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This bestselling
textbook teaches
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quantum mechanics and provides an insightful discussion of what it actually means.

Starting from introductory quantum and classical mechanics, this text develops the quantum field theories that make up the `Standard

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Model' of
elementary
processes in a
systematic
presentation
emphasizing
theoretical concepts
as well as
experimental
applications.
Quantum field
theory provides the
theoretical

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backbone to most
modern physics.

This book is
designed to bring
quantum field theory
to a wider audience
of physicists. It is
packed with worked
examples, witty
diagrams, and
applications
intended to
introduce a new

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audience to this
revolutionary theory.

This text explains
the features of
quantum and
statistical field
systems that result
from their field-
theoretic nature and
are common to
different physical
contexts. It supplies
the practical tools

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for carrying out calculations and discusses the meaning of the results. The central concept is that of effective action (or free energy), and the main technical tool is the path integral, although other formalisms are also mentioned. The

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author emphasizes
the simplest models
first, then

progresses to
discussions of real
systems before
addressing more
general and
rigorous
conclusions. The
book is structured
around carefully
selected problems,

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which are solved in
detail.

Quantum Field
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The Quantum
Vacuum
Quantum Field
Theory and the
Standard Model
A Concise
Introduction

This book is a
modern

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introduction to the ideas and techniques of quantum field theory. After a brief overview of particle physics and a survey of relativistic wave equations and Lagrangian methods, the author develops

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and spinor
fields, and then
of gauge fields.
The emphasis
throughout is on
functional
methods, which
have played a
large part in
modern field
theory. The book
concludes with a

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A brief survey of
"topological"
objects in field
theory and, new
to this edition,
a chapter
devoted to
supersymmetry.
Graduate
students in
particle physics
and high energy
physics will
benefit from

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this book.

This book fills a gap in the middle ground between quantum mechanics of a single electron to the concept of a quantum field. In doing so, the book is divided into two parts; the first provides the

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necessary
background to
quantum theory
extending from
Planck's
formulation of
black body
radiation to
Schrodinger's
equation; and
the second part
explores Dirac's
relativistic
electron to

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quantum fields,
finishing with
an description
of Feynman
diagrams and
their meaning.
Much more than a
popular account,
yet not too
heavy so as to
be inaccessible,
this book
assumes no prior
knowledge of

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Peskin
quantum physics
or field theory
and provides the
necessary
foundations for
readers to then
progress to more
advanced texts
on quantum field
theory. It will
be of interest
to undergraduate
students in
physics and

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mathematics, in
addition to an
interested,
general
audience.

Features:

Provides an
extensive yet
accessible
background to
the concepts
Contains
numerous,
illustrative

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diagrams
Presents in-
depth

explanations of
difficult
subjects

This modern
textbook offers
an introduction
to Quantum
Mechanics as a
theory that
underlies the
world around us,

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from atoms and
molecules to
materials,
lasers, and
other
applications.

The main
features of the
book are:

Emphasis on the
key principles
with minimal
mathematical
formalism

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Demystifying
discussions of
the basic
features of
quantum systems,
using
dimensional
analysis and ord
er-of-magnitude
estimates to
develop
intuition
Comprehensive
overview of the

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key concepts of
quantum

chemistry and
the electronic
structure of
solids Extensive

discussion of
the basic

processes and
applications of
light-matter
interactions

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Provides a
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revolution and
the theoretical
and experimental
evidence which
makes the
Standard Model
the leading

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*introduction to
quantum field
theory for
graduates,
providing intuitive,
physical
explanations
supported by real-
world applications
and homework
problems.*

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This book provides an introduction to Quantum Field Theory (QFT) at an elementary level—with only special relativity, electromagnetism and quantum mechanics as prerequisites. For this fresh approach to teaching QFT, based on

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numerous lectures
and courses given
by the authors, a
representative
sample of topics
has been selected
containing some of
the more
innovative,
challenging or
subtle concepts.
They are presented
with a minimum of
technical details,

