ME 501 Numerical Methods in Mechanical Engineering (3-0-3)


Prerequisite: SE 301 or Equivalent (not to be taken for credit with MATH 574)

ME 530 Advanced Compressible Fluid Flow (3-0-3)

Oblique shock waves. Expansion waves. General features of multidimensional compressible flow. Introduction to small perturbation theory. The method of characteristics with applications to steady and unsteady flows.

Prerequisite: ME 425/AE 325 or Equivalent

ME 531 Advanced Thermodynamics I (3-0-3)


Prerequisite: ME 204 or Equivalent

ME 532 Advanced Fluid Mechanics I (3-0-3)


Prerequisite: ME 311 or Equivalent

ME 533 Ideal Fluid Flow (3-0-3)


Prerequisite: ME 311 or Equivalent

ME 534 Conduction Heat Transfer (3-0-3)

Prerequisite: MATH 301 & ME 315 or Equivalent

ME 535 Radiation Heat Transfer (3-0-3)

Prerequisite: ME 315 or Equivalent

ME 536 Convection Heat Transfer (3-0-3)

Convection systems. Derivation of conservation equations and solutions for laminar and turbulent boundary layer flows. Forced convection, internal and external flows. Natural convection. Special topics and applications.
Prerequisite: ME 532

ME 537 Combustion and Emission (3-0-3)

Prerequisite: ME 204 or Equivalent

ME 539 Solar Energy Utilization (3-0-3)

Design consideration of various concentrating collectors for thermal and photovoltaic applications. Solar thermal/electric power conservation. Solar thermal energy storage. Solar thermal design methods: f-chart utilizability. Solar space conditioning design and computer simulation models such as TRNSYS. Economic considerations. Solar desalination and other applications. Design projects in selected areas.
Prerequisite: ME 439 or Equivalent

ME 543 Nonlinear Finite Element Analysis (3-0-3)

Prerequisite: ME 489 or CE 517 or consent of the instructor.

ME 546 Industrial Aerodynamics (3-0-3)

Planetary boundary layer and atmospheric characteristics. Bluff body aerodynamics; separation, vortex shedding, wakes, static and dynamic wind forces. Response of structures to dynamic loading. Applications to buildings, structures, vehicles, etc.
Prerequisite: ME 311 or Equivalent
ME 547 Thermal Environment and Energy Analysis (3-0-3)


Prerequisite: ME 315 or Equivalent

ME 548 Combustion Phenomena (3-0-3)

Flame propagation theories, structure of premixed hydrocarbon flames, mathematical formulations for flame propagation. Diffusion flames, droplet combustion. Detonation and deflagration wave theory.

Prerequisite: ME 204 or Equivalent

ME 549 Thermal Design of Heat Exchangers (3-0-3)

Classification of a variety of heat exchangers, various methods for the exchanger analysis and performance evaluation, pressure drop analysis including header design and flow maldistribution, fouling and its impact on the exchanger performance and life-cycle analysis. Special design considerations for regenerators, plate-fin, tube-and-frame, shell-and-tube, reboilers, condensers, evaporators, and direct-contact heat exchangers.

Prerequisite: ME 315 or Equivalent

ME 550 Fundamentals of Astronautics (3-0-3)

Introduction to the solar system, launching, fundamental laws of astrodynamics (space mechanics), orbit maneuvering and determination, important applications in missile trajectories, optimal trajectories, communication satellite and spacecraft attitude, re-entry and hypersonic considerations.

Prerequisite: Graduate Standing

ME 551 Continuum Mechanics (3-0-3)


Prerequisite: Graduate Standing (also offered under CE 518)

ME 552 Advanced Dynamics (3-0-3)


Prerequisite: Graduate Standing
ME 553 Advanced Vibrations (3-0-3)

Prerequisite: Graduate Standing

ME 554 Elasticity (3-0-3)

Prerequisite: ME 551

ME 555 Plasticity (3-0-3)

The physics of plasticity: Plastic deformation, Stress-Strain relations, temperature and rate dependence; crystal plasticity. Constitutive theory: Viscoplasticity, rate-independent plasticity, yield criteria, flow rule and hardening rules, uniqueness theorems, limit analysis. Problems in contained plastic deformation; torsion of prismatic bars, thick walled cylinder, bending of beams. Problems in plastic flow and collapse. Large deformation plasticity. Numerical methods in plasticity.
Prerequisite: ME 551

