HANDBOOK FOR GRADUATE STUDENTS

in

MECHANICAL ENGINEERING

College of Engineering

Wayne State University

Detroit, Michigan

http://www.eng.wayne.edu/ME/Welcome.html

September 2010

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Introduction

The primary source of information about graduate programs at Wayne State is the Graduate School web page.

http://www.gradschool.wayne.edu

From the Graduate School web page you can download Admission Application forms.

This handbook has been developed to provide you with an understanding of the policies and regulations governing admission, academic standards and student obligations within the M.S. and Ph.D. programs in Mechanical Engineering, focusing on College and Departmental requirements that are in addition to the general requirements listed by the Wayne State Graduate School. This handbook is divided into two main sections, the first deals with the MSME degree and the second with the Ph.D. degree.

At regular intervals you should carefully review the Graduate School web page and this document to ensure that you are in compliance with specific requirements of the University, the College of Engineering, and the Department of Mechanical Engineering. Should you have any questions regarding your graduate program, contact the ME Director of Graduate Studies, Prof. Trilochan Singh (tsingh@.wayne.edu). In particular, Prof. Singh's signature is needed on any document requiring formal approval from the ME Graduate Program Committee. Newly admitted graduate students will be advised by Prof. Singh until they select a permanent advisor, which they should do as soon as possible.

Master of Science in Mechanical Engineering

I. Admission

An Application for Admission, with application fee and official transcript records from each college attended, is required before a student may register for graduate study. International students are required to pass the Test of English as a Foreign Language (TOEFL) with a score of at least 550 for the written version.

Please apply online for graduate (MS/PhD) admission at:

http://www.gradadmissions.wayne.edu/.

To qualify for admission, an applicant must have the equivalent of a baccalaureate degree from an ABET (Accreditation Board for Engineering and Technology) accredited or equivalent college or university of recognized standing. An applicant must have adequate preparation and discernable ability to pursue graduate study in the major field he/she elects. A regular admission for Master's degree applicants may be authorized if the applicant's honor point average is 3.0/4.0 or above for the upper division (approximately the last 80 semester hours) of his/her undergraduate course work and if he/she holds a degree from an ABET accredited or equivalent institution. Students with degrees in fields other than Mechanical Engineering or degrees from non-accredited institutions will be expected to complete some of the following courses before being admitted to the Master's degree program in Mechanical Engineering:

ME 2210	Thermodynamics: Theory & Laboratory
ME 2400	Statics and Mechanics of Materials
ME 3300	Fluid Mechanics: Theory & Laboratory
ME 3400	Dynamics

ME 4210	Heat Transfer: Theory & Laboratory
and either	
ME 4150	Design of Machine Elements
or	
ME 4300	Thermal Fluid Systems Design

II. Time Limitations:

Students have a six-year time limit to complete all requirements for the Master's degree. The six-year period begins with the end of that semester during which the student has first taken work which applies toward meeting the requirements of the degree. The College of Engineering reserves the right of revalidation of over-age credits. In revalidation cases, the advisor and the student must set a terminal date for completion of all degree requirements, including such additional requirements as may be indicated to revalidate the over-age credits.

In work counted toward a Master's degree, no credit may be more than six years old at the time all requirements are completed. A time extension may be authorized by the Associate Dean for Academic Affairs of the College of Engineering with the approval of the Department Chairman, but only for conditions which are clearly beyond the control of the student. Upon recommendation of the advisor and approval of the Associate Dean for Academic Affairs of the College of Engineering, a student may arrange for revalidation of over-age credits which are between six and ten years old and which represent courses completed at Wayne State University. Credits from other institutions may not be revalidated. A special examination fee is charged for course revalidations.

III. Transfer of Graduate Credits

Credit from a graduate school at another institution may be transferred provided it is:

(a) certified as graduate-level on an official transcript of the original institution;

(b) applicable to the degree program of the individual;

(c) not used toward the requirements of another degree; and

(d) certified with grade B or better (B minus credit is not acceptable for transfer).

A maximum of eight semester hours may be transferred towards the MSME. A student wishing to transfer graduate credits should file a petition requesting such transfer, approved by his/her advisor, the ME Director of Graduate Studies, and the Associate Dean for Academic Affairs of the College of Engineering.

IV. Residence Requirements:

An MSME student must elect at least twenty-four semester hours of graduate work at Wayne State University

V. Advisors

Students enrolled in Master's degree programs (thesis option) are expected to select a permanent advisor prior to completion of their second semester of course work. The permanent advisor will assist in the preparation of the Plan of Work. The student's choice of a permanent advisor should be governed by his/her field of interest.

