Cumulative Learning on the Course

Week	Topic 1	Topic 2	Contribution to big picture
1	Design Process with Focus on Mission Definition	Probability concepts and distributions	To understand the basic concepts needed in treatment of random loads and processes. General description of random variables and their properties and continuous and discrete probability distributions. Definition the random process of your engineering project.
2	Transient and steady state process for single frequency	Representation of random time signal by superposition	General description of random vibration and it's stages for single degree of freedom system for single frequency in time and frequency domains. Extension to multiple frequencies and superposition to create random signal. Fast Fourier Transform and it's inverse.
3	Environmental loads and load spectra	Response spectrum	To identify the kind of environmental loads relevant to your engineering project and how they form. The selection of proper load spectra for design. Computation of responses based load spectra and Response Amplitude Operator (RAO). Methods to determine RAO.
4	Direct, numerical, extraction of elevation probabilities from random signal	Direct, numerical, extraction of peak-to-peak probabilities from random signal	Numerical methods to extract probability of certain elevation and peak-to-peak values from random signal
5	Spectral moments for displacements, velocities and accelerations	Crossing analysis, distribution of peaks and maxima	Analysis of zero-crossing from random signal with identification of peaks and maximum values from signal through spectral moments
6	Short-term assessment for ultimate limit state	Long-term assessment for fatigue limit state	Application of random process theory for short-term prediction relevant for ultimate strength assessment and long-term prediction for cumulative fatigue damage.
7	Exam reviewing the learned contents		

Tasks and Workload

- The course utilizes problem-based-learning concept

- The aim of the course is to identify, categorize, analyze and synthesize the random loads for selected engineering application,
  - identification of the problem,
  - characterization of the environment,
  - analysis of the response for random excitation,
  - definition of the short- and long-term responses and statistics (fatigue and ultimate limit states).

- Each week:
  - We define an engineering problem to be solved
  - We go through the lecture slides and recorded lectures
  - Student group (3-4 students) solves the weekly assignment
  - We discuss the challenges on online Q&A sessions
  - Student group submit a written report
  - The weekly submissions will be graded from 1-5 and feedback on how to increase the grade
  - Within one week you may submit the corrected report which forms the final assignment grade

- The weekly submissions will contribute 50% to the course grade. The remaining 50% of the grade is defined by either a Learning diary (at your preferred frequency) or the Final exam.

Workload

- Lectures and Q&A: 24h (2 x 2h/week, 12 sessions)
- Home assignments: 48h (6 x 8hours/week)
- Studying materials: 48h (6 x 8hours/week)
- Preparation + Exam / Writing the learning diary: 10h