

- |                         |  |
|-------------------------|--|
| 1. Record Nr.           | UNINA990000513530403321                            |
| Autore                  | Starr, Trevor F.                                   |
| Titolo                  | Glass-Fibre databook / Compiled by Trevor F. Starr |
| Pubbl/distr/stampa      | London : Chapman and Hall, , c1993                 |
| ISBN                    | 0-412-46280-X                                      |
| Descrizione fisica      | 248 p. : ill. ; 30 cm                              |
| Disciplina              | 666.157  |
| Locazione               | DINEL  |
| Collocazione            | 10 B I 601   |
| Lingua di pubblicazione | Inglese  |
| Formato                 | Materiale a stampa                                 |
| Livello bibliografico   | Monografia   |
- 
- |                         |   |
|-------------------------|---|
| 2. Record Nr.           | UNINA9910787757003321   |
| Autore                  | Toptygin I. N (Igor Nikolaevich)  |
| Titolo                  | Foundations of classical and quantum electrodynamics / / Igor N. Toptygin |
| Pubbl/distr/stampa      | Somerset County, New Jersey : , : Wiley-VCH, , [2013] 2014                |
| ISBN                    | 3-527-67751-8<br>3-527-68042-X<br>3-527-67749-6                           |
| Descrizione fisica      | 1 online resource (734 p.)  |
| Collana                 | New York Academy of Sciences  |
| Disciplina              | 530.1433  |
| Soggetti                | Quantum electrodynamics   |
| Lingua di pubblicazione | Inglese   |
| Formato                 | Materiale a stampa  |
| Livello bibliografico   | Monografia  |
| Note generali           | Description based upon print version of record.                           |
| Nota di bibliografia    | Includes bibliographical references and index.                            |
| Nota di contenuto       | Cover -- Title Page -- Contents -- Preface -- Fundamental Constants       |

and Frequently Used Numbers -- Basic Notation -- 1 The Mathematical Methods of Electrodynamics -- 1.1 Vector and Tensor Algebra -- 1.1.1 The Definition of a Tensor and Tensor Operations -- 1.1.2 The Principal Values and Invariants of a Symmetric Tensor of Rank 2 -- 1.1.3 Covariant and Contravariant Components -- 1.1.4 Tensors in Curvilinear and Nonorthogonal Systems of Coordinates -- 1.2 Vector and Tensor Calculus -- 1.2.1 Gradient and Directional Derivative. Vector Lines -- 1.2.2 Divergence and Curl. Integral Theorems -- 1.2.3 Solenoidal and Potential (Curl-less) Vectors -- 1.2.4 Differential Operations of Second Order -- 1.2.5 Differentiating in Curvilinear Coordinates -- 1.2.6 Orthogonal Curvilinear Coordinates -- 1.3 The Special Functions of Mathematical Physics -- 1.3.1 Cylindrical Functions -- 1.3.2 Spherical Functions and Legendre Polynomials -- 1.3.3 Dirac Delta Function -- 1.3.4 Certain Representations of the Delta Function -- 1.3.5 The Representation of the Delta Function through Loop Integrals in a Complex Plane -- 1.3.6 Expansion in Total Systems of Orthogonal and Normalized Functions. General Considerations -- 1.3.7 Fourier Series -- 1.3.8 Fourier Integral -- 1.4 Answers and Solutions -- 2 Basic Concepts of Electrodynamics: The Maxwell Equations -- 2.1 Electrostatics -- 2.1.1 The Coulomb Law -- 2.1.2 Electric Field -- 2.1.3 Energy and Forces in Electrostatic Fields -- 2.2 Magnetostatics -- 2.2.1 Current Density and the Magnetic Field. Biot-Savart Law -- 2.2.2 Lorentz Force and Ampère's Formula -- 2.2.3 Conservation of Electric Charge and the Continuity Equation -- 2.2.4 Equations of Magnetostatics. Vector Potential -- 2.2.5 Energy and Forces in Magnetostatic Fields -- 2.3 Maxwell's Equations. Free Electromagnetic Field -- 2.3.1 The Law of Electromagnetic Induction. 2.3.2 The Systems of Measurement Units of Electric and Magnetic Values -- 2.3.3 An Analysis of the System of Maxwell's Equations -- 2.3.4 Free Electromagnetic Field -- 2.3.5 The Partial Polarization of Waves -- 2.3.6 Analytical Signal -- 2.3.7 The Hamiltonian Form of Equations for a Free Electromagnetic Field -- 2.4 Answers and Solutions -- 3 The Special Theory of Relativity and Relativistic Kinematics -- 3.1 The Principle of Relativity and Lorentz Transformations -- 3.1.1 Properties of Space-Time and Intervals -- 3.1.2 Lorentz Transformations -- 3.1.3 Pseudo-Euclidean Geometry -- 3.2 Kinematics of Relativistic Particles -- 3.2.1 Energy and Momentum -- 3.2.2 Kinematic Problems -- 3.3 Answers and Solutions -- 4 Fundamentals of Relativistic Mechanics and Field Theory -- 4.1 Four-Dimensional Vectors and Tensors -- 4.1.1 Transformations of Tensors -- 4.1.2 Dual Tensors -- 4.2 The Motion of Charged Particles in Electromagnetic Fields. Transformation of the Electric Field -- 4.2.1 Interaction of Charged Particles with the Electromagnetic Field -- 4.2.2 Equations of Motion of a Relativistic Particle -- 4.2.3 Transformations of Electromagnetic Field Stress -- 4.2.4 Dynamics of Orbital and Spin Magnetic Moments -- 4.2.5 The Approximate Methods. Averaging over Rapid Movements -- 4.3 The Four-Dimensional Formulation of Electrodynamics. Introduction to Field Theory -- 4.3.1 Lagrangian and Hamiltonian Methods in Field Theory -- 4.3.2 The Action for an Electromagnetic Field -- 4.3.3 Noether's Theorem and Integrals of Motion -- 4.4 Answers and Solutions -- 5 Emission and Scattering of Electromagnetic Waves -- 5.1 Green's Functions and Retarded Potentials -- 5.1.1 The Green's Function of a Wave Equation -- 5.1.2 Retarded Potentials -- 5.1.3 The Spectral Composition of Emission -- 5.2 Emission in Nonrelativistic Systems of Charges and Currents. 5.2.1 Electric Dipole Emission -- 5.2.2 Quadrupole and Magnetic Dipole Emission -- 5.2.3 The Hertz Vector and Antenna Radiation -- 5.3 Emission by Relativistic Particles -- 5.3.1 The Electromagnetic Field