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*the discussion of
the main ideas
being more
important than the
presentation of the
typically very
technical
mathematical
details necessary
to obtain the final
results. Special
attention is given
to the realization of
symmetries in*

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*particle physics:
Theory Michael E*
global and local
symmetries,
explicit,
spontaneously
broken, and
anomalous
continuous
symmetries, as
well as discrete
symmetries.
Beyond providing
an overview of the
standard model of

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*the strong, weak
and
electromagnetic
interactions and
the current
understanding of
the origin of mass,
the text
enumerates the
general features of
renormalization
theory as well as
providing a cursory
description of*

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effective field theories and the problem of naturalness in physics. Among the more advanced topics the reader will find are an outline of the first principles derivation of the CPT theorem and the spin-statistics connection. As

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Peskin
*indicated by the
title, the main aim
of this text is to
motivate the
reader to study
QFT by providing a
self-contained and
approachable
introduction to the
most exciting and
challenging
aspects of this
successful
theoretical*

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framework.

Changes and

additions to the
new edition of this

classic textbook

include a new

chapter on

symmetries, new

problems and

examples,

improved

explanations, more

numerical

problems to be

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worked on a
computer, new
applications to
solid state physics,
and consolidated
treatment of time-
dependent
potentials.

Quantum
mechanics is a
subject that has
captured the
imagination of a
surprisingly broad

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range of thinkers, including many philosophers of science. Quantum field theory, however, is a subject that has been discussed mostly by physicists. This is the first book to present quantum field theory in a manner that makes

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Peskin

*it accessible to
philosophers.*

*Because it presents
a lucid view of the
theory and debates
that surround the
theory, An
Interpretive
Introduction to
Quantum Field
Theory will interest
students of physics
as well as students
of philosophy. Paul*

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Teller presents the basic ideas of quantum field theory in a way that is understandable to readers who are familiar with non-relativistic quantum mechanics. He provides information about the physics of the

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theory without
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Bookin
calculational detail,
and he enlightens
readers on how to
think about the
theory physically.
Along the way, he
dismantles some
popular myths and
clarifies the novel
ways in which
quantum field
theory is both a
theory about fields

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and about
Theory. Michael E
Peskin
is to raise
questions about
the philosophical
implications of the
theory and to offer
some tentative
interpretive views
of his own. This
provocative and
thoughtful book
challenges
philosophers to

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*extend their
thinking beyond
the realm of
quantum
mechanics and it
challenges
physicists to
consider the
philosophical
issues that their
explorations have
encouraged.*

*Waves, Particles
and Fields*

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*An Introduction To
Theory Michael E
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*An Introduction to
Quantum Field
Theory*

*Modern Quantum
Field Theory*

This textbook
presents a detailed
introduction to the
general concepts of
quantum field

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Theory, with special
emphasis on
Theory Michael E
Peskin
principal aspects of
functional methods
and renormalization
in gauge theories,
and includes an
introduction to
semiclassical and
perturbative
quantum gravity in
flat and curved
spacetimes.

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Based on the lectures given at TU Munich for third-year physics students, this book provides the basic concepts of relativistic quantum field theory, perturbation theory, Feynman graphs, Abelian and non-Abelian gauge

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its theoretical
foundations.

Phenomenology of
W and Z bosons, as
well as Higgs
bosons, is part of
the electroweak
chapter in addition
to recent
experimental
results, precision
tests and current
status of the

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Standard Model.
This advanced
textbook supplies
graduate students
with a primer in
quantum theory. A
variety of processes
are discussed with
concepts such as
potentials, classical
current
distributions,
prescribed external

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fields dealt with in the framework of relativistic quantum mechanics. Then, in an introduction to field theory, the author emphasizes the deduction of the said potentials or currents. A modern presentation of the subject together with many

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exercises, unique in
its unusual

underlying concept
of combining
relativistic quantum
mechanics with
basic quantum field
theory.

