

1. Record Nr.	UNINA9910484321803321
Autore	Erbin Harold <1989->
Titolo	String field theory : a modern introduction / / Harold Erbin
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2021] ©2021
ISBN	3-030-65321-8
Descrizione fisica	1 online resource (424 pages)
Collana	Lecture Notes in Physics ; ; 980
Disciplina	539.7258
Soggetti	String models Quantum field theory
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	<p>Intro -- Preface -- Organization -- Acknowledgements -- References -- Contents -- About the Author -- 1 Introduction -- 1.1 Strings, a Distinguished Theory -- 1.2 String Theory -- 1.2.1 Properties -- Worldsheets CFT -- Spectrum -- 1.2.2 Classification of Superstring Theories -- 1.2.3 Interactions -- Worldsheets and Riemann Surfaces -- Amplitudes -- Divergences and Feynman Graphs -- 1.3 String Field Theory -- 1.3.1 From the Worldsheets to Field Theory -- 1.3.2 String Field Action -- 1.3.3 Expression with Spacetime Fields -- 1.3.4 Applications -- 1.4 Suggested Readings -- References -- Part I</p> <p>Worldsheet Theory -- 2 Worldsheet Path Integral: Vacuum Amplitudes -- 2.1 Worldsheet Action and Symmetries -- 2.2 Path Integral -- 2.3 Faddeev-Popov Gauge Fixing -- 2.3.1 Metrics on Riemann Surfaces -- 2.3.2 Reparametrizations and Analysis of P1 -- Teichmuller Deformations -- Conformal Killing Vectors -- 2.3.3 Weyl Transformations and Quantum Anomalies -- 2.3.4 Ambiguities, Ultralocality and Cosmological Constant -- 2.3.5 Gauge Fixed Path Integral -- 2.4 Ghost Action -- 2.4.1 Actions and Equations of Motion -- 2.4.2 Weyl Ghost -- 2.4.3 Zero-Modes -- 2.5 Normalization -- 2.6 Summary -- 2.7 Suggested Readings -- References -- 3 Worldsheet Path Integral: Scattering Amplitudes -- 3.1 Scattering Amplitudes on Moduli Space -- 3.1.1 Vertex Operators and Path Integral -- 3.1.2 Gauge Fixing: General Case -- 3.1.3 Gauge Fixing: 2-Point Amplitude</p>

-- Review of the Problem -- Computation of the Amplitude --
Expression with Ghosts -- 3.2 BRST Quantization -- 3.2.1 BRST
Symmetry -- 3.2.2 BRST Cohomology and Physical States -- 3.3
Summary -- 3.4 Suggested Readings -- References -- 4 Worldsheet
Path Integral: Complex Coordinates -- 4.1 Geometry of Complex
Manifolds -- 4.2 Complex Representation of Path Integral -- 4.3
Summary -- 4.4 Suggested Readings -- References.
5 Conformal Symmetry in D Dimensions -- 5.1 CFT on a General
Manifold -- 5.2 CFT on Minkowski Space -- 5.3 Suggested Readings --
References -- 6 Conformal Field Theory on the Plane -- 6.1 The
Riemann Sphere -- 6.1.1 Map to the Complex Plane -- 6.1.2 Relation
to the Cylinder: String Theory -- 6.2 Classical CFTs -- 6.2.1 Witt
Conformal Algebra -- 6.2.2 $PSL(2, \mathbb{C})$ Conformal Group -- 6.2.3
Definition of a CFT -- 6.3 Quantum CFTs -- 6.3.1 Virasoro Algebra --
6.3.2 Correlation Functions -- 6.4 Operator Formalism and Radial
Quantization -- 6.4.1 Radial Ordering and Commutators -- 6.4.2
Operator Product Expansions -- 6.4.3 Hermitian and BPZ Conjugation
-- 6.4.4 Mode Expansion -- 6.4.5 Hilbert Space -- State-Operator
Correspondence -- Euclidean and BPZ Conjugations and Inner Products
-- Verma Modules -- Normal Ordering -- 6.4.6 CFT on the Cylinder --
6.5 Suggested Readings -- References -- 7 CFT Systems -- 7.1 Free
Scalar -- 7.1.1 Covariant Action -- 7.1.2 Action on the Complex Plane
-- 7.1.3 OPE -- 7.1.4 Mode Expansions -- 7.1.5 Commutators -- 7.1.6
Hilbert Space -- 7.1.7 Euclidean and BPZ Conjugates -- 7.2 First-Order
bc Ghost System -- 7.2.1 Covariant Action -- 7.2.2 Action on the
Complex Plane -- 7.2.3 OPE -- 7.2.4 Mode Expansions -- 7.2.5
Commutators -- 7.2.6 Hilbert Space -- Energy Vacuum (Grassmann
Odd) -- Energy Normal Ordering (Grassmann Odd) -- Structure of the
Hilbert Space (Grassmann Odd) -- 7.2.7 Euclidean and BPZ Conjugates
-- 7.2.8 Summary -- 7.3 Suggested Readings -- References -- 8 BRST
Quantization -- 8.1 BRST for Reparametrization Invariance -- 8.2 BRST
in the CFT Formalism -- 8.2.1 OPE -- 8.2.2 Mode Expansions -- 8.2.3
Commutators -- 8.3 BRST Cohomology: Two Flat Directions -- 8.3.1
Conditions on the States -- 8.3.2 Relative Cohomology -- Light-Cone
Parametrization -- Reduced Cohomology -- Full Relative Cohomology.
8.3.3 Absolute Cohomology, States and No-Ghost Theorem -- 8.3.4
Cohomology for Holomorphic and Anti-holomorphic Sectors -- 8.4
Summary -- 8.5 Suggested Readings -- References -- Part II String
Field Theory -- 9 String Field -- 9.1 Field Functional -- 9.2 Field
Expansion -- 9.3 Summary -- 9.4 Suggested Readings -- References
-- 10 Free BRST String Field Theory -- 10.1 Classical Action for the
Open String -- 10.1.1 Warm-Up: Point-Particle -- 10.1.2 Open String
Action -- 10.1.3 Gauge Invariance -- 10.1.4 Siegel Gauge -- 10.2
Open String Field Expansion, Parity and Ghost Number -- 10.3 Path
Integral Quantization -- 10.3.1 Tentative Faddeev-Popov Gauge Fixing
-- 10.3.2 Tower of Ghosts -- 10.4 Spacetime Action -- 10.5 Closed
String -- 10.6 Summary -- 10.7 Suggested Readings -- References --
11 Introduction to Off-Shell String Theory -- 11.1 Motivations --
11.1.1 3-Point Function -- 11.1.2 4-Point Function -- 11.2 Off-Shell
States -- 11.3 Off-Shell Amplitudes -- 11.3.1 Amplitudes from the
Marked Moduli Space -- 11.3.2 Local Coordinates -- 11.4 Suggested
Readings -- References -- 12 Geometry of Moduli Spaces and Riemann
Surfaces -- 12.1 Parametrization of $P(g,n)$ -- 12.2 Tangent Space --
12.3 Plumbing Fixture -- 12.3.1 Separating Case -- 12.3.2 Non-
separating Case -- 12.3.3 Decomposition of Moduli Spaces and
DegenerationLimit -- 12.3.4 Stubs -- 12.4 Summary -- 12.5
Suggested Readings -- References -- 13 Off-Shell Amplitudes -- 13.1
Cotangent Spaces and Amplitudes -- 13.1.1 Construction of Forms --

