



DYNAMICS OF OCEAN STRUCTURES

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INTENDED AUDIENCE : Any interested learners.

COURSE OUTLINE :

The course will give a brief overview of different types of ocean structures that are deployed in sea for exploiting oil, gas and minerals. While fundamentals of structural dynamics are discussed, detailed mathematical modeling of ocean structures and their dynamic analysis under waves, wind and current are highlighted with special emphasis to fluid-structure interaction. Introduction to stochastic dynamics of ocean structures is also discussed with lot of tutorials and sample papers that shall intuit self-learning through the course. Focus is on the explanation of fundamental concepts as addressed to graduate students.

ABOUT INSTRUCTOR :

Prof. Srinivasan Chandrasekaran is a full professor (HAG) and is well-known academician with a teaching and research experience of about 30 years. He has authored about 17 text books, and 170 journal papers in the domain of structural engineering. His NPTEL courses are very popular and has benefitted more than about 50,000 participants, in both India and abroad. Lectures of the course will be delivered in class-room style, for which the instructor is very popular. Extensive support for Matlab program with computer codes and solved examples will be discussed by the delts-developed codes by the instructor.

COURSE PLAN :

- Week 1:** Introduction to offshore structures
 - Environmental loads
 - Structural action
- Week 2:** Single degree-of-freedom
 - Equation of motion
 - Free vibration of SDOF systems
- Week 3:** Damped and undamped forced vibration
 - Damped forced vibration
 - Response build up
- Week 4:** Numerical examples
 - Numerical examples- MDOF
- Week 5:** Eigen value problems
 - Orthogonality of modes
 - Numerical methods in MDOF
- Week 6:** Influence coefficient method
 - Stodla method
 - Rayleigh method
 - Modal response of MDOF
- Week 7:** Rayleigh damping
 - Caughey damping
 - Damping by super-positioning
 - Duhamel integral
 - Model super position and Truncation
 - Missing mass correction
- Week 8:** Fluid structure interaction
 - Retrofitting and Rehabilitation
 - Earthquake forces
- Week 9:** Articulated towers
 - Fluid structure interaction application in ocean structures
 - Response control of compliant structures (MLAT)
 - MLAT with passive dampers
- Week 10:** Tension leg platforms
 - Fluid-structure interaction
 - Dynamic analysis for springing and ringing
- Week 11:** Numerical integration
 - Dynamic analysis offshore triceratops
 - Stochastic process
- Week 12:** Response spectrum
 - Return period
 - Fatigue damage