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*Tools to Safeguard New
Buildings and Assess
Existing Ones Nonlinear*

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analysis methods such as static pushover are globally considered a reliable tool for seismic and structural assessment. But the accuracy of seismic capacity estimates—which can

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*prevent catastrophic loss of
life and astronomical
damage repair
costs—depends on the use of
the correct basic input
parameters. Seismic Design
Aids for Nonlinear Analysis*

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of Reinforced Concrete Structures simplifies the estimation of those vital parameters. Many design engineers make the relatively common mistake of using default properties

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of materials as input to nonlinear analyses without realizing that any minor variation in the nonlinear characteristics of constitutive materials, such as concrete and steel, could

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*result in a solution error
that leads to incorrect
assessment or
interpretation. Streamlined
Analysis Using a
Mathematical Model To
achieve a more accurate*

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*pushover analysis and
improve general
performance-based design,
this book reassesses some
key inputs, including axial
force-bending moment yield
interaction, moment-*

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curvature, and moment-rotation characteristics. It analyzes these boundaries using a detailed mathematical model of reinforced concrete sections based on international

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codes, and then proposes design curves and tables derived from the authors' studies using a variety of nonlinear tools, computer programs, and software. The text reviews relevant

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*literature and describes
mathematical modeling,
detailing numerical
procedures step by step.
Including supplementary
online material that can be
used to compute any*

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parameter, this reference delineates nonlinear properties of materials so that they can be used instantly for seismic analysis without having to solve cumbersome equations.

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Reinforced

*Concrete Mechanics and
Design, Global Edition*

*This textbook describes the
basic mechanical features of
concrete and explains the
main resistant mechanisms*

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activated in the reinforced concrete structures and foundations when subjected to centred and eccentric axial force, bending moment, shear, torsion and prestressing. It presents a

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complete set of limit-state design criteria of the modern theory of RC incorporating principles and rules of the final version of the official Eurocode 2. This textbook examines

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*methodological more than
notional aspects of the
presented topics, focusing
on the verifications of
assumptions, the
rigorousness of the analysis
and the consequent degree*

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of reliability of results. Each chapter develops an organic topic, which is eventually illustrated by examples in each final paragraph containing the relative numerical applications.

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These practical end-of-chapter appendices and intuitive flow-charts ensure a smooth learning experience. The book stands as an ideal learning resource for students of

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*structural design and
analysis courses in civil
engineering, building
construction and
architecture, as well as a
valuable reference for
concrete structural design*

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*professionals in practice.
Corrosion-resistant,
electromagnetic transparent
and lightweight fiber-
reinforced polymers (FRPs)
are accepted as valid
alternatives to steel in*

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*concrete reinforcement.
Reinforced Concrete with
FRP Bars: Mechanics and
Design, a technical guide
based on the authors' more
than 30 years of collective
experience, provides*

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principles, algorithms, and practical examples. Well-illustrated with case studies on flexural and column-type members, the book covers internal, non-prestressed FRP reinforcement. It

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assumes some familiarity with reinforced concrete, and excludes prestressing and near-surface mounted reinforcement applications. The text discusses FRP materials properties, and

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addresses testing and quality control, durability, and serviceability. It provides a historical overview, and emphasizes the ACI technical literature along with other research

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worldwide. Includes an explanation of the key physical mechanical properties of FRP bars and their production methods Provides algorithms that govern design and detailing,

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*including a new formulation
for the use of FRP bars in
columns Offers a
justification for the
development of strength
reduction factors based on
reliability considerations*

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*Uses a two -story building
solved in Mathcad® that can
become a template for real
projects This book is mainly
intended for practitioners
and focuses on the
fundamentals of*

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*performance and design of
concrete members with FRP
reinforcement and
reinforcement detailing.
Graduate students and
researchers can use it as a
valuable resource. Antonio*

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Nanni is a professor at the University of Miami and the University of Naples Federico II. Antonio De Luca and Hany Zadeh are consultant design engineers. Reinforced Concrete Beams,

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Columns and Frames

*Basic Principles of Concrete
Structures*

*Reinforced concrete
Structural Concrete*

This new edition of a highly practical text gives a detailed presentation of the

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design of common reinforced concrete structures to limit state theory in accordance with BS 8110.

