

# MS in Mechanical Engineering

Courses of study leading to the MS degree are available with specialization in three of the departmental faculty research areas. Details of the MS program can be found under the College of Engineering (<http://catalog.wichita.edu/graduate/engineering/>) heading. Additional information can be obtained at the mechanical engineering webpage (<http://wichita.edu/mechanical/>)<sup>1</sup>.

<sup>1</sup> Link opens new window.

## General Admission Requirements

In addition to the requirements outlined by the Graduate School, the MSME program requires its applicants to:

1. Have a calculus-based engineering degree (having completed differential equations and physics courses with lab) with a cumulative GPA equivalent of 3.000 on a 4.000 scale, based on the undergraduate study;
2. Applicants in other majors such as math, physics or chemistry may be considered for conditional admission if they have completed calculus, including differential equations, and physics courses with lab; Undergraduate courses will be listed to correct deficiencies which will prepare them for graduate courses in mechanical engineering;
3. Department recommends the submission of GRE scores;
4. Applicants whose native language is not English must submit official, acceptable scores for either the TOEFL, or the Academic Module of the IELTS examination, or the PTE-Academic. Please visit the Graduate School website (<http://wichita.edu/gradschool/>)<sup>1</sup> to check English proficiency requirements;
5. Submit a statement of interest and two academic reference letters corroborating the applicant's undergraduate background; and
6. Depending upon the chosen concentration area, students may have to complete prerequisite coursework, as explained below.

**Traditional MSME:** Applicants must have a broad background in energy systems, including courses in thermodynamics, fluid mechanics and heat transfer; in advanced materials, including courses in materials science and engineering with laboratory experience; and in mechanical systems, including courses in statics, dynamics and design of machine elements;

**Energy and Environment Concentration:** Applicants must have a broad background in energy systems, including courses in thermodynamics, fluid mechanics and heat transfer.

**Advanced Materials Concentration:** Applicants must have a broad background in advanced materials, including courses in materials science and engineering with laboratory experience.

**Design Concentration:** Applicants must have a broad background in mechanical systems, including courses in statics, dynamics and design of machine elements.

Applicants who do not meet the listed requirements for their chosen concentration should meet with their advisor or graduate coordinator, so that they may recommend a list of undergraduate courses that will correct any deficiencies and prepare them for the chosen concentration. Prerequisite courses must be completed by the time the plan of study is to be filed.

<sup>1</sup> Link opens new window.

## General Guidelines Toward the MSME Degree

- Students must select one of the following options for completion of all MSME programs (traditional or any concentration): 1) all coursework, 2) directed project or 3) thesis.
- A plan of study (indicating whether the student is selecting the traditional MSME degree option or the MSME with concentration option) should be submitted during the first semester of enrollment and at least 60 percent of the credit hours in a plan of study must be 700 or higher level WSU courses.
- The professional and scholarly integrity training requirement must be completed, preferably during the first semester of the program.
- For a list of current courses, please visit the ME website (<http://wichita.edu/mechanical/>)<sup>1</sup>.

<sup>1</sup> Link opens new window.

## Degree Options

Course	Title	Hours
<b>Thesis Option</b>		
Select a minimum of 24 credit hours of coursework		24
Select a minimum of 6 credit hours of thesis		6
<b>Total Credit Hours</b>		<b>30</b>

Course	Title	Hours
<b>Directed Project Option</b>		
Select a minimum of 30 credit hours of coursework		30
Select 3 credit hours of directed project		3
<b>Total Credit Hours</b>		<b>33</b>

Course	Title	Hours
<b>All Coursework Option <sup>2</sup></b>		
Select a minimum of 33 credit hours of coursework, and completion of a terminal activity <sup>3</sup>		33
<b>Total Credit Hours</b>		<b>33</b>

<sup>2</sup> At least one of the courses should have an "applied learning" component as required by WSU. Qualified courses are ME 731 Advanced Heat Exchanger Design, ME 737 Robotics and Control, and ME 872 Graduate Capstone Design.

<sup>3</sup> Details of the 33-credit-hour all coursework option: terminal activity for the all coursework option can be satisfied by passing a comprehensive exam administered by the ME department.

## Coursework Requirements

Students may select the traditional MSME degree option (with no specific concentration) or select the MSME degree option with any one of the three concentrations (energy and environment, advanced materials, and design).

### MSME (Traditional/No Concentration)

	Thesis Option	Project Option	All Course Option
Core Courses <sup>4</sup>	6	6	6
ME Courses	12	15	18

Technical electives <sup>5</sup>	6	9	9
<b>Total</b>	<b>24</b>	<b>30</b>	<b>33</b>

**MSME (with Concentration)**

	<b>Thesis Option</b>	<b>Project Option</b>	<b>All Course Option</b>
Core Courses <sup>4</sup>	6	6	6
Concentration Courses	9	12	15
Technical Electives <sup>5</sup>	9	12	12
<b>Total</b>	<b>24</b>	<b>30</b>	<b>33</b>

<sup>4</sup> Details of the core courses are given under general course requirements below.

