

## Bridge Vibration

Principles, Modeling, and Engineering Applications

Bridge vibration has fascinated civil engineers since the pursuit of longer bridge spans began in the early twentieth century. As bridges became longer, lighter, and more flexible, engineers increasingly recognized the need for a deeper understanding of structural vibration and its effects on safety, serviceability, and durability. This book presents the research contributions of the authors, together with selected works of leading scholars and recent developments, to provide a comprehensive treatment of bridge vibrations. The book is divided into two parts. Part I introduces the fundamental theories of bridge vibration, with linear, nonlinear, and random vibrations as its core concepts. Part II discusses vibration mechanisms, analytical methodologies, and representative case studies involving vehicle-, train-, wind-, seismic-, and pedestrian-induced bridge vibrations, as well as cable vibrations in cable-supported bridges. Real-world case studies are included throughout to illustrate significant vibration events and practical engineering solutions. Providing a self-contained and rigorous framework for understanding bridge vibrations, the book combines theoretical insight with robust analytical methods for advanced study and serves as a practical reference for engineers addressing vibration-related challenges in bridge engineering.

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