Vibration Analysis of Structures

Strukturdynamik
6 credits

Contract course

TUU010

Valid from: 2024 Autumn semester

Determined by	Main field of study	
Board of Studies for Mechanical Engineering and Design	Mechanical Engineering	
Date determined	**Course level**	**Progressive specialisation**
2024-09-27	Second cycle	AXX
Revised by	**Disciplinary domain**	
	Technology	
Revision date	**Subject group**	
	Mechanical Engineering	
Offered first time	**Offered for the last time**	
Autumn semester 2024		
Department	**Replaced by**	
Institutionen för ekonomisk och industriell utveckling		

Intended learning outcomes

The objective of the course is to familiarize the student with fundamental laws in mechanics of vibration, and to give the student the proficiency needed to independently apply these laws to vibration problems. After completed the course, the student is able to:

- model simple and more complex mechanical systems;
- understand definitions and fundamental concepts used in mechanics of vibrations, e.g. velocity, acceleration, energy, frequency, period and damping factor;
- use modal analysis, solve eigenvalue problems and determine frequencies and eigenmodes for different structural elements;
- use Lagrange's equations to derive the governing equations for a vibrating system;
- solve the governing equations analytically and numerically;
- perform simpler analyses for stability of non-linear systems;
- derive simpler theorems used within mechanics of vibration.

Course content

Modelling of vibrating systems. Derivation of the governing equations using Newton's laws and Lagrange's equations for linear systems. Systems with one or multiple degrees of freedom. Analytical solution of free and damped oscillations including harmonic and general forcing. Methods for determining eigenfrequencies. Modal analysis. Discrete and continuous systems. Approximation methods and finite elements.

Teaching and working methods

The teaching comprises lectures, tutorials and computer laborations.

Examination

| UPG2 | Hand-in exercises | 6 credits | U, 3, 4, 5 |

Grades

Four-grade scale, LiU, U, 3, 4, 5