

## GRADUATE COURSE SUGGESTIONS BY TOPICAL AREAS

**All MAE Graduate Students: required to enroll in MAE 801 (Seminar) each semester**

All **Master's Thesis** Students: minimum 9 credits of MAE 695 required

All **Master's Non-Thesis** Students: 3 credits of MAE 586 required (typically during final semester)

All **Distance Education** Students: 3 credits of MAE 586 required (typically during final semester)

All **Doctoral** Students: minimum 24 credits of MAE 895 required

**Note:** All course offerings, including MAE 589 (Special Topics) and MAE 789 (Advanced Topics), are subject to change each semester. Please consult the current semester's class search for up-to-date offerings.

AEROSPACE RESEARCH AREA	COURSE NUMBER AND TITLE
<b>Aerodynamics and Applied Aerodynamics</b>	MAE 543 Fracture Mechanics MAE 537 Mechanics of Composite Structures MAE 539 Advanced Materials MAE 541 Advanced Solid Mechanics I MAE 730 Modem Plasticity MAE 731 Materials Processing by Deformation
<b>Aerospace Propulsion</b>	MAE 575 Advanced Propulsion Systems MAE 504 Fluid Dynamics of Combustion I MAE 550 Foundations of Fluid Dynamics MAE 553 Compressible Fluid Flow MAE 560 Computational Fluid Mechanics and Heat Transfer MAE 505 Heat Transfer Theory and Applications MAE 704 Fluid Dynamics of Combustion II MAE 708 Advanced Convective Heat Transfer MAE 766 Computational Fluid Dynamics
<b>Aircraft Design</b>	MAE 551 Airfoil Theory MAE 561 Wing Theory MAE 525 Advanced Flight Vehicle Stability & Control MAE 511 Advanced Dynamics with Applications to Aerospace Systems MAE 521 Linear Control & Design for MIMO Systems MAE 531 Engineering Design Optimization MAE 721 Robust Control with Convex Methods MAE 789 Advanced Topics - Advanced Dynamics II MAE 789 Advanced Topics - Adv Analytical Methods in Structural Vibration
<b>Composite Materials and Fabrication</b>	MAE 531 Engineering Design Optimization MAE 539 Advanced Materials MAE 537 Mechanics of Composite Structures MAE 541 Advanced Solid Mechanics I MAE 730 Modem Plasticity MAE 731 Materials Processing by Deformation
<b>Computational Fluid Dynamics for AE</b>	MAE 550 Foundations of Fluid Dynamics MAE 560 Computational Fluid Mechanics and Heat Transfer MAE 553 Compressible Fluid Flow MAE 562 Physical Gas Dynamics MAE 504 Fluid Dynamics of Combustion I MAE 551 Airfoil Theory MAE 561 Wing Theory MAE 766 Computational Fluid Dynamics MAE 770 Computation of Reacting Flows MAE 776 Turbulence MAE 704 Fluid Dynamics of Combustion II
<b>Flight Dynamics and Control</b>	MAE 561 Wing Theory MAE 521 Linear Control & Design for MIMO Systems MAE 562 Physical Gas Dynamics MAE 551 Airfoil Theory MAE 522 Non Linear System Analysis and Control MAE 704 Fluid Dynamics of Combustion II MAE 721 Robust Control with Convex Methods MAE 789 Advanced Topics - Adv Analytical Methods in Structural Vibration

