

Preface

Due to the rapid growth of offshore renewable energy structures such as offshore wind and ocean energy devices (such as wave energy converters and tidal current turbines), the science, technology and engineering in this field are seeing a phenomenal development. However, the needed competencies and knowledge are not available in a single reference. Particularly, for hybrid marine platforms, where wind and wave energy devices are combined to use possible synergies through proper combinations, limited information is available.

Incredible progress has been made in the last decades in the advancement of offshore energy structures, especially for offshore wind applications. Now, the bottom-fixed offshore wind turbines are mature enough to compete with land-based wind turbines. This has given rise to the development of new concepts/structures for deep ocean applications. Floating wind turbines are emerging and several concepts have been commissioned, which produce electricity. Also, wave energy converters are being well-developed during the last decades and several concepts are in the stage of producing electricity. Recently, the combination of wave and wind energy devices in hybrid marine platforms has been the focus of scientists in the field of offshore technology. This generated an obvious need for a book providing the state-of-the-art knowledge in offshore energy structures.

Offshore renewable industry has planned for further booming in coming years which needs having more engineers in the “offshore energy structures” field. This is what this book is about. In this book, the author has tried to avoid sophisticated mathematical expressions. The hope is that engineers with moderate mathematical background can get a proper insight to offshore energy structures by reading this book. However, to read some parts of the book, a proper knowledge of calculus is necessary.

- The book is written for MSc students and engineers in the field of offshore technology, renewable energy, marine, ocean and coastal engineering. This book can be used in MSc-level courses in departments of civil engineering, mechanical engineering as well as ocean, coastal and marine engineering.
- This book tries to simply introduce the base for design of offshore energy structures.

- The book is about wind turbines, wave energy converters, and combined concepts such as wave-wind energy platforms.
- This is a book for masters students and engineers willing to study and work in offshore renewable energy business. In general, there is no book in the market covering all these aspects.
- The book makes a link between available standards and theoretical methods. The basics have been explained and applications in real life are exemplified. Design codes, standards and numerical tools are mentioned.
- The book is applicable for engineers working in offshore business. It is easy and simple. The author has tried to avoid complicated mathematical points while explaining the physics.
- The book covers designs applicable in industry while mentioning the practical codes and needed information.

Some of the main keywords covered in this book are listed below:

- Offshore structure
- Renewable energy
- Wave energy converters
- Wind turbines
- Floating wind turbines
- Combined wave and wind energy
- Aero-hydro-elastic
- Energy structures
- Structural dynamics
- Stochastic methods

The objectives of the book, considering the design aspects needed for offshore energy structures, are explained in the first chapter. Also, the scope of the book considering the interconnections between different chapters are highlighted in the first chapter. The book consists of the following chapters:

1. Introduction
2. Wind turbines
3. Fixed offshore wind turbines
4. Floating offshore wind turbines
5. Wave energy converters
6. Combined wave and wind power devices
7. Design aspects
8. Wave and wind theories
9. Aerodynamic and hydrodynamic loads
10. Dynamic response analyses
11. Stochastic analyses

Finally, I would like to thank my dear family (in particular, my wife) for their support which enabled me to finish this important task.

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