For courses in architecture and civil engineering. Reinforced Concrete: Mechanics and Design uses the theory of reinforced concrete design to teach students the basic scientific and artistic

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principles of civil engineering. The text takes a topic often introduced at the advanced level and makes it accessible to all audiences by building a foundation with core engineering concepts. The Seventh Edition is up-to-date with the latest Building Code for Structural Concrete, giving students

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access to accurate information that can be applied outside of the classroom. Students are able to apply complicated engineering concepts to real world scenarios with in-text examples and practice problems in each chapter. With explanatory features throughout, the Seventh Edition makes the reinforced

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concrete design a theory all engineers can learn from.

For courses in reinforced concrete. A practitioner's guide to reinforced concrete design Reinforced Concrete Design integrates current building and material codes with realistic examples to give readers a practical

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understanding of this field and the work of its engineers. Using a step-by-step solution format, the text takes a fundamental, active-learning approach to analyzing the design, strength, and behavior of reinforced concrete members and simple reinforced concrete structural systems. Content

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throughout the 9th edition conforms to the latest version of ACI-318 Code. It expands discussion of several common design elements and practice issues, and includes more end-of-chapter problems reflecting real-world design projects. The sixth edition of this comprehensive textbook provides the same

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philosophical approach that has gained wide acceptance since the first edition was published in 1965. The strength and behavior of concrete elements are treated with the primary objective of explaining and justifying the rules and formulas of the ACI Building Code. The treatment is incorporated into the

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chapters in such a way that the reader may study the concepts in a logical sequence in detail or merely accept a qualitative explanation and proceed directly to the design process using the ACI Code.

Mechanics and Elementary Design
(Classic Reprint)

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Mechanics and Elementary Design
Mechanics and Design, Global Edition
Seismic Design of Reinforced Concrete
Buildings

*Reinforced Concrete Design: A
Practical Approach, 2E is the
only Canadian textbook which*

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covers the design of reinforced concrete structural members in accordance with the CSA Standard A23.3-04 Design of Concrete Structures, including its 2005, 2007, and 2009 amendments, and the National

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Building Code of Canada 2010. Reinforced Concrete Design: A Practical Approach covers key topics for curriculum of undergraduate reinforced concrete design courses, and it is a useful learning resource for

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the students and a practical reference for design engineers. Since its original release in 2005 the book has been well received by readers from Canadian universities, colleges, and design offices. The authors have

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been commended for a simple and practical approach to the subject by students and course instructors. The book contains numerous design examples solved in a step-by-step format. The second edition is going to

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be available exclusively in hard cover version, and colours have been used to embellish the content and illustrations. This edition contains a new chapter on the design of two-way slabs and numerous revisions of the

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original manuscript. Design of two-way slabs is a challenging topic for engineering students and young engineers. The authors have made an effort to give a practical design perspective to this topic, and

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have focused on analysis and design approaches that are widely used in structural engineering practice. The topics include design of two-way slabs for flexure, shear, and deflection control. Comprehensive

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revisions were made to Chapter 4 to reflect the changes contained in the 2009 amendment to CSA A23.3-04. Chapters 6 and 7 have been revised to correct an oversight related to the transverse

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reinforcement spacing requirements in the previous edition of the book. Chapter 8 includes a new design example on slender columns and a few additional problems. Several errors and omissions (both text

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and illustrations) have also been corrected. More than 300 pages of the original book have been revised in this edition. Several supplements are included on the book web site. Readers will get time-limited access to the

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*new column design software
BPA COLUMN, which can
generate column interaction
diagrams for rectangular and
circular columns of variable
dimensions and reinforcement
amount. Additional supplements*

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include spreadsheets related to foundation design and column load take down, and a few Power Point presentations showcasing reinforced concrete structures under construction and in completed form.

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Instructors will have an access to additional web site, which contains electronic version of the Instructor's Solution Manual with complete solutions to the end-of-chapter problems, and Power Point presentations

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containing all illustrations from the book. The book is a collaborative effort between an academic and a practising engineer and reflects their unique perspectives on the subject. Svetlana Brzev, Ph.D.,

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P.Eng. is a faculty at the Civil Engineering Department of the British Columbia Institute of Technology, Burnaby, BC. She has over 25 years of combined teaching, research, and consulting experience related to

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*structural design and
rehabilitation of concrete and
masonry structures, including
buildings, municipal, and
industrial facilities. John Pao,
MEng, PEng, Struct.Eng, is the
President of Bogdonov Pao*

