DYNAMICS OF OCEAN STRUCTURES

PROF. SRINIVASAN CHANDARSEKARAN
Department of Ocean Engineering
IIT Madras

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 dels-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 damperss

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