The importance and
the beauty of
modern quantum
field theory resides
in the power and

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variety of its
methods and ideas,
which find
application in
domains as different
as particle physics,
cosmology,
condensed matter,
statistical
mechanics and
critical phenomena.
This book
introduces the

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reader to the
modern
developments in a
manner which
assumes no
previous knowledge
of quantum field
theory. Along with
standard topics like
Feynman diagrams,
the book discusses
effective
lagrangians,

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renormalization group equations, the path integral formulation, spontaneous symmetry breaking and non-abelian gauge theories. The inclusion of more advanced topics will also make this a most useful book for graduate

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students and
researchers.

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Quantum Field
Theory

Introduction to
Quantum Fields on
a Lattice

Quantum Field
Theory

An Introduction

*Presenting a variety
of topics that are*

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*only briefly touched
on in other texts,
this book provides a
thorough
introduction to the
techniques of field
theory. Covering
Feynman diagrams
and path integrals,
the author
emphasizes the
path integral
approach, the*

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*Wilsonian approach
to renormalization,
and the physics of
non-abelian gauge
theory. It provides a
thorough treatment
of quark
confinement and
chiral symmetry
breaking, topics not
usually covered in
other texts at this
level. The Standard*

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*Quantum Field
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Peskin*
*Model of particle
physics is discussed
in detail.*

*Connections with
condensed matter
physics are
explored, and there
is a brief, but
detailed, treatment
of non-perturbative
semi-classical
methods. Ideal for
graduate students in*

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Peskin
high energy physics
and condensed
matter physics, the
book contains many
problems, which help
students practise
the key techniques
of quantum field
theory.

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Quantum
Mechanics, Second
Edition presents an

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accessible, fully-
updated introduction
on the principles of

quantum
mechanics. The
book outlines the
fundamental
concepts of
quantum theory,
discusses how
these arose from
classic experiments
in chemistry and

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physics, and presents the quantum-mechanical foundations of many key scientific techniques.

Chapters cover an introduction to the key principles underpinning quantum mechanics, differing

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*types of molecular
structures, bonds
and behaviors, and
applications of
quantum
mechanical theory
across a number of
important fields,
including new
chapters on Density
Functional Theory,
Statistical
Thermodynamics*

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*and Quantum
Computing. Drawing
on the extensive
experience of its
expert author, this
book is a reliable
introduction to the
principles of
quantum mechanics
for anyone new to
the field, and a
useful refresher on
fundamental*

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*knowledge and
latest developments
for anyone more
experienced in the
field. Presents a
fully updated
accounting that
reflects the most
recent
developments in
Quantum Theory
and its applications
Includes new*

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*chapters on Special
Functions, Density
Functional Theory,
Statistical
Thermodynamics
and Quantum
Computers Presents
additional problems
and exercises to
further support
learning
A comprehensive,
graduate-level*

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theory, giving equal
emphasis to
operator and path
integral formalisms.
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Mechanics is an
introduction to the
power and elegance
of quantum
mechanics.

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*Assuming little in
the way of prior
knowledge,*

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are carefully and
precisely presented,
and explored*

*through numerous
applications and
problems. Some of
the more*

*challenging aspects
that are essential for*

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a modern appreciation of the subject have been included, but are introduced and developed in the simplest way possible.

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invaluable
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*introduction to the
field and help
prepare them for
more advanced
courses.*

*Introduction to
Quantum
Mechanics: * Starts
from basics,
reviewing relevant
concepts of
classical physics*

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*where needed. **
Motivates by
considering weird
behaviour of
*quantumparticles. **

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mathematical
arguments in their
simplest form.

