

Graduate Course Structure for PhD and MS Students

Specialization areas and their corresponding courses

Note: if you want to use a course not on this list, get approval from your faculty advisor.

Fluid Mechanics

Introductory courses	MAE 210A,B,C	Fluid Mechanics I, II, III
Advanced courses	MAE 212 MAE 214A MAE 216 MAE 215 MAE 223 MAE 224A, B	Introductory Compressible Flow Introduction to Turbulence and Turbulent Mixing Ocean Turbulence and Mixing Hydrodynamic Stability Computational Fluid Dynamics Environmental Fluid Dynamics

Biomechanics

Introductory courses	MAE 209 / BENG 209	Continuum Mechanics Applied to Medicine/Biology
Advanced courses	MAE 261 MAE 262 MAE 263 MAE 266/MATS 252	Cardiovascular Fluid Mechanics Fluid Mechanics of the Cell Experimental Methods in Cell Mechanics Biomaterials and Medical Devices

Combustion (Thermal sciences)

Introductory courses	MAE 211 MAE 212	Introduction to Combustion Introductory Compressible Flow
Advanced courses	MAE 213 MAE 220A,B,C MAE 221AB MAE 256	Mechanics of Propulsion Physics of Gases; Physical Gasdynamics; Nonequilibrium Gasdynamics Heat Transfer; Mass Transfer Radiative Transfer for Energy Applications

Solid Mechanics

Introductory courses	MAE 231A,B	Foundations of Solid Mechanics; Elasticity
Advanced courses	MAE 231C or SE 273 MAE 232A,B,C MAE 233A,B MAE 235 MAE 238	Anelasticity Theory of Plasticity and Viscoelasticity Finite Element Methods in Solid Mechanics I, II, III Fracture Mechanics; Micromechanics Computational Techniques in Finite Elements Stress Waves in Solids

MAE 267/MATS 253

Nanomaterials and Properties

Environmental Engineering

Introductory courses **MAE 210B**

Fluid Mechanics II

Advanced courses **MAE 214A**
MAE 216
MAE 221A,B
MAE 224A,B
MAE 255
MAE 256

Introduction to Turbulence and Turbulent Mixing
Ocean Turbulence and Mixing
Heat Transfer; Mass Transfer;
Environmental Fluid Dynamics
Boundary Layer/Renew Energy Meteorology
Radiative Transfer for Energy Applications

Design

Introductory courses **MAE 291**
MAE 292

Design and Mechanics in Computer technology
Computer-Aided Design and Analysis

Advanced courses **MAE 232A,B,C**

Finite Element Methods in Solid Mechanics I, II, III

Linear and Optimal Control

Introductory courses **MAE 280A, B**

Linear Systems Theory; Linear Control Design

Advanced courses **MAE 284**
MAE 287
MAE 288A
MAE 288B
MAE 289
MAE 290A, B

Robust and Multi-Variable Control
Control of Distributed Parameter Systems
Optimal Control
Optimal Estimation
Functional Analysis with Applications
Efficient Numerical Methods for Simulation, Optimization
and Control; Numerical Methods for Differential Equations

Adaptive Systems and Dynamic Modeling

Introductory courses **MAE 242**
MAE 247
MAE 281A, B

Robot Motion Planning
Cooperative Control of Multi-Agent Systems
Nonlinear Systems; Nonlinear Control

Advanced courses **MAE 282**
MAE 283A
MAE 283B
MAE 286
MAE 222

Adaptive Control
Parametric Identification, Theory & Methods
Approximate Identification & Control
Hybrid Systems
Flow Control

Materials Sciences

Introductory courses **MATS 201A/MAE 271A**
MATS 201B/MAE 271B

Thermodynamics of Solids
Solid State Diffusion & Reaction Kinetics

Advanced courses **MATS 201C/MAE 271C**
MATS 205A/MAE 272
MATS 211/MAE 229A
MATS 218/MAE 250
MATS 227/MAE 251

