UNIVERSITY OF MAINE
DEPARTMENT OF MECHANICAL ENGINEERING

GUIDELINES FOR GRADUATE STUDY

Approved February 24, 2020

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1. Introduction

Graduate study in mechanical engineering at the University of Maine is intended to bring together faculty members and graduate students into a community of scholars who have a common interest in advanced professional study and original research. The program seeks to cultivate the spirit of intellectual independence and provide the opportunity for extending the boundaries of the engineering profession. Current areas of research include Biomechanics and Biomedical Engineering, Biomimetics, Composite Materials and Structures, Computational Mechanics, Continuum Mechanics, Controls and Dynamic Systems, Design Optimization, Fluid Mechanics, Heat Transfer, Marine Renewable Energy, Nanomaterials and Devices, Offshore Engineering, Reduced-Order Modeling, Robotics, Smart Materials, Solar Thermal Energy, Solid Mechanics, Thermal Sciences, Uncertainty Quantification, and Engineering Education.

2. Advisor

The graduate coordinator serves as an initial academic advisor to students who enter the graduate program. The selection of a graduate thesis advisor is the most important decision in any graduate program. The graduate thesis advisor will serve as an academic mentor and will chair the committee that decides on the acceptability of the research performed for the thesis.

The graduate coordinator will assist the student in course selections until the student has selected a formal graduate thesis advisor. A graduate thesis advisor should be selected within the first semester in the program if at all possible to ensure that the course work provides the background necessary to perform the research for the thesis. Failure to select an advisor early in your graduate program can increase the number of courses required to obtain your degree. The course work must represent a cohesive background, which support the student’s research and meets the objectives of the graduate thesis advisor and the student.

The graduate thesis advisor and the student must establish a plan of study that covers the entire range of the student's degree. For a master’s degree this should be done as soon as the graduate thesis advisor is selected. For the Ph.D. degree, the course work should be viewed as supporting the dissertation and is subordinate to completion of an acceptable dissertation. The plan of study is discussed below.

3. The Graduate Committee

To guide and supervise a student's progress in graduate studies, a graduate thesis advisor must be selected before the end of the student's second semester of study. This committee is composed of a major professor (graduate thesis advisor) and other

University of Maine graduate faculty members. Normally the thesis advisor will be a faculty member in the mechanical engineering department. A graduate faculty member from outside the department can co-advise and supervise the student's research only if the student has an active co-advisor in mechanical engineering with appropriate expertise in the area of the thesis. All co-advisors from outside the department must have sufficient credentials to receive an appointment as external or cooperating graduate faculty. The committee will review and accept the thesis or dissertation proposal and will conduct the thesis or dissertation defense. For Master's students, the committee should be selected in the beginning of the second term of study and include a graduate thesis advisor, at least one other ME professor and a third professor that should be from outside of the student's area of specialization. For Doctoral students, the committee should be selected before the end of the second term of study. The committee must include a graduate thesis advisor, two other ME professors, a member of the graduate faculty from outside the Mechanical Engineering Department and an external reader who will normally be appointed to the graduate faculty. All of the faculty should have expertise related to the area of the thesis. The external reader must have sufficient credentials to be appointed to the graduate faculty and needs to be a recognized expert the area of the thesis. Generally the external reader will be a recognized researcher in a national laboratory, an industrial research laboratory, a foreign researcher or a distinguished faculty member at another academic institution. The acceptability of the external reader will be based on publications, rank and recognition in professional societies (i.e. ASME Fellow) and the professional position held by the reader. It is generally accepted that except in extreme circumstances the Ph.D. committee will not change after the acceptance of the dissertation proposal. Committee meetings held either in person or via teleconference will be held each semester to review a student's progress, although the external reader does not need to be present at all meetings. The external reader is intended to serve as an additional reviewer of the work. Thus while the presence of the external reader is not required at all meetings, the external reader must participate in each of the meetings. The appropriate results should be communicated to the external reader for each progress review and for the final defense so that the reader can determine if the work is of a quality sufficient for the degree to be awarded. It is normally expected that all decisions by the committee will be unanimous.

