Department of Mechanical, Environmental, and Civil Engineering

Master of Science in Mechanical Engineering Description

The Master of Science in Mechanical Engineering program is an industry-focused, practice-oriented degree that will deepen mechanical engineering skills in design, manufacturing, controls, robotics, energy, sustainability, and much more. What sets our program apart is its strong emphasis on integrating applied mechanics, computer simulations, design, and energy science and technology. The graduate program provides a strengthened technical background for mechanical engineering and other multidisciplinary problems that we intend to us as a thread in the curriculum.

Admission to the master's mechanical engineering program requires a bachelor's degree in mechanical engineering or related field of study from an accredited institution. Students not meeting this requirement will be considered for admission on an individual basis and may be admitted subject to the completion of appropriate undergraduate courses to remove any deficiencies in preparation.

Students must maintain a GPA of 3.0 or better, and make grades of C or better in all courses on the degree plan. Grades for courses completed at other institutions, or at Tarleton before the start of the master's degree, are not included in the degree plan GPA, but they are still subject to the requirement of C or better. No undergraduate courses can be counted towards the master's degree (Tarleton rule). A maximum of 12 graduate credit hours may be transferred.

Master of Science in Mechanical Engineering

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Required Courses		
Required Courses		
MEEN 5310	Advanced Solid Mechanics	3
MEEN 5320	Optimization of Engineering Systems	3
MEEN 5330	Mechanics of Viscous Flow	3
MEEN 5333	Advanced Engineering Thermodynamics	3
MEEN 5332	Advanced heat transfer	3
MEEN 5360	Introduction to Robotics	3
Choose one from the following:		3
MATH 5305	Statistical Models	
MATH 5306	Dynamical Systems	
MATH 5330	Mathematical Modeling	
MATH 5360	Numerical Analysis	
MEEN 5390	Advanced Engineering Mathematics	
Any other approved 5000 level course in MATH		
Total hours		21

Additional Required Courses for Concentrations

Thesis

Choose one from the following:		3
MEEN 5311	Finite Element Analysis: Theory and Practice	
MEEN 5331	Computational Methods for Fluid Mechanics and Heat Transfer	
Choose one from the following:		3
MEEN 5321	Lean Six Sigma	
MEEN 5340	Advanced Energy Systems	
MEEN 5088	Master's Thesis	6
Total Hours		12

Professional (non-thesis)

MEEN 5311	Finite Element Analysis: Theory and Practice	3
MEEN 5321	Lean Six Sigma	3
MEEN 5331	Computational Methods for Fluid Mechanics and Heat Transfer	3
MEEN 5340	Advanced Energy Systems	3
Total Hours		12

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Admission to the MEEN-MS program requires a Bachelor’s degree in mechanical engineering from an accredited institution, with a GPA of 3.0 or better. Students not meeting this requirement will be considered for admission on an individual basis and may be admitted subject to the completion of appropriate undergraduate courses to remove any deficiencies in preparation.

2

After receiving admission to graduate studies, the student choosing thesis option will consult with the **graduate program coordinator** concerning appointment of the chair of their **advisory committee**. The chair, in consultation with the student, will select the remainder of the committee, which will consist of no fewer than three members of the graduate faculty. The chair of the committee must be from the ENCS department, and at least one member must have an appointment to a department other than ENCS. The duties of the graduate program coordinator include responsibility for the proposed degree plan, the research proposal, the thesis and the final examination. In addition, the graduate program coordinator is responsible for advising the student on all academic matters, and, in the case of academic deficiency, initiating recommendations to the Office of Graduate Studies.

3

The student’s **graduate program coordinator**, in consultation with the student, will develop the **degree plan**, which must specify the thesis or non-thesis option. The degree plan may include additional coursework, if it is deemed necessary by the graduate faculty in order to address **deficiencies**. The degree plan must be completed and filed in accordance with Tarleton office of graduate studies requirements.

4

For the thesis option, the student must prepare a thesis proposal for approval by the advisory committee and the head of the ENCS department. The **Thesis Manual**, which contains details regarding the preparation and submission of a thesis for approval, is available on the Graduate College website. Students who plan to pursue a thesis should obtain a copy of this manual early in their graduate program. A thesis proposal must be submitted to the Graduate Office at least one semester prior to a thesis submission. Preparation and submission of thesis must be in accordance with Tarleton office of graduate studies requirements.

