

Engineering Mechanics Indian Institute Of Technology Guwahati

All machining process are dependent on a number of inherent process parameters. It is of the utmost importance to find suitable combinations to all the process parameters so that the desired output response is optimized. While doing so may be nearly impossible or too expensive by carrying out experiments at all possible combinations, it may be done quickly and efficiently by using computational intelligence techniques. Due to the versatile nature of computational intelligence techniques, they can be used at different phases of the machining process design and optimization process. While powerful machine-learning methods like gene expression programming (GEP), artificial neural network (ANN), support vector regression (SVM), and more can be used at an early phase of the design and optimization process to act as predictive models for the actual experiments, other metaheuristics-based methods like cuckoo search, ant colony optimization, particle swarm optimization, and others can be used to optimize these predictive models to find the optimal process parameter combination. These machining and optimization processes are the future of manufacturing. Data-Driven Optimization of Manufacturing Processes contains the latest research on the application of state-of-the-art computational intelligence techniques from both predictive modeling and optimization viewpoint in both soft computing approaches and machining processes. The chapters provide solutions applicable to machining or manufacturing process problems and for optimizing the problems involved in other areas of mechanical, civil, and electrical engineering, making it a valuable reference tool. This book is addressed to engineers, scientists, practitioners,

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stakeholders, researchers, academicians, and students interested in the potential of recently developed powerful computational intelligence techniques towards improving the performance of machining processes.

The increased level of activity on structural health monitoring (SHM) in various universities and research labs has resulted in the development of new methodologies for both identifying the existing damage in structures and predicting the onset of damage that may occur during service. Designers often have to consult a variety of textbooks, journal papers and reports, because many of these methodologies require advanced knowledge of mechanics, dynamics, wave propagation, and material science. Computational Techniques for Structural Health Monitoring gives a one-volume, in-depth introduction to the different computational methodologies available for rapid detection of flaws in structures. Techniques, algorithms and results are presented in a way that allows their direct application. A number of case studies are included to highlight further the practical aspects of the selected topics. Computational Techniques for Structural Health Monitoring also provides the reader with numerical simulation tools that are essential to the development of novel algorithms for the interpretation of experimental measurements, and for the identification of damage and its characterization. Upon reading Computational Techniques for Structural Health Monitoring, graduate students will be able to begin research-level work in the area of structural health monitoring. The level of detail in the description of formulation and implementation also allows engineers to apply the concepts directly in their research.

Mechanics is the fundamental branch of physics whose two offshoots, static and dynamics, find varied application in thermodynamics, electricity and electromagnetism.

Engineering Mechanics is a simple yet insightful textbook on

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the concepts and principles of mechanics in the field of engineering. Written in a comprehensive manner, Engineering Mechanics greatly elaborates on the tricky aspects of the motion of particle and its cause, forces and vectors, lifting machines and pulleys, inertia and projectiles, juxtaposition them with relevant, neat illustrations, which make the science of engineering mechanics an interesting study for aspiring engineers. The authors have packaged the book, Engineering Mechanics, with a huge number of theoretical questions, numerical problems and a highly informative objective-type question bank. The book aspires to cater to the learning needs of BE/BTech students and also those preparing for competitive exams.

This book is intended to help the reader understand impact phenomena as a focused application of diverse topics such as rigid body dynamics, structural dynamics, contact and continuum mechanics, shock and vibration, wave propagation and material modelling. It emphasizes the need for a proper assessment of sophisticated experimental/computational tools promoted widely in contemporary design. A unique feature of the book is its presentation of several examples and exercises to aid further understanding of the physics and mathematics of impact process from first principles, in a way that is simple to follow.

This book focuses on the two-phase flow problems relevant in the automotive and power generation sectors. It includes fundamental studies on liquid–gas two-phase interactions, nucleate and film boiling, condensation, cavitation, suspension flows as well as the latest developments in the field of two-phase problems pertaining to power generation systems. It also discusses the latest analytical, numerical and experimental techniques for investigating the role of two-phase flows in performance analysis of devices like combustion engines, gas turbines, nuclear reactors and fuel

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cells. The wide scope of applications of this topic makes this book of interest to researchers and professionals alike.

The second edition of Engineering Mechanics is specially designed as a textbook for undergraduate students of engineering. It provides a detailed and holistic treatment of the basic theories and principles of both statics and dynamics. Starting from the fundamental concepts of force and equilibrium along with free body diagrams, this book comprehensively covers the various analytical aspects of rigid body mechanics, including a suitable discourse on simple lifting machines. Within each chapter, the simpler topics and problems precede those that are more complex and advanced. Each chapter starts with the key concepts and gradually builds up on the advanced topics using detailed and easy-to-understand illustrations.

