## Analytical Mechanics Fowles Solutions

Classical MechanicsClassical MechanicsLectures in Analytical MechanicsClassical Dynamics of Particles and SystemsClassical MechanicsAnalytical MechanicsClassical MechanicsFundamentals of **BiomechanicsAnalytical MechanicsAnalytical** MechanicsMechanicsAn Introduction to Mechanical EngineeringInstructor's Solutions Manual to Accompany Analytical Mechanics 5th Ed. by Fowles/CassidayIntegrated ScienceClassical MechanicsIntroduction to Theoretical MechanicsQuantum MechanicsAnalytical System DynamicsAnalytical Mechanics of Space SystemsIntroduction to Classical MechanicsIntroduction to Quantum MechanicsDiamonds in NatureAnalytical MechanicsClassical MechanicsProcess ControlENGINEERING MECHANICS: DYNAMICS, 6TH EDAnalytical MechanicsApplied Strength of MaterialsPhysics for Scientists and Engineers, Volume 2: Electricity, Magnetism, Light, and Elementary Modern PhysicsAnalytical MechanicsIntroductory Chemistry: An Atoms First ApproachIntroduction to Modern OpticsClassical MechanicsNumerical Solution of Ordinary Differential EquationsTheoretical Physics 7Basic Principles and Calculations in Chemical EngineeringDifferential Equations with Boundary-Value ProblemsMechanics of FluidsFundamentals of Probability and Statistics for EngineersElementary Mechanics Using Matlab

### **Classical Mechanics**

"Analytical System Dynamics: Modeling and Simulation" combines results from analytical mechanics and system dynamics to develop an approach to modeling constrained multidiscipline dynamic systems. This combination yields a modeling technique based on the energy method of Lagrange, which in turn, results in a set of differential-algebraic equations that are suitable for numerical integration. Using the modeling approach presented in this book enables one to model and simulate systems as diverse as a six-link, closed-loop mechanism or a transistor power amplifier.

### **Classical Mechanics**

As in previous editions, this ninth edition of Massey's Mechanics of Fluids introduces the basic principles of fluid mechanics in a detailed and clear manner. This bestselling textbook provides the sound physical understanding of fluid flow that is essential for an honours degree course in civil or mechanical engineering as well as courses in aeronautical and chemical engineering. Focusing on the engineering applications of fluid flow, rather than mathematical techniques, students are gradually introduced to the subject, with the text moving from the simple to the complex, and from the familiar to the unfamiliar. In an all-new chapter, the ninth edition closely examines the modern context of fluid mechanics, where climate change, new forms of energy generation, and fresh water conservation are pressing issues. SI units are

used throughout and there are many worked examples. Though the book is essentially selfcontained, where appropriate, references are given to more detailed or advanced accounts of particular topics providing a strong basis for further study. For lecturers, an accompanying solutions manual is available.

#### Lectures in Analytical Mechanics

A concise introduction to numerical methods and the mathematicalframework neededto understand their performance Numerical Solution of Ordinary Differential Equationspresents a complete and easy-tofollow introduction to classical topics in the numerical solution of ordinary differentialeguations. The book's approach not only explains the presentedmathematics, but also helps readers understand how these numerical methods are used to solve real-world problems. Unifying perspectives are provided throughout the text, bringingtogether and categorizing different types of problems in order tohelp readers comprehend the applications of ordinary differentialequations. In addition, the authors' collective academic experienceensures a coherent and accessible discussion of key topics, including: Euler's method Taylor and Runge-Kutta methods General error analysis for multi-step methods Stiff differential equations Differential algebraic equations Two-point boundary value problems Volterra integral equations Each chapter features problem sets that enable readers to testand build their knowledge of the presented methods, and

a relatedWeb site features MATLAB® programs that facilitate theexploration of numerical methods in greater depth. Detailedreferences outline additional literature on both analytical andnumerical aspects of ordinary differential equations for furtherexploration of individual topics. Numerical Solution of Ordinary Differential Equations isan excellent textbook for courses on the numerical solution ofdifferential equations at the upper-undergraduate and beginninggraduate levels. It also serves as a valuable reference forresearchers in the fields of mathematics and engineering.

