

MA 564- Nonlinear Vibration

Course Code:	MA-564
UTAA Credit (Theoretical-Laboratory hours/week):	3(3-0)
ECTS Credit:	6.0
Department:	Mechanical and Aeronautical Engineering
Language of Instruction:	English
Level of Study:	Graduate
Offered Semester:	Fall and Spring Semesters.

Course Objectives

Provide the students with a knowledge about nonlinear oscillations. Give knowledge about and develop skills for the application of approximate analytical methods. Give knowledge about parametric vibrations and develop skills for the application of related computation methods.

Course Content

Phase space. Singular points and their stability. Bifurcations. / Exact solution. / Approximate analytical methods. / Vibrations of conservative and non-conservative systems. Natural frequency calculation. / Self sustaining oscillations. Limit cycle. / Forced vibrations. Jump phenomenon. Super-harmonic, sub-harmonic and combination resonances. / Vibrations of varying parameter systems. / Parametric vibrations. The Floquet Theory. Parametric resonances. / Vibrations of multi-degree-of-freedom systems. Internal resonances. / Introduction to chaotic vibrations

Course Learning Outcomes

- 1-knowledge about nonlinear vibrations.
- 2-An ability to apply perturbation and other approximate methods to the solution of nonlinear vibration problems.
- 3-A knowledge about parametric vibrations.
- 4-An ability to work out the stability chart of a given parametric system.
- 5-A knowledge about chaotic vibrations.