

ENGINEERING BASICS

The following information helps you solve technical problems frequently encountered in designing and selecting motion control components and systems.

Torque

$$T = FR \quad (1)$$

Where:

T = Torque, lb-ft

F = Force, lb

R = Radius, or distance that the force is from the pivotal point, ft

Linear to rotary motion

$$N = \frac{V}{0.262D} \quad (2)$$

Where:

N = Speed of shaft rotation, rpm

V = Velocity of material, fpm

D = Diameter of pulley or sprocket, in.

Horsepower

Rotating objects:

$$P = \frac{TN}{5,250} \quad (3)$$

Where:

P = Power, hp

T = Torque, lb-ft

N = Shaft speed, rpm

Objects in linear motion:

$$P = \frac{FV}{33,000} \quad (4)$$

Where:

P = Power, hp

F = Force, lb

V = Velocity, fpm

Pumps:

$$P = \frac{QBS}{3,960\mu} \quad (5)$$

Where:

P = Power, hp

Q = Flow rate, gpm

H = Head, ft

S = Specific gravity of fluid

μ = Pump efficiency

Fans and blowers:

$$P = \frac{QP}{228\mu} \quad (6)$$

Where:

P = Power, hp

Q = Flow rate, cfm

p = Pressure, psi

μ = Efficiency

Accelerating torque and force

Of rotating objects

$$T = \frac{(WK^2)\Delta N}{308t} \quad (7)$$

Where:

T = Torque required, lb-ft

WK^2 = Total inertia of load to be accelerated, lb-ft². (See Formulas 9, 10, 11, and 12.)

ΔN = Change in speed, rpm

t = Time to accelerate load, sec

Objects in linear motion:

$$P = \frac{W\Delta V}{1,932t} \quad (8)$$

Where:

P = Force required, lb

W = Weight, lb

ΔV = Change in velocity, fpm

t = Time to accelerate load, sec

Moment of inertia

Solid cylinder rotating about its own axis:

$$WK^2 = (1/2)WR^2 \quad (9)$$

Where:

WK^2 = Moment of inertia, lb-ft²

W = Weight of object, lb

R = Radius of cylinder, ft

Hollow cylinder rotating about its own axis:

$$WK^2 = \frac{W(R_1^2 + R_2^2)}{2} \quad (10)$$

Where:

WK^2 = Moment of inertia, lb-ft²

W = Weight of object, lb

R_1 = Outside radius, ft

R_2 = Inside radius, ft



Material in linear motion with a continuous fixed relation to a rotational system:

$$WK_L^2 = W \left(\frac{V}{2\pi N} \right)^2 \quad (11)$$

Where:

WK_L^2 = Linear inertia, lb-ft²

W = Weight of material, lb

V = Linear velocity, fpm

N = Rotational speed of shaft, rpm

Reflected inertia of a load through a speed reduction means — gear, chain, or belt system:

$$WK_R^2 = \frac{WK_L^2}{R^2} \quad (12)$$

Where:

WK_R^2 = Reflected inertia, lb-ft²

WK_L^2 = Load inertia, lb-ft²

R = Reduction ratio

Duty cycle calculation

The RMS (root mean square) value of a load is one of the quantities often used to size PT components.

$$L_{RMS} = \sqrt{\frac{L_1^2 t_1 + L_2^2 t_2 + \dots + L_n^2 t_n}{t_1 + t_2 + \dots + t_n}} \quad (13)$$

Basic Engineering Principles

M Woodhall



Basic Engineering Principles:

Basic engineering principles J. A. Merkel, 1981 **Basic Engineering Principles** James A. Merkel, 1974 **BASIC PRINCIPLES OF ENGINEERING PHYSICS** Dr. R. S. Chandok, Dr. K. Sailesh Kumar, Dr. Bhavani Naga Prasanna H, Dr. B. Radhakrishna, 2025-07-22

Physics forms the fundamental backbone of all engineering sciences providing the essential principles and laws that underpin technological advances and innovations. The study of engineering physics equips students with the crucial analytical tools and conceptual understanding necessary to solve practical engineering problems and to design efficient reliable systems across various disciplines. This book *Basic Principles of Engineering Physics* has been meticulously crafted to serve as an introductory textbook for undergraduate engineering students. It covers core topics ranging from classical mechanics and thermodynamics to modern physics concepts such as quantum mechanics and nanotechnology. The emphasis throughout is on building a solid foundation by elucidating fundamental concepts with clarity and rigor while highlighting relevant engineering applications. Each chapter introduces essential theoretical frameworks followed by practical examples, illustrative problems, and exercises to reinforce learning and promote critical thinking. The content aligns with the current syllabi adopted by premier engineering universities and is designed to balance academic learning with real-world relevance. Our objective is to make this book a comprehensive and accessible resource that inspires students to appreciate the role of physics in engineering innovation. Constructive feedback from readers is welcome to enhance the content further. We express our sincere gratitude to all colleagues, students, and reviewers who have contributed their valuable insights during the development of this book.

