Master of Engineering

Program Requirements: The student must complete a total of 30 credit hours at the graduate level including the completion of three courses from a single engineering discipline or computer science. The completion of five courses in a designated concentration field will allow the student to have the concentration area listed on the student’s NC State transcript. The remaining courses can be taken from any course offerings in the Engineering Online program.

Courses Available from Materials Science and Engineering for Area of Specialization

MSE 500  Modern Concepts in Materials Science
MSE 556  Composite Materials
MSE 702  Defects in Solids
MSE 705  Mechanical Behavior of Engineering Materials
MSE 706  Phase Transformation & Kinetics
MSE 708  Thermodynamics of Materials
MSE 712  Scanning Electron Microscopy
MSE 715  Fundamentals of Transmission Electron Microscopy
MSE 761  Polymer Blends and Alloys
MSE 791K  Modeling form the Nanoscale to the Macroscale

Courses Available from Electrical and Computer Engineering for Area of Specialization

ECE 506  Architecture of Parallel Computers
ECE 511  Analog Electronics
ECE 515  Digital Communications
ECE 517  Object-Oriented Languages and Systems
ECE 520  Digital ASIC Design
ECE 521  Computer Design and Technology
ECE 525  Medical Instrumentation
ECE 535  Design of Electromechanical Systems
ECE 538  Integrated Circuit Technology Fabrication
ECE 549  RF Design for Wireless
ECE 556  Agent-based Mechatronics Systems
ECE 570  Computer Networks
ECE 573  Internet Protocols
ECE 576  Connection-Oriented Networks
ECE 579  Introduction to Computer Performance Modeling
ECE 582  Wireless Communication Systems
ECE 591Z  Computational Intelligence: Neural, Fuzzy and Genetic Systems
ECE 716  System Control Engineering
ECE 718  Computer-Aided Circuit Analysis
ECE 723  Optical Properties of Semiconductors
ECE 733  Digital Electronics
ECE 744  Design of Electronic Packaging and Interconnects
ECE 752  Information Theory
ECE 775 Optical Networks

Courses Available from Nuclear Engineering for Area of Specialization

NE 591U Radiation and Reactor Fundamentals

Courses Available from Computer Science for Area of Specialization

CSC 501 Operating Systems Principles
CSC 505 Design and Analysis of Algorithms
CSC 506 Architecture of Parallel Computers
CSC 510 Software Engineering
CSC 512 Compiler Construction
CSC 513 Electronic Commerce Technology
CSC 517 Object-Oriented Languages and Systems
CSC 520 Artificial Intelligence I
CSC 541 Advanced Data Structures
CSC 546 Management Decisions and Control Systems
CSC 557 Multimedia Computing & Networking
CSC 570 Computer Networks
CSC 573 Internet Protocols
CSC 576 Connection-Oriented Networks
CSC 579 Introduction to Computer Performance Modeling
CSC 582 Computer Models of Interactive Narrative
CSC 750 Service-Oriented Computing
CSC 775 Optical Networks
CSC 750 Web Services.

Courses Available from Mechanical and Aerospace Engineering for Area of Specialization

MAE 501 Advanced Engineering Thermodynamics
MAE 504 Fluid Dynamics of Combustion I
MAE 505 Heat Transfer Theory Applications
MAE 513 Principles of Structural Vibrations
MAE 518 Acoustic Radiation I
MAE 521 Linear Control and Design for Mimo Systems
MAE 524 Principles of Mechatronic Control
MAE 533 Finite Element Analysis
MAE 534 Mechatronics Design
MAE 537 Mechanics of Composite Structure
MAE 541 Advanced Machine Design
MAE 543 Fracture Mechanics
MAE 544 Real Time Robotics
MAE 545 Metrology for Precision Manufacturing
MAE 550 Foundations of Fluid Dynamics
MAE 560 Computational Fluid Mechanics and Heat Transfer
MAE 561 Wing Theory
MAE 575 Advanced Propulsion
MAE 589 Astrodynamics
MAE 589 C Spacecraft Control
MAE 589D Spacecraft Attitude Dynamics
MAE 589G  Space Flight Guidance and Navigation
MAE 589Q  Design for Strength and Endurance
MAE 589R  Advanced Propulsion
MAE 589W Smart Materials
MAE 589 U and Y – Special Engineering Topics I and II – GE students only
MAE 589Z  Mechanical Design Engineering
MAE 704  Fluid Dynamics of Combustion II
MAE 742  Mechanical Design for Assembly