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*Associates Ltd. of Vancouver,
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Companies with offices in
Seattle and Los Angeles. Mr. Pao
has extensive consulting
experience related to design of
reinforced concrete buildings,*

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*including high-rise residential
and office buildings, shopping
centers, parking garages, and
institutional buildings.*

**17 2 STRESS FIELDS FOR
SIMPLE STRUCTURES 2. 1**

INTRODUCTION *In this chapter*

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the behavior and strength of simple structures made of reinforced or prestressed concrete is investigated with the aid of stress fields. In particular, the webs and flanges of beams, simple walls, brackets, bracing

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beams and joints of frames are investigated. By this means, the majority of design cases are already covered. In reality, all structural components are three-dimensional. Here, however, components are considered

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either directly as two-dimensional plate elements (i. e. the plane stress condition with no variation of stress over the thickness of the element) or they are subdivided into several plates. Since two-dimensional

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structural elements are statically redundant, it is possible for a particular loading to be in equilibrium with many (theoretically an infinite number of) stress states. If the lower bound method of the theory of

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plasticity is employed, then an admissible stress field or any combination of such stress fields may be selected. In chapter 4 it is shown that this method is suitable for the design of reinforced concrete

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structures, and the consequence of the choice of the final structural system on the structural behavior is dealt with in detail. The first cases of the use of this method date back to Ritter [6] and Morsch

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*[4], who already at the beginning of the century investigated the resultants of the internal stresses by means of truss models.
High strength fibre composites (FRPs) have been used with civil*

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structures since the 1980s, mostly in the repair, strengthening and retrofitting of concrete structures. This has attracted considerable research, and the industry has expanded exponentially in the last decade.

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Design guidelines have been developed by professional organizations in a number of countries including USA, Japan, Europe and China, but until now designers have had no publication which provides

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practical guidance or accessible coverage of the fundamentals. This book fills this void. It deals with the fundamentals of composites, and basic design principles, and provides step-by-step guidelines for design. Its

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main theme is the repair and retrofit of un-reinforced, reinforced and prestressed concrete structures using carbon, glass and other high strength fibre composites. In the case of beams, the focus is on

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their strengthening for flexure and shear or their stiffening. The main interest with columns is the improvement of their ductility; and both strengthening and ductility improvement of un-reinforced

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structures are covered. Methods for evaluating the strengthened structures are presented. Step by step procedures are set out, including flow charts, for the various structural components, and design examples and

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practice problems are used to illustrate. As infrastructure ages worldwide, and its demolition and replacement becomes less of an option, the need for repair and retrofit of existing facilities will increase. Besides its

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*audience of design
professionals, this book suits
graduate and advanced
undergraduate students.
Based on the latest version of
designing codes both for
buildings and bridges*

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*(GB50010-2010 and JTG
D62-2004), this book starts from
steel and concrete materials,
whose properties are very
important to the mechanical
behavior of concrete structural
members. Step by step, analysis*

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of reinforced and prestressed concrete members under basic loading types (tension, compression, flexure, shearing and torsion) and environmental actions are introduced. The characteristic of the book that

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distinguishes it from other textbooks on concrete structures is that more emphasis has been laid on the basic theories of reinforced concrete and the application of the basic theories in design of

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new structures and analysis of existing structures. Examples and problems in each chapter are carefully designed to cover every important knowledge point. As a basic course for undergraduates majoring in civil

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engineering, this course is different from either the previously learnt mechanics courses or the design courses to be learnt. Compared with mechanics courses, the basic theories of reinforced concrete

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structures cannot be solely derived by theoretical analysis. And compared with design courses, this course emphasizes the introduction of basic theories rather than simply being a translation of design

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specifications. The book will focus on both the theoretical derivations and the engineering practices.

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FRP Composites for Reinforced

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*and Prestressed Concrete
Structures*

*Outlines & Highlights for
Reinforced Concrete*

Mechanics and Design,

Solutions Manual

Emphasizing a conceptual

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understanding of concrete design and analysis, this revised and updated edition builds the student's understanding by presenting design methods in an easy to understand manner supported with the use of numerous examples and

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problems. Written in intuitive, easy-to-understand language, it includes SI unit examples in all chapters, equivalent conversion factors from US customary to SI throughout the book, and SI unit design tables. In addition, the coverage has been completely

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updated to reflect the latest ACI 318-11 code.