13.1.2 Amplitudes and Surface States -- 13.2 Properties of Forms --
13.2.1 Vanishing of Forms with Trivial Vectors -- 13.2.2 BRST Identity
-- 13.3 Properties of Amplitudes -- 13.3.1 Restriction to $\hat{P}(g,n)$ --
13.3.2 Consequences of the BRST Identity -- 13.4 Suggested Readings
-- References -- 14 Amplitude Factorization and Feynman Diagrams.
14.1 Amplitude Factorization -- 14.1.1 Separating Case -- 14.1.2
Non-separating Case -- 14.2 Feynman Diagrams and Feynman Rules
-- 14.2.1 Feynman Graphs -- 14.2.2 Propagator -- 14.2.3
Fundamental Vertices -- Recursive Definition: Tree-Level Vertices --
Recursive Definition: General Vertices -- Other Vertices -- 14.2.4 Stubs
-- 14.2.5 1PI Vertices -- 14.3 Properties of Fundamental Vertices --
14.3.1 String Product -- 14.3.2 Feynman Graph Interpretation -- 14.4
Suggested Readings -- References -- 15 Closed String Field Theory --
15.1 Closed String Field Expansion -- 15.2 Gauge Fixed Theory --
15.2.1 Kinetic Term and Propagator -- 15.2.2 Interactions -- 15.2.3
Action -- 15.3 Classical Gauge Invariant Theory -- 15.4 BV Theory --
15.5 1PI Theory -- 15.6 Suggested Readings -- References -- 16
Background Independence -- 16.1 The Concept of Background
Independence -- 16.2 Problem Setup -- 16.3 Deformation of the CFT
-- 16.4 Expansion of the Action -- 16.5 Relating the Equations of
Motion -- 16.6 Idea of the Proof -- 16.7 Suggested Readings --
References -- 17 Superstring -- 17.1 Worldsheet Superstring Theory
-- 17.1.1 Heterotic Worldsheet -- Beta-Gamma System -- 17.1.2
Hilbert Spaces -- 17.2 Off-Shell Superstring Amplitudes -- 17.2.1
Amplitudes -- 17.2.2 Factorization -- 17.2.3 Spurious Poles -- Origin
-- Vertical Integration: Large Hilbert Space -- Vertical Integration:
Small Hilbert Space -- 17.3 Superstring Field Theory -- 17.3.1 String
Field and Propagator -- 17.3.2 Constraint Approach -- 17.3.3 Auxiliary
Field Approach -- 17.3.4 Large Hilbert Space -- 17.4 Suggested
Readings -- References -- 18 Momentum-Space SFT -- 18.1 General
Form -- 18.2 Generalized Wick Rotation -- 18.3 Suggested Readings
-- References -- A Conventions -- A.1 Coordinates -- A.2 Operators
-- A.3 QFT -- A.4 Curved Space and Gravity -- A.5 List of Symbols.
B Summary of Important Formulas -- B.1 Complex Analysis -- B.2 QFT,
Curved Spaces and Gravity -- B.2.1 Two Dimensions -- B.3 Conformal
Field Theory -- B.3.1 Complex Plane -- B.3.2 General Properties -- B.
3.3 Hermitian and BPZ Conjugations -- Hermitian -- BPZ -- B.3.4
Scalar Field -- B.3.5 Reparametrization Ghosts -- B.4 Bosonic String --
C Quantum Field Theory -- C.1 Path Integrals -- C.1.1 Integration
Measure -- C.1.2 Field Redefinitions -- C.1.3 Zero-Modes -- C.2 BRST
Quantization -- C.3 BV Formalism -- C.3.1 Properties of Gauge Algebra
-- C.3.2 Classical BV -- C.3.3 Quantum BV -- C.4 Suggested Readings
-- References -- Index.
