistic Transformations of the
Direction Cosines -- 7.6 Application of Relativistic Velocity and Velocity
Addition Law -- 7.6.1 The Fizeau Effect: The Fresnel's Coefficient of
Drag -- 7.6.2 Aberration of Light -- 7.6.3 Relativistic Doppler Effect --
8 Four-Dimensional World -- 8.1 Four-Dimensional Space-Time -- 8.2
Proper Time -- 8.3 World Velocity or Four Velocities -- 8.4 Lorentz
Transformation of Space and Time in Four-Vector Form -- 9 Mass in
Relativity -- 9.1 Relativistic Mass -- 9.1.1 First Method Based on
Hypothetical Experiment of Tolman and Lews -- 9.1.2 Second Method
Based on a Thought Experiment -- 9.1.3 Third Method -- 9.2
Experimental Verification of Relativistic Mass -- 9.3 Lorentz
Transformation of Relativistic Mass -- 10 Relativistic Dynamics -- 10.1
Four Forces or Minkowski Force -- 10.2 Four Momenta -- 10.3
Relativistic Kinetic Energy -- 10.4 Mass-Energy Relation -- 10.5
Relation Between Momentum and Energy -- 10.6 Evidence in Support of
Mass-Energy Relation -- 10.7 Force in Special Theory of Relativity --
10.8 Covariant Formulation of Newton's Law -- 10.9 Examples of
Longitudinal Mass and Transverse Mass -- 10.10 The Lorentz
Transformation of Momentum -- 10.11 The Expression $p^2 - E^2/c^2$ Is
Invariant Under Lorentz Transformation -- 11 Photon in Relativity --
11.1 Photon -- 11.2 Compton Effect -- 11.3 The Lorentz
Transformation of Momentum of Photon -- 11.4 Minkowski Force for
Photon -- 12 Relativistic Lagrangian and Hamiltonian -- 12.1
Relativistic Lagrangian.
12.2 Relativistic Hamiltonian Function -- 12.3 Covariant Lagrangian
and Hamiltonian Formulation -- 12.4 Lorentz Transformation of Force
-- 12.5 Relativistic Transformation Formula for Density -- 13
Electrodynamics in Relativity -- 13.1 Relativistic Electrodynamics --
13.2 Equation of Continuity -- 13.3 Maxwell's Equations -- 13.4
Derivation of Equation of Continuity from Maxwell's Equations -- 13.5
Displacement Current -- 13.6 Transformation for Charge Density --
13.7 Four Current Vector -- 13.8 Equation of Continuity in Covariant
Form -- 13.9 Transformation of Four Current Vector -- 13.10
Maxwell's Equations in Covariant Form -- 13.10.1 The d'Alembertian
Operator is Invariant Under Lorentz Transformation -- 13.10.2
Lorentz-Gauge Condition in Covariant Form -- 13.10.3 Gauge
Transformations -- 13.11 Transformation of Four Potential Vector --
13.12 The Electromagnetic Field Tensor -- 13.13 Lorentz
Transformation of Electromagnetic Fields -- 13.14 Maxwell's Equations
Are Invariant Under Lorentz Transformations -- 13.15 Lorentz Force on
a Charged Particle -- 13.16 Electromagnetic Field Produced by a
Moving Charge -- 13.17 Relativistic Lagrangian and Hamiltonian
Functions ... -- 14 Electromagnetic Waves -- 14.1 Introduction -- 14.2
Wave Equation for Magnetic Intensity -- 14.3 Wave Equation for

Electric Field Strength "0245E -- 14.4 Electromagnetic Waves in a Non-conducting Dielectric Medium -- 14.5 Poynting's Theorem (Energy Conservation) -- 14.6 Boundary Conditions -- 14.7 Plane Electromagnetic Waves in a Non-conducting Isotropic Medium -- 14.8 Plane Electromagnetic Waves in a Conducting Medium -- 14.9 Skin Depth -- 14.10 Wave Guides -- 14.11 Coulomb Gauge -- 14.12 Hertz Vector -- 14.13 A Brief Introduction of Relativistic Wave Equation -- 15 Relativistic Mechanics of Continua -- 15.1 Relativistic Mechanics of Continuous Medium (Continua).
Appendix Appendix A -- Appendix Appendix B -- Appendix
References -- -- Index.