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Theory and the
Standard Model
An Introduction to
Quantum Theory
An Introduction to
Quantum Physics*

**This book deals with
quantum field
theory, the language
of modern
elementary particles**

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**physics. Based on
university lectures
given by the author,
this volume provides
a detailed technical
treatment of
quantum field theory
that is particularly
useful for students; it
begins with the
quantization of the
most important free
fields, the scalar, the**

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spin-1/2 and the photon fields, and is then followed by a detailed account of symmetry properties, including a discussion on global and local symmetries and the spontaneous breaking of symmetries. Perturbation theory, one-loop effects for

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**quantum
electrodynamics, and
renormalization
properties are also
covered. In this
second edition new
chapters have been
introduced with a
general description
of path integral
quantization both on
quantum mechanics
and in quantum field**

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theory, with a
particular attention
to the gauge fields.

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quantization of
Fermi fields is also
discussed. Request
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friendly introduction
to quantum field
theory Quantum
field theory is a

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**powerful framework
that extends
quantum mechanics
in ways that are
essential in many
modern applications.
While it is the
fundamental
formalism for the
study of many areas
of physics, quantum
field theory requires
a different way of**

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thinking, and many newcomers to the subject struggle with

the transition from quantum mechanics.

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Theory introduces

the key concepts of

quantum field theory

in a brief and

accessible manner

while never

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**sacrificing
mathematical rigor.
The result is an easy-
to-use textbook that
distills the most
general properties of
the theory without
overwhelming
beginning students
with more advanced
applications. Bridges
quantum mechanics
and quantum field**

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analogies and
differences

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“quantum field
theoretical mindset”
while maintaining
mathematical rigor
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fields as the
continuum limit of a
quantized system of
many particles

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between wave function—fundamental in
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mechanics—and the
formalism of second
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**Provides a step-by-
step derivation of
Feynman rules for
the perturbative**

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theories Introduces
students to
renormalization,
path integrals
techniques, and more
Discusses more
modern topics like
effective field
theories Ideal for
both undergraduate
and graduate
students Proven in**

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**the classroom
Applications of
quantum field
theoretical methods
to gravitational
physics, both in the
semiclassical and the
full quantum
frameworks, require
a careful formulation
of the fundamental
basis of quantum
theory, with special**

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**attention to such
important issues as
renormalization,
quantum theory of
gauge theories, and
especially effective
action formalism.**

**The first part of this
graduate textbook
provides both a
conceptual and
technical
introduction to the**

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**theory of quantum
fields. The
presentation is
consistent, starting
from elements of
group theory,
classical fields, and
moving on to the
effective action
formalism in general
gauge theories.
Compared to other
existing books, the**

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general formalism of renormalization in described in more detail, and special attention paid to gauge theories. This part can serve as a textbook for a one-semester introductory course in quantum field theory. In the second part, we discuss basic

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**aspects of quantum
field theory in
curved space, and
perturbative
quantum gravity.
More than half of
Part II is written
with a full exposition
of details, and
includes elaborated
examples of simplest
calculations. All
chapters include**

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exercises ranging from very simple ones to those requiring small original investigations. The selection of material of the second part is done using the “must-know” principle. This means we included detailed expositions of

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**relatively simple
techniques and
calculations,
expecting that the
interested reader will
be able to learn more
advanced issues
independently after
working through the
basic material, and
completing the
exercises.**

This introduction to

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**quantum field theory
(QFT) is written by a
physical chemist for
physical chemists,
chemical physicists,
and other non-
physicists with
knowledge of
quantum theory but
who want to explore
ways in which they
might use the power
of QFT in their**

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investigations. This book starts where many graduate courses in quantum theory that are offered to chemistry students leave off and first develops some of the necessary tools, such as Fock algebra, which is applied to solving the quantum

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**oscillator problem.
Then it is used to
develop the theory of
coherent states, time-
dependent
perturbation theory,
and the treatment of
bosons and fermions.
With this
background, the
QFT of a perfect gas
is derived and a
connection to**

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thermodynamics is demonstrated.

Application to imperfect gases provides a new approach to modelling gas-liquid phase transitions.