If a student wishes to change advisors, he/she should discuss the proposed change with his/her current advisor. A departmental form for change of advisor must be filled, and signed by the current advisor, departmental Director of Graduate Studies, and department Chairman.

VI. MS Thesis Committee

The Master's Thesis Committee will consist of three graduate faculty members from the Mechanical Engineering Department, including the advisor. Upon approval by the ME Director of Graduate Studies, a graduate faculty member of the Department of Mechanical Engineering may be replaced by a member from another department.

The Master's Thesis Committee will administer the final oral examination.

VII. Candidacy

Students enrolled in Master's degree programs must file a Plan of Work by the time the equivalent of eight semester hours of graduate credit have been earned. In addition, MS thesis students must file a thesis outline form by the same time. Both the thesis outline and Master's Plan of Work must be approved by the Director of Graduate Studies.

VIII. Course Requirements

Three plans are offered by the Department of Mechanical Engineering leading to the Master of Science degree:

a. Option A -- requires a minimum of 32 semester credits of course work including 8 credits of thesis.

b. Option C -- requires a minimum of 32 semester credits of course work without thesis.

c. Option D: requires a minimum of 33 semester credits of course work including 1 credit of ME 6991 ("Internship in Industry"). Students can chose up to three semesters of internship with the permission of Graduate Advisor and OISS (Office of International Students and Scholars). The permission of OISS is required for international students only. ME 6991 (Internship in Industry) credits must be taken in addition to the minimum 32 required for the MSME under plan A or plan C. The student is responsible for arranging the internship in the industry. The student must have completed two semesters of studies as a full time graduate student before registering for ME 6991 (Internship in Industry).

Note

- At least 24 of the total required 32 semester credit hours must be taken in the Mechanical Engineering Department.

- FOR EACH CORE COURSE A GRADE OF B- OR HIGHER MUST BE EARNED
- THE GRADUATE GPA WILL BE CALCULATED USING ALL GRADUATE COURSES TAKEN WHILE AT WAYNE STATE
- A minimum of three 7000-level Engineering courses, two of which must be from Mechanical Engineering, are required for Plan C and Plan D students and a minimum of two 7000-level Mechanical Engineering courses are required for Plan A students. Directed study and directed research course (ME 7990 and ME 7996) cannot be used to satisfy this requirement.
- For all students there is a limit of 4 semester credit hours in directed study or directed research, i.e., courses ME 7990, ME 5990 and ME 7996 can yield a total of no more than 4 semesters credit hours to be applied towards the M.S. in Mechanical Engineering.

Course Group Requirements

- Master's degree students in Options A, C and D must select at least four courses from one of the following seven groups. In addition, at least one of the four courses must be a core course from that group. Core courses are indicated by an asterisk (*). A GRADE OF B- OR HIGHER MUST BE EARNED IN A CORE COURSE.
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A. VIBRATIONS AND ACOUSTICS

*	ME 5400	Dynamics II
*	ME 5410	Vibrations II
	ME 5425	Analyses of Vibration Measurements & Instrumentation
*	ME 5440	Industrial Noise Control
*	ME 5460	Fundamentals of Acoustics & Noise Control
	ME 7400	Advanced Dynamics

	ME 7410	Vibrations of Continuous Systems
	ME 7420	Random Vibrations
	ME 7460	Advanced Acoustics & Noise Control
	ME 7480	Nonlinear Vibrations

B. CONTROL, DYNAMICS AND ROBOTIC SYSTEMS

*	ME 5400	Dynamics II
*	ME 5410	Vibrations II
*	ME 6550	Modeling and Control of Dynamic Systems
	ME 7400	Advanced Dynamics
	ME 7550	Control of Dynamic Systems
	ECE 7440	Dynamic Systems and Optimal Control

C. BIOMECHANICAL ENGINEERING

	ME 5040	Finite Element Methods I
*	ME 5100	Engineering Physiology (BME 5010)
*	ME 5160	Musculoskeletal Biomechanics (BME 5210)
	ME 5170	Design of Human Rehabilitation Systems (BME 5570)
	ME 5180	Int. to Biomaterials (BME 5370)
	ME 6180	Biomedical Instrumentation (BME 6480)
	ME 7020	Finite Element Methods II
	ME 7100	Mathematical Modeling in Biomedical Engineering (BME 7100)
	ME 7160	Impact Biomechanics (BME 7160)
	ME 7180	Advanced Topics in Biomaterials and Tissue Biomechanics (BME 7300)
	ME 7195	Tissue Biomechanics (BME 7210)
	ME 8020	Crash Worthiness and Occupant Protection in Transportation Systems I
	ME 8030	Crash Worthiness and Occupant Protection in Transportation Systems II