Courses Available from Industrial Engineering for Area of Specialization

IE 510  Applied Engineering Economy
IE 514  Manufacturing Product Engineering
IE 544  Occupational Biomechanics
IE 546  Management Decision and Controls Systems
IE 589M  Lean Production Principles and Practices
IE 589V  Engineering Product Management
IE 707  Real-Time Control of Automated Manufacturing
IE 712  Bayesian Decision Analysis for Engineers and Managers
IE 715  Manufacturing Process Engineering
IE 716  Automated Systems Engineering
IE 719  CIM System Design
IE 723  Product Planning, Scheduling & Inventory Control
IE 741  Occupational Safety Engineering
IE 748  Quality Engineering
IE 791B  Rapid Prototyping

Courses Available from Chemical and Biomolecular Engineering for Area of Specialization

CHE 543  Polymer Science and Technology
CHE 551  Biochemical Engineering
CHE 575  Advances in Pollution Prevention: Environmental Management
CHE 576  Life Cycle Analysis
CHE 596A Surface Chemical Reaction
CHE 596I  Colloid Science and Nanoscale Engineering
CHE 596U  Fundamentals of Transport Phenomena
CHE 597C  Molecular Cell Engineering
CHE 597J  Polymers at Interfaces and in Confined Geometries
CHE 598K  Polymer Rheology and Processing
CHE 711  Chemical Engineering Process Modeling
CHE 713  Thermodynamics I
CHE 717  Chemical Reaction Engineering
CHE 718  Advanced Chemical Reaction Engineering
CHE 761  Polymer Blends and Alloys

Courses Available from Civil, Construction and Environmental Engineering for Area of Specialization

CE 501  Transportation Systems Engineering
CE 502  Traffic Operations
CE 509  Highway Safety
CE 522  Theory and Design of Prestressed Concrete
CE 523  Theory and Behavior of Steel Structures
CE 524  Analysis and Design of Masonry Structures
CE 525  Structural Analysis II
CE 528  Structural Design in Wood
CE 561  Construction Project Management
CE 564  Legal Aspect of Contracting
CE 567  Risk and Financial Management in Construction
CE 571  Physical Principles of Environmental Engineering
CE 573  Biological Principles of Environmental Engineering
CE 574  Chemical Properties of Environmental Engineering
CE 576  Engineering Principles of Air Pollution Control
CE 579  Principles of Air Quality Engineering
CE 577  Engineering Principles of Solid Waste Management
CE 584  Hydraulics of Ground Water
CE 588  Water Resource Engineering
CE 596F  Environmental Process Biotechnology for Engineers
CE 702  Traffic Flow Theory
CE 720  Matrix and Finite Element Structural Analysis I
CE 722  Structural Dynamics
CE 723  Advanced Structural Dynamics
CE 725  Earthquake Structural Engineering
CE 726  Advanced Theory of Concrete Structures
CE 741  Advanced Soil Mechanics I
CE 742  Advanced Soil Mechanics II
CE 744  Foundation Engineering
CE 746  Dynamics of Soils and Foundations
CE 747  Geosynthetics in Geotechnical Engineering
CE 751  Theory of Concrete Mixtures
CE 757  Pavement Management Systems
CE 761  Design of Temporary Structures in Construction
CE 766  Building Construction Systems
CE 771  Physical-Chemical Water Treatment Processes
CE 772  Environmental Exposure and Risk Analysis
CE 774  Environmental Bioproces Technology

Additional Courses Available

MA 501 Adv. Mathematics for Engineers & Scientists I
MA 502 Adv. Mathematics for Engineers & Scientists II
Master of Civil Engineering

Program Requirements: The student must complete a total of 30 credit hours at the graduate level. Approximately two-thirds must be taken in civil engineering within an area of emphasis, and supporting courses should be from one or two other areas within civil engineering. The remaining one-third of the credits may consist of any graduate level civil engineering or related supporting courses from other departments.

