

#### Matter Waves

Waves associated with particles like - electrons. protons, neutrons, atoms, molecules, etc.

#### Electromagnetic Waves

Do not require any material medium for their propagation e.g., light waves

#### Mechanical Waves Require material medium for

their propagation

#### **Essential Properties** for propagation

- · Elasticity
- Inertin
- Minimum friction

#### Relation how wave velocity (v), wavelength (λ) and frequency (v)

Wave velocity  $v = v\lambda$ 

Time period  $(T) = \frac{1}{\text{frequency}}$ Angular frequency ( $\omega$ ) =  $2\pi\nu$ 

Wave number  $(\overline{v}) =$ wavelength.

Types of waves

Individual particles of the medium oscillate perpendicular to the direction of wave propagation

Transverse waves

# Longitudinal waves

Individual particles of the medium oscillate along the direction of wave propagation

#### Displacement relation in a plane progressive wave

 $y(x,t) = A\sin(\omega t - kx + \phi_0)$  $y(x, t) = A \sin 2\pi \left(\frac{t}{T} - \frac{x}{\lambda}\right)$ 

velocity amplitude vo = Am Acceleration amplitude  $a_0 = A\omega^2$ 

#### WAVES

Information and energy propagate in the form of signal or disturbances without actual transfer of matter

#### Speed of transverse wave in a stretched string:

T = tensionand M = mass/length

#### Speed of longitudinal wave

Speed of sound,  $V = \sqrt{\frac{B}{a}}$ 

$$=\sqrt{\frac{Y}{\rho}}=\sqrt{\frac{P}{\rho}}=\sqrt{\frac{\gamma P}{\rho}}=\sqrt{\frac{\gamma RT}{M}}$$

for air  $\gamma = 7/5$ .

Elasticity of solids maximum and of gases-minium

· If string is stretched by some weight

# **Chapter 20 Waves**

# **Archie Frederick Collins**

#### **Chapter 20 Waves:**

Fundamentals of Ship Hydrodynamics Lothar Birk, 2019-04-25 Fundamentals of Ship Hydrodynamics Fluid Mechanics Ship Resistance and Propulsion Lothar Birk University of New Orleans USA Bridging the information gap between fluid mechanics and ship hydrodynamics Fundamentals of Ship Hydrodynamics is designed as a textbook for undergraduate education in ship resistance and propulsion The book provides connections between basic training in calculus and fluid mechanics and the application of hydrodynamics in daily ship design practice Based on a foundation in fluid mechanics the origin use and limitations of experimental and computational procedures for resistance and propulsion estimates are explained The book is subdivided into sixty chapters providing background material for individual lectures The unabridged treatment of equations and the extensive use of figures and examples enable students to study details at their own pace Key features Covers the range from basic fluid mechanics to applied ship hydrodynamics Subdivided into 60 succinct chapters In depth coverage of material enables self study Around 250 figures and tables Fundamentals of Ship Hydrodynamics is essential reading for students and staff of naval architecture ocean engineering and applied physics The book is also useful for practicing naval architects and engineers who wish to brush up on the basics prepare for a licensing exam or expand their knowledge Handbook Of Coastal And Ocean Engineering (Expanded Edition) (In 2 Volumes) Young C Kim, 2017-12-21 The handbook contains a comprehensive compilation of topics that are at the forefront of many of the technical advances in ocean waves coastal and ocean engineering More than 110 internationally recognized authorities in the field of coastal and ocean engineering have contributed articles in their areas of expertise to this handbook These international luminaries are from highly respected universities and renowned research and consulting organizations around the world Laboratory Tests for Unsaturated Soils Eng-Choon Leong, Martin Wijaya, 2023-02-16 The testing of unsaturated soils requires greater care and effort than that of saturated soils Although unsaturated soil mechanics has been embraced by geotechnical engineering engineering practice has not yet caught up as the characterization of unsaturated soils is difficult and time consuming and made harder still by a lack of standards Laboratory Tests for Unsaturated Soils collates test procedures to cover all laboratory tests for characterising unsaturated soils It covers the background theory test procedures and interpretation of test results Each test procedure is broken down into simple stages and described in detail The pitfalls of each test and the interpretation of the test results are explained Test data and calculation methods are given along with many numerical examples to illustrate the methods of interpretation and to offer the presentation of typical results The book is especially useful for students and researchers who are new to the field and provides a practical handbook for engineering applications Radio Theory and Operating for the Radio Student and Practical Operator Mary Texanna Loomis.1927 Batcheller Collection Radio Theory and Operating Mary Texanna Loomis, 1928 **Computational Physics** Philipp O.J. Scherer, 2017-09-07 This textbook presents basic numerical methods and applies them to a large variety of

physical models in multiple computer experiments Classical algorithms and more recent methods are explained Partial differential equations are treated generally comparing important methods and equations of motion are solved by a large number of simple as well as more sophisticated methods Several modern algorithms for quantum wavepacket motion are compared The first part of the book discusses the basic numerical methods while the second part simulates classical and quantum systems Simple but non trivial examples from a broad range of physical topics offer readers insights into the numerical treatment but also the simulated problems Rotational motion is studied in detail as are simple quantum systems A two level system in an external field demonstrates elementary principles from quantum optics and simulation of a quantum bit Principles of molecular dynamics are shown Modern boundary element methods are presented in addition to standard methods and waves and diffusion processes are simulated comparing the stability and efficiency of different methods A large number of computer experiments is provided which can be tried out even by readers with no programming skills Exercises in the applets complete the pedagogical treatment in the book In the third edition Monte Carlo methods and random number generation have been updated taking recent developments into account Krylov space methods for eigenvalue problems are discussed in much more detail Short time Fourier transformation and wavelet transformation have been included as tools for time frequency analysis Lastly elementary quantum many body problems demonstrate the application of variational and Monte Carlo methods Electricity, 1919 Springer Handbook of Robotics Bruno Siciliano, Oussama Khatib, 2016-07-27 The second edition of this handbook provides a state of the art overview on the various aspects in the rapidly developing field of robotics Reaching for the human frontier robotics is vigorously engaged in the growing challenges of new emerging domains Interacting exploring and working with humans the new generation of robots will increasingly touch people and their lives The credible prospect of practical robots among humans is the result of the scientific endeavour of a half a century of robotic developments that established robotics as a modern scientific discipline The ongoing vibrant expansion and strong growth of the field during the last decade has fueled this second edition of the Springer Handbook of Robotics The first edition of the handbook soon became a landmark in robotics publishing and won the American Association of Publishers PROSE Award for Excellence in Physical Sciences Mathematics as well as the organization s Award for Engineering Technology The second edition of the handbook edited by two internationally renowned scientists with the support of an outstanding team of seven part editors and more than 200 authors continues to be an authoritative reference for robotics researchers newcomers to the field and scholars from related disciplines The contents have been restructured to achieve four main objectives the enlargement of foundational topics for robotics the enlightenment of design of various types of robotic systems the extension of the treatment on robots moving in the environment and the enrichment of advanced robotics applications Further to an extensive update fifteen new chapters have been introduced on emerging topics and a new generation of authors have joined the handbook s team A novel addition to the second edition is a comprehensive

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