MASTER OF SCIENCE IN MECHANICAL ENGINEERING (M.S.M.E.)

Master of Science in Mechanical Engineering

Point of Contact: Yong Zhu, Ph.D.

Admission Requirements

Applications are invited from individuals who possess a B.S. degree in Mechanical Engineering or close fields from an accredited institution. Applicants not meeting the requirements may be provisionally admitted and will be required to take sufficient undergraduate courses to make up deficiencies.

To be considered for admission, the applicant must submit the following minimum requirements:

- Submit to the Graduate Admissions Office a completed graduate application for admission with payment of appropriate application fee.
- Submit two letters of recommendation from previous academic faculty and/or from current or previous supervisors, if employed.
- Demonstrate satisfactory performance as an undergraduate by providing a complete set of official undergraduate transcripts.
- International students: Refer to the International Students section of this bulletin for additional admission requirements.
- To be accepted on a regular basis, candidates for the degree must have obtained a cumulative GPA of at least 3.0. Prospective students with a GPA of less than 3.0 may be conditionally accepted into the program.

Degree Requirements

The Master of Science in Mechanical Engineering program requires thirty (30) credits of graduate level course work. The program consists of 15 credits of mandatory core courses. Students have the option of a six-credit thesis or a three-credit project with an additional three-credit technical elective. Students may select 9 or 12 additional credits from the list of technical electives.

Typical Course Sequence

First Semester	Second Semester
[[MTH-361]] – Partial Differential Equations	[[ME-436]] – Solid Mechanics
[[ME-415]] – Programmable Logic Controllers	[[ME-480]] – Advanced CADD
Technical Elective	Technical Elective
Third Semester	**Fourth Semester**
[[ME-427]] – Transport Phenomena	[[ME-599]] – Thesis (six credits) **OR** Project (three credits)
Technical Elective	
Technical Elective (if project option)	

Core Courses

[[MTH-361]] Partial Differential Equations; [[ME-415]] Programmable Logic Controllers; [[ME-427]] Transport Phenomena; [[ME-436]] Solid Mechanics; [[ME-480]] Advanced CADD.

Thesis/Project Option:

Graduate students are strongly recommended to select the thesis option to complete their graduate course work. However, they may choose a three-credit hour project option.

Technical Electives

Technical electives may be selected from the technical elective graduate course list. In addition, up to one graduate level course from any engineering or science field is transferable.

Non-thesis option: Three credits of ME 599 are required. Students should submit a well-documented report to the department.

Thesis option: Six credits of thesis ME 599 are required. The thesis shall be defended in an open forum. Three faculty members constitute a thesis committee with the thesis advisor as chair.

Students who opt to complete a thesis may select from posted research topics or proposed areas of interest of the faculty and submit a proposal of their thesis to the Department. Final decision of topic and advisor will be taken by the Department in accordance with Department guidelines. Ordinarily, these topics will touch on one or more of the following areas: Structural Analysis, Thermal Sciences, Finite Element Method, Solid Mechanics, Dynamics, MEMS, Control Systems, Robotics, Mechatronics, and Energy Conversion.

Both full- and part-time students are limited to a maximum of three thesis credits in any single semester.

The minimum acceptable grade point average is 3.0. (See Grade Regulations)

Advanced standing or transfer credit is limited to three (3) graduate credits. Petitions should be submitted to the Mechanical & Electrical Engineering Department, and should document minimum competency defined as relevant graduate course work at an accredited institution with an earned minimum grade of 3.0 (0-to-4 scale) or equivalent expertise.

Financial Aid

A limited number of assistantships are available for full-time students. Applicants should possess superior academic qualifications and provide good scores in the GRE (General and Engineering).

Academic Integrity

At Wilkes the faculty and the entire University community share a deep commitment to academic honesty and integrity.

