



# Dynamic Analysis of Offshore Structures

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# Preface

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The discovery of large deposits of oil and gas in deep-water regions has resulted in the construction of large production and drilling platforms, which often have to withstand severe environmental conditions in inhospitable areas. Often the natural period of vibration of these structures is comparable with the typical period of variation of the environmental forces, making a dynamic spectral analysis necessary.

This book starts by explaining the fundamentals of probabilistic processes, develops the theory necessary for the description and analysis of sea states and describes the random-vibration approach to structural response. Chapter 3 explains the essential hydrodynamics of water waves, describes wave forecasting, and defines the statistical parameters associated with sea state description. Chapter 4 deals with the calculation of wave forces on slender members (such as those used in the construction of steel lattice-type structures) using Morison's equation, and Chapter 5 describes extensively the use of diffraction theory in the calculation of wave forces on large-diameter bodies such as those found on concrete gravity-type structures. In Chapter 6, the study of environmental forces is completed by describing the effect of currents and winds.

Chapter 7 is an introduction to the theory of vibration, including a description of the spectral approach, and Chapter 8 describes the extension of this theory to multi-degree-of-freedom structures, as well as giving a brief introduction to the method of matrix analysis of structural response. Finally, in Chapter 9 some case studies are reported, and the problems of fatigue and soil-structure interaction are discussed.

The text is suitable for one-year courses in offshore structure

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analysis at postgraduate or final-year undergraduate level, and it should also prove useful for study by practising structural, civil and maritime engineers.

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