K.N. Toosi University of technology   Aerospace Engineering Faculty

Program and Degree: **BSc in Aerospace Engineering**	
Course Description	
Course Title	**Mechanical Vibrations**
Prerequisites	Dynamics, Engineering Mathematics
The course aims	Students' acquaintance with the principles, concepts and applications of vibrations in engineering 1- Ability to mathematical modeling of vibrations of simple and complex systems 2- The ability of solving vibrations problems by analytical and numerical methods 3- Damping of the vibrations and the isolation of the devices from the effects of vibrations
Contents	1- Definition and concepts of oscillatory motions, harmonic periodic motions, degrees of freedom, mathematical model of dynamical systems, linear and nonlinear systems 2- Free Vibrations of systems: Motion equations using Newton's laws, the principle of Dulmer's method and energy method, vibrations without depreciation and amortization, logarithmic degradation, effective and equivalent mass 3- Force vibrations of systems: types of external efforts, Analysis of vibrations with complex numbers and time and frequency methods, general motion of the system and the principle of supper position 4- Application of vibrations: springs and dampers, viscos and dry friction, vibration reduction and vibration isolation, vibration measurement instruments, vibration with non-harmonic stimulation, Laplace transform, numerical solution of vibrations 5- Vibration of systems of two degrees of freedom, dynamic absorption of vibrations, impact phenomena and related systems 6- critical speed of rotary shafts 7- Vibrations of several degrees of freedom and continuous systems such as beams, cables, and vibration.
Duration	**1 Semester (16 weeks)**
Course Hours	**3 hours/week**
Course Type	**Required**