Master of Science in Mechanical Engineering

Courses (Choose 32 credits)

Title	Description	Credits
Thermodynamics of Propulsion and Power Systems	Analysis and modeling of propulsion and power systems, including combustion, compressible flow through nozzles, chemical equilibrium, and moist air systems.	3 credits
Principles of Turbomachinery	Application of Newton's laws of motion and basic laws of thermodynamics to analysis of fluid flow in turbomachinery.	3 credits
Introduction to Combustion	Concepts related to laminar and turbulent premixed and nonpremixed combustion with applications to propulsion and stationary systems.	3 credits
Engineering Optimization	Problem formulation, algorithms and computer solution of various engineering optimization problems.	3 credits
Automatic Control Systems	Dynamic analysis of systems involving automatic control of position, speed, power, flow, pressure, temperature, and other physical quantities.	3 credits
Finite Elements in Engineering	Computer modeling and fundamental analysis of solid, fluid, and heat flow problems using existing computer codes.	3 credits
Introduction to Computer-Aided Analysis of Machine Dynamics	Techniques and formulations for computer-based kinematic and dynamic analyses of machines.	3 credits
Heat Transfer — Conduction	One- and two-dimensional conduction heat transfer for steady state and transient systems with varying boundary conditions.	3 credits
Heat Transfer — Convection	Laminar and turbulent flow heat transfer in natural and forced convection systems.	3 credits
Heat Transfer — Radiation	Thermal radiation fundamentals; specular and diffuse systems; differential and integral methods; numerical techniques; industrial applications.	3 credits
Two-Phase Heat Transfer	Heat transfer processes involving evaporation, boiling, and condensation.	3 credits
Foundations of Fluid Mechanics I	First semester of core sequence in fluid mechanics; Navier-Stokes equations, potential flow, low Re flow, laminar boundary layers.	3 credits
Foundations of Fluid Mechanics II	Second semester of core sequence in fluid mechanics; continuation of boundary layers, stability, transition, turbulence, turbulent boundary	3 credits

	layers, turbulence models.	
Numerical Solutions Applied to Heat Transfer and Fluid Mechanics Problems	Application of finite difference methods to the study of potential and viscous flows and conduction and convection heat transfer.	3 credits
Fundamentals of Combustion	Theoretical formulations and methods of solution of engineering problems and physical/chemical processes in various propulsion systems.	3 credits
Turbulent and Two-Phase Combustion	Fundamentals of chemically reacting turbulent flows in homogeneous systems including turbulent flames, spray combustion, ignition, reacting boundary layers.	3 credits
Foundations of Engineering Systems Analysis	Analytical methods are developed using the vector space approach for solving control and estimation problems; examples from different engineering applications.	3 credits
Automatic Control Systems	Advanced problems and techniques in the design of automatic control systems with emphasis on stability, controller design, and optimum performance.	3 credits
Solid Mechanics	Introduction to continuum mechanics, variational methods, and finite element formulations; application to bars, beams, cylinders, disks, and plates.	3 credits
Simulation of Mechanical Systems	Introduces computational fundamentals, including digital logic; programming language, basic numerical analysis and data processing, as applied to mechanical simulation techniques.	3 credits
Colloquium	Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.	1 credit
Individual Studies	Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.	1-3 credits