

# First Course In Continuum Mechanics

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A Concise Course in Continuum Mechanics  
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revision of a classic text by a distinguished author emphasis is on problem formulation and derivation of governing equations new edition features increased emphasis on applications new chapter covers long term changes in materials under stress

a concise account of various classic theories of fluids and solids this book is for courses in continuum mechanics for graduate students and advanced undergraduates thoroughly class tested in courses at stanford university and the university of warwick it is suitable for both applied mathematicians and engineers the only prerequisites are an introductory undergraduate knowledge of basic linear algebra and differential equations unlike most existing works at this level this book covers both isothermal and thermal theories the theories are derived in a unified manner from the fundamental balance laws of continuum mechanics intended both for classroom use and for self study each chapter contains a wealth of exercises with fully worked solutions to odd numbered questions a complete solutions manual is available to instructors upon request short bibliographies appear at the end of each chapter pointing to material which underpins or expands upon the material discussed provided by publisher

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the modeling and simulation of fluids solids and other materials with significant coupling and thermal effects is becoming an increasingly important area of study in applied mathematics and engineering necessary for such studies is a fundamental understanding of the basic principles of continuum mechanics and thermodynamics this book is a clear introduction to these principles it is designed for a one or two quarter course for advanced undergraduate and beginning graduate students in the mathematical and engineering sciences and is based on over nine years of teaching experience it is also sufficiently self contained for use outside a classroom environment prerequisites include a basic knowledge of linear algebra multivariable calculus differential equations and physics the authors begin by explaining tensor algebra and calculus in three dimensional euclidean space using both index and coordinate free notation they introduce the basic axioms of continuum mechanics pertaining to mass force motion temperature energy and entropy and the concepts of frame indifference and material constraints they devote four chapters to different theories of fluids and solids and unusually at this level they consider both isothermal and thermal theories in detail the book contains a wealth of exercises that support the theory and illustrate various applications full solutions to odd numbered exercises are given at the end of each chapter and a complete solutions manual for all exercises is available to instructors upon request each chapter also contains a bibliography with references covering different presentations further applications and numerical aspects of the theory book jacket

a first course in rational continuum mechanics volume 1 general concepts describes general concepts in rational continuum mechanics and covers topics ranging from bodies and forces to motions and energies kinematics and the stress tensor constitutive relations are also discussed and some definitions and theorems of algebra geometry and calculus are included exercises and their solutions are given as well comprised of four chapters this volume begins with an introduction to rational mechanics by focusing on the mathematical concepts of bodies forces motions and energies systems that provide possible universes for mechanics are described the next chapter explores kinematics with emphasis on bodies placements and motions as well as other relevant concepts like local deformation and homogeneous transplacement the book also considers the stress tensor and cauchy's fundamental theorem before concluding with a discussion on constitutive relations this

monograph is designed for students taking a course in mathematics or physics

this book presents a modern treatment of continuum mechanics suitable for a one semester course constructing a unified theoretical framework for thermomechanical phenomena in a continuum it emphasizes clarity and accessibility while retaining rigor the text is systematic concise and reader friendly with minimal reliance on advanced or complicated mathematical techniques the book is organized in a simple and straightforward manner the six chapters progress from fundamentals to applications the opening chapters introduce indicial notation cartesian tensors continuum kinematics and the basic physical laws in both integral and differential forms laying a foundation valid for solids and fluids alike constitutive relations for nonlinear thermoviscoelastic solids and nonlinear stokesian viscous fluids are then developed and reduced to important special cases the final chapters focus on elastic solids and fluids presenting governing equations together with analytical solutions to illustrative problems broad in scope yet focused on the essentials the book covers nonlinear elastic solids and fluids with thermal and dissipative effects within a single framework

a concise account of various classic theories of fluids and solids this book is for courses in continuum mechanics for graduate students and advanced undergraduates thoroughly class tested in courses at stanford university and the university of warwick it is suitable for both applied mathematicians and engineers the only prerequisites are an introductory undergraduate knowledge of basic linear algebra and differential equations unlike most existing works at this level this book covers both isothermal and thermal theories the theories are derived in a unified manner from the fundamental balance laws of continuum mechanics intended both for classroom use and for self study each chapter contains a wealth of exercises with fully worked solutions to odd numbered questions a complete solutions manual is available to instructors upon request short bibliographies appear at the end of each chapter pointing to material which underpins or expands upon the material discussed provided by publisher

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