

MECHANICAL ENGINEERING (PH.D.)

Admission Requirements

Applicants must apply online (<https://wayne.edu/apply/#graduate>) for admission to the Ph.D. program. Along with the application, the applicant must upload an official transcript from every college and/or university attended. All students who have earned degrees from a country where English is not the native language must have a minimum score of 79 on the internet-based TOEFL (iBT) or 550 from a paper-based TOEFL (pBT) or IELTS score of 6.5. Deadline dates for filing an Application for Admission are published by the Office of Graduate Admission (<http://www.gradschool.wayne.edu/>).

Doctoral applicants must present higher entrance qualifications than those required of master's degree applicants. To be admitted into the ME Ph.D. program, an applicant must satisfy all Graduate School requirements (<https://wayne.edu/admissions/graduate/admission-requirements/>). The applicant must have a grade point average (g.p.a.) of at least 3.5/4.0 in a master's degree program in mechanical engineering (M.S.M.E.) and must have completed a bachelor's degree from an ABET accredited institution in the United States or a comparable degree from an officially recognized institution outside the United States. The applicant must have adequate preparation and discernible ability to pursue graduate study in the major field he/she elects.

Applications to the Ph.D. program can also be submitted by students who have completed a bachelor's degree from an ABET accredited institution in the United States or a comparable degree from an officially recognized institution outside the United States with a g.p.a. of at least 3.6/4.0. Students with an undergraduate g.p.a. less than 3.6/4.0 must complete a master's degree in mechanical engineering prior to consideration for admission to the Ph.D. program.

Admission to the Ph.D. program is contingent upon satisfying the following requirements:

- All students must have a M.S. in Mechanical Engineering or a very similar field. Applicants without a M.S. in Mechanical Engineering are considered on a case-by-case basis.
- Submission of Graduate Record Examination (GRE) scores are optional.
- International applicants are required to submit a WES Evaluation (<https://wayne.edu/admissions/graduate/international/>) for their transcripts. Note that the official transcript evaluation must be transmitted directly from WES to the Office of Graduate Admissions.
- The admission to the Ph.D. program is contingent upon the approval of an Mechanical Engineering graduate faculty to serve as the permanent Ph.D. advisor for the applicant.

All applicants must pay the \$50 Application Fee. Note that your application will not be assessed until all necessary items are submitted via our online application.

Course Requirements

A minimum of ninety credits beyond the baccalaureate degree must be earned in the Ph.D. program. These credits are distributed in the following way:

1. Thirty credits dissertation requirements are fulfilled by successfully completing ME 9991, ME 9992, ME 9993, and ME 9994 (*Doctoral Candidate Status: Dissertation Research and Direction I, II, III, and IV*, respectively). All Ph.D. students must have achieved the status

of doctoral candidate before they will be allowed to register for dissertation credits. They are required to register for thesis or dissertation credits in 4 consecutive academic year semesters without any interruption (7.5 credits per semester). If a student has registered for all Doctoral Dissertation Research credits but has not completed dissertation requirements then he/she may register in ME 9995 - *Candidate Maintenance Status* until the requirements are completed, the time limit for degree is reached, or the student withdraws from the program.

2. A minimum of 30 credits must be earned in formal lecture credits.
3. At least 30 credits of course work beyond the Bachelor's degree must be in courses open only to graduate students (i.e., courses at 7000-level or higher).
4. At least half of all course work exclusive of dissertation credits must be earned in the Mechanical Engineering Department
5. All Ph.D. students are required to take the following core course:
 - ME 5000 – *Engineering Analysis I*
6. All Ph.D. students are required to select a minor field and complete at least 6 credit hours in courses numbered 5000 or above in the selected field.
7. A maximum of 30 credits may be earned in Special Topics courses.
8. A maximum of 8 credits may be earned in ME 7990 - *Directed Study*.
9. A maximum of 8 credits may be earned in ME 7996 - *Research*.
10. All course work must be completed in accordance with the regulations of the Graduate School and the College governing graduate scholarship and degrees.