<sup>5</sup> Any ME course (NOT selected in the core or under ME courses) or outside department course, 600 level or above, approved by the major professor/advisor.

**Core Courses (6 credit hours)**

Core courses are those courses that are required by all MSME students for a successful completion of their degree program.

<b>Course</b>	<b>Title</b>	<b>Hours</b>
ME 730	Modeling of Engineering Systems	3
ME 749	Applications of Finite Element Methods in Mechanical Engineering	3
ME 777	Mechanical Engineering Seminar	0

*Note:* If the student has already taken ME 730 and/or ME 749 in their undergraduate curriculum at Wichita State University, they need to replace these core courses with the following courses, decided by their advisor/graduate coordinator. For ME 730, students must take *one of the following courses:* AE 527 Numerical Methods in Engineering, IME 724 Statistical Methods for Engineers, MATH 757 Partial Differential Equations for Engineers, MATH 758 Complex and Vector Analysis for Engineers, MATH 857 Selected Topics in Engineering Mathematics, MATH 858 Selected Topics in Engineering Mathematics II, and STAT 763 Applied Regression Analysis. For ME 749, students must take *one of the following courses:* ME 782 Engineering Applications of Computational Fluid Dynamics and Heat Transfer, ME 859 Introduction to Molecular Simulations, ME 870 Advanced Laser Applications in Manufacturing/ ME 870L Advanced Laser Applications in Manufacturing Lab, AE 719 Introduction to Computational Fluid Dynamics, AE 722 Finite Element Analysis of Structures I, AE 822 Finite Element Analysis of Structures II, BME 735 Biocomputational Modeling, or IME 758 Analysis of Manufacturing Processes. Similar courses from other universities will not be considered for replacement, instead of the core courses. ME 777 Mechanical Engineering Seminar must be taken two times during the program term.

**ME Courses (variable credit hours)**

Any graduate level mechanical engineering course that is not listed as a core course could be considered as an ME course. An ME graduate level course selected by the student toward the ME course option for the MSME (traditional) degree can't be counted toward the technical electives category. A maximum of 3 credit hours from courses titled

Independent Study, ME 890 or ME 990, will be allowed towards the master's degree.

**Technical Electives (variable credit hours)**

Technical elective courses are *student-specific* courses that are 600 level or above (either within or outside of the ME department), and help students toward their research and/or enhance their quality of education. These are decided by consulting with the student's major professor or advisor.

	<b>Thesis Option</b>	<b>Project Option</b>	<b>All Course Option</b>
Traditional Option	6	9	9
Concentration Option	9	12	12

*Note:* Not more than 6 credit hours should be taken outside the ME department for the thesis option, and not more than 9 credit hours for the project/all course option.

**Concentration Courses (variable credit hours)**

Concentration courses are those courses that are specifically tailored in terms of course objectives toward a particular concentration/area. These courses are required for successful completion of an MSME degree with a specific concentration. A concentration course selected by the student toward the concentration courses option for the MSME (concentration) degree can't be counted toward the technical electives category. Courses that could be selected toward the concentration courses option for the MSME (with concentration) degree are given under specific concentration categories.

**Program Requirements****Core Courses**

Core courses are those courses that are required by all MSME students for a successful completion of their degree.

<b>Course</b>	<b>Title</b>	<b>Hours</b>
<b>Core Courses (6 credit hours)<sup>6</sup></b>		
ME 730	Modeling of Engineering Systems	3
ME 749	Applications of Finite Element Methods in Mechanical Engineering	3
ME 777	Mechanical Engineering Seminar	0
<b>Total Credit Hours</b>		<b>6</b>

**ME Course Requirement – Traditional Program with no Concentration**

Any graduate level mechanical engineering course that is not listed as a core course could be considered as an ME course. An ME graduate level course selected by the student toward the ME Course option for the MSME — Traditional degree program can't be counted toward the technical electives category.

<b>Course</b>	<b>Title</b>	<b>Hours</b>
<b>ME Course Requirements for Traditional Program Options</b>		
Thesis Option	Select 12 credit hours of ME courses	12
Project Option	Select 15 credit hours of ME courses	15

All Course Option	Select 18 credit hours of ME courses	18
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### Concentration Courses

Concentration courses are those courses that are specifically tailored in terms of course objectives toward a particular concentration/area. These courses are required for a successful completion of an MSME degree with a specific concentration.