Advances and Trends in Structural Engineering, Mechanics and Computation features over 300 papers classified into 21 sections, which were presented at the Fourth International Conference on Structural Engineering, Mechanics and Computation (SEMC 2010, Cape Town, South Africa, 6-8 September 2010). The SEMC conferences have been held every 3 years in

Simscape, a Matlab/Simulink toolbox for modeling physical systems, is the ideal platform for developing and deploying models for hybrid and electric vehicle systems and sub-systems. This book is step-by-step guide through the process of developing precise and accurate models for all critical areas of hybrid and electric vehicles. For electric and hybrid technology to deliver superior performance and efficiency, all

sub-systems have to work seamlessly and in unison every time and all the time. To ensure this level of precision and reliability, modeling and simulation play crucial roles during the design and development cycle of electric and hybrid vehicles. The majority of books currently on the market discuss relevant technologies and the physics and engineering of hybrid and electric vehicles. This book is unique by focusing on developing models of physical systems at the core of these vehicles using the tool of choice, Simscape. Relevant background and appropriate theory are referenced and summarized in the context of model development with significantly more emphasis on the model development procedure and obtaining usable and accurate results.

An understanding of friction and wear behavior of materials is crucial in order to improve their performance and durability. New research is providing the opportunity to solve common problems relating to the development of materials, surface modification, coatings, and processing methods across industries. *Processing Techniques and Tribological Behavior of Composite Materials* provides relevant theoretical frameworks and the latest empirical research findings on the strategic role of composite tribology in a variety of settings. This book is intended for students, researchers, academicians, and professionals working in industries where wear reduction and performance

enhancement of machines and machine elements is essential to success.

"The science and study of Functionally Graded Materials (FGMs) has intrigued researchers over the last few decades. Their application has the capability to produce parts with unmatched properties which are virtually impossible to obtain via conventional material routes. This book addresses various FGM aspects and provides a relevant quality and comprehensive data source. The book covers trends, process classification on various basis, physical processes involved, structure, properties, applications, advantages, and limitations. Emerging trends in the field are discussed in detail and advancements are thoroughly reviewed and presented to broaden the spectrum of FGM applications. This reference book will be of interest to scholars, researchers, academicians, industry practitioners, government labs, libraries and anyone interested in the area of Materials Engineering"-- Explains the fundamental concepts and principles underlying the subject, illustrates the application of numerical methods to solve engineering problems with mathematical models, and introduces students to the use of computer applications to solve problems. A continuous step-by-step build up of the subject makes the book very student-friendly. All topics and sequentially coherent subtopics are carefully organized and explained distinctly within

each chapter. An abundance of solved examples is provided to illustrate all phases of the topic under consideration. All chapters include several spreadsheet problems for modeling of physical phenomena, which enable the student to obtain graphical representations of physical quantities and perform numerical analysis of problems without recourse to a high-level computer language. Adequately equipped with numerous solved problems and exercises, this book provides sufficient material for a two-semester course. The book is essentially designed for all engineering students. It would also serve as a ready reference for practicing engineers and for those preparing for competitive examinations. It includes previous years' question papers and their solutions.

This book is based on expertise of the authors obtained through their long teaching careers. It is put up in a simple language so that it could cater to one and all. The attention of the students is drawn to the topics of bending moments and twisting moments which are not properly explained in most of other books. They have been explained with the help of Vectors, which are used to present these quantities in such a way that one can easily distinguish between these two, as what is Bending moments and what is Twisting Motions.

This text is based on the understanding and application of three fundamental physical considerations which govern the

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mechanics of solids in equilibrium. All the discussion and theoretical development is explicitly related to these three basic considerations. This approach brings in unity to an elementary presentation of the subject. Considerable emphasis has been put on the process of constructing idealized models to represent actual physical situations.

Feature: • Completely in SI Units • The book begins with all crude approximations and goes on to remove them one-by-one leading to a more realistic picture of the concepts o Strong pedagogical features Includes: o 626 Figures o 456 Problems feature

This comprehensive and self-contained textbook will help students in acquiring an understanding of fundamental concepts and applications of engineering mechanics. With basic prior knowledge, the readers are guided through important concepts of engineering mechanics such as free body diagrams, principles of the transmissibility of forces, Coulomb's law of friction, analysis of forces in members of truss and rectilinear motion in horizontal direction. Important theorems including Lami's theorem, Varignon's theorem, parallel axis theorem and perpendicular axis theorem are discussed in a step-by-step manner for better clarity.