The following are considered to be serious violations and will not be tolerated:

1. Plagiarism: the use of another's ideas, programs, or words without proper acknowledgment.
2. Collusion: improper collaboration with another in preparing assignments, computer programs, or in taking examinations.
3. Cheating: giving improper aid to another, or receiving such aid from another, or from some other source.
4. Falsifying: the fabrication, misrepresentation, or alteration of citations, experimental data, laboratory data, or data derived from other empirical methods.

ME. MECHANICAL ENGINEERING

ME-401. APPLIED ENGINEERING ANALYSIS
Credits: 3

This course is intended for physical science and engineering students. Topics include inner product spaces, operator algebra, eigenvalue problems, Fourier series, Sturm-Liouville theory, and partial differential equations. Cross list [[MTH-461]]

ME-402. ENGINEERING COMPUTATIONAL ANALYSIS
Credits: 3

This course introduces applications of Matrix algebra (Review only), solution of linear simultaneous equations , solving linear system of equations by iteration methods , roots of algebraic and transcendental equations , interpolation, methods of finding polynomial roots , Eigen values & eigenvectors, numerical integration, numerical differentiation, numerical solution of initial value problems, boundary value problems.

ME-411. PRODUCT DEVELOPMENT
Credits: 3

This course introduces organizational issues and decision-making for capital investments in new technologies. The commercialization process is traced from research and development and marketing activities through the implementation phase involving the manufacturing function. Term project is a commercialization plan for a new manufacturing technology.

ME-414. INVERSE PROBLEMS IN MECHANICS
Credits: 3

Inverse problems are very common in engineering where the outputs are known but the inputs are unkown. This course will show how to properly setup a well-posed inverse problem, how to solve matrix inverse, and conduct hands on experiments by creating strain gage based force transducers.
Click here for course fee.

ME-415. PROGRAMMABLE LOGIC CONTROLLERS
Credits: 3

Introduction to the fundamental concepts and design of programmable logic controllers and systems with emphasis on programmable logic controllers, ladder logic programming, and advanced PLC applications.
Click here for course fee.

Pre-Requisites

Instructor permission.

ME-417. ROBOTICS
Credits: 3

This course is an introduction of robot mechanisms, intelligent controls, and industrial robot programming. Course topics include kinematics and motion planning, mechanism design for manipulators and mobile robots, dynamics and control design, actuators and sensors, human-machine interface, and embedded software. Laboratories and projects provide experience with DC and servo motors, real-time feedback control, embedded software, and industrial robot programming.

Click here for course fee.

Pre-Requisites

EGR-222 and ME-234

Co-Requisites

MTH-212 concurrent or before

ME-418. QUALITY CONTROL ENGINEERING
Credits: 3

This course addresses quality control in the manufacturing environment, statistical methods used in quality assurance, statistical process control.

ME-425. ENERGY SYSTEMS
Credits: 3

This course introduces fundamental principles of energy transmission and energy conversion. Comprehension of the physical systems in which the conversion of energy is accomplished. Primary factors necessary in the design and performance analysis of energy systems three credits.

ME-427. TRANSPORT PHENOMENA
Credits: 3

This course introduces theory and applications of heat, mass, and momentum transport. The fluid dynamics topics such as conservation laws, laminar and turbulent flow, Navier Stokes equations of motion and other related topics will be covered. Topics include free and forced convection, boiling and condensation, and the analogy between heat and mass transport. Practical problems of engineering applications in different areas will be discussed.

ME-432. VIBRATION OF DYNAMIC SYSTEMS
Credits: 3

This course is an introductory course in mechanical vibration dealing with free and forced vibration of single and multi-degree of freedom for linear systems.

ME-436. SOLID MECHANICS
Credits: 3

This course is an introduction to continuum mechanics, variational methods, including vectors and tensors, state of stress and compatibility equation, plain stress and strain. Energy Principles and virtual work will be discussed.