Note:

- A grade of B or better must be earned in all ME courses.
- A grade of B- or better must be earned in all non-ME courses (Minor).
- The Graduate GPA will be calculated using all graduate courses taken at Wayne State University.

The Mechanical Engineering Department has three research thrust areas, namely the "*Noise and Vibration Control*", the "*Advanced Materials and Manufacturing*", and the "*Advanced Propulsion and Energy Systems*". In addition, many *Biomedical Engineering* courses are cross listed with ME courses and are available for ME Graduate students to take and be considered towards their degree. Graduate students must select a field of study in one of the three thrust areas of the ME Department.

Noise and Vibration Control Thrust Area

Courses offered in the **Noise and Vibration Control** Thrust area are:

Code	Title	Credits
ME 5000	Engineering Analysis I	4
ME 5115	Fundamentals of Electric-drive Vehicle Modeling	4
ME 5400	Dynamics II	4
ME 5440	Industrial Noise Control	4
ME 5460	Fundamentals in Acoustics and Noise Control	4
ME 5990	Directed Study	1-4
ME 5995	Special Topics in Mechanical Engineering I	1-4
ME 6550	Modeling and Control of Dynamic Systems	4
ME 7315	Electric-drive Vehicle Simulation and Control	4
ME 7400	Advanced Dynamics	4
ME 7440	Signal Processing Technologies and Their Applications	4
ME 7460	Advanced Acoustics and Noise Control	4
ME 7480	Nonlinear Vibration	4
ME 7550	Control of Dynamic Systems	4

ME 7590	Nonlinear Control Systems	4
ME 7990	Directed Study	1-4
ME 7995	Special Topics in Mechanical Engineering II	1-8
ME 7996	Research	1-4
ME 9990	Pre-Doctoral Candidacy Research	1-8
ME 9991	Doctoral Candidate Status I: Dissertation Research and Direction	7.5
ME 9992	Doctoral Candidate Status II: Dissertation Research and Direction	7.5
ME 9993	Doctoral Candidate Status III: Dissertation Research and Direction	7.5
ME 9994	Doctoral Candidate Status IV: Dissertation Research and Direction	7.5
ME 9995	Candidate Maintenance Status: Doctoral Dissertation Research and Direction	0

Advanced Materials and Manufacturing Thrust Area

Courses offered in the **Advanced Materials and Manufacturing** Thrust area are:

Code	Title	Credits
ME 5000	Engineering Analysis I	4
ME 5040	Finite Element Methods I	4
ME 5453	Product and Manufacturing Systems and Processes	4
ME 5580	Computer-Aided Mechanical Design	4
ME 5620	Fracture Mechanics in Engineering Design	4
ME 5720	Mechanics of Composite Materials	4
ME 5990	Directed Study	1-4
ME 5995	Special Topics in Mechanical Engineering I	1-4
ME 7020	Finite Element Methods II	4
ME 7451	Advanced Manufacturing II: Material Forming	4
ME 7680	Manufacturing Processing Mechanics	4
ME 7720	Advanced Mechanics of Composite Materials	4
ME 7820	Engineering Non-Destructive Evaluation (NDE) Methods and Industrial Applications	4
ME 7990	Directed Study	1-4
ME 7995	Special Topics in Mechanical Engineering II	1-8
ME 7996	Research	1-4
ME 8020	Crashworthiness and Occupant Protection in Transportation Systems I	4
ME 8030	Crashworthiness and Occupant Protection in Transportation Systems II	4
ME 9990	Pre-Doctoral Candidacy Research	1-8
ME 9991	Doctoral Candidate Status I: Dissertation Research and Direction	7.5
ME 9992	Doctoral Candidate Status II: Dissertation Research and Direction	7.5
ME 9993	Doctoral Candidate Status III: Dissertation Research and Direction	7.5
ME 9994	Doctoral Candidate Status IV: Dissertation Research and Direction	7.5
ME 9995	Candidate Maintenance Status: Doctoral Dissertation Research and Direction	0

Advanced Propulsion and Energy Systems Thrust Area

Courses offered in the **Advanced Propulsion and Energy Systems** Thrust area are:

