

# MECHANICAL ENGINEERING (ENGINEERING)

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| <b>Graduate Program Head</b> | Mary Frecker   |
| <b>Program Code</b>          | ME   |
| <b>Campus(es)</b>            | University Park (Ph.D., M.S.)<br>World Campus (M.S.)   |
| <b>Degrees Conferred</b>     | Doctor of Philosophy (Ph.D.)<br>Master of Science (M.S.)   |
| <b>The Graduate Faculty</b>  | View ( <a href="https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=ME">https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=ME</a> ) |

Graduate programs and research facilities are available in combustion, heat transfer, fluid mechanics, energy storage, dynamic system analysis, robotics, mechanical design, energy systems, biomedical applications, and micro-nano applications. Air pollution control, automotive safety, tribology, designing for noise control and for reliability also provide many research and design opportunities.

## Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (<https://gradschool.psu.edu/graduate-admissions/how-to-apply/>). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions Policies (<https://gradschool.psu.edu/graduate-education-policies/>).

To maintain a high quality program, it is important that our students are also of a caliber to succeed. As such, the admission requirements for the students enrolling in the online program will not differ from those of our resident students. Online students will only be accepted into the program with approval from the Department's Admissions Committee. Within the Department, the ME Admissions Committee (made up of ME Graduate Faculty) will provide recommendations to the Professor-in-Charge of Graduate Studies on accepting students to the MSME degree program. It is expected that students have a Bachelor of Science degree in a suitable engineering field from a U.S. regionally accredited institution or from an officially recognized degree-granting international institution. Admission decisions will also be based upon relevant work experience and recommendation letters. GRE scores will not be accepted.

The language of instruction at Penn State is English. English proficiency test scores (TOEFL/IELTS) may be required for international applicants. See GCAC-305 Admission Requirements for International Students (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/gcac-305-admission-requirements-international-students/>) for more information.

## Degree Requirements

### Master of science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

The M.S. degree program is designed for students to gain advanced knowledge for research, analysis, and design in mechanical engineering.

Resident students pursuing an M.S. degree may choose one of two options: completion of 24 course credits and the submission of a thesis (6 credits) to the Graduate School, or 30 course credits and the

submission of a scholarly paper to the department. The M.S. degree program is also offered on-line in which only the 30 course credits and the submission of a scholarly paper is permitted. The requirements for the M.S. M E degree program are:

1. Minimum of 30 course credits at the 400 level or higher, of which 20 course credits must be earned at Penn State. Note that 2 additional credits are required by enrolling in the ME 590 Colloquium but these 2 additional credits do not count toward the 30 course credits. The required course credits must be completed with a grade point average of 3.00 or higher.
2. All students must successfully complete two credits of ME 590 Colloquium preferably in their first two semesters in the program. These two colloquium credits do not count toward the 30 course credits in Requirement 1 above.
3. At least 18 credits in 500- and 600-level courses.
4. A minimum of 12 credits in 400- and 500-level courses in Mechanical Engineering, excluding ME 410, ME 440W, ME 441W, ME 442W, ME 443W, ME 450, and any other required undergraduate courses. ME 596 cannot be used to fulfill this requirement.
5. The MSME requires three credits of mathematics. These credits must be taken from the following group of courses:

| Code   | Title                                       | Credits |
|--|---|---------|
| EMCH 524A  | Mathematical Methods in Engineering         | 3       |
| EMCH 524B  | Mathematical Methods in Engineering         | 3       |
| ME 512   | Heat Transfer–Conduction                    | 3       |
| ME 550   | Foundations of Engineering Systems Analysis | 3       |
| 400- and 500-level MATH courses (MATH 4XX, MATH 5XX) except the following: |   |         |
| MATH 419   | Theoretical Mechanics                       |         |
| MATH 427   | Foundations of Geometry                     |         |
| MATH 428   | Geometry for Teachers                       |         |
| MATH 435   | Basic Abstract Algebra                      |         |
| MATH 451   | Numerical Computations                      |         |
| MATH 455   | Introduction to Numerical Analysis I        |         |
| MATH 456   | Introduction to Numerical Analysis II       |         |
| MATH 461   |   |         |
| MATH 470   | Algebra for Teachers                        |         |
| MATH 471   | Geometry for Teachers                       |         |
| MATH 475Y  | History of Mathematics                      |         |
| MATH 482   | Mathematical Methods of Operations Research |         |
| MATH 484   | Linear Programs and Related Problems        |         |

Courses with specific focus on numerical analysis will not count toward the mathematics requirement.