ME 557 Modern Control of Linear Systems (3-0-3)

Prerequisite: ME 413 or Equivalent

ME 558 Rotordynamics (3-0-3)

Prerequisite: ME 552

ME 559 Random Vibrations (3-0-3)

Introduction to random vibrations and stochastic processes. Spectral analysis and frequency respons

Prerequisite: ME 482 or Equivalent

ME 560 Smart Materials and Structures (3-0-3)

Analysis, design, and implementation of smart structures and systems: modeling of beams and plate with induced strain actuation, piezoelectric ceramics and polymers, shape memory alloys, electrorheological fluids. Piezoelectric and magnetostrictive sensors and actuators, and fiber optic sensors. Integration mechanics. Damage detection and repair. Applications.

Prerequisite: Graduate Standing

ME 562 Vibration Measurement and Analysis (3-0-3)


Prerequisite: ME 413 or Equivalent

ME 563 Ultrasonic Testing Techniques (3-0-3)


Prerequisite: Graduate Standing

ME 564 Noise and Vibration Control (3-0-3)


Prerequisite: Graduate Standing

ME 565 Dynamics of Multibody Systems I (3-0-3)

Definition of a multibody system; Mechanical joints and their kinematic constraints; Equations of motion for a multibody system, the constrained form of Lagrange’s equation, Lagrange multipliers, joint reaction forces; Coordinate partitioning, the Lagrangian form with embedded constraints; Dynamics of spatial
multibody systems, coordinate transformations using Euler parameters, formulation of the joint constraints, Dynamic equations of motion; Introduction to computational methods in dynamics.

Prerequisite: ME 552

ME 570 Experimental Methods in Materials and Processes (3-0-3)

Laboratory investigations of the mechanical, physical, and surface properties of materials. Experimental investigations of materials’ behavior during processing and in various operating environments. Experimental design and evaluation of results.

Prerequisite: Graduate Standing

ME 572 Analysis of Manufacturing Processes (3-0-3)


Prerequisite: ME 206 or Equivalent

ME 573: Probabilistic Concepts in Design and Production (3-0-3)


Prerequisites: STAT 319 or Consent of Instructor.

ME 574 Advanced Materials Science (3-0-3)


Prerequisite: Graduate Standing

ME 575 Advanced Corrosion Engineering (3-0-3)


Prerequisite: Graduate Standing

ME 576 Tribology (3-0-3)


*Prerequisite:* ME 307 or Equivalent

**ME 578 Mechanical Properties of Engineering Polymers (3-0-3)**


*Prerequisite:* ME 574

**ME 579 Advanced Mechanical Behavior of Materials (3-0-3)**

Description of stress, strain, strain rate and elastic properties of materials. Fundamental aspects of crystal plasticity. Theory and characteristics of dislocations. Strengthening mechanisms at low temperature. Deformation at elevated temperatures and deformation maps. Emphasizing the relationships between microscopic mechanisms and macroscopic behavior of materials.

*Prerequisite:* ME 574

**ME 580 Principles of Metal Forming (3-0-3)**


*Prerequisite:* ME 572

**ME 581 Computer Integrated Manufacturing (3-0-3)**


*Prerequisite:* ME 572

**ME 583 Fatigue and Fracture of Engineering Materials (3-0-3)**


*Prerequisite:* ME 307 or Equivalent

**ME 584 Quality Engineering (3-0-3)**

Statistical process control techniques for quality and productivity improvement in production processes. Quality control charts for variable data and attribute data. Process capability analysis. Acceptance procedures based on the quality of the product. Taguchi's ideas of quality. Experience with statistical quality control software. Case studies. The course will also address documentation using ISO 9000 and
other quality standards.

Prerequisite: STAT 319 or Equivalent (not to be taken for credit with SE 534)

ME 585 Advanced Physical Metallurgy (3-0-3)

Review of structure of metals, analytical methods, dislocation and plastic deformations, diffusion, solidification of metals, nucleation and growth kinetics, phase diagrams, thermally activated plastic deformations, fracture and fracture mechanics.

Prerequisite: ME 574

ME 586 Finite Element Analysis in Metal Forming (3-0-3)


Prerequisite: ME 206 or Equivalent

ME 591 Special Topics in Thermofluid Sciences I (3-0-3)

Advanced topics are selected from thermofluid area of mechanical engineering. Contents of the course will be provided in detail one semester before its offering. Approval of the Departmental Graduate Committee and the Graduate Council must be secured before offering this course.