ME-438. MACHINE DESIGN II
Credits: 3

An advanced course in machine design topics that expands upon the concepts of Machine Design I. This course goes into more detail of the basic machine fundamentals introduced previously such as levers, belts, pulleys, gears, cams and power screws. Emphasis is also placed on 3D printing and the future of additive manufacturing.

Pre-Requisites

ME-333

ME-439. CLASSICAL MECHANICS
Credits: 3

This course is an introduction to classical mechanics. Topics covered include: Newtonian mechanics, oscillations, Lagrangian and Hamilton's principle, Dynamics of a systems of particles and rigid bodies.

ME-442. MATERIAL SCIENCE
Credits: 3

This course introduces advance materials for engineers, emphasizing the fundamentals of manufacturing/structure/property/function relation and applications. Topics include materials selection for machine design components in micro and nano-scales, biomaterials, nano-composites, and optimized materials for nano-sensors & actuator systems.

ME-443. ADDITIVE MANUFACTURING
Credits: 3

An introduction to additive manufacturing, also known as 3-D printing, which is a process of building 3-D objects from a digital file. Emphasis will be placed on both existing and emerging additive manufacturing processes in the context of design, modeling, materials, processing, and applications. This course provides hands-on experience and implements active learning strategies.
Click here for course fees.

ME-447. THIN FILM MANUFACTURING
Credits: 3

This course explores the principles of micro-devices manufacturing by thin film deposition processing methods. Vacuum deposition technologies such as physical vapor deposition and the electron beam evaporation process will be covered for conductors, resistors, and dielectric thin film depositions. Sol-Gel chemical thin film processing of oxides and piezoelectric materials along with direct circuit manufacturing by photo seeding and electro-less copper deposition will be covered.
Click here for course fees.

Pre-Requisites

Instructor permission.

ME-451. MECHATRONICS
Credits: 3

This course is a multidiscipline technical area defined as the synergistic integration of mechanical engineering with electronic and intelligent computer control in the design and manufacture of industrial products and processes. This course covers topics such as actuators and drive systems, sensors, programmable controllers, microcontroller programming and interfacing, and automation systems integration.

ME-452. NANO-TECHNOLOGY
Credits: 3

This course explores the fundamentals of Nanotechnology and its applications for colloidal suspension, Electrophoretic deposition and nano sensing by understanding materials properties, micro-machining, sensor and actuator principles. Two hours lecture and three hours lab per week.

ME-454. CONTROL SYSTEMS
Credits: 3

Laplace transforms and matrices. Mathematical modeling of physical systems. Block diagram and signal flow graph representation. Time-domain performance specifications. Stability analysis; Routh-Hurwitz criterion. Steady state error analysis. Root-locus and frequency response techniques. Design and compensation of feedback systems. Introductory State space analysis.

ME-480. ADVANCED CADD
Credits: 3

An advanced course in Computer-Aided Drafting and Design (CADD) using SolidWorks. This course will introduce topics such as advanced modeling, advanced assemblies, Finite Element Analysis (FEA), sheet metal, and modal analysis.
Click here for course fee.

Pre-Requisites

ME-180 or instructor permission.

ME-498. ADVANCED TOPICS IN MECHANICAL ENGINEERING
Credits: 1-3

This course includes selected topics in the field of mechanical engineering. These may include one or more of the following: control systems, automation, robotics, manufacturing systems, solid mechanics, energy systems, fluid flow, acoustics, computer systems, bio-mechanics.
Click here for course fees.

ME-501. GRADUATE EDUCATION CONTINUUM
Credits: 1-9

Recorded with grade for one credit-hour. Occurs as a continuum bases till successful completion of thesis or project.

ME-599. THESIS/PROJECT
Credits: 3-6

Students have the option of selecting up to six credits- hours of thesis or three credit hour of project under guidance of a thesis/project advisor. The thesis will have a committee of three members; at least two members (including the adviser) must be Wilkes faculty members. The thesis/project should be presented in an open forum.