5

Courses used toward any degree at Tarleton or another institution may not be applied for graduate credit. If the course to be transferred was taken prior to the conferral of a degree at another institution, a letter from the registrar at that institution, stating that the course was not applied for credit toward the degree, must be submitted to the Office of Graduate Studies. A maximum of **12 credit hours** may be transferred.

Civil & Environmental Engineering Courses

Civil Engineering Courses

CVEN 22325. DO NOT USE. 3 Credit Hours (Lecture: 3 Hours, Lab: 2 Hours).

Engineering Courses

Environmental Engineering Courses

ENVE 5088. Master's Thesis. 1-6 Credit Hours (Lecture: 0 Hours, Lab: 0 Hours).
Required each semester in which a student is working and receiving direction on a master's thesis in ENVE-MS. Minimum two semesters (6 hours) required for master's thesis option. Prerequisites: graduate standing.

ENVE 5302. Atmospheric Systems and Air Pollution Control. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Study of atmospheric impact on air pollution. Study of sources of air pollution and their control to include gases and particulate matter. Study of air pollution regulations and air pollution modeling. Design of systems to control and abate air pollution. Study and design of sampling systems to monitor air pollution. Prerequisite: CHEM 1409; ENGR 2322;.

ENVE 5310. Water Resources Engineering. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Fundamentals of hydraulics applicable to open channel flow, natural streams and waterways; irrigation flow characteristics; hydrologic analysis; fluid measurement methods; introduction to hydraulic models including HEC-RAS; and economic aspects of water resources. Prerequisite: ENVE 3300 or consent of instructor.

ENVE 5319. Physical Operations in Water and Wastewater Treatment. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Physical operations in water and wastewater treatment are covered in this course. These include the design of lift stations and gravity sewers, screens, sedimentation tanks, clarifiers and holding basins. Prerequisite: ENVE 3000.

ENVE 5320. Chemical and Biological Processes in Water and Wastewater Treatment. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course covers processes associated with water and wastewater treatment that are mediated chemically or using biological means as well as the design of systems that use such mechanisms. Design of secondary treatment systems, removal of nutrients and design of tertiary treatment systems are covered. Prerequisite: CHEM 2323 (coreq); ENVE 3350 (coreq);.

ENVE 5322. Surface Water Hydrology. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Advanced study of the hydrologic cycle, including rainfall-runoff mechanisms, hydrographs, reservoir and channel routing and the application of modeling software in watershed analysis. Prerequisite: ENVE 3300 or consent of instructor.

ENVE 5323. Ground Water Hydrology. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Groundwater flow, well hydraulics, the exploration and management of groundwater resources, modelling of subsurface flow with software and the design of well fields. Prerequisite: ENVE 3300 or consent of instructor.

ENVE 5324. Surface water quality modeling. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Coverage of fate and transport of contaminants in surface water. The course includes modelling of occurrence and transport of dissolved oxygen, chemicals and other substances in surface water as well as the interphase movement of chemicals between water and sediments. Prerequisite: ENVE 3300 or consent of instructor.

ENVE 5325. Environmental Monitoring and Measurements. 3 Credit Hours (Lecture: 1 Hour, Lab: 3 Hours).
Studying and analyzing environmental engineering processes and systems through appropriate experimental methods. The course will include sampling, protocol development and design of experiments, relevant measurement techniques and experimental methods. Emphasis on quality control, calibration, documentation and interpretation of results facilitating the development of best practice approaches for experimental design and analysis. Prerequisite: ENVE 3350 (coreq); ENVE 4320 (coreq) Lab fee: $2.

ENVE 5350. Solid and Hazardous Waste Management. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course is designed to provide students with the necessary background and knowledge pertaining to the engineering design of solid and hazardous waste management and disposal. Topics covered include landfill design, resource conservation recovery and reuse, hazardous waste management.

ENVE 5351. Environmental Biology and Bioremediation. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course presents information on the role of microorganisms in the design of treatment processes and explores the factors affecting biologically-mediated treatment of wastes in the surface and subsurface environments.