# Classical Dynamics of Particles and Systems

### **Classical Mechanics**

Process Control: Modeling, Design, and Simulation is the first complete introduction to process control that fully integrates software tools-helping you master critical techniques hands-on, using MATLAB-based computer simulations. Author B. Wayne Bequette includes process control diagrams, dynamic modeling, feedback control, frequency response analysis techniques, control loop tuning, and start-to-finish chemical process control case studies.

### **Analytical Mechanics**

Analytical Mechanics, first published in 1999, provides a detailed introduction to the key analytical

techniques of classical mechanics, one of the cornerstones of physics. It deals with all the important subjects encountered in an undergraduate course and prepares the reader thoroughly for further study at graduate level. The authors set out the fundamentals of Lagrangian and Hamiltonian mechanics early on in the book and go on to cover such topics as linear oscillators, planetary orbits, rigid-body motion, small vibrations, nonlinear dynamics, chaos, and special relativity. A special feature is the inclusion of many 'email guestions', which are intended to facilitate dialogue between the student and instructor. Many worked examples are given, and there are 250 homework exercises to help students gain confidence and proficiency in problem-solving. It is an ideal textbook for undergraduate courses in classical mechanics, and provides a sound foundation for graduate study.

### **Classical Mechanics**

Analytical Mechanics is the investigation of motion with the rigorous tools of mathematics, with remarkable applications to many branches of physics (Astronomy, Statistical and Quantum Mechanics, etc.). Rooted in the works of Lagrange, Euler, and Poincaré, it is a classical subject with fascinating developments and still rich with open problems. It addresses such fundamental questions as: Is the solar system stable? Is there a unifying "economy" principle in mechanics? How can a point mass be described as a "wave"? This book was written to fill a gap between elementary expositions and more advanced (and clearly more

stimulating) material. It takes the challenge to explain the most relevant ideas and to show the most important applications using plain language and "simple" mathematics, often through an original approach. Basic calculus is enough for the reader to proceed through the book and when more is required, the new mathematical concepts are illustrated, again in plain language. The book is conceived in such a way that some difficult chapters can be bypassed, whilst still grasping the main ideas. However, anybody wishing to go deeper in some directions will find at least the flavour of recent developments and many bibliographical references. Theory is always accompanied by examples. Many problems are suggested and some are completely worked out at the end of each chapter. The book may effectively be used (and it is in several Italian Universities) for undergraduate as well as for PhD courses in Physics and Mathematics at various levels.

#### **Fundamentals of Biomechanics**

This is the fifth edition of a well-established textbook. It is intended to provide a thorough coverage of the fundamental principles and techniques of classical mechanics, an old subject that is at the base of all of physics, but in which there has also in recent years been rapid development. The book is aimed at undergraduate students of physics and applied mathematics. It emphasizes the basic principles, and aims to progress rapidly to the point of being able to handle physically and mathematically interesting problems, without getting bogged down in excessive

formalism. Lagrangian methods are introduced at a relatively early stage, to get students to appreciate their use in simple contexts. Later chapters use Lagrangian and Hamiltonian methods extensively, but in a way that aims to be accessible to undergraduates, while including modern developments at the appropriate level of detail. The subject has been developed considerably recently while retaining a truly central role for all students of physics and applied mathematics. This edition retains all the main features of the fourth edition, including the two chapters on geometry of dynamical systems and on order and chaos, and the new appendices on conics and on dynamical systems near a critical point. The material has been somewhat expanded, in particular to contrast continuous and discrete behaviours. A further appendix has been added on routes to chaos (period-doubling) and related discrete maps. The new edition has also been revised to give more emphasis to specific examples worked out in detail. Classical Mechanics is written for undergraduate students of physics or applied mathematics. It assumes some basic prior knowledge of the fundamental concepts and reasonable familiarity with elementary differential and integral calculus.