<b>AEROSPACE RESEARCH AREA (Cont.)</b>	<b>COURSE NUMBER AND TITLE</b>
<b>Flight Research using UAV's</b>	MAE 525 Advanced Flight Vehicle Stability & Control
	MAE 521 Linear Control & Design for MIMO Systems
	MAE 522 Non Linear System Analysis and Control
	MAE 511 Advanced Dynamics with Applications to Aerospace Systems
	MAE 551 Airfoil Theory
	MAE 561 Wing Theory
	MAE 721 Robust Control with Convex Methods
	MAE 789 Advanced Topics - Advanced Dynamics II
	MAE 789 Advanced Topics - Adv Analytical Methods in Structural Vibration
<b>Space Exploration Systems Analysis and Design</b>	MAE 511 Advanced Dynamics with Applications to Aerospace Systems
	MAE 521 Linear Control & Design for MIMO Systems
	MAE 531 Engineering Design Optimization
	MAE 513 Principles of Structural Vibration
	MAE 535 Design of Electromechanical Systems
	MAE 589 Special Topics - Space Exploration Systems
	MAE 721 Robust Control with Convex Methods
	MAE 789 Advanced Topics - Advanced Dynamics II
	MAE 789 Advanced Topics - Adv Analytical Methods in Structural Vibration
<b>Multifunction Materials and SMART Structures</b>	MAE 532 Smart Structures and Micro-Transducers
	MAE 539 Advanced Materials
	MAE 543 Fracture Mechanics
	MAE 536 Micro/Nano Electromechanical Systems
	MAE 538 Smart Structures and Materials
	MAE 730 Modem Plasticity
MAE 734 Finite Element Analysis II	
<b>Spacecraft Dynamics, Navigation, and Control</b>	MAE 511 Advanced Dynamics with Applications to Aerospace Systems
	MAE 522 Non Linear System Analysis and Control
	MAE 525 Advanced Flight Vehicle Stability & Control
	MAE 521 Linear Control & Design for MIMO Systems
	MAE 531 Engineering Design Optimization
	MAE 589 Special Topics - Space Exploration Systems
	MAE 721 Robust Control with Convex Methods
	MAE 789 Advanced Topics - Advanced Dynamics II
MAE 789 Advanced Topics - Adv Analytical Methods in Structural Vibration	
<b>MECHANICAL RESEARCH AREA</b>	<b>COURSE NUMBER AND TITLE</b>
<b>Acoustics and Vibration</b>	MAE 511 Advanced Dynamics with Applications to Aerospace Systems
	MAE 513 Principles of Structural Vibration
	MAE 518 Acoustic Radiation I
	MAE 533 Finite Element Analysis I
	MAE 538 Smart Structures and Materials
	MAE 541 Advanced Solid Mechanics I
	MAE 718 Acoustic Radiation II
	MAE 734 Finite Element Analysis II
	MAE 789
<b>Alternative and Renewable Energy</b>	MAE 501 Advanced Engineering Thermodynamics
	MAE 550 Foundations of Fluid Dynamics
	MAE 560 Computational Fluid Mechanics and Heat Transfer
	MAE 505 Heat Transfer Theory and Applications
	MAE 551 Airfoil Theory
	MAE 561 Wing Theory
	MAE 702 Statistical Thermodynamics
	MAE 704 Fluid Dynamics of Combustion II
MAE 708 Advanced Convective Heat Transfer	
<b>Applied and Experimental Mechanics</b>	MAE 513 Principles of Structural Vibration
	MAE 533 Finite Element Analysis I
	MAE 537 Mechanics of Composite Structures
	MAE 539 Advanced Materials
	MAE 541 Advanced Solid Mechanics I
	MAE 543 Fracture Mechanics
	MAE 730 Modem Plasticity
	MAE 731 Materials Processing by Deformation
MAE 734 Finite Element Analysis II	