D. SOLID MECHANICS

	ME 5040	Finite Element Methods I
*	ME 5400	Dynamics II

*	ME 5410	Vibrations II
*	ME 5600	Advanced Mechanics of Materials
*	ME 5620	Fracture Mechanics in Engineering Design
*	ME 5700	Fundamentals of Mechanics
*	ME 5720	Mechanics of Composite Materials
	ME 5730	Tribology and Lubrication Technology
	ME 7020	Finite Element Methods II
	ME 7100	Mathematical Modeling in Bioengineering
	ME 7610	Theory of Elasticity I
	ME 7680	Manufacturing Processing Mechanics
	ME 7720	Advanced Mech. of Composite Materials
	ME 7820	Engg Non-Destructive Evaluation Methods & Industrial Applications
	ME 8020	Crash Worthiness and Occupant Protection in Transportation Systems I
	ME 8030	Crash Worthiness and Occupant Protection in Transportation Systems II

D. MANUFACTURING /Desibn

	ME 5170	Design of Human Rehabilitation Systems (BME 5570)
	ME 5440	Industrial Noise Control
	ME 5470	Creative Problem Solving in Design & Manufacturing
•	ME 5453	Automotive Manufacturing Systems and Processes
	ME 5580	Computer-Aided Design
*	ME 5620	Fracture Mechanics in Engineering Design
*	ME 7451	Advanced Manufacturing Processes II
	ME 7680	Manufacturing Processing Mechanics
	ME 7820	Engg Non-Destructive Evaluation Methods & Industrial Applications
	IE 7270	Reliability Estimation
	IE 7420	Flexible Manufacturing Systems

Other Industrial/Manufacturing Engineering courses such as Six Sigma, Quality Management, Product Development may be taken in lieu of the above IE courses with the approval of the graduate advisor.

F. THERMAL/FLUID SCIENCE

ME 5210 Convective and Radiative Heat Transfer
* ME 5300 Intermediate Fluid Mechanics
* ME 5800 Combustion Engines
ME 5810 Combustion and Emissions
ME 5820 Thermal Environmental Engineering
ME 7200 Advanced Thermodynamics & Combustion
ME 7240 Processes in Continuous Combustion Systems
ME 7250 Advanced Radiative Heat Transfer
• ME 7260 Heat and Mass Transfer
ME 7290 Advanced Combustion and Emissions I
ME 7300 Advanced Fluid Mechanics
ME 7310 Computational Fluid Mechanics & Heat Transfer
ME 8290 Advanced Combustion and Emissions II
ME 5110 Fundamentals Fuel Cell Systems (AET 5110)
ME 5120 Fundamentals Alternative Energy Technology (AET 5120)
ME 5850 Hydrogen Infrastructure and Alt. Fuel Transportation (AET 5410)
ME 5870 Alt. Energy Technologies for Various Transportation Modes (AET 5420)
ME 7210 Fundamentals Battery Systems for Electric and Hybrid Vehicles (AET 7310)

Engineering Analysis

A minimum of 4 semester credit hours in engineering analysis or math intensive course is required from the suggested list (to be approved by the Graduate Advisor): ME 5000, 5010, 5300, 5400, 5410, 5460, 5620, 7260, 7300, 7610, MAT 5220, 5230, 5410 etc.

MASTER THESIS REQUIREMENTS:

Master Thesis credit requirements are met by satisfactory completion of ME 8999.

Student Performance Requirements

- The overall GPA for MS graduation must be B or better.
- Three "C+" or lower grades will result in termination of the student from the ME graduate program.

IX. Examinations

A final public, oral examination based on the MS thesis is required. The examination will be administered by the advisor and two other graduate faculty members from Mechanical Engineering. One ME member of the thesis committee may be replaced by non-ME graduate faculty, if the thesis topic is multi-disciplinary, with the approval of Director of Graduate Studies. Passing of the examination requires a majority vote of the committee.

X. Graduation http://es.wayne.edu/registrar/registrarforms

Each degree candidate must file an Application for Degree at the beginning of the term in which he/she plans to complete degree requirements. 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.

Doctor of Philosophy

Effective for PhD students admitted during or after May 2001

From the Graduate School web page http://www.gradschool.wayne.edu
you can download Ph.D. forms, including Plan of Work, Transfer of Credits, Candidacy, Oral Examinations, and get updated information about the Annual Ph.D. Student Review process.