The book concludes with photons and their interaction with molecular ensembles, and brings us to full

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**circle by deriving the
blackbody radiation
law, which started it
all. The power of the
QFT methodology
and the breadth of its
applications should
fascinate the reader
as it has the author.**

**Introduction to
Quantum Mechanics
From Facts to
Formalism**

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Quantum Field
Theory**

**Introduction to
Algebraic and
Constructive
Quantum Field
Theory**

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relativistic
quantum
mechanics,
quantum
electrodynamics,
and Feynman
diagrams. The
authors make
these subjects
accessible through
carefully worked

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examples
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illustrating the
technical aspects
of the subject, and
intuitive
explanations of
what is going on
behind the
mathematics. After
presenting the
basics of quantum
electrodynamics,
the authors

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***discuss the theory
of renormalization
and its relation to
statistical
mechanics, and
introduce the
renormalization
group. This
discussion sets
the stage for a
discussion of the
physical principles
that underlie the***

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***fundamental
interactions of
elementary particle
physics and their
description by
gauge field
theories.***

***Hands-on practice
in solving
quantum physics
problems***

***Quantum Physics
is the study of the***

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***behavior of matter
and energy at the
molecular, atomic,
nuclear, and even
smaller
microscopic
levels. Like the
other titles in our
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Workbook series,
Quantum Physics
Workbook For
Dummies allows***

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***you to hone your
skills at solving
the difficult and
often confusing
equations you
encounter in this
subject. Explains
equations in easy-
to-understand
terms Harmonic
Oscillator
Operations,
Angular***

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need to get up to
speed in problem
solving!***

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the successful first***

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this extended and
revised text is
designed as a
short and simple
introduction to
quantum field
theory for final
year physics
students and for
postgraduate
students

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***beginning
research in
theoretical and
experimental
particle physics.
The three main
objectives of the
book are to:
Explain the basic
physics and
formalism of
quantum field
theory To make***

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***the reader
proficient in theory
calculations using
Feynman diagrams
To introduce the
reader to gauge
theories, which
play a central role
in elementary
particle physics.
Thus, the first ten
chapters deal with
QED in the***

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canonical formalism, and are little changed from the first edition. A brief introduction to gauge theories (Chapter 11) is then followed by two sections, which may be read independently of each other. They cover QCD and

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(Chapters 12-15)
and the unified
electroweak theory
(Chapters 16 – 19)
respectively.
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end of each
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***introduction to
quantum
chromodynamics
and the methods
used to
understand it: in
particular, path
integrals and the
renormalization
group. The
treatment of
electroweak
interactions has***

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recent
developments in
quantum field
theory such as
gravitational
waves, the helicity*

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scattering,
recursion relations
for amplitudes
with complex
momenta, and the
hidden connection
between Yang-
Mills theory and
Einstein gravity.
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the entire mathematical fabric of the formal description of quantum mechanics stems essentially from the fact that quantum probabilities interfere (i.e., from the superposition principle). This book is dedicated to substantiating this claim. In the process, the book tries to

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demonstrate how the factual content of quantum mechanics can be transcribed in the formal language of vector spaces and linear transformations by disentangling the empirical content from the usual formal description. More importantly, it tries to bring out what this transcription achieves.

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The book uses a
pedagogic strategy
which reverse

engineers the
postulates of quantum
mechanics to devise a
schematic outline of
the empirical content
of quantum mechanics
from which the
postulates are then
reconstructed step by
step. This strategy is
adopted to avoid the

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disconcerting details of actual experiments (however simplified) to spare the beginner of issues that lurk in the fragile foundations of the subject. In the Copenhagen interpretation of quantum mechanics, the key idea is measurement. But "measurement" carries an entirely

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different meaning from the connotation that the term carries elsewhere in physics. This book strives to underline this as strongly as possible. The book is intended as an undergraduate text for a first course in quantum mechanics. Since the book is self contained, it may also be used by enthusiastic

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get a glimpse of the
core content of the

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approach to motivate
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with the purpose of illustrating common ideas within different domains of physics. Starting from a basic knowledge of quantum mechanics and classical electromagnetism, the exposition is self-contained and explicitly details all steps of the derivations. The new

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edition features a substantially new treatment of nucleon pairing.