Applications of ladder friction, wedge friction, screw friction and belt friction are discussed in detail. The textbook is primarily written for undergraduate engineering students in India. Numerous theoretical questions, unsolved numerical problems and solved problems are included throughout the text to develop a clear understanding of the key principles of engineering mechanics. This text is the ideal resource for first year engineering undergraduates taking an introductory, single-semester course in engineering mechanics.

Following on from the International Conference on Structural Engineering, Mechanics and Computation, held in Cape Town in April 2001, this book contains the Proceedings, in

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two volumes. There are over 170 papers written by Authors from around 40 countries worldwide. The contributions include 6 Keynote Papers and 12 Special Invited Papers. In line with the aims of the SEMC 2001 International Conference, and as may be seen from the List of Contents, the papers cover a wide range of topics under a variety of themes. There is a healthy balance between papers of a theoretical nature, concerned with various aspects of structural mechanics and computational issues, and those of a more practical nature, addressing issues of design, safety and construction. As the contributions in these Proceedings show, new and more efficient methods of structural analysis and numerical computation are being explored all the time, while exciting structural materials such as glass have recently come onto the scene. Research interest in the repair and rehabilitation of existing infrastructure continues to grow, particularly in Europe and North America, while the challenges to protect human life and property against the effects of fire, earthquakes and other hazards are being addressed through the development of more appropriate design methods for buildings, bridges and other engineering structures.

Turbomachinery: Concepts, Applications, and Design is an introductory turbomachinery textbook aimed at seniors and first year graduate students, giving balanced treatment of both the concepts and design aspects of turbomachinery, based on sound analysis and a strong theoretical foundation. The text has three sections, Basic Concepts, Incompressible Fluid Machines; and Compressible Fluid Machines. Emphasis is on straightforward presentation of key concepts and applications, with numerous examples and problems that clearly link theory and practice over a wide range of engineering areas. Problem solutions and figure slides are available for instructors adopting the text for their classes.

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The Second International Conference on Structural Engineering Mechanics and Computation was held in Cape Town, South Africa in 2004. Its mission was 'To review and share the latest developments, and address the challenges that the present and the future pose'. This book contains its key findings with contributions from academics, researchers and practitioners in the broad fields of structural mechanics, associated computation and structural engineering. Their work builds a clear picture of recent achievements in the advancement of knowledge and understanding in these areas. This text therefore covers all aspects of structural mechanics and is broken down into 36 sections which communicate the latest discoveries and developments across the following areas: * vibration, dynamics, impact response, soil-structure interaction and damage mechanics * numerical modeling and computational methods * practical aspects of the analysis, design, and construction of structures - Specific classes of structures such as shells, plates, frames, bridges, buildings, lightweight structures, space structures and foundation structures * a variety of construction materials ranging from the traditional timber, masonry, concrete, steel and glass, to recent innovations encompassing high-performance composites, ceramics, high-strength concrete, fibre-reinforced concrete, stainless steel and smart alloys. The large number of high-quality papers presented and the wide spectrum of relevant topics covered, as well as the great diversity of nationalities represented by the participants, bring the reader up to speed with developments on a global scale. Covering linear and non-linear single degree-of-freedom and multi-degree-of-freedom systems, this book teaches the use of vibration principles. The authors present vibration principles in a general context and illustrate the use of these principles through examples from different disciplines. This book provides a thorough understanding of the principles

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and applications of engineering mechanics. Beginning with an introduction to the subject, the book provides a detailed treatment of systems of forces and explains the concepts of centroid and centre of gravity, moment of inertia, virtual work, friction, kinematics of particle and motion of projectiles. It also discusses the laws of motion, power and energy, and collision of elastic bodies in dynamics. Topics are dealt with in a well-organised sequence with proper explanations and simple mathematical formulations. Key features: Includes both vector and scalar analyses of topics. Emphasises the practical applicability of engineering mechanics to real-life situations. Provides key concepts to help instructors deliver improved lectures. Includes a large number of worked-out examples. Provides chapter-end review questions to test students' understanding of the subject. Includes chapter-end numerical problems to enhance problem-solving ability. Incorporates objective type questions to help students prepare for examinations.

