Simulation Based Mechanical Engineering Sciences Track

A total of 30 hours are required for the M.S. degree. At least 18 must be in MCEN courses, or 15 must be in MCEN courses with 6 MCEN thesis hours. In addition to the coursework for each track, M.S. students are required to take two semesters of Graduate Seminar, MCEN 5027. This class is pass/fail and is attendance based. It does NOT count towards the 30 credit hours required for the degree. Attendance is required at 2/3 of the seminars for a passing grade.

Required Core Courses (9 hours)

MCEN 5020 Methods of Engineering Analysis 1 (3)
MCEN 5040 Methods of Engineering Analysis 2 (3)
MCEN 5228 Numerical Methods in Engineering and Science (3)

Core Courses: Physical Phenomena (3 hours from the list below)

Some courses may have prerequisites. Additional courses may be approved on a petition basis.

MCEN 5228 Introduction to Nano-Science (3)
MCEN 6228 Microscale Heat Transfer(3)
MCEN 5228 Nano-Mechanics (3)
MCEN 5021 Fluid Dynamics (3)
MCEN 5022 Classical Thermodynamics(3)
MCEN 5023 Solid Mechanics (3)
MCEN 5024 Materials Chemistry & Structure (3)
MCEN 5042 Heat Transfer (3)
MCEN 5044 Mechanical Behavior of Materials(3)
MCEN 5228 Environmental Modeling (3)
PHYS 5250 Introduction to Quantum Mechanics 1 (3)

Core Courses: Computer Modeling (3 hours from the list below)

Some courses may have prerequisites. Additional courses may be approved on a petition basis.

CSCI 5454 Design and Analysis of Algorithms (3)
CSCI 7111 Topics in Parallel Processing (3)
MCEN 5142 Computational Fluid Dynamics, Heat Transfer, and Combustion (3)
MCEN 5173 Finite Element Analysis (3)
MCEN 6228 Molecular Modeling (3)
ASEN 5007 Introduction to Finite Elements (3)
ASEN 5519/MCEN 5228 Computational Fluid Dynamics (3)
ASEN 6367 Advanced Finite Element Methods for Plates, Shells and Solids (3)
ASEN 5327 Computational Fluid Mechanics (3)
ASEN 5519 Modeling and Simulation of Microfluidic Systems (3)
APPM 5560 Markov Processes, Queues, and Monte Carlo Simulations (3)

APPM 6550 Introduction to Stochastic Processes (3)
APPM 6640 Multigrid Methods (3)
MCEN 5228 Inverse Methods (3)

Thesis Requirements (6 hours)
MCEN 6959 Masters Thesis (3)
MCEN 6959 Masters Thesis (3)

In addition all students who write an MS thesis must register for:
MCEN 5208 Intro to Research (1) - This is a pass/fail seminar series offered in fall semesters that teaches ethics of research, how to write a proposal, library skills, etc.

Enrichment Courses (6 hours from the list below)

Some courses may have prerequisites. Additional courses may be approved on a petition basis.

MCEN 5041 Viscous Flow (3)
MCEN 5121 Compressible Flow (3)
MCEN 5135 Wind Energy and Wind Turbine Design
MCEN 5152 Introduction to Combustion (3)
MCEN 4228 Failure of Engineering Materials (3)
MCEN 5183 Mechanics of Composite Materials (3)
MCEN 6228 Structure and Properties of Polymers (3)
MCEN 6228 Cardiovascular Biomechanics (3)
MCEN 6228 Multi Phase Flows (3)
MCEN 6278 Acoustics (3)
MCEN 7122 Combustion Phenomena (3)
MCEN 7123 Dynamics of Continuous Media (3)
MCEN 7221 Turbulence (3)
APPM 5380 Modeling in Applied Mathematics (3)
APPM 5520 Introduction to Mathematical Statistics (3)
APPM 6520 Mathematical Statistics (3)
APPM 7300 Nonlinear Waves and Integrable Equations (3)
ASEN 5053 Rocket Propulsion (3)
ASEN 5063 Gas Turbine Propulsion(3)
ASEN 5151 High Speed Aerodynamics (3)
ASEN 5315 Ocean Modeling (3)
ASEN 5417 Numerical Methods for Differential Equations (3)
ASEN 6013 High Speed Propulsion (3)
ASEN 6061 Molecular Gas Dynamics and DSMC (3)
ASEN 6517 Computational Methods in Dynamics (3)
CHEN 5220 Mass Transport (3)
CHEN 5360 Catalysis and Kinetics (3)
CHEN 5370 Intermediate Chemical Engineering Thermodynamics (3)
CHEM 5151 Atmospheric Chemistry (3)

CVEN 5313 Environmental Fluid Mechanics (3)
CVEN 5488 Computational Modeling in Geotechnical Engineering (3)
CVEN 7511 Computational Mechanics of Solids and Structures (3)
ATOC 5050 Introduction to Atmospheric Dynamics (3)

Elective Courses (3 hours)
Any 5000 level or above