6. A thesis or paper must be presented to meet the specific requirement of the culminating experience type selected; the paper may take the form of a doctoral research proposal if agreed upon in advance by the student and the graduate adviser. Online students seeking an MSME degree will only be permitted to write a paper.
7. Preparatory course(s) required for teaching assistants (such as ENGR 888), remedial courses, and any courses required in our undergraduate program are not counted toward degree requirements.

### CULMINATING EXPERIENCE OPTION A - M.S. THESIS

Candidate registers for a minimum of six credits of ME 600 or ME 610 and submits a thesis following the procedures specified by the Graduate

School. This program will consist of at least 24 course credits of which 18 credits must be at the 500 level (not including ME 596), and six thesis credits. At least 12 credits must be 400- or 500-level Mechanical Engineering courses.

### CULMINATING EXPERIENCE OPTION B - M.S. PAPER

Candidate registers for 30 course credits of which 18 credits must be at the 500 level. A maximum of three credits of ME 596 can be counted in the total of 30 credits. At least 12 credits must be 400- or 500-level Mechanical Engineering courses. Candidates write a paper on a topic mutually agreed upon by the adviser suitable for publication in a professional journal or presentation at a national or international conference.

### Doctor of Philosophy (Ph.D.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

The Ph.D. program emphasizes scholarly research and helps students prepare for research and related careers in industry, government, and academe. Students must pass written and oral qualifying examinations. The Ph.D. program is quite flexible, with minimal formal requirements. The Ph.D. is awarded upon completion of a program of advanced study that includes a minimum period of residence, a satisfactory dissertation, and the passing of comprehensive and final oral examinations as determined by the student's Ph.D. committee.

Generally, a Ph.D. student must have 30 credits above a master's degree before taking the comprehensive examination.

### Minor

A graduate minor is available in any approved graduate major or dual-title program. The default requirements for a graduate minor are stated in Graduate Council policies listed under GCAC-600 Research Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>) and GCAC-700 Professional Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>), depending on the type of degree the student is pursuing:

- GCAC-611 Minor - Research Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-611-minor-research-doctorate/>)
- GCAC-641 Minor - Research Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-641-minor-research-masters/>)
- GCAC-709 Minor - Professional Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-709-professional-doctoral-minor/>)
- GCAC-741 Minor - Professional Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-741-masters-minor-professional/>)

### Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (<https://gradschool.psu.edu/graduate-funding/>) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (<https://gradschool.psu.edu/graduate-education-policies/>)

gsad/gsad-900/gsad-901-graduate-assistants/) set by The Graduate School.

Graduate students are supported by a variety of government and industry fellowships, traineeships, and research and teaching assistantships. Stipends vary depending on the source. Competition for support is extremely keen; however, outstanding students are considered for attractive offers of support, including various fellowships specifically for new students in the College of Engineering. By completing the department's application for financial assistance, you will automatically be considered for a graduate assistantship. To receive full consideration for financial aid, all application materials should be submitted by December 15.

World Campus students in graduate degree programs may be eligible for financial aid. Refer to the Tuition and Financial Aid section (<https://www.worldcampus.psu.edu/tuition-and-financial-aid/>) of the World Campus website for more information.

### Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Mechanical Engineering (ME) Course List (<https://bulletins.psu.edu/university-course-descriptions/graduate/me/>)

### Contact

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| <b>Campus</b>  | University Park  |
| <b>Graduate Program Head</b>   | Mary I Frecker   |
| <b>Director of Graduate Studies (DGS) or Professor-in-Charge (PIC)</b> | Robert Francis Kunz  |
| <b>Program Contact</b>   | Megan B. Peters<br>127 Reber Building<br>University Park PA 16802<br>mbp5460@psu.edu<br>(814) 865-1345   |
| <b>Program Website</b>   | View ( <a href="http://www.me.psu.edu/">http://www.me.psu.edu/</a> )   |
| <b>Campus</b>  | World Campus   |
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| <b>Program Website</b>   | View ( <a href="http://www.worldcampus.psu.edu/degrees-and-certificates/mechanical-engineering-masters/overview/">http://www.worldcampus.psu.edu/degrees-and-certificates/mechanical-engineering-masters/overview/</a> ) |