Areas of Emphasis

Construction Engineering and Management
CE 561 Construction Project Management
CE 564 Legal Aspects of Contracting
CE 567 Risk and Financial Management in Construction
CE 751 Theory of Concrete Mixtures
CE 761 Design of Temporary Structures in Construction
CE 766 Building Construction Systems

Environmental Engineering
CE 571 Physical Principles in Environmental Engineering
CE 572 Design of Water and Wastewater Facilities
CE 573 Biological Principles of Environmental Engineering
CE 574 Chemical Principles of Environmental Engineering
CE 576 Engineering Principles of Air Pollution Control
CE 577 Engineering Principles of Solid Waste Management
CE 579 Principles of Air Quality Engineering
CE 771 Physical-Chemical Water Treatment Processes
CE 772 Environmental Exposure and Risk Analysis
CE 774 Environmental Bioprocess Technology

Geotechnical/Geoenvironmental Engineering
CE 584 Hydraulics of Ground Water
CE 593 Special Topics in Geotechnical Engineering (GE 593B – Rock Mechanics)
CE 741 Advanced Soil Mechanics I
CE 742 Advanced Soil Mechanics II
CE 744 Foundation Engineering
CE 747 Geosynthetics in Geotechnical Engineering

Structures and Mechanics
CE 522 Theory and Design of Prestressed Concrete
CE 523 Theory and Behavior of Steel Structures
CE 524 Analysis and Design of Masonry Structures
CE 528 Structural Design in Wood
CE 594 Special Topics in Structural Mechanics
CE 715 Advanced Strength of Materials
CE 720 Matrix and Finite Element Structural Analysis I
CE 722 Structural Dynamics
CE 725 Earthquake Structural Engineering
CE 726 Advanced Theory & Concrete Structures

**Transportation Systems and Materials**
CE 501 Transportation Systems Engineering
CE 502 Traffic Operations
CE 509 Highway Safety
CE 702 Traffic Flow Theory
CE 755 Highway Pavement Design
CE 757 Pavement Management Systems

**Water Resources and Coastal Engineering (courses are combined with environmental for area of emphasis)**
CE 584 Hydraulics of Groundwater
CE 588 Water Resources Engineering

**Other available courses of possible interest:**
CE 759 Inelastic Behavior of Construction Materials
IE 510 Applied Engineering Economy
MA 501 Adv. Mathematics for Engineers & Scientists I
MA 502 Adv. Mathematics for Engineers & Scientists II
MAE 533 Finite Element Analysis
MSE 705 Mechanical Behavior of Engineering Materials

**Master of Computer Science**

Program Requirements: The student must complete a total of 31 credit hours at the graduate level including the completion of three core courses in Computer Science. At least twenty-one hours must be in courses bearing the CSC prefix and must include CSC 600. The remaining three courses may consist of any graduate level engineering (including computer science), mathematics or statistics courses offering through Engineering Online.

**CSC Core Requirements**

At least two courses must be taken from one of the following categories and one from the other category.

**Category 1: Theory**
CSC 512 Compiler Construction
CSC 565 Graph Theory
CSC 579 Performance Modeling
CSC 580 Numerical Analysis*
CSC 707 Theory of Computation

**Category 2: Systems**
CSC 501 Operating Systems
CSC 506 Architecture of Parallel Computers
CSC 510 Software Engineering
CSC 520 Artificial Intelligence
CSC 540 Database Systems
CSC 562 Graphics*
CSC 570 Networks

*not available online to date
Other Online CSC Courses:

- CSC 505  Design and Analysis of Algorithms
- CSC 513  Electronic Commerce Technology
- CSC 517  Object-Oriented Languages and Systems
- CSC 520  Artificial Intelligence I
- CSC 541  Advanced Data Structures
- CSC 546  Management Decision and Control Systems
- CSC 557  Multimedia Computing and Networking
- CSC 573  Internet Protocols
- CSC 576  Connection-Oriented Networks
- CSC 582  Computer Models of Interactive Narrative
- CSC 750  Web Services

Other Online Courses:

- Math 501  Advanced Mathematics for Engineers & Scientists I
- Math 502  Advanced Mathematics for Engineers & Scientists II
- ECE 520  Digital ASIC Design
- ECE 521  Computer Design and Technology

Master of Science in Aerospace Engineering

Program Requirements: The student must complete a total of 30 credit hours at the graduate level. A minimum of four core Mechanical and Aerospace (MAE) courses must be taken from a concentration area and two additional MAE courses must be taken at the 500 or 700 level. In addition, each student must complete three credits of MAE 586, Project Work in Aerospace Engineering. The remaining three courses may consist of any graduate level engineering, mathematics or statistics courses offered through Engineering Online.

MAE Core Requirements offered online a minimum of every two years. A concentration must be selected from one of the following areas of study.