ENVE 5352. Green Engineering. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course covers the design and use of non-traditional, greener alternatives in the treatment of wastes in various environmental media as well as the theoretical, practical and regulatory implications of such design.

ENVE 5353. Environmental Case Studies. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Through case studies rooted in environmental issues, this course offers a cross-disciplinary introduction to environmental studies. Environmental inquiry on political ecology, earth science, energy, economics, eco-literature, public health, ecological design, sustainability, policy, and environmental justice. Basic concepts —such as thermodynamics, biodiversity, cost-benefit analysis, contamination, governance, the Anthropocene, and the commons—are variously defined and employed within specific explorations of environmental challenges in the modern world.

ENVE 5357. Environmental Bioprocess Technology. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
This course will cover principles of microbiological, biochemical, and biophysical processes used in environmental waste treatment and remediation processes. Enzyme kinetics, fermentation and other engineering applications with particular emphasis on water quality control processes.

Mechanical Engineering Courses

MEEN 5088. Master's Thesis. 1-6 Credit Hours (Lecture: 0 Hours, Lab: 0 Hours).
Required each semester in which a student is working and receiving direction on a master's thesis in MEEN-MS. Minimum two semesters (6 hours) required for master's thesis option. Prerequisites: Graduate standing.

MEEN 5310. Advanced Solid Mechanics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Application of continuum mechanics to study the response of materials to different loading conditions; general principles common to all media such as conservation of mass, balance of linear momentum, conservation of momentum and energy; constitutive equations defining idealized materials for structural elements, mechanical energy considering stress and strain.

MEEN 5311. Finite Element Analysis: Theory and Practice. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Line, plane, solid, plate, and shell elements-theory; practical aspects of modeling; applications in mechanical engineering; final project.

MEEN 5320. Optimization of Engineering Systems. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Applications of optimization techniques to engineering design problems from a variety of fields, including aerospace, automotive, chemical, electrical, construction, and manufacturing; the focus is on using optimization techniques in a comprehensive manner, to enhance the creative process of conceptual and detailed design of engineering systems.

MEEN 5321. Lean Six Sigma. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
A close examination of Lean Six Sigma tools and methodology, and its relationship to the engineering design, optimization, and validation processes for product development. Students will learn about translation of requirements, Taguchi's robust design solutions, and failure mode-effect analysis for design and processes.

MEEN 5330. Mechanics of Viscous Flow. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
The mechanics of Newtonian viscous fluids. The use of modern analytical techniques to obtain solutions for flows with small and large Reynolds numbers, particularly in the areas of boundary layer theory, laminar flows, and turbulent flows.

MEEN 5331. Computational Methods for Fluid Mechanics and Heat Transfer. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Numerical methods for solving Navier-Stokes equations in complex geometries, including theory, implementation, and applications.

MEEN 5332. Advanced heat transfer. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
General problems of heat transfer by conduction, convection, and radiation; solution by the analog and numerical methods, thermal boundary layers, analysis of heat exchanges; problems on thermal radiation.

MEEN 5333. Advanced Engineering Thermodynamics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Concepts and laws of thermodynamics, including energy, entropy, and energy analysis, property relations, equilibrium conditions, and evaluation of properties; advanced special topics such as kinetic theory, statistical thermodynamics, radiation, and photovoltaic energy conversion .

MEEN 5340. Advanced Energy Systems. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Advanced energy conversion technologies that are currently on the market or under development; tools used by professionals to design energy systems and to evaluate their performance; related concepts from thermodynamics, heat transfer, fluid mechanics, geophysics, and chemistry.

MEEN 5360. Introduction to Robotics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
An introduction to robotics through computational methods commonly used in this field; fundamentals of kinematics, dynamics, and control of robot manipulators, robotic vision, and sensing; mechanisms, actuators, sensors, controllers, and processors for engineering of mechanical manipulation; advanced concepts from mechanics, control theory, optimization, probabilistic inference, simulation, kinematics, and computer science.

MEEN 5390. Advanced Engineering Mathematics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).
Mathematical analysis techniques for the solution of engineering analysis problems and for the simulation of engineering systems; both continuous and discrete methods are covered; initial and boundary value problems for ordinary and partial differential equations.

School of Engineering Courses