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# Aerospace Engineering and Engineering Mechanics

In the College of Engineering

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## Faculty

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Allen Plotkin, Ph.D., Professor of Aerospace Engineering and Engineering Mechanics  
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## Courses Acceptable on Master's Degree Programs in Aerospace Engineering and Engineering Mechanics (A E) (E M)

Refer to Courses and Curricula and Regulations of the Graduate Division sections of this bulletin for explanation of the course numbering system, unit or credit hour, prerequisites, and related information.

### UPPER DIVISION COURSES IN AEROSPACE ENGINEERING (A E)

#### **A E 520. Intermediate Aerospace Flight Mechanics (3)**

Prerequisite: Aerospace Engineering 320.  
Rigid-body dynamics with applications in spacecraft attitude dynamics.

#### **A E 530. Rocket and Space Propulsion (3)**

Prerequisite: Aerospace Engineering 430.  
Equilibrium combustion thermodynamics. Performance of rocket propelled vehicles. Rocket propulsion fundamentals. Topics in chemical (solid and liquid) and electrical propulsion systems.

#### **A E 540. Aircraft Stability and Control II (3)**

Prerequisite: Aerospace Engineering 440.  
Dynamic stability and control of rigid aircraft; general equations of unsteady motion, stability derivatives, perturbed state thrust forces and moment, special problems in dynamic stability and response.

#### **A E 550. Viscous Flow (3)**

Prerequisites: Credit or concurrent registration in Engineering Mechanics 340, and Engineering 510.

Kinematics of fluid motion. Conservation of mass, momentum, and energy. Navier-Stokes equations; exact solutions. Boundary layer approximations, turbulent flow.

#### **A E 596. Advanced Aerospace Engineering Topics (3)**

Prerequisite: Consent of instructor.  
Modern developments in aerospace engineering. See *Class Schedule* for specific content. Maximum credit of six units for any combination of Aerospace Engineering or Engineering Mechanics 496, 499, and 596 applicable to a bachelor's degree. Maximum combined credit of six units of Aerospace Engineering or Engineering Mechanics 596 and 696 applicable to a 30-unit master's degree.

### UPPER DIVISION COURSES IN ENGINEERING MECHANICS (E M)

#### **E M 510. Finite Element Methods in Aerospace Structures (3)**

Prerequisite: Aerospace Engineering 410.  
Static and dynamic analysis of aerospace structures utilizing finite element methods.

#### **E M 530. Composite Structural Analysis (3)**

Prerequisites: Engineering 280 and Civil Engineering 301.  
Strength of composite materials; lamination theory; strength analysis of laminates; bending, buckling, and vibration of composite plates.

#### **E M 585. Fundamentals of Micro-Electro-Mechanical Systems (MEMS) (3)**

One lecture and four hours of laboratory.  
Prerequisites for aerospace engineering majors: E E 204, E M 220, and M E 240.  
Prerequisites for electrical engineering majors: E E 330, E M 202, and M E 240.  
Prerequisites for mechanical engineering majors: E E 303, E M 220, and M E 240.

Microfabrication techniques, microsensors and microactuators, and scaling laws. A design project of a micro-device including schematic creation, test of performance, layout generation, and layout versus schematic comparison.

#### **E M 596. Advanced Engineering Mechanics Topics (1-3)**

Prerequisite: Consent of instructor.  
Modern developments in engineering mechanics. See *Class Schedule* for specific content. Maximum credit of six units for any combination of Engineering Mechanics 496, 499, and 596 applicable to a bachelor's degree. Maximum combined credit of six units of Engineering Mechanics 596 and 696 applicable to a 30-unit master's degree.

### GRADUATE COURSES IN AEROSPACE ENGINEERING (A E)

#### **A E 601. Computational Fluid Mechanics (3)**

Prerequisites: Credit or concurrent registration in Aerospace Engineering 302 and Engineering 510.

Finite difference method of solving general fluid mechanics problems. Study of stability, convergence, compatibility, dissipation, and dispersion. A project is required.

#### **A E 612. Compressible Fluid Flow (3)**

Prerequisites: Aerospace Engineering 302 and credit or concurrent registration in Engineering 510.

Theory of flow at supersonic speeds. Linearized theory, three-dimensional wings in steady flight, slender-body theory, methods of characteristics.