### **Analytical Mechanics**

Essential Advanced Physics is a series comprising four parts: Classical Mechanics, Classical Electrodynamics, Quantum Mechanics and Statistical Mechanics. Each part consists of two volumes, Lecture Notes and

Problems with Solutions, further supplemented by an additional collection of test problems and solutions available to gualifying university instructors. Written for graduate and advanced undergraduate students, the goal of this series is to provide readers with a knowledge base necessary for professional work in physics, be that theoretical or experimental, fundamental or applied research. From the formal point of view, it satisfies typical PhD basic course requirements at major universities. Selected parts of the series may be also valuable for graduate students and researchers in allied disciplines, including astronomy, chemistry, materials science, and mechanical, electrical, computer and electronic engineering. The EAP series is focused on the development of problem-solving skills. The following features distinguish it from other graduate-level textbooks: Concise lecture notes (250 pages per semester) Emphasis on simple explanations of the main concepts, ideas and phenomena of physics Sets of exercise problems, with detailed model solutions in separate companion volumes Extensive crossreferencing between the volumes, united by common style and notation Additional sets of test problems, freely available to gualifying faculty This volume, Classical Mechanics: Lecture Notes is intended to be the basis for a one-semester graduate-level course on classical mechanics and dynamics, including the mechanics of continua, in particular deformations, elasticity, waves, and fluid dynamics.

### **Analytical Mechanics**

Designed for a first course in strength of materials, Applied Strength of Materials has long been the bestseller for Engineering Technology programs because of its comprehensive coverage, and its emphasis on sound fundamentals, applications, and problem-solving techniques. The combination of clear and consistent problem-solving techniques, numerous end-of-chapter problems, and the integration of both analysis and design approaches to strength of materials principles prepares students for subsequent courses and professional practice. The fully updated Sixth Edition. Built around an educational philosophy that stresses active learning, consistent reinforcement of key concepts, and a strong visual component, Applied Strength of Materials, Sixth Edition continues to offer the readers the most thorough and understandable approach to mechanics of materials.

### Mechanics

Giving students a thorough grounding in basic problems and their solutions, Analytical Mechanics: Solutions to Problems in Classical Physics presents a short theoretical description of the principles and methods of analytical mechanics, followed by solved problems. The authors thoroughly discuss solutions to the problems by taking a comprehensive a

### An Introduction to Mechanical Engineering

This textbook offers a clear and comprehensive

introduction to methods and applications in guantum mechanics, one of the core components of undergraduate physics courses. It follows on naturally from the previous volumes in this series, thus developing the understanding of guantized states further on. The first part of the book introduces the guantum theory of angular momentum and approximation methods. More complex themes are covered in the second part of the book, which describes multiple particle systems and scattering theory. Ideally suited to undergraduate students with some grounding in the basics of guantum mechanics, the book is enhanced throughout with learning features such as boxed inserts and chapter summaries, with key mathematical derivations highlighted to aid understanding. The text is supported by numerous worked examples and end of chapter problem sets. About the Theoretical Physics series Translated from the renowned and highly successful German editions, the eight volumes of this series cover the complete core curriculum of theoretical physics at undergraduate level. Each volume is self-contained and provides all the material necessary for the individual course topic. Numerous problems with detailed solutions support a deeper understanding. Wolfgang Nolting is famous for his refined didactical style and has been referred to as the "German Feynman" in reviews.

#### Instructor's Solutions Manual to Accompany Analytical Mechanics 5th Ed. by Fowles/Cassiday

Market Desc: Engineers and Students of Engineering Special Features: 
• Provides new problems that produce forces as functions of time and that integrate to project trajectories for particles and rigid bodies. Presents new Statics sample problems in frames and machines, methods of joints for simple trusses, 2D moment calculations, and moments and couples. Adopts the 'time order of occurrence' display of key equations: work-energy, conservation of energy, and impulse-momentum. Includes new Dynamics sample problems in angular impulse and momentum, graphing the path or a particle, polar coordinates, and more. Continues to offer comprehensive coverage of drawing free body diagrams. About The Book: Over the past 50 years, Meriam & Kraige's Engineering Mechanics has established a highly respected tradition of excellence. Readers turn to this book because of its emphasis on accuracy, rigor, clarity, and applications. The new sixth edition continues this tradition while also improving the accessibility of the material. The explanations of concepts are now easier to understand and more worked examples have been incorporated throughout the pages.

### **Integrated Science**

#### **Classical Mechanics**

Master introductory mechanics with ANALYTICAL MECHANICS! Direct and practical, this physics text is designed to help you grasp the challenging concepts of physics. Specific cases are included to help you

master theoretical material. Numerous worked examples found throughout increase your problemsolving skills and prepare you to succeed on tests.