#### MSME—Advanced Materials Concentration

Course	Title	Hours
<b>Advanced Materials Concentration Courses</b> <sup>7</sup>		
Select at least 9 credit hours for the thesis option. Select 12 credit hours for the project option. Select 15 credit hours for the all course option.		
ME 651	Biomaterials	3
ME 660	Polymer Materials and Engineering	3
ME 665	Selection of Materials for Design and Manufacturing	3
ME 667	Mechanical Properties of Materials	3
ME 670	Introduction to Nanotechnology	3
ME 672	Manufacturing of Composites	3
ME 673	Recovery of Engineering Materials	3
ME 728	Advanced Electronic Materials	3
ME 752	Failure Analysis Methods and Tools	3
ME 753	Advanced Materials for Energy Systems	3
ME 760	Fracture Mechanics	3
ME 762	Polymeric Composite Materials	3
ME 844	Advanced Biomaterials	3
ME 862	Synthesis and Applications of Nanomaterials	3
ME 865	Corrosion Science Engineering	3
ME 870	Advanced Laser Applications in Manufacturing	3
ME 870L	Advanced Laser Applications in Manufacturing Lab	0

#### MSME—Design Concentration

Course	Title	Hours
<b>Design Concentration Courses</b> <sup>7</sup>		
Select at least 9 credit hours for the thesis option. Select 12 credit hours for the project option. Select 15 credit hours for the all course option.		
ME 637	Computer-Aided Engineering	3
ME 709	Injury Biomechanics	3
ME 725	Mechanical Vibrations and Acoustics	3
ME 729	Computer-Aided Analysis of Mechanical Systems	3
ME 737	Robotics and Control	3
ME 739	Advanced Machine Design	3
ME 747	Microcomputer-Based Mechanical Systems	3
ME 758	Nonlinear Controls of Electro-Mechanical Systems	3

ME 760	Fracture Mechanics	3
ME 829	Advanced Computer-Aided Analysis of Mechanical Systems	3
ME 870	Advanced Laser Applications in Manufacturing	3
ME 870L	Advanced Laser Applications in Manufacturing Lab	0

#### MSME—Energy and Environment Concentration

Course	Title	Hours
<b>Energy and Environment Concentration</b> <sup>7</sup>		
Select at least 9 credit hours for the thesis option. Select 12 credit hours for the project option. Select 15 credit hours for the all course option.		
ME 602	Engineering for the Environment	3
ME 644	Design of HVAC Systems	3
ME 702	Energy and Sustainability	3
ME 782	Engineering Applications of Computational Fluid Dynamics and Heat Transfer	3
ME 719	Basic Combustion Theory	3
ME 731	Advanced Heat Exchanger Design	3
ME 745	Design of Thermal Systems	3
ME 753	Advanced Materials for Energy Systems	3
ME 801	Boundary Layer Theory	3
ME 802	Turbulence	3
ME 854	Two-Phase Flow Heat Transfer	3
ME 859	Introduction to Molecular Simulations	3

#### Technical Electives

Technical elective courses are *student-specific* courses that are 600 level or above (either within or outside of the ME department), and help students toward their research and/or enhance their quality of education. These are decided by consulting with the student's major professor or advisor.

Course	Title	Hours
<b>Technical Electives</b> <sup>8</sup>		
<i>Traditional Programs</i>		
Thesis Option: select 6 credit hours of technical electives		6
Project Option: select 9 credit hours of technical electives		9
All Course Option: select 9 credit hours of technical electives		9
<i>Concentration Programs (all concentrations)</i>		
Thesis Option: select 9 credit hours of technical electives		9
Project Option: select 12 credit hours of technical electives		12
All Course Option: select 12 credit hours of technical electives		12

<sup>6</sup> If the student has already taken ME 749 and/or ME 730 in their undergraduate curriculum at Wichita State University, they need to replace these core courses with the following courses, decided by their advisor/graduate coordinator. For ME 730, students must take *one of the following courses*: AE 527 Numerical Methods in Engineering, IME 724 Statistical Methods for Engineers, MATH 757 Partial Differential Equations for Engineers, MATH 758 Complex and Vector Analysis for Engineers, MATH 857 Selected Topics in Engineering Mathematics, MATH 858 Selected Topics in Engineering Mathematics II, or STAT 763 Applied Regression Analysis. For ME 749, students must take *one of the following courses*: ME 782 Engineering Applications of Computational Fluid Dynamics and Heat Transfer, ME 859 Introduction to

Molecular Simulations, ME 870 Advanced Laser Applications in Manufacturing/ ME 870L Advanced Laser Applications in Manufacturing Lab, AE 719 Introduction to Computational Fluid Dynamics, AE 722 Finite Element Analysis of Structures I, AE 822 Finite Element Analysis of Structures II, BME 735 Biocomputational Modeling, or IME 758 Analysis of Manufacturing Processes. Similar courses from other universities will not be considered for replacement, instead of the core courses. ME 777 Mechanical Engineering Seminar must be taken two times during the program term.

<sup>7</sup> Courses that are not from the list of core courses.

<sup>8</sup> Not more than 6 credit hours should be taken outside the ME department for the thesis option, and not more than 9 credit hours for the project/all course option. A maximum of 3 credit hours from courses titled Independent Study, ME 890 or ME 990, will be allowed towards the master's degree.

### **Applied Learning**

Students in the MSME program are required to complete an applied learning or research experience to graduate from the program. The requirement can be met by:

1. Completing at least 6 credit hours of Thesis (ME 876), or
2. Completing 3 credit hours of Master's Directed Project (ME 878),  
or
3. Completing at least one of the following courses — which have significant interactions with industry and/or applied and experiential learning components: ME 731, ME 737 or ME 872, or
4. Completing 1 credit hour of cooperative education, or a 0 credit hour cooperative education.