Prerequisite: Graduate Standing

ME 595 Special Topics in Engineering Mechanics I (3-0-3)

Advanced topics are selected from engineering mechanics area of mechanical engineering. Contents of the course will be provided in detail one semester before its offering. Approval of the Departmental Graduate Committee and the Graduate Council must be secured before offering this course.

Prerequisite: Graduate Standing

ME 597 Special Topics in Materials & Manufacturing I (3-0-3)

Advanced topics are selected from materials and manufacturing area of mechanical engineering. Contents of the course will be provided in detail one semester before its offering. Approval of the Departmental Graduate Committee and the Graduate Council must be secured before offering this course.

Prerequisite: Graduate Standing

ME 599 Seminar (1-0-0)

Graduate students working towards M.S. degree, are required to attend the seminars given by faculty, visiting scholars, and fellow graduate students. Additionally each student must present at least one seminar on a timely research topic. Among other things, this course is designed to give the student an
overview of research in the department, and a familiarity with the research methodology, journals and professional societies in his discipline. Graded on a Pass or Fail basis.

*Prerequisite:* Graduate Standing

**ME 610 MS Thesis (0-0-6)**

**ME 611 Statistical Thermodynamics (3-0-3)**


*Prerequisite:* Graduate Standing

**ME 612 Phase Change Heat Transfer and Two Phase Flow (3-0-3)**


*Prerequisite:* ME 536

**ME 632 Advanced Fluid Mechanics II (3-0-3)**


*Prerequisite:* ME 532

**ME 658 Fracture Mechanics (3-0-3)**


*Prerequisite:* ME 551

**ME 661 Nonlinear Systems Dynamic Analysis (3-0-3)**


*Prerequisite:* MATH 301 or Equivalent
ME 665 Dynamics of Multibody Systems II (3-0-3)

Prerequisite: ME 565

ME 666 Dynamics and Control of Mechanical Systems (3-0-3)

Prerequisite: ME 557

ME 671 Electrode Kinetics (3-0-3)

Prerequisite: ME 575

ME 672 Control of Manufacturing Processes (3-0-3)

Application of computer-based control system techniques to batch manufacturing processes. A brief review of control concepts and servomechanisms with an in-depth study of modeling and control problems associated with several manufacturing processes. These include, but not restricted to, metal cutting, metal forming and welding processes as well as the control problem associated with manipulated robotic arms in a manufacturing context.  
Prerequisite: ME 572

ME 673 Metallurgical Processes and Thermodynamics (3-0-3)

Prerequisite: ME 574

ME 675 Phase Transformation in Metals (3-0-3)

Examines the thermodynamics and fundamentals of rate processes in metals. Phenomen-ological and atomistic points of view are considered. Kinetics of liquid-solid, solid-solid transformations and transport of matter in solids are discussed.  
Prerequisite: ME 574
ME 691 Special Topics in Thermofluid Sciences II (3-0-3)

Advanced topics are selected from thermofluid area of mechanical engineering. Contents of the course will be provided in detail one semester before its offering. Approval of the Departmental Graduate Committee and the Graduate Council must be secured before offering this course.

Prerequisite: Graduate Standing

ME 695 Special Topics in Engineering Mechanics II (3-0-3)

Advanced topics are selected from the broad area of mechanical engineering. Contents of the course will be provided in detail one semester before its offering. Approval of the Departmental Graduate Committee and the Graduate Council must be secured before offering this course.

Prerequisite: Graduate Standing

ME 697 Special Topics in Materials & Manufacturing II (3-0-3)

Advanced topics are selected from the broad area of mechanical engineering. Contents of the course will be provided in detail one semester before its offering. Approval of the Departmental Graduate Committee and the Graduate Council must be secured before offering this course.

Prerequisite: Graduate Standing

ME 699 Seminar (1-0-0)

Graduate students working towards Ph.D. degree, are required to attend the seminars given by faculty, visiting scholars, and fellow graduate students. Additionally each student must present at least one seminar on a timely research topic. Among other things, this course is designed to give the student an overview of research in the department, and a familiarity with the research methodology, journals and professional societies in his discipline. Graded on a Pass or Fail basis.

ME 710 Ph.D. Dissertation (0-0-12)