The authors present a rigorous treatment of the first principles of the algebraic and analytic core of quantum field theory. Their aim is to correlate modern mathematical theory with the explanation of

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the observed process of particle production and of particle-wave duality that heuristic quantum field theory provides. Many topics are treated here in book form for the first time, from the origins of complex structures to the quantization of tachyons and domains of dependence for quantized wave

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equations. This work
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begins with a

comprehensive

analysis, in a universal
format, of the

structure and

characterization of

free fields, which is

illustrated by

applications to specific

fields. Nonlinear local

functions of both free

fields (or Wick

products) and

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interacting fields are established
mathematically in a way that is consistent with the basic physical constraints and practice. Among other topics discussed are functional integration, Fourier transforms in Hilbert space, and implementability of canonical transformations. The

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authors address
readers interested in
fundamental
mathematical physics
and who have at least
the training of an
entering graduate
student. A series of
lexicons connects the
mathematical
development with the
underlying physical
motivation or
interpretation. The

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basic classical
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equations, A
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*Introduction to
Quantum
Mechanics*

provides a self-

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*contained
presentation of
the mathematics
and physics of
quantum
mechanics. The
relevant
aspects of
classical
mechanics and
electrodynamics
are reviewed,
and the basic*

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*concepts of
wave-particle
duality are
developed as a
logical
outgrowth of
experiments
involving
blackbody
radiation, the
photoelectric
effect, and
electron*

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*diffraction.
The Copenhagen
interpretation
of the wave
function and
its relation to
the particle
probability
density is
presented in
conjunction
with Fourier
analysis and*

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its generalization to function spaces. These concepts are combined to analyze the system consisting of a particle confined to a box, developing the probabilistic

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*interpretation
of observations
and their
associated
expectation
values. The
Schrödinger
equation is
then derived by
using these
results and
demanding both
Galilean*

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*invariance of
the probability
density and
Newtonian
energy-momentum
relations. The
general
properties of
the Schrödinger
equation and
its solutions
are analyzed,
and the theory*

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*of observables
is developed
along with the
associated
Heisenberg
uncertainty
principle.*

*Basic
applications of
wave mechanics
are made to
free wave
packet*

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*spreading,
barrier
penetration,
the simple
harmonic
oscillator, the
Hydrogen atom,
and an electric
charge in a
uniform
magnetic fi
eld. In
addition, Dirac*

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*notation,
elements of
Hilbert space
theory,
operator
techniques, and
matrix algebra
are presented
and used to
analyze
coherent
states, the
linear*

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*potential, two
state
oscillations,
and electron
diffraction.
Applications
are made to
photon and
electron spin
and the
addition of
angular
momentum, and*

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*direct product
multiparticle
states are used
to formulate
both the Pauli
exclusion
principle and
quantum
decoherence.*

*The book
concludes with
an introduction
to the rotation*

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*group and the
general
properties of
angular
momentum.*

*In modern
physics, the
classical
vacuum of
tranquil
nothingness has
been replaced
by a quantum*

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vacuum with
fluctuations of
measurable
consequence. In
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Milonni
describes the
concept of the
vacuum in
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emphasis on

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quantum electro
dynamics. He
elucidates in
depth and
detail the role
of the vacuum
electromagnetic
field in
spontaneous
emission, the
Lamb shift, van
der Waals, and
Casimir forces,

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*and a variety
of other
phenomena, some
of which are of
technological
as well as
purely
scientific
importance.*

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informative
text also
provides an*

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*introduction
based on
fundamental
vacuum
processes to
the ideas of
relativistic
quantum
electrodynamics
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field theory,
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later selected
by readers as
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chapter
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an excellent
beginning of
the book,
introducing a
wealth of
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basic physical
ideas rather
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formal,
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aspects of the

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careful and
thorough
treatment of
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forces at a
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