<b>MECHANICAL RESEARCH AREA (Cont.)</b>	<b>COURSE NUMBER AND TITLE</b>
<b>Bio-fluids</b>	MAE 550 Foundations of Fluid Dynamics
	MAE 558 Microfluidics and Nanofluidics
	MAE 553 Compressible Fluid Flow
	MAE 776 Turbulence
	MAE 766 Computational Fluid Dynamics
<b>Bio-mechanics</b>	MAE 537 Mechanics of Composite Structures
	MAE 541 Advanced Solid Mechanics I
	MAE 543 Fracture Mechanics
	MAE 544 Real Time Robotics
	MAE 730 Modern Plasticity
	MAE 734 Finite Element Analysis II
<b>Combustion</b>	MAE 501 Advanced Engineering Thermodynamics
	MAE 504 Fluid Dynamics of Combustion I
	MAE 505 Heat Transfer Theory and Applications
	MAE 550 Foundations of Fluid Dynamics
	MAE 702 Statistical Thermodynamics
	MAE 704 Fluid Dynamics of Combustion II
<b>Design, Manufacturing, and Material Mechanics</b>	MAE 531 Engineering Design Optimization
	MAE 533 Finite Element Analysis I
	MAE 538 Smart Structures and Materials
	MAE 539 Advanced Materials
	MAE 541 Advanced Solid Mechanics I
	MAE 545 Metrology for Precision Manufacturing
	MAE 731 Materials Processing by Deformation
	MAE 734 Finite Element Analysis II
	MAE 742 Mechanical Design for Automated Assembly
<b>Dynamic Systems and Control</b>	MAE 511 Advanced Dynamics with Applications to Aerospace Systems
	MAE 521 Linear Control & Design for MIMO Systems
	MAE 522 Non Linear System Analysis and Control
	MAE 535 Design of Electromechanical Systems
	MAE 538 Smart Structures and Materials
	MAE 544 Real Time Robotics
	MAE 721 Robust Control with Convex Methods
	MAE 789 Advanced Topics - Advanced Dynamics II
	MAE 789 Advanced Topics - Adv Analytical Methods in Structural Vibration
<b>Energy Conversion and Systems</b>	MAE 501 Advanced Engineering Thermodynamics
	MAE 504 Fluid Dynamics of Combustion I
	MAE 505 Heat Transfer Theory and Applications
	MAE 513 Principles of Structural Vibration
	MAE 540 Advanced Air Conditioning Design
	MAE 702 Statistical Thermodynamics
MAE 708 Advanced Convective Heat Transfer	
<b>Fluid Dynamics</b>	MAE 504 Fluid Dynamics of Combustion I
	MAE 550 Foundations of Fluid Dynamics
	MAE 553 Compressible Fluid Flow
	MAE 558 Microfluidics and Nanofluidics
	MAE 573 Hydrodynamic Stability and Transition
	MAE 704 Fluid Dynamics of Combustion II
	MAE 766 Computational Fluid Dynamics
MAE 776 Turbulence	
<b>Heat Transfer</b>	MAE 505 Heat Transfer Theory and Applications
	MAE 501 Advanced Engineering Thermodynamics
	MAE 560 Computational Fluid Mechanics and Heat Transfer
	MAE 708 Advanced Convective Heat Transfer