Code	Title	Credits
ME 5000	Engineering Analysis I	4
ME 5110	Fundamental Fuel Cell Systems	4
ME 5215	Fundamentals of Battery Systems for Electric and Hybrid Vehicles	4
ME 5300	Intermediate Fluid Mechanics	4
ME 5800	Combustion Engines	4
ME 5810	Combustion and Emissions	4
ME 5990	Directed Study	1-4
ME 5995	Special Topics in Mechanical Engineering I	1-4
ME 7260	Heat and Mass Transfer	4
ME 7290	Advanced Combustion and Emissions I	4
ME 7310	Computational Fluid Mechanics and Heat Transfer	4
ME 7990	Directed Study	1-4
ME 7995	Special Topics in Mechanical Engineering II	1-8
ME 7996	Research	1-4
ME 8290	Advanced Combustion and Emissions II	4
ME 9990	Pre-Doctoral Candidacy Research	1-8
ME 9991	Doctoral Candidate Status I: Dissertation Research and Direction	7.5
ME 9992	Doctoral Candidate Status II: Dissertation Research and Direction	7.5
ME 9993	Doctoral Candidate Status III: Dissertation Research and Direction	7.5
ME 9994	Doctoral Candidate Status IV: Dissertation Research and Direction	7.5
ME 9995	Candidate Maintenance Status: Doctoral Dissertation Research and Direction	0

Courses Cross-listed with Biomedical Engineering

Cross-listed courses with **Biomedical Engineering** are:

Code	Title	Credits
ME 5160	Musculoskeletal Biomechanics	4
ME 5180	Introduction to Biomaterials	4
ME 6180		4
ME 7100	Mathematical Modeling in Impact Biomechanics	4
ME 7160	Impact Biomechanics	4
ME 7180	Advanced Topics in Biomaterials and Tissue Biomechanics	4

Dissertation Committee

At the time the doctoral plan of work is being prepared, the Doctoral Committee which serves as both the Final Qualifying Examination Committee and the Dissertation Committee for each Ph.D. student should be formed. The permanent advisor of the student will serve as chairman of the Doctoral Committee. The Committee will be made up of at least three graduate faculty members from Mechanical Engineering and one graduate faculty member from outside the department. The other members will be selected by the student's permanent advisor subject to approval by the ME Director of Graduate Studies and the Office for Graduate Studies. The Doctoral Committee will administer the Final Written and Oral Qualifying Examinations and the Dissertation Public Lecture Presentation-Defense. Upon approval by the ME Director of Graduate Studies and the Graduate School Ph.D. Office, a graduate faculty member of the Mechanical Engineering Department may be replaced by a member from another department as long as the committee meets the minimum Graduate School requirement.

A "Doctoral Dissertation Outline" form, approved by all members of the Doctoral Committee and the Director of Graduate Studies, should be filed with the Graduate School PhD office at or near the beginning of the student's dissertation work.

Ph.D. Candidacy Requirements

An approved Ph.D. Plan of Work must be filed with the Office for Graduate Studies within one semester after passing the preliminary qualifying examination (PQE). A student must have completed 50 graduate credits that count toward the Ph.D. program, formed a Ph.D. committee and submitted a "Recommendation for Candidacy" form to the Graduate School. Changes in the Plan of Work must be approved by the advisor and the ME Director of Graduate Studies.