This book describes the application of nonlinear static and dynamic analysis for the design, maintenance and seismic strengthening of reinforced concrete structures. The latest

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structural and RC constitutive modelling techniques are described in detail, with particular attention given to multi-dimensional cracking and damage assessment, and their practical applications for performance-based design. Other

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subjects covered include 2D/3D analysis techniques, bond and tension stiffness, shear transfer, compression and confinement. It can be used in conjunction with WCOMD and COM3 software
Nonlinear Mechanics of Reinforced Concrete presents a

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practical methodology for structural engineers, graduate students and researchers concerned with the design and maintenance of concrete structures.

For courses in architecture and civil engineering. Accessible, up-

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to-date coverage of reinforced concrete design Reinforced Concrete: Mechanics and Design uses the theory of reinforced concrete design to teach students the basic scientific and artistic principles of civil engineering. The text takes a

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topic often introduced at the advanced level and makes it accessible to all audiences by building a foundation with core engineering concepts. Examples and practice problems in each chapter help students develop their engineering judgement and

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learn to apply complicated engineering concepts to real-world scenarios. The 8th Edition is up to date with the 2019 Edition of the ACI 318-19 Building Code for Structural Concrete, giving students access to accurate information that can be

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applied outside of the classroom. Extend learning beyond the classroom Pearson eText is an easy-to-use digital textbook. It lets students customize how they study and learn with enhanced search and the ability to create flashcards, highlight, and add

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notes all in one place. The mobile app lets students learn wherever life takes them, offline or online. Learn more about Pearson eText. STEEL DESIGN covers the fundamentals of structural steel design with an emphasis on the design of members and their

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connections, rather than the integrated design of buildings. The book is designed so that instructors can easily teach LRFD, ASD, or both, time-permitting. The application of fundamental principles is encouraged for design

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procedures as well as for practical design, but a theoretical approach is also provided to enhance student development. While the book is intended for junior-and senior-level engineering students, some of the later chapters can be used

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in graduate courses and practicing engineers will find this text to be an essential reference tool for reviewing current practices. Important Notice: Media content referenced within the product description or the product text may not be available

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***Reinforced Concrete-mechanics
and Design***

***Structural Design from First
Principles***

***Reinforced Concrete with FRP
Bars***

Non-Linear Mechanics of

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Reinforced Concrete

Encouraging creative uses of reinforced concrete, Principles of Reinforced Concrete Design draws a clear distinction between fundamentals and

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*professional consensus.
This text presents a
mixture of fundamentals
along with practical
methods. It provides the
fundamental concepts
required for designing*

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reinforced concrete (RC) structures, emphasizing principles based on mechanics, experience, and experimentation, while encouraging practitioners to consult their local

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building codes. The book presents design choices that fall in line with the boundaries defined by professional consensus (building codes), and provides reference

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material outlining the design criteria contained in building codes. It includes applications for both building and bridge structural design, and it is applicable worldwide,

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*as it is not dependent
upon any particular codes.
Contains concise coverage
that can be taught in one
semester Underscores the
fundamental principles of
behavior Provides students*

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*with an understanding of
the principles upon which
codes are based Assists in
navigating the labyrinth
of ever-changing codes
Fosters an inherent
understanding of design*

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The text also provides a brief history of reinforced concrete. While the initial attraction for using reinforced concrete in building construction has been attributed to its

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fire resistance, its increase in popularity was also due to the creativity of engineers who kept extending its limits of application. Along with height achievement,

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reinforced concrete gained momentum by providing convenience, plasticity, and low-cost economic appeal. Principles of Reinforced Concrete Design provides undergraduate

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students with the fundamentals of mechanics and direct observation, as well as the concepts required to design reinforced concrete (RC) structures, and applies to

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*both building and bridge
structural design.*

*The theory of reinforced
concrete design is
presented as a direct
application of the laws of
statics and behavior of*

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reinforced concrete. This book emphasizes that a successful design must not only satisfy the design equations, but practical construction aspects as well. Covering basic

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*undergraduate level
concepts and more advanced
topics, this book includes
detailed treatments of
flexure, shear,
development and columns at
a level suitable for*

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*undergraduate use, as well
as the more difficult
areas of strain
compatibility solutions of
beams, P-(Delta) analyses
of frames, strut-and-tie
models, and design for*

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earthquake resistance. The numerous examples are all worked out completely, step-by-step.