<b>MECHANICAL RESEARCH AREA (Cont.)</b>	<b>COURSE NUMBER AND TITLE</b>
<b>Industrial Assessment</b>	MAE 501 Advanced Engineering Thermodynamics
	MAE 505 Heat Transfer Theory and Applications
	MAE 540 Advanced Air Conditioning Design
	MAE 550 Foundations of Fluid Dynamics
	MAE 560 Computational Fluid Mechanics and Heat Transfer
	MAE 589 Special Topics - Indus Energy
	MAE 704 Fluid Dynamics of Combustion II
	MAE 708 Advanced Convective Heat Transfer
	MAE 709 Advanced Radiative Heat Transfer
<b>Metrology</b>	MAE 513 Principles of Structural Vibration
	MAE 533 Finite Element Analysis I
	MAE 539 Advanced Materials
	MAE 541 Advanced Solid Mechanics I
	MAE 545 Metrology for Precision Manufacturing
	MAE 589 Special Topics - Optics
	MAE 731 Materials Processing by Deformation
	MAE 734 Finite Element Analysis II
MAE 742 Mechanical Design for Automated Assembly	
<b>Micro and Nano-MEMS</b>	MAE 513 Principles of Structural Vibration
	MAE 536 Micro/Nano Electromechanical Systems
	MAE 558 Microfluidics and Nanofluidics
	MAE 532 Smart Structures and Micro-Transducers
	MAE 538 Smart Structures and Materials
	MAE 545 Metrology for Precision Manufacturing
	MAE 730 Modern Plasticity
MAE 734 Finite Element Analysis II	
<b>Plasticity and Fracture</b>	MAE 531 Engineering Design Optimization
	MAE 533 Finite Element Analysis I
	MAE 537 Mechanics of Composite Structures
	MAE 539 Advanced Materials
	MAE 541 Advanced Solid Mechanics I
	MAE 543 Fracture Mechanics
	MAE 730 Modern Plasticity
	MAE 731 Materials Processing by Deformation
MAE 734 Finite Element Analysis II	
<b>Porous Media</b>	MAE 505 Heat Transfer Theory and Applications
	MAE 539 Advanced Materials
	MAE 501 Advanced Engineering Thermodynamics
	MAE 708 Advanced Convective Heat Transfer
<b>Reacting Flows</b>	MAE 550 Foundations of Fluid Dynamics
	MAE 553 Compressible Fluid Flow
	MAE 558 Microfluidics and Nanofluidics
	MAE 770 Computation of Reacting Flows
	MAE 776 Turbulence
<b>SMART Materials</b>	MAE 531 Engineering Design Optimization
	MAE 532 Smart Structures and Micro-Transducers
	MAE 533 Finite Element Analysis I
	MAE 537 Mechanics of Composite Structures
	MAE 538 Smart Structures and Materials
	MAE 541 Advanced Solid Mechanics I
	MAE 730 Modern Plasticity
MAE 734 Finite Element Analysis II	
<b>Solidification</b>	MAE 505 Heat Transfer Theory and Applications
	MAE 539 Advanced Materials
	MAE 543 Fracture Mechanics
	MAE 730 Modern Plasticity

MECHANICAL RESEARCH AREA (Cont.)	COURSE NUMBER AND TITLE
<b>Thermal Fluids</b>	MAE 504 Fluid Dynamics of Combustion I
	MAE 505 Heat Transfer Theory and Applications
	MAE 550 Foundations of Fluid Dynamics
	MAE 558 Microfluidics and Nanofluidics
	MAE 501 Advanced Engineering Thermodynamics
	MAE 702 Statistical Thermodynamics
	MAE 704 Fluid Dynamics of Combustion II
	MAE 708 Advanced Convective Heat Transfer
<b>Turbulence</b>	MAE 504 Fluid Dynamics of Combustion I
	MAE 560 Computational Fluid Mechanics and Heat Transfer
	MAE 550 Foundations of Fluid Dynamics
	MAE 573 Hydrodynamic Stability and Transition
	MAE 766 Computational Fluid Dynamics
	MAE 776 Turbulence

### MAE 589 - Special Topics in Mechanical Engineering

Note: This is a list of typically offered topics. Course offerings are subject to change each semester, see the current semester's class search for up-to-date offerings.

Topic	Professor
Intro to Structural Health Monitoring	F-G Yuan
Precision Manufacturing Processes & Systems	J. Tu
Fundamentals of Product Design	S. Ferguson
Advanced IC Engines	T. Fang
Dynamic Analysis of Human Movement	K. Saul
Direct Energy Conversion	B. O'Connor
Boundary Layer Theory	V. Narayanaswamy
Applied Aerodynamics	A. Gopalarathnam
Optical Engineering	C-H Chang
Space Exploration Systems	A. Mazzoleni
Applied Acoustics	M. Muller
Product Design Management	S. Ferguson
Intro to Experimental Fluid Mechanics	K. Granlund

### MAE 789 - Advanced Topics in Mechanical Engineering

Note: This is a list of typically offered topics. Course offerings are subject to change each semester, see the current semester's class search for up-to-date offerings.

Topic	Professor
Advanced Dynamics II	A. Mazzoleni
Advanced Analytical Methods in Structural Vibration	D. Keltie