### **Introduction to Theoretical Mechanics**

### **Quantum Mechanics**

Fundamentals of Biomechanics introduces the exciting world of how human movement is created and how it can be improved. Teachers, coaches and physical therapists all use biomechanics to help people improve movement and decrease the risk of injury. The book presents a comprehensive review of the major concepts of biomechanics and summarizes them in nine principles of biomechanics. Fundamentals of Biomechanics concludes by showing how these principles can be used by movement professionals to improve human movement. Specific case studies are presented in physical education, coaching, strength and conditioning, and sports medicine.

### **Analytical System Dynamics**

#### **Analytical Mechanics of Space Systems**

#### **Introduction to Classical Mechanics**

Essential Advanced Physics (EAP) is a series Page 12/24

comprising four parts: Classical Mechanics, Classical Electrodynamics, Quantum Mechanics and Statistical Mechanics. Each part consists of two volumes, Lecture notes and Problems with solutions, further supplemented by an additional collection of test problems and solutions available to qualifying university instructors. Written for graduate and advanced undergraduate students, the goal of this series is to provide readers with a knowledge base necessary for professional work in physics, be that theoretical or experimental, fundamental or applied research. From the formal point of view, it satisfies typical PhD basic course requirements at major universities. Selected parts of the series may also be valuable for graduate students and researchers in allied disciplines, including astronomy, chemistry, materials science, and mechanical, electrical, computer and electronic engineering. The EAP series is focused on the development of problem-solving skills. The following features distinguish it from other graduate-level textbooks: Concise lecture notes (250 pages per semester) Emphasis on simple explanations of the main concepts, ideas and phenomena of physics Sets of exercise problems, with detailed model solutions in separate companion volumes Extensive cross-referencing between the volumes, united by common style and notation Additional sets of test problems, freely available to qualifying faculty This volume, Classical Mechanics: Problems with solutions contains detailed model solutions to the exercise problems formulated in the companion Lecture notes volume. In many cases, the solutions include result discussions that enhance the lecture material. For the reader's convenience, the Page 13/24

problem assignments are reproduced in this volume.

#### **Introduction to Quantum Mechanics**

AN INTRODUCTION TO MECHANICAL ENGINEERING, 4E introduces readers to today's ever-emerging field of mechanical engineering as it instills an appreciation for how engineers design hardware that builds and improves societies around the world. This book is ideal for those completing their first or second year in a college or university's mechanical engineering program. It is also useful for those studying a closely related field. The authors effectively balance timely treatments of technical problem-solving skills, design, engineering analysis, and modern technology to provide the solid mechanical engineering foundation readers need for future success. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

#### **Diamonds in Nature**

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

### **Analytical Mechanics**

### **Classical Mechanics**

With the direct, accessible, and pragmatic approach of Fowles and Cassiday's ANALYTICAL MECHANICS, Seventh Edition, thoroughly revised for clarity and concision, students will grasp challenging concepts in introductory mechanics. A complete exposition of the fundamentals of classical mechanics, this proven and enduring introductory text is a standard for the undergraduate Mechanics course. Numerical worked examples increased students' problem-solving skills, while textual discussions aid in student understanding of theoretical material through the use of specific cases.

#### **Process Control**

Classical Dynamics of Particles and Systems presents a modern and reasonably complete account of the classical mechanics of particles, systems of particles, and rigid bodies for physics students at the advanced undergraduate level. The book aims to present a modern treatment of classical mechanical systems in such a way that the transition to the guantum theory of physics can be made with the least possible difficulty; to acquaint the student with new mathematical techniques and provide sufficient practice in solving problems; and to impart to the student some degree of sophistication in handling both the formalism of the theory and the operational technique of problem solving. Vector methods are developed in the first two chapters and are used throughout the book. Other chapters cover the

fundamentals of Newtonian mechanics, the special theory of relativity, gravitational attraction and potentials, oscillatory motion, Lagrangian and Hamiltonian dynamics, central-force motion, twoparticle collisions, and the wave equation.

# ENGINEERING MECHANICS: DYNAMICS, 6TH ED

A complete basic undergraduate course in modern optics for students in physics, technology, and engineering. The first half deals with classical physical optics; the second, quantum nature of light. Solutions.