This enlightening textbook for undergraduates on civil engineering degree

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*courses explains
structural design from its
mechanical principles,
showing the speed and
simplicity of effective
design from first
principles. This text*

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presents good approximate solutions to complex design problems, such as "Wembley-Arch" type structures, the design of thin-walled structures, and long-span box girder

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bridges. Other more code-based textbooks concentrate on relatively simple member design, and avoid some of the most interesting design problems because code

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compliant solutions are complex. Yet these problems can be addressed by relatively manageable techniques. The methods outlined here enable quick, early stage, "ball-

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park" design solutions to be considered, and are also useful for checking finite element analysis solutions to complex problems. The conventions used in the book are in

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accordance with the Eurocodes, especially where they provide convenient solutions that can be easily understood by students. Many of the topics, such as composite

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beam design, are straight applications of Eurocodes, but with the underlying theory fully explained. The techniques are illustrated through a series of worked examples

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which develop in complexity, with the more advanced questions forming extended exam type questions. A comprehensive range of fully worked tutorial questions are

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*provided at the end of
each section for students
to practice in preparation
for closed book exams.*

*This work has been
selected by scholars as
being culturally*

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*this knowledge alive and
relevant.*

*Section and Slender Member
Analysis*

*Reinforced Concrete Design
Mechanics and Design,
James Macgregor, 5th*

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Edition

*Reinforced Concrete Design
with FRP Composites*

Although the use of
composites has increased
in many industrial,
commercial, medical, and

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defense applications,
there is a lack of
technical literature
that examines composites
in conjunction with
concrete construction.
Fulfilling the need for

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a comprehensive,
explicit guide,
Reinforced Concrete
Design with FRP
Composites presents
specific informat
This book is focused on

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the theoretical and practical design of reinforced concrete beams, columns and frame structures. It is based on an analytical approach of designing

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normal reinforced
concrete structural
elements that are
compatible with most
international design
rules, including for
instance the European

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design rules – Eurocode
2 – for reinforced
concrete structures. The
book tries to
distinguish between what
belongs to the
structural design

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philosophy of such structural elements (related to strength of materials arguments) and what belongs to the design rule aspects associated with specific

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characteristic data (for the material or loading parameters). A previous book, entitled Reinforced Concrete Beams, Columns and Frames – Mechanics and

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Design, deals with the fundamental aspects of the mechanics and design of reinforced concrete in general, both related to the Serviceability Limit State (SLS) and

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the Ultimate Limit State (ULS), whereas the current book deals with more advanced ULS aspects, along with instability and second-order analysis aspects.

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Some recent research results including the use of non-local mechanics are also presented. This book is aimed at Masters-level students, engineers,

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researchers and teachers in the field of reinforced concrete design. Most of the books in this area are very practical or code-oriented, whereas this

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book is more
theoretically based,
using rigorous
mathematics and
mechanics tools.

Contents 1. Advanced
Design at Ultimate Limit

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State (ULS). 2. Slender
Compression Members –
Mechanics and Design. 3.
Approximate Analysis
Methods. Appendix 1.
Cardano's Method.
Appendix 2. Steel

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Reinforcement Table.

About the Authors

Jostein Hellesland has

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1988. His contribution to the field of stability has been recognized and magnified by many high-quality papers in famous international journals

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Structures, Journal of
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contributions mainly

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concern the dynamics,
stability and inelastic
behavior of structural
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web experience for
teaching reinforced
concrete design – BA-
CORTEX.

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book, readers will
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understanding of the fundamentals of reinforced concrete design. The author presents a thorough introduction to the field, covering such

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areas as theories, ACI
Code requirements, and
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concrete sections, and framework. Numerous examples are also integrated throughout the chapters to help reinforce the principles that are discussed.

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change, and frequent references to the same are made throughout the book. The nomenclature is, usually, made up of initials of the words indicated, and for this reason it was thought best to

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**(ULS). 4. Bending-Curvature at
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Appendix 1. Cardano's
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the Authors Charles
Casandjian was formerly**

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design. He has published work
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**chairman of the EMI-
ASCE Stability committee. His
contributions mainly concern
the dynamics, stability and
inelastic behavior of structural
components, with special
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**Damage Mechanics (more than 70 publications in International peer-reviewed journals).
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been Professor of Structural Mechanics at the University of Oslo, Norway since January 1988. His contribution to the field of stability has been recognized and magnified by many high-quality papers in

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