Phase Transformations
Imperfections in Solids
Mechanical Properties
Fatigue, Fracture, and Failure
Structure and Bonding of Solids

MATS 213A,B	Dynamic Behavior of Materials I & II
MATS 233A,/MAE 252A,B	Processing & Synthesis of Advanced Materials
MATS 236/MAE 253	Ceramic & Glass Technology
MATS 251/MAE265	Structure & Properties of Electronic, Magnetic, Photonic Materials
MATS 252/MAE 266	Biomaterials and Medical Devices
MAE 253/MAE 267	Nanomaterials and Properties

Applied Plasma Physics

Introductory courses	MAE 217A	Introduction to Gas Discharge Plasma Physics
	MAE 217B	Intro to Non-magnetized Plasma Physics
	MAE 217C	Intro to Magnetized Plasma Physics
	MAE 218A	Intro to High Energy Density Physics (MHD and Pinches)
	MAE 218B	Intro to High Energy Density Physics (Laser-Plasma Interactions)
Advanced courses	MAE 227A	Fundamentals of Modern Plasma Physics (Magnetized Plasma)
	MAE 227B	Fundamentals of Modern Plasma Physics (Laser-Plasma Interactions)
	MAE 228	Selected Topics in Plasma Physics
	PHYS 218A,B,C	Plasma Physics
	PHYS 228	High Energy Astrophysics and Compact Objects
	PHYS 235	Nonlinear Plasma Theory
	ECE 240A	Laser and Optics

Mathematics

MAE 289	Functional Analysis and Applications
MAE 294A,B,C	Methods in Applied Mechanics I, II, III
MAE 290A,B	Efficient Numerical Methods for Simulation, Optimization and Control; Numerical Methods for Differential Equations
MATH 210A,B,C	Mathematical Methods in Physics and Engineering
MATH 211	Fourier Analysis on Finite Groups
MATH 212A	Introduction to the Mathematics of Systems and Control
MATH 220A,B,C	Complex Analysis
MATH 221A,B,C	Topics in Several Complex Variables
MATH 227A,B,C	Topics In Complex Analysis
MATH 231A,B,C	Partial Differential Equations
MATH 233	Singular Perturbation Theory for Differential Equations
MATH 240A,B,C	Real Analysis
MATH 241A,B,C	Functional Analysis
MATH 247A	Topics in Real Analysis
MATH 250A,B,C	Differential Geometry
MATH 270A,B,C	Numerical Mathematics
MATH 271A,B,C	Numerical Optimization
MATH 272A,B,C	Numerical Partial Differential Equations
MATH 273A,B,C	Scientific Computation
MATH 274A	Topics in Real Analysis
MATH 280A,B,C	Probability Theory
MATH 285A, B	Stochastic Processes
MATH 286	Stochastic Differential Equations

MATH 287A,B,C

Time Series Analysis; Multivariate Analysis;
Nonparametric Analysis

MATH 290A,B,C

Topology

Basic Science

CHEM 213

Chemistry of Macromolecules

CHEM 214

Molecular and Cellular Biochemistry

ECE 220

Space Plasma Physics

ECE 222

Applied Electromagnetic Theory

ECE 253A

Digital Image Analysis

ECE 270A, B

Neurocomputing

PHYS 200A,B

Theoretical Mechanics

PHYS 201

Mathematical Physics

PHYS 203A,B

Advanced Classical Electrodynamics

PHYS 211A,B

Solid-State Physics

SIO 203A,B,C

Methods of Applied Analysis

Not all courses will be offered every year. Consult the course offerings for the current year.

If you want to use a course not on this list, get approval from your faculty advisor.

A Note About MAE 207's:

MAE 207, Topics in Engineering Science, is often used to develop new courses before an actual course number is assigned. You may use 207's as many as two times. The topics must be different from one another. If you want to use more, please consult with your faculty advisor or the MAE Graduate Advisor.