I. Admission

An Application for Admission, with application fee and official transcript records from each college attended, is required before a student may register for graduate study. A student must arrange to take any required entrance examinations. International students are required to pass the Test of English as a Foreign Language (TOEFL) with a score of at least 550 (written) or 213 (cbt) or 80 (ibt) or 6.5 (IELTS). It is recommended that all applicants submit Graduate Record Exam (GRE) scores, particularly those who are requesting financial assistance.

Deadline dates for filing an Application for Admission are published by the Office of Graduate Admission, Wayne State University, Detroit, MI 48202 http://www.gradschool.wayne.edu/.

Doctoral applicants must present higher entrance qualifications than those required of Master's degree applicants. A doctoral applicant should have an honor point average of 3.5/4.0 or better in a master's degree program in M.E. and must have completed an undergraduate M.E. degree or have done substantial specialized work in his/her proposed doctoral major field. Exceptions to these requirements must be approved by the ME Director of Graduate Studies.

II. Time Limitations:

Students have a seven-year time limit to complete all requirements for the Ph.D. degree. The seven-year period begins with the end of the semester during which the student was admitted to doctoral study and was taking work toward meeting the requirements for the degree. In the program leading to the Ph.D. degree, up to thirty-two semester hours (or forty-eight quarter hours) of B or better graduate credit earned prior to the student's admission as a doctoral applicant may be applied toward the degree without regard to lapse of time. Credit earned beyond these thirty-two semester hours shall not be over ten years old at the time of admission as a Ph.D. candidate. Credit 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 are authorized only for conditions which are clearly beyond the student's control.

III. Transfer of Graduate Credits

Credit from a graduate school at another institutions may be transferred provided it is:

(a) certified as graduate-level on an official transcript of the original institution;

(b) applicable to the degree program of the individual;

(c) not used toward the requirements of another degree; and

(d) certified with grade B or better (B minus credit is not acceptable for transfer).

All transfer credits must be approved by the chairman of the student's Doctoral Committee and the Director of Graduate Studies. Upon recommendation of the advisor, a Ph.D. applicant may transfer graduate credits only with the permission of the Office for Graduate Studies. Such permission is granted only when it is deemed that such authorization will result in improvement of the student's program of study and, at the same time, comply with time limitations. Transfer credits cannot be used to meet the residence requirement.

IV. Residence Requirements:

The requirement of one year of residence for the Ph.D. is normally met by completion of 6 semester hours of course work, exclusive of dissertation, in each of two successive semesters after admission as a Ph.D. applicant. A Ph.D. student must elect thirty hours of graduate course work exclusive of the doctoral dissertation at Wayne State University.

V. Advisors

All Ph.D. students are required to select a permanent advisor within one semester after they have passed the preliminary qualifying examination. The permanent advisor will assist in

the preparation of the Plan of Work. The student's choice of a permanent advisor should be governed by his/her field of interest.

If a student wishes to change advisors, he/she should discuss the proposed change with his/her current advisor. A departmental form for change of advisor must be filled, and signed by the current advisor, departmental Director of Graduate Studies, and department Chairman.

VI. Dissertation Committees

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 will 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 chairman of the student's permanent advisor subject to approval by the 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 Office for Graduate Studies, a graduate faculty member of the Department of Mechanical Engineering may be replaced by a member from another department.

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

VII. Candidacy

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. A student may be admitted to the status of doctoral candidate upon successful completion of the Preliminary Qualifying Examinations and upon approval of the Dissertation Outline by the dissertation committee and the Graduate School. Changes in the Plan of Work must be approved by the advisor, the ME Director of Graduate Studies and the Office for Graduate Studies.

VIII. Course Requirements

A minimum of 90 semester credits with an overall HPA of at least 3.0 is required for the Ph.D. program. These credits are distributed in the following way:

a. Dissertation: neither more nor less than 30 semester credits.
b. A minimum of 30 semester credits must be earned in formal lecture credits. Of these at least 20 must be in the major field.
c. A maximum of 30 semester credits may be earned in Special Topics courses; and a maximum of 8 semester credits may be earned in Directed Study courses.