### **Analytical Mechanics**

This didactically unrivalled textbook and timeless reference by Nobel Prize Laureate Claude Cohen-Tannoudji separates essential underlying principles of quantum mechanics from specific applications and practical examples and deals with each of them in a different section. Chapters emphasize principles; complementary sections supply applications. The book provides a qualitative introduction to quantum mechanical ideas; a systematic, complete and elaborate presentation of all the mathematical tools and postulates needed, including a discussion of their physical content and applications. The book is recommended on a regular basis by lecturers of undergraduate courses.

### **Applied Strength of Materials**

This series of texts on classical theoretical physics is based on Walter Greiner's highly successful series of courses in Frankfurt am Main, Germany. The volumes provide a complete survey of the field as well as various examples and problems for students to work through.

#### Physics for Scientists and Engineers, Volume 2: Electricity, Magnetism, Light, and Elementary Modern Physics

Intended for advanced undergraduates and beginning graduate students, this text is based on the highly successful course given by Walter Greiner at the University of Frankfurt, Germany. The two volumes on classical mechanics provide not only a complete survey of the topic but also an enormous number of worked examples and problems to show students clearly how to apply the abstract principles to realistic problems.

### **Analytical Mechanics**

This book – specifically developed as a novel textbook on elementary classical mechanics – shows how analytical and numerical methods can be seamlessly integrated to solve physics problems. This approach allows students to solve more advanced and applied problems at an earlier stage and equips them to deal with real-world examples well beyond the typical special cases treated in standard textbooks. Another advantage of this approach is that students are brought closer to the way physics is actually Page 17/24

discovered and applied, as they are introduced right from the start to a more exploratory way of understanding phenomena and of developing their physical concepts. While not a requirement, it is advantageous for the reader to have some prior knowledge of scientific programming with a scriptingtype language. This edition of the book uses Matlab, and a chapter devoted to the basics of scientific programming with Matlab is included. A parallel edition using Python instead of Matlab is also available. Last but not least, each chapter is accompanied by an extensive set of course-tested exercises and solutions.

#### Introductory Chemistry: An Atoms First Approach

#### **Introduction to Modern Optics**

John Taylor has brought to his most recent book, ClassicalMechanics, all of the clarity and insight that made his Introduction toError Analysisa best-selling text. ClassicalMechanicsis intended for students who have studied some mechanics in anintroductory physics course, such as "freshman physics." With unusual clarity, the book covers most of the topics normally found in books at this level, includingconservation laws, oscillations, Lagrangian mechanics, two-body problems, non-inertial frames.

mechanics, two-body problems, non-inertial frames, rigid bodies, normal modes, chaos theory,Hamiltonian mechanics, and continuum mechanics. A particular highlight is the chapter on chaos, which focuses on a

fewsimple systems, to give a truly comprehensible introduction to the concepts that we hear so much about. At the end of each chapter is a large selection of interesting problems for the student, 744 in all, classified by topic and approximate difficulty, and ranging from simple exercises to challenging computer projects. Adopted by more than 450 colleges and universities in the USA and Canada and translated into six languages, Taylor's Classical Mechanicsisa thorough and very readable introduction to a subject that is four hundredyears old but as exciting today as ever. Theauthor manages to convey that excitement as well as deep understanding and insight. Ancillaries A detailed Instructors' Manual is available for adopting professors. Art from the book may be downloaded by adopting professors.

### **Classical Mechanics**

This textbook differs from others in the field in that it has been prepared very much with students and their needs in mind, having been classroom tested over many years. It is a true "learner's book" made for students who require a deeper understanding of probability and statistics. It presents the fundamentals of the subject along with concepts of probabilistic modelling, and the process of model selection, verification and analysis. Furthermore, the inclusion of more than 100 examples and 200 exercises (carefully selected from a wide range of topics), along with a solutions manual for instructors, means that this text is of real value to students and lecturers across a range of engineering disciplines.

Key features: Presents the fundamentals in probability and statistics along with relevant applications. Explains the concept of probabilistic modelling and the process of model selection, verification and analysis. Definitions and theorems are carefully stated and topics rigorously treated. Includes a chapter on regression analysis. Covers design of experiments. Demonstrates practical problem solving throughout the book with numerous examples and exercises purposely selected from a variety of engineering fields. Includes an accompanying online Solutions Manual for instructors containing complete step-by-step solutions to all problems.