Aerodynamics, Fluid Mechanics and Propulsion

- MAE 504 Fluid Dynamics of Combustion I
- MAE 550 Foundations of Fluid Dynamics
- MAE 553 Compressible Fluid Flow
- MAE 560 Computational Fluid Mech. & Heat Transfer
- MAE 561 Wing Theory
- MAE 575 Advanced Propulsion

Aerospace Structures, Materials and Control

- MAE 513 Principles of Structural Vibration
- MAE 518 Acoustic Radiation I
- MAE 524 Principles of Mechatronic Control
- MAE 533 Finite Element Analysis I
- MAE 534 Mechatronics Design
MAE 535 Design of Electromechanical Systems
MAE 537 Mechanics of Composite Structures

Additional Online Courses Available:

MAE 501 Advanced Engineering Thermodynamics
MAE 505 Heat Transfer Theory and Applications
MAE 521 Linear Control & Design for MIMO
MAE 541 Advanced Machine Design I
MAE 544 Real Time Robotics
MAE 545 Metrology for Precision Manufacturing
MAE 543 Fracture Mechanics
MAE 589 Astrodynamics
MAE 589 C Spacecraft Control
MAE 589D Spacecraft Attitude Dynamics
MAE 589G Space Flight Guidance and Navigation
MAE 589Q Design for Strength and Endurance
MAE 589W Smart Materials
MAE 589Z Mechanical Design Engineering
MAE 742 Mechanical Design for Automated Assembly
MA 501 Adv. Mathematics for Engineers & Scientists I
MA 502 Adv. Mathematics for Engineers & Scientists II

Master of Science in Mechanical Engineering

Program Requirements: The student must complete a total of 30 credit hours at the graduate level. A minimum of four core Mechanical and Aerospace (MAE) courses must be taken from a concentration area and two additional MAE courses must be taken at the 500 or 700 level. In addition, each student must complete three credits of MAE 586, Project Work in Mechanical Engineering. The remaining three courses may consist of any graduate-level engineering, mathematics or statistics courses offered through Engineering Online.

Thermal/Fluid Sciences

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 553 Compressible Fluid Flow
MAE 560 Computational Fluid Mechanics & Heat Transfer

Dynamics, Vibrations, Controls and Mechatronics

MAE 513 Principles of Structural Vibration
MAE 518 Acoustic Radiation I
MAE 521 Linear Control & Design for MIMO
MAE 524 Principles of Mechatronic Control
MAE 534 Mechatronics Design
MAE 535 Design of Electromechanical Systems
MAE 544 Real Time Robotics

**Structural Mechanics and Materials**

MAE 533 Finite Element Analysis I
MAE 537 Mechanics of Composite Structures
MAE 545 Metrology for Precision Manufacturing
MAE 541 Advanced Machine Design I
MAE 543 Fracture Mechanics
MAE 742 Mechanical Design for Automated Assembly

**Other recommended courses**

MAE 575 Advanced Propulsion
MAE 589Q Design for Strength & Endurance
MAE 589W Smart Materials
MAE 589Z Mechanical Design Engineering
MAE 704 Fluid Dynamics of Combustion II
MA 501 Adv. Mathematics for Engineers & Scientists I
MA 502 Adv. Mathematics for Engineers & Scientists II

**Master of Science in Chemical Engineering**

Program Requirements: The student must complete a total of 30 credit hours at the graduate level. Completion of four core courses in Chemical Engineering is required. The remaining six courses should be taken from Chemical and Biomolecular Engineering (preferably) or from any graduate level engineering, mathematics or statistics courses offered through Engineering Online.

**Chemical Engineering Core Courses**

CHE 711 Chemical Engineering Process Modeling
CHE 713 Thermodynamics I
CHE 717 Chemical Reaction Engineering
CHE 596U Fundamentals of Transport Phenomena

**Other Courses Available Online**

CHE 543 Polymer Science and Technology
CHE 551 Biochemical Engineering
CHE 575 Advances in Pollution Prevention: Environmental Management
CHE 576 Life Cycle Analysis
CHE 596I Colloid Science Engineering
CHE 589M Multi-Scale Modeling of Fluids & Soft Matter
CHE 597C Chemical Engineering Projects: Polymer Interfaces and in Confined Geometries
CHE 598K Polymer Rheology and Processing
CHE 718 Advanced Chemical Reaction Engineering
MA 501 Adv. Mathematics for Engineers & Scientists I
MA 502 Adv. Mathematics for Engineers & Scientists II