Basic Lumber Engineering for Builders Max Schwartz, 1997

The beam and lumber requirements for your jobs aren't always clear, especially with changing building codes and lumber products. If you need to figure any type of on-the-job lumber engineering, this book will help fill the gap between what you can find in building code span tables and the complex calculations that you need to hire a certified engineer to do. The book covers most building types and framing systems including door, window, and roof framing. And there's a chapter on connections, retrofitting with anchor bolts, framing anchors, and tie downs, plus the latest requirements for cross bridging and anchoring. Also included is an important chapter on designing concrete formwork, figuring the pressures, tolerances, and thickness for plywood. Plyform composition and fiber-reinforced plastic. In the back of the book, you'll find a computer disk with an easy-to-use version of Northbridge Software's Wood Beam Sizing™. Just follow the step-by-step instructions in the program to find out what size member you need for the spans and loads that you require based on the wood species that you're using. Requires Windows 3.1 or higher.

Basic Engineering Principles Wayne Knott, National Forest Products Association, 1974 **Basic Engineering Mechanics Explained, Volume 3** Gregory Pastoll, 2019-04-09

This series of three volumes aims to explain in a reader-friendly way the essential principles of basic mechanics as used in engineering. It attempts to provide clarity, motivation, and relevance for any reader who wants to understand the principles of mechanics and

be able to apply them to practical situations BEME should be found useful by anyone studying teaching or using the science of mechanics Vol 3 contents Centrifugal and centripetal force Rotational inertia Rotational and linear inertia in accelerating systems Kinetic energy of rotation and angular momentum Simple harmonic motion Vehicle dynamics Engineering Principles in Everyday Life for Non-Engineers Saeed Benjamin,2016-02-03 This book is about the role of some engineering principles in our everyday lives Engineers study these principles and use them in the design and analysis of the products and systems with which they work The same principles play basic and influential roles in our everyday lives as well Whether the concept of entropy the moments of inertia the natural frequency the Coriolis acceleration or the electromotive force the roles and effects of these phenomena are the same in a system designed by an engineer or created by nature This shows that learning about these engineering concepts helps us to understand why certain things happen or behave the way they do and that these concepts are not strange phenomena invented by individuals only for their own use rather they are part of our everyday physical and natural world but are used to our benefit by the engineers and scientists Learning about these principles might also help attract more and more qualified and interested high school and college students to the engineering fields Each chapter of this book explains one of these principles through examples discussions and at times simple equations

Engineering Principles in Everyday Life for Non-Engineers Saeed Benjamin Niku,2022-05-31 This book is about the role of some engineering principles in our everyday lives Engineers study these principles and use them in the design and analysis of the products and systems with which they work The same principles play basic and influential roles in our everyday lives as well Whether the concept of entropy the moments of inertia the natural frequency the Coriolis acceleration or the electromotive force the roles and effects of these phenomena are the same in a system designed by an engineer or created by nature This shows that learning about these engineering concepts helps us to understand why certain things happen or behave the way they do and that these concepts are not strange phenomena invented by individuals only for their own use rather they are part of our everyday physical and natural world but are used to our benefit by the engineers and scientists Learning about these principles might also help attract more and more qualified and interested high school and college students to the engineering fields Each chapter of this book explains one of these principles through examples discussions and at times simple equations

Basic Engineering for Medics and Biologists T. Clive Lee,Peter Niederer,2010 Developments in bioengineering and medical technology have led to spectacular progress in clinical medicine As a result increased numbers of courses are available in the area of bioengineering and clinical technology These often include modules dealing with basic biological and medical sciences aimed at those taking up these studies who have a background in engineering To date relatively few participants from medicine have taken up courses in biomedical engineering to the detriment of scientific exchange between engineers and medics The European Society for Engineering and Medicine ESEM aims to bridge the gap between engineering and medicine and biology It promotes cultural and

scientific exchanges between the engineering and the medical biological fields This primer consists of a series of First Step chapters in engineering and is principally presented for those with a medical or biology background who intend to start a MSc programme in biomedical engineering and for medics or biologists who wish to better understand a particular technology It will also serve as a reference for biomedical engineers Written by engineers and medics who are leaders in their field it covers the basic engineering principles underpinning biomechanics bioelectronics medical informatics biomaterials tissue engineering bioimaging and rehabilitation engineering It also includes clinically relevant examples

Basic Engineering Principles A. L. Nicolai, 1939*

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