- At least one-half of all course work exclusive of dissertation credits must be earned in the Department of Mechanical Engineering.
- At least 30 semester credits of work beyond the Bachelor's degree must be in courses open only to graduate students (700-898 numbering sequence).
- All Ph.D. students are required to earn a minor. The requirement is satisfied by completing at least 8 semester credit hours in courses numbered 500 and above.
- Each Ph.D. student is required to take two courses
  - ME 5700 - Fundamentals of Mechanics
  - MAT 5220 - Partial Differential Equations & Boundary Value Problems

  and one of the following core courses:

  Solid Mechanics:

  ME 7610 - Theory of Elasticity I

Dynamics/Vibrations:

ME 7410 - Vibrations of Continuous Systems

Fluid Mechanics:

ME7310 - Computational Fluid Mechanics and Heat Transfer

Thermal Sciences:

ME 7260 - Heat and Mass Transfer

Dissertation requirements are met by satisfactory completion of ME 9995-9999. All Ph.D. students must have been admitted to the status of doctoral candidate before they will be allowed to elect dissertation credits. All graduate students are required to register for thesis or dissertation credits in 4 consecutive semesters (7.5 credits each semester). If thesis is not completed by the time a student has completed registration for 30 credits, he would be required to register for maintenance credit.

Effective for Ph.D. students admitted during or after Fall semester 1999, all ME Ph.D. students who have passed the preliminary qualifying examination must register for ME 7997 (Departmental Seminar) and receive a grade of Satisfactory for at least two semesters. They must attend at least 50% of these departmental seminars offered during a semester to receive a grade of Satisfactory. Two semesters of this course must be listed in the student's plan of work. BME seminars can be counted towards the 50% requirement. Students must provide the front desk with their e-mail address to receive information on the seminars. Students are encouraged to give a talk at the seminar.

IX. Examinations

The Department of Mechanical Engineering requires the following examinations:

Preliminary Qualifying Examination

All Ph.D. students are required to pass a three-part, written preliminary qualifying examination. A student can choose to be examined in any three of the seven fields listed below. Each student has only two chances to pass this examination.

I. Controls

II. Dynamics

III. Vibrations

IV. Fluid Mechanics

V. Solid Mechanics

VI. Thermodynamics

VII. Heat and Mass Transfer

The written preliminary qualifying examination is given during the last week of February. A student must register his/her choice of fields with the Director of Graduate Studies at least 30 days before the examination date (see the separate "Guidelines for Ph. D. Preliminary Qualifying Examination" (PQE) *** http://www.eng.wayne.edu/page.php?id=5389 *** for details). The student must make the first attempt at the PQE within three semesters of admission (spring/summers excluded), and must take all three subjects at the first attempt. The second attempt, if needed, must be at the very next offering of the PQE.

Dissertation Registration:

The Doctor of Philosophy requires that students register during the preparation of the dissertation for Candidate Status: Doctoral Dissertation Research and Direction I, II, III and IV (9991, 9992, 9993, and 9994 respectively), in consecutive academic year semesters. registering for more than 10 credits of ME 9999 Doctoral Dissertation Research. Registration for these four Candidate Status courses equates to 30 credits. If a student has registered for all four Candidate Status courses but has not completed dissertation requirements, the student may register in

Candidate Maintenance status (9995) until the requirements are completed, the time limit for degree is reached, or the student withdraws from the program.

Final Qualifying Examination:

Each student is required to successfully pass the final Qualifying Examination which consists of written and oral parts covering the student's major and minor areas and other related fields. In addition, 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 one or more parts of the written final qualifying examination, he/she must be re-examined in the above mentioned part or parts before the end of the semester following the one in which the failure occurred. The student will only be allowed one re-examination in any part of the examination. Successive failures of any part of the examination will result in dismissal.

The student passes the oral examination upon recommendation of the committee and if there is not more than one dissenting vote. The student is allowed only one re-examination.

X. Additional Requirements for Ph.D. Degree

Each Ph.D. student is expected to present a Mechanical Engineering departmental seminar covering his/her dissertation research. This seminar is in addition to the Public Lecture Presentation-Defense described in the previous section. Before graduation, each Ph.D. student is expected to have one journal paper accepted.

Pre-Defense Presentation:

At least four weeks before the planned Dissertation Public Presentation Defense, the student will present a preliminary thesis defense lecture to the members of Ph.D. dissertation committee, who will provide a feedback to the student within two weeks for the purpose of incorporating any changes/corrections in the thesis.

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 Director of Graduate Studies. 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 adviser or an external member of the committee. Alternatively, the student (or any committee member) may request that the Graduate School appoint a Graduate Examiner from outside the committee.

XI. Graduation http://es.wayne.edu/registrar/registrarforms

Each degree candidate must file an Application for Degree at the beginning of the term in which he/she plans to complete degree requirements. 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.