Requirements For All Ph.D. Students

- **Preliminary Qualifying Examination:** This is a three-part written examination administered twice per year by the ME Graduate Program Committee during the first week of the months of October and February. All Ph.D. applicants must pass this examination within their first year after joining the Ph.D. program at WSU. Students must fill out the "PQE Registration Form" that can be downloaded from the ME web site and submit it to the ME Graduate Program Director or at the ME front desk no later than one week prior to the exam date.
- **Final Qualifying Examination:** This examination consists of written and oral parts covering the student's major and minor areas and other related fields. The oral part of the examination shall include a presentation of the proposal for the dissertation research. The Final Qualifying Examination is administered by the student's Doctoral Committee.
 - Under ordinary circumstances, the committee members may not be changed before the Qualifying Examination (written and oral) have been passed. Under extraordinary circumstances the Office for Graduate Studies may approve a committee change, but such change shall require written justification and approval in advance of the examination.
 - If the student fails the final qualifying examination, he/she must be re-examined before the end of the semester that follows the one in which the failure occurred. The student is allowed only one re-examination. Successive failure of the examination will result in dismissal.
 - The student passes the final qualifying examination upon the recommendation of his/her Ph.D. Committee with no more than one dissenting vote.
- **An approved Plan of Work** should be filed with the Office for Graduate Studies. The Plan of Work form can be downloaded from the Graduate School web site at <https://gradschool.wayne.edu/phd/forms> (<https://gradschool.wayne.edu/phd/forms/>).
- **A Doctoral Dissertation Outline**, approved by all members of the Doctoral Committee and the Departmental Graduate Program Committee, should be filed by the student immediately after completing the oral part of the Final Qualifying Examination.
- **The Conflict of Interest Form** must be turned in twice, once with the Prospectus and again with the pre-defense paperwork (Final Report Form). The Conflict of Interest Form can be downloaded from the Graduate School web site at <https://gradschool.wayne.edu/phd/forms> (<https://gradschool.wayne.edu/phd/forms/>).
- **The Safe Assign form** must be turned in three weeks prior to the Dissertation Defense.
- **Pre-Defense Presentation:** At least four weeks before the planned Dissertation Public Lecture Presentation-Defense, the student will present a preliminary dissertation defense lecture to the members of his/her Ph.D. Committee, who will provide a feedback to the student

within two weeks for the purpose of incorporating any changes/ corrections in the thesis.

- Before graduation, each Ph.D. student is expected to have one journal paper accepted.
- **Dissertation Public Lecture Presentation-Defense:** The dissertation format and appearance must be approved by the Office for Graduate Studies before the Dissertation Public Lecture Presentation-Defense is to be arranged. Additionally, each committee member must have certified, in writing (using the Dissertation Public Lecture Presentation-Defense form), that the dissertation has been read and approved for a Public Lecture Presentation-Defense.
 - The final lecture is to be publicized by public notice to the academic community. This responsibility rests with the student's advisor. At this final lecture, the candidate will outline his/her methodology, research and the results of the investigation. Members of the committee will lead the discussion following the presentation.
 - At the conclusion of the oral defense of the dissertation, the Graduate Examiner shall poll the Dissertation Committee and report in writing to the Office for Graduate Studies. The Graduate Examiner is the presiding officer at the Defense and is responsible for its conduct. The role of the Graduate Examiner may be assumed by the dissertation advisor or an external member of the committee.
- For additional information, students should consult the Graduate School's regulations (<http://bulletins.wayne.edu/graduate/general-information/degree-certificate-requirements/#doctoraldegreesphdtext>) governing doctoral study.

Time Limitations

Students have a seven-year time limit to complete all requirements of the Ph.D. degree. The seven-year period starts at the beginning of the semester during which the student was admitted to doctoral study and was working toward fulfilling the requirements of the degree. Up to thirty-two graduate credit hours with a grade B or better earned prior to the student's admission as a doctoral applicant may be applied toward the degree without regard to lapse of time. Credits earned beyond these thirty-two semester hours will not be counted towards the Ph.D. degree at the time of admission to the Ph.D. program. Credits earned after acceptance as a Ph.D. applicant may not be over seven years old at the time the degree is conferred, except when, on the recommendation of the advisor, up to ten semester hours of credit previously earned at Wayne State University may be specified for revalidation by examination. In the event that any courses have been previously revalidated in connection with the earning of the Master's degree, these shall be counted as a part of the total ten. Time extensions beyond these limitations can only be approved by the Graduate School on a yearly basis. The extension requests should reflect conditions that are clearly beyond the student's control.

Graduation

Each degree candidate must file an Application for Degree at the beginning of the semester in which he/she plans to complete degree requirements at <https://reg.wayne.edu/students/degrees> (<https://reg.wayne.edu/students/degrees/>). The candidate should consult the academic calendar of the Graduate Division Bulletin. If an application for a degree was filed for a previous semester in which the student did not graduate, a new application is necessary. The student must be registered in the semester he/she plans to graduate.