

MSEM in Dynamics and Vibration

The dynamics and vibration track provides the engineering and scientific foundation for the analysis and design of machines and structures for their movement and vibration. Dynamics is the description of motion and the study of motion that results from applied forces and constraints. Vibration is the special case of the dynamics of oscillatory motion or sound.

MS Track for Dynamics and Vibration

The MSME degree program for dynamics and vibration is based on the fundamental course work offered through the Department of Mechanical Engineering (ME). This sequence of courses includes those below, with a choice between the last two depending on the odd/even year.

ME 860	Theory of Vibration	Fall (every year)
ME 861	Advanced Dynamics	Spring (every year)
ME 863	Nonlinear Vibrations	Spring (even years)
ME 961	Nonlinear Dynamics and Chaos	Spring (odd years)

The EM program also includes ME 820 (Continuum Mechanics), ME 821 (Linear Elasticity), and a course in mathematics.

Graduate Course and Research Topics

Dynamics:

Kinematics in two and three dimensions, Newton's equations of motion, energy methods for deriving equations of motion, Hamilton's principle, Hamiltonian systems, particle and rigid body dynamics. (Shaw, Haddow, Feeny)

Vibration:

Mathematical modeling of vibration systems using the principles of dynamics; free vibration with linear and Coulomb damping, harmonically forced vibration, suddenly forced vibration, and randomly excited vibration; single and multiple degrees of freedom, modal analysis, proportional and general damping; distributed parameter systems and reduced order modeling; nonlinear resonances, modal interactions, parametric excitation and self excited systems; perturbation methods and bifurcation theory; symbol dynamics and chaos. (Shaw, Haddow, Feeny)

Typical M.S. Thesis Program

in

Dynamics and Vibration

Fall Arrival

Fall Semester: 9 cr

ME 820	Continuum Mechanics (EM requirement)	3 cr
ME 860	Theory of Vibration	3 cr
(1) course from	Mathematics or Statistics, 400 level or above (EM requirement)	3 cr

Spring Semester: 9cr

ME 861	Advanced Dynamics (EM requirement)	3 cr
ME 821	Linear Elasticity (EM requirement)	3 cr
(1) course from	the list of courses below	3 cr
ME 863	Nonlinear Vibrations	
ME 961	Nonlinear Dynamics and Chaos	

Summer: 6 cr

ME 899	Master's Thesis Research	6 cr
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Fall Semester: 6 cr

(2) Elective courses	any 400, 800 or 900 level courses inside or outside Mechanical Engineering	6 cr
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TOTAL 30 credits

Engineering Mechanics Degree Requirements:

The following four must be satisfied.

1. ME 820 (Continuum Mechanics)
2. ME 821 (Linear Elasticity)
3. Either ME 861 (Advanced Dynamics) or ME 825 (Experimental Mechanics)
4. A course in Mathematics or Statistics, 400 level or above.

Typical M.S. Thesis Program

in

Dynamics and Vibration

Spring Arrival

Spring Semester: 9cr

ME 861	Advanced Dynamics (EM requirement)	3 cr
	(2) Elective courses, e.g. from the list of courses below	6 cr
ME 825	Experimental Mechanics	
ME 855	Data Acquisition	
ME 872	Finite Element Analysis	
	or other 400, 800 or 900 level courses inside or outside Mechanical Engineering	

Fall Semester: 9 cr

ME 820	Continuum Mechanics (EM requirement)	3 cr
ME 860	Theory of Vibration	3 cr
	(1) course from Mathematics or Statistics, 400 level or above (EM requirement)	3 cr

Summer: 6 cr

ME 899	Master's Thesis Research	6 cr
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Spring Semester: 6 cr

ME 820	Linear Elasticity (EM requirement)	3 cr
	(1) course from the list of courses below	3 cr
ME 863	Nonlinear Vibrations	
ME 961	Nonlinear Dynamics and Chaos	

TOTAL	30 credits
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Engineering Mechanics Degree Requirements:

The following four must be satisfied.

1. ME 820 (Continuum Mechanics)
2. ME 821 (Linear Elasticity)
3. Either ME 861 (Advanced Dynamics) or ME 825 (Experimental Mechanics)
4. A course in Mathematics or Statistics, 400 level or above.