#### Numerical Solution of Ordinary Differential Equations

DIFFERENTIAL EOUATIONS WITH BOUNDARY-VALUE PROBLEMS, 9th Edition, strikes a balance between the analytical, gualitative, and guantitative approaches to the study of Differential Equations. This proven text speaks to students of varied majors through a wealth of pedagogical aids, including an abundance of examples, explanations, Remarks boxes, and definitions. Written in a straightforward, readable, and helpful style, the book provides a thorough overview of the topics typically taught in a first course in Differential Equations as well as an introduction to boundary-value problems and partial Differential Equations. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

### **Theoretical Physics 7**

An introduction to the basic principles and methods of analytical mechanics, with selected examples of advanced topics and areas of ongoing research.

### Basic Principles and Calculations in Chemical Engineering

This book serves as an excellent stepping stone from introductory physics to graduate-level physics, it provides a level field for the various techniques used to solve problems in classical mechanics, it explains the Lagrangian and Hamiltonian methods more simply, and is a must for junior and senior physics undergraduates.

### Differential Equations with Boundary-Value Problems

Best-selling introductory chemical engineering book now updated with far more coverage of biotech, nanotech, and green engineering • •Thoroughly covers material balances, gases, liquids, and energy balances. •Contains new biotech and bioengineering problems throughout. •Adds new examples and homework on nanotechnology, environmental engineering, and green engineering. •All-new student projects chapter. •Self-assessment tests, discussion problems, homework, and glossaries in each chapter. Basic Principles and Calculations in Chemical Engineering, 8/e, provides a complete, practical, and student-friendly introduction to the principles and Page 21/24

techniques of modern chemical, petroleum, and environmental engineering. The authors introduce efficient and consistent methods for solving problems, analyzing data, and conceptually understanding a wide variety of processes. This edition has been revised to reflect growing interest in the life sciences, adding biotechnology and bioengineering problems and examples throughout. It also adds many new examples and homework assignments on nanotechnology, environmental, and green engineering, plus many updates to existing examples. A new chapter presents multiple student projects, and several chapters from the previous edition have been condensed for greater focus. This text's features include: • •Thorough introductory coverage, including unit conversions, basis selection, and process measurements. •Short chapters supporting flexible, modular learning. •Consistent, sound strategies for solving material and energy balance problems. •Key concepts ranging from stoichiometry to enthalpy. •Behavior of gases, liquids, and solids. •Many tables, charts, and reference appendices. •Self-assessment tests, thought/discussion problems, homework problems, and glossaries in each chapter.

### **Mechanics of Fluids**

#### Fundamentals of Probability and Statistics for Engineers

Diamonds in Nature: A Guide to Rough Diamonds illustrates the range of crystal shapes, colours,

surface textures, and mineral inclusions of rough, uncut, naturally forming diamonds. Each chapter contains photographs that show the unique physical characteristics of the diamonds, and the accompanying text describes the processes that led to their formation. This book is an invaluable reference manual for professional geoscientists—including gemmologists and exploration geologists.

#### **Elementary Mechanics Using Matlab**

Integrated Science, Fifth Edition is a straightforward, easy-to-read, yet substantial introduction to the fundamental behavior of matter and energy in living and nonliving systems. The authors provide even, wellintegrated coverage of physics, chemistry, earth science, astronomy, and biology. The text's pedagogy (chapter outlines, core concept maps, and overviews) reveals how the science disciplines are interrelated and integrated throughout the text. This edition continues to introduce basic concepts and key ideas while providing opportunities for students to learn reasoning skills and a new way of thinking about their environment. The book is intended to serve the needs of non-science majors who are required to complete one or more science courses as part of a general or basic studies requirement. No prior work in science is assumed. The language, as well as the mathematics, is as simple as can be practical for a college-level science course.

ROMANCE\_ACTION & ADVENTURE\_MYSTERY & THRILLER\_BIOGRAPHIES & HISTORY\_CHILDREN'S YOUNG ADULT\_FANTASY\_HISTORICAL FICTION HORROR\_LITERARY FICTION\_NON-FICTION\_SCIENCE FICTION