of a Propagating Charged Particle -- 5.3.2 The Loss of Energy and Momentum of a Charged Particle -- 5.3.3 The Spectral Distribution of Radiation Emitted by Relativistic Particles -- 5.3.4 Radiation from Colliding Particles -- 5.3.5 Radiation from Particle Decays and Transformations -- 5.4 Interaction of Charged Particles with Radiation -- 5.4.1 Interaction of a Charged Particle with its Own Electromagnetic Field -- 5.4.2 Renormalization of Mass. The Radiation Damping Force in the Relativistic Case -- 5.4.3 Scattering of Electromagnetic Waves by Particles -- 5.5 Answers and Solutions -- 6 Quantum Theory of Radiation Processes. Photon Emission and Scattering -- 6.1 Quantum Theory of the Free Electromagnetic Field -- 6.1.1 Field Oscillators -- 6.1.2 Photons -- 6.1.3 Occupation Number Representation and Operators of the Electromagnetic Field -- 6.1.4 Coherent States -- 6.1.5 Representation of the Quantum States and the Operators in the Basis of Coherent States -- 6.1.6 Squeezed States -- 6.1.7 Entangled States -- 6.1.8 Beamsplitters -- 6.2 Quantum Theory of Photon Emission, Absorption, and Scattering by Atomic Systems -- 6.2.1 Interaction of the Quantized Electromagnetic Field with a Nonrelativistic System -- 6.2.2 Spontaneous and Stimulated Emission -- 6.2.3 Electric Dipole Radiation -- 6.2.4 Electric Quadrupole and Magnetic Dipole Radiation -- 6.2.5 Perturbation Theory for the Density Matrix -- 6.2.6 Long-Wavelength Dipole Approximation -- 6.3 Interaction between Relativistic Particles -- 6.3.1 The Relativistic Dirac Equation for Fermions -- 6.3.2 The Klein-Gordon-Fock Equation -- 6.3.3 The Analysis of the Dirac Equation. 6.3.4 The Interaction Operator of a Relativistic Particle with Photons -- 6.3.5 Method of Equivalent Photons -- 6.4 Answers and Solutions -- 7 Fundamentals of Quantum Theory of the Electron-Positron Field -- 7.1 Covariant Form of the Dirac Equation. Relativistic Bispinor Transformation -- 7.2 Covariant Quadratic Forms -- 7.3 Charge Conjugation and Wave Functions of Antiparticles -- 7.4 Secondary Quantization of the Dirac Field. Creation and Annihilation Operators for Field Quanta -- 7.5 Energy and Current Density Operators for Dirac Particles -- 7.6 Interaction between Electron-Positron and Electromagnetic Fields -- 7.7 Schrödinger Equation for Interacting Fields and the Evolution Operator -- 7.8 Scattering Matrix and Its Calculation -- 7.9 Calculations of Probabilities and Effective Differential Cross-Sections -- 7.10 Scattering of a Relativistic Particle with a Spin in the Coulomb Field -- 7.11 Green's Functions of Electron-Positron and Electromagnetic Fields -- 7.12 Interaction between Electrons and Muons -- 7.12.1 Electron-Muon Collisions -- 7.12.2 Conversion of an Electron-Positron Pair into a Muon Pair -- 7.13 Higher-Order Corrections -- 7.14 Answers and Solutions -- Appendix A Conversion of Electric and Magnetic Quantities between the International System of Units and the Gaussian System -- Appendix B Variation Principle for Continuous Systems -- B.1 Vibrations of an Elastic Medium as the Vibration Limit of Discrete Point Masses -- B.2 The Lagrangian Form of Equations of Motion for a Continuous Medium -- Appendix C General Outline of Quantum Theory -- C.1 Spectrum of Physical Values and the Wave Function -- C.2 State Vector -- C.3 Indistinguishability of Identical Particles -- C.4 Operators and Their Properties -- C.5 Some Useful Formulas of Operator Algebra -- C.6 Wave Functions of the Hydrogen-Like Atom (the Lowest Levels). C.6.1 Addition of Angular Moments -- C.6.2 Spin Operators and Wave Functions of Fermions ( $s = 1/2$ ) -- References -- Index.

introduces the material at different levels, oriented towards 3rd-4th year bachelor, master, and PhD students. This is so as to describe the whole complexity of physical phenomena, instead of a mosaic of disconnected data. The required mathematical background is collated in Chapter 1, while the necessary physical background is included in the main text of the corresponding chapters and a

---