

Read Book Intermediate Mechanics Of Materials

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of new materials and the analysis ... which shows the ...

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manufacturing, including areas such as simulation based engineering & science (SBES), integrated computational materials ...

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This book covers the essential topics for a second-level course in strength of materials or mechanics of materials, with an emphasis on techniques that are useful for mechanical design. Design typically involves an initial conceptual stage during which many options are considered. At this stage, quick approximate analytical methods are crucial in determining which of the initial proposals are feasible. The ideal would be to get within 30% with a few lines of calculation.

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The designer also needs to develop experience as to the kinds of features in the geometry or the loading that are most likely to lead to critical conditions. With this in mind, the author tries wherever possible to give a physical and even an intuitive interpretation to the problems under investigation. For example, students are encouraged to estimate the location of weak and strong bending axes and the resulting neutral axis of bending before performing calculations, and the author discusses ways of getting good accuracy with a simple one degree of freedom Rayleigh-Ritz approximation. Students are

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also encouraged to develop a feeling for structural deformation by performing simple experiments in their outside environment, such as estimating the radius to which an initially straight bar can be bent without producing permanent deformation, or convincing themselves of the dramatic difference between torsional and bending stiffness for a thin-walled open beam section by trying to bend and then twist a structural steel beam by hand-applied loads at one end. In choosing dimensions for mechanical components, designers will expect to be guided by criteria of minimum weight, which

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with elementary calculations, generally leads to a thin-walled structure as an optimal solution. This consideration motivates the emphasis on thin-walled structures, but also demands that students be introduced to the limits imposed by structural instability. Emphasis is also placed on the effect of manufacturing errors on such highly-designed structures - for example, the effect of load misalignment on a beam with a large ratio between principal stiffness and the large magnification of initial alignment or loading errors in a strut below, but not too far below the buckling load. Additional material

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can be found on <http://extras.springer.com/> .

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This new book offers an original approach to second-level course in Mechanics of Materials/Strength, taken by Mechanical, Aerospace, and Civil Engineering students in their junior/senior year. Barber begins by discussing the tenets of engineering design, and links subsequent mechanics concepts to the design work practicing engineers do. Physical and often intuitive interpretations are provided, in addition to analytical explanations. The author also presents simple experiments students can perform to gain a better understanding of mechanics concepts.

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Throughout the book he strives to simplify the mathematics and engineering terminology, and develop explanations in a way students can follow clearly.

Intermediate Mechanics of Materials is designed for the second course in mechanics of materials. In the first course, the students are introduced to mechanics of materials variables, the relationship between these variables, and the use of these variables in the development of the simplest

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theories of one-dimensional structural elements of axial rods, torsion of circular shafts, and symmetric bending of beams. Intermediate Mechanics of Materials builds on this foundation by incorporating temperature, material non-homogeneities, material non-linearities, and geometric complexities. This book is independent of the one used in the learning and teaching of the first course of mechanics of materials. The growth of new disciplines such as plastic and biomedical engineering has increased emphasis on incorporating non-linear material behavior in engineering design and analysis.

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Incorporating material non-homogeneity is also growing with the increased use of metal matrix composites, polymer composites, reinforced concrete, and wooden beams stiffened with steel strips and other laminated structures. Residual stresses to increase load carrying capacity of metals, unsymmetric bending, shear center, beam and shaft vibrations, beams on elastic foundations, Timoshenko beams, are all complexities that are acquiring greater significance in engineering. In Intermediate Mechanics of Materials, the author shows the modularity of the logic, shown on the front

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cover of the book. The repetitive use of this logic demonstrates the ease with which the aforementioned complexities can be incorporated into the simple theories of the first course and used for design and analysis of simple structures. For additional details see madhuvable.org

Based on class-tested material, this concise yet comprehensive treatment of the fundamentals of solid mechanics is ideal for those taking single-semester courses on the subject. It provides interdisciplinary coverage of the key topics, combining solid

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mechanics with structural design applications, mechanical behavior of materials, and the finite element method. Part I covers basic theory, including the analysis of stress and strain, Hooke's law, and the formulation of boundary-value problems in Cartesian and cylindrical coordinates. Part II covers applications, from solving boundary-value problems, to energy methods and failure criteria, two-dimensional plane stress and strain problems, antiplane shear, contact problems, and much more. With a wealth of solved examples, assigned exercises, and 130 homework

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problems, and a solutions manual available online, this is ideal for senior undergraduates studying solid mechanics, and graduates taking introductory courses in solid mechanics and theory of elasticity, across aerospace, civil and mechanical engineering, and materials science.

Intermediate Mechanics of Materials provides an engaging treatment of three-dimensional stress and strain transformation, composites, non-linear and inelastic structural analysis, thin-walled structural members, energy methods, and the finite element method.

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Concise and accessible, the text logically links complex ideas together while building on students' prior knowledge. It explains different concepts through the repetitive use of a symbolic model, which relates displacements, strains, stresses, and internal/external forces and moments to each other. Intermediate Mechanics of Materials is designed for the second undergraduate course in mechanics of materials. Students should be already familiar with the basic concepts of stress, strain, axial rods, torsion of circular shafts, and symmetric bending of beams.

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Your ticket to excelling in mechanics of materials With roots in physics and mathematics, engineering mechanics is the basis of all the mechanical sciences: civil engineering, materials science and engineering, mechanical engineering, and aeronautical and aerospace engineering. Tracking a typical undergraduate course, Mechanics of Materials For Dummies gives you a thorough introduction to this foundational subject. You'll get clear, plain-English

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explanations of all the topics covered, including principles of equilibrium, geometric compatibility, and material behavior; stress and its relation to force and movement; strain and its relation to displacement; elasticity and plasticity; fatigue and fracture; failure modes; application to simple engineering structures, and more. Tracks to a course that is a prerequisite for most engineering majors

Covers key mechanics concepts, summaries of useful equations, and helpful tips From geometric principles to solving complex equations, *Mechanics of Materials For Dummies*

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is an invaluable resource for engineering students!

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