"Provides a comprehensive discussion of the fundamental theories and principles of engineering mechanics"--

This compact and easy-to-read text provides a clear analysis of the principles of equilibrium of rigid bodies in statics and dynamics when they are subjected to external mechanical loads. The book also introduces the readers to the effects of force or displacements so as to give an overall picture of the behaviour of an engineering system. Divided into two parts-statics and dynamics-the book has a structured format, with a gradual development of the subject from simple concepts to advanced topics so that the beginning undergraduate is able to comprehend the subject with ease. Example problems are chosen from engineering practice and all the steps involved in the solution of a problem are explained in detail. The book also covers advanced topics such as the use of virtual work principle for finite element analysis; introduction of

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Castigliano's theorem for elementary indeterminate analysis; use of Lagrange's equations for obtaining equilibrium relations for multibody system; principles of gyroscopic motion and their applications; and the response of structures due to ground motion and its use in earthquake engineering. The book has plenty of exercise problems-which are arranged in a graded level of difficulty-, worked-out examples and numerous diagrams that illustrate the principles discussed. These features along with the clear exposition of principles make the text suitable for the first year undergraduate students in engineering.

The book presents research papers presented by academicians, researchers, and practicing structural engineers from India and abroad in the recently held Structural Engineering Convention (SEC) 2014 at Indian Institute of Technology Delhi during 22 – 24 December 2014. The book is divided into three volumes and encompasses multidisciplinary areas within structural engineering, such as earthquake engineering and structural dynamics, structural mechanics, finite element methods, structural vibration control, advanced cementitious and composite materials, bridge engineering, and soil-structure interaction. Advances in Structural Engineering is a useful reference material for structural engineering fraternity including undergraduate and postgraduate students, academicians, researchers and practicing engineers.

This book focuses on droplets and sprays relevant to combustion and propulsion applications. The book includes fundamental studies on the heating, evaporation and combustion of individual droplets and basic mechanisms of spray formation. The contents also extend to the latest analytical, numerical and experimental techniques for investigating the behavior of sprays in devices like combustion engines and gas turbines. In addition, the book

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explores several emerging areas like interactions between sprays and flames and the dynamic characteristics of spray combustion systems on the fundamental side, as well as the development of novel fuel injectors for specific devices on the application side. Given its breadth of coverage, the book will benefit researchers and professionals alike.

Production, new materials development, and mechanics are the central subjects of modern industry and advanced science. With a very broad reach across several different disciplines, selecting the most forward-thinking research to review can be a hefty task, especially for study in niche applications that receive little coverage. For those subjects, collecting the research available is of utmost importance. The Handbook of Research on Advancements in Manufacturing, Materials, and Mechanical Engineering is an essential reference source that examines emerging obstacles in these fields of engineering and the methods and tools used to find solutions. Featuring coverage of a broad range of topics including fabricating procedures, automated control, and material selection, this book is ideally designed for academics; tribology and materials researchers; mechanical, physics, and materials engineers; professionals in related industries; scientists; and students.

Foundations and Applications of Engineering Mechanics Cambridge University Press

This book addresses the solution of rotating beam free-vibration problems using the finite element method. It provides an introduction to the governing equation of a rotating beam, before outlining the solution procedures using Rayleigh-Ritz, Galerkin and finite element methods. The possibility of improving the convergence of finite element methods

through a judicious selection of interpolation functions, which are closer to the problem physics, is also addressed. The book offers a valuable guide for students and researchers working on rotating beam problems – important engineering structures used in helicopter rotors, wind turbines, gas turbines, steam turbines and propellers – and their applications. It can also be used as a textbook for specialized graduate and professional courses on advanced applications of finite element analysis.

Problem Solving Is A Vital Requirement For Any Aspiring Engineer. This Book Aims To Develop This Ability In Students By Explaining The Basic Principles Of Mechanics Through A Series Of Graded Problems And Their Solutions. Each Chapter Begins With A Quick Discussion Of The Basic Concepts And Principles. It Then Provides Several Well Developed Solved Examples Which Illustrate The Various Dimensions Of The Concept Under Discussion. A Set Of Practice Problems Is Also Included To Encourage The Student To Test His Mastery Over The Subject. The Book Would Serve As An Excellent Text For Both Degree And Diploma Students Of All Engineering Disciplines. Amie Candidates Would Also Find It Most Useful.

Insights and Innovations in Structural Engineering, Mechanics and Computation comprises 360 papers that were presented at the Sixth International Conference on Structural Engineering, Mechanics

and Computation (SEMC 2016, Cape Town, South Africa, 5-7 September 2016). The papers reflect the broad scope of the SEMC conferences, and cover a wide range of engineering structures (buildings, bridges, towers, roofs, foundations, offshore structures, tunnels, dams, vessels, vehicles and machinery) and engineering materials (steel, aluminium, concrete, masonry, timber, glass, polymers, composites, laminates, smart materials).

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