#### **A E 620. Incompressible Aerodynamics (3)**

Prerequisites: Aerospace Engineering 301 and Engineering 510.  
Theory of incompressible aerodynamics; airfoil and wing theory; computational methods.

### A E 643. Laminar Flow (3)

Prerequisites: Aerospace Engineering 302 and Engineering 510.

Fluid kinematics and dynamics. Governing equations in general coordinate systems. Navier-Stokes equations; exact solutions, approximations including boundary layer. Three-dimensional flows. Numerical methods. Vector and tensor notation will be used.

### A E 644. Turbulent Flow (3)

Prerequisites: Engineering Mechanics 340 and Engineering 510.

Nature of turbulence based on simple flow observations and a theoretical basis for interpreting and predicting the behaviors of specialized turbulent flow problems.

### A E 696. Advanced Topics in Aerospace Engineering (2 or 3)

Intensive study in specific areas of aerospace engineering. May be repeated with new content. See *Class Schedule* for specific content. Maximum credit six units applicable to a master's degree. Maximum combined credit of six units of 596 and 696 applicable to a 30-unit master's degree.

### A E 797. Research (1-3) Cr/NC/RP

Prerequisite: Consent of graduate adviser.

Research in engineering. Maximum credit six units applicable to a master's degree.

### A E 798. Special Study (1-3) Cr/NC/RP

Prerequisite: Consent of staff; to be arranged with department chair and instructor.

Individual study. Maximum credit three units applicable to a master's degree.

### A E 799A. Thesis or Project (3) Cr/NC/RP

Prerequisites: An officially appointed thesis committee and advancement to candidacy.

Preparation of a project or thesis for the master's degree.

### A E 799B. Thesis or Project Extension (0) Cr/NC

Prerequisite: Prior registration in Thesis or Project 799A with an assigned grade symbol of RP.

Registration required in any semester or term following assignment of RP in Course 799A in which the student expects to use the facilities and resources of the university; also student must be registered in the course when the completed thesis is granted final approval.

### A E 799C. Comprehensive Examination Extension (0) Cr/NC

Prerequisite: Completion or concurrent enrollment in degree program courses.

Registration required of students whose only requirement is completion of the comprehensive examination for the master's degree. Registration in 799C limited to two semesters.

## GRADUATE COURSES IN ENGINEERING MECHANICS (E M)

### E M 600. Seminar (1-3)

Prerequisite: Consent of the graduate adviser and instructor.

Intensive study of one of the following topics: Nonlinear vibrations, random vibrations, continuum mechanics, anisotropic elasticity, energy methods, plasticity, and other areas of engineering mechanics. May be repeated with new content. See *Class Schedule* for specific content. Maximum credit six units applicable to a master's degree.

### E M 603. Theory of Vibrations (3)

Prerequisites: Aerospace Engineering 410 and Engineering 510.

Linear and nonlinear periodic phenomena as applied to discrete systems and continuous media with application to physical problems.

### E M 611. Vibration of Elastic Solids (3)

Prerequisites: Engineering 510 and Aerospace Engineering 410 or Mechanical Engineering 520.

Vibrational characteristics of elastic media. Vibration of plates. Longitudinal and transverse wave motion in infinite, semi-infinite and finite thickness media.

### E M 621. Theory of Elasticity (3)

Prerequisites: Civil Engineering 301 and credit or concurrent registration in Engineering 510.

Analysis of stress and strain: stress-strain relations; the equations of elasticity; uniqueness theorem; compatibility conditions; flexure and torsion.

### E M 711. Structural Acoustics (3)

Prerequisites: Engineering 510 and Engineering Mechanics 611.

Acoustic radiation from different sources. Vibration of and acoustic radiation from beams, plates, and other solids. Effect of fluid loading.

### E M 724. Theory of Plates and Shells (3)

Prerequisite: Engineering Mechanics 621.

Bending and buckling of plates. Membrane and bending theory of shells of revolution. Discontinuity analysis of shells.

### E M 727. Theory of Elastic Stability (3)

Prerequisite: Engineering Mechanics 621.

Stability of elastic systems. Differential equations of stability by summation of forces and moments, and by the variational method. Applications.

### E M 797. Research (1-3) Cr/NC/RP

Prerequisite: Consent of graduate adviser.

Research in engineering. Maximum credit six units applicable to a master's degree.

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