It is the student's responsibility to arrange a time and a place for all committee meetings. A written notice of the meeting as well as verbal confirmation of the meetings should be made with all of the committee members. The student should be aware that appropriate committee members will have quite busy schedules and so the student should be polite and flexible when approaching committee members regarding scheduling meetings. The best approach is to select 3 or 4 appropriate times for the meetings with your graduate thesis advisor. Based on these times, the student can then ask or e-mail all of the committee members to determine if those meeting times are acceptable. If none of those times work, the process should be repeated until a satisfactory time is found. The graduate thesis advisor and graduate coordinator will assist the student to ensure that the proper forms are completed and that the committee member's understand their responsibilities for each of the meetings and examinations.

Changes in the committee need to be made based on changes in the thesis content and must be consistent with the expertise of the faculty and the content of the thesis. In order to change an established committee all of the faculty must agree to the change. If conflicts arise regarding the makeup of the committee the decision regarding the membership of the committee will be made in a meeting of the faculty of the mechanical engineering department. The student will be allowed to be present to discuss the facts in the case. These discussions will then be made in a meeting of the faculty and the decision will be final.

4. Program of Study

Due to varying backgrounds and interests, specific courses for a program are chosen by a graduate student and his/her graduate committee. MS students without an undergraduate degree in engineering will take undergraduate courses as required by their committee. For students who have graduated from the Mechanical Engineering Technology program at the University of Maine, or a similar technology program at another university, a suggested required course sequence is included in Appendix A1. Suggested sequence for students with degrees in a related engineering field and in a general science filed are presented in Appendices 1B and 1C, respectively. Qualified students will be offered a conditional admittance while enrolled in the required undergraduate courses and will subsequently granted full admittance upon successful completion of these courses. Decision on which undergraduate courses will be required will be made by the graduate coordinator and will depend upon previously taken courses indicated in the student's transcript. In all cases a complete formal program of study should be submitted to the graduate coordinator prior to completion of more than 12 credits in the department, regardless of whether those credits can be counted toward the graduate degree. For M.S. students who do not have a bachelor's degree from an accredited mechanical engineering program, the plan of study should include course work that the department faculty determines is sufficient for completion of a degree in mechanical engineering from the University of Maine. Students who are seeking a Ph.D. degree without an undergraduate degree in mechanical engineering, or a closely related discipline, will be required to obtain an MS degree in mechanical engineering from the University of Maine prior to undertaking further graduate study in the department.

The initial plan of study for the degree should be considered as tentative and is meant to provide direction and guidance for the student. A formal Program of Study (form 13a for MS, form 13b for Ph.D.) is required for the graduate school prior to completing 12 credit hours or by the third registration period, whichever comes first. The Program of Study helps define the path to degree completion, including the courses that will be taken, and needs to be developed in consultation with the graduate thesis advisor. It is highly recommended that students take one or two courses outside of their area of research to ensure a sufficient breadth of knowledge needed for future careers. All committee members will need to approve and sign the Program of Study (form 13a for MS, form

13b for Ph.D.) which is developed by the student in consultation with the graduate thesis advisor as discussed in section 2. The program of study does not need to be final, particularly for the Ph.D., since additional or alternative course work may be required by the advisor. However, any changes made in course selection will necessitate approval of the entire committee on Form 14.

Graduate students will typically register for two or three formal courses each term, so that three to four terms will usually be required to complete the requirements for the Master's Degree. The time required to complete the requirements for the Doctor of Philosophy Degree is dependent on the dissertation and should not be considered to be related to the time required for the necessary course work.

A full-time course load for graduate students is nine (9) credits per semester. All graduate students must be registered in those semesters in which staff time or university facilities are being used.

All graduate students who are supported on a research or teaching assistantship are required to attend the weekly mechanical engineering seminar, MEE696. Student attendance will be recorded for every seminar. If a student is unable to attend a seminar due to extenuating circumstances, then the student is required to notify the research advisor or graduate coordinator in advance. All graduate students must give at least one seminar during their graduate degree program.

Courses to be applied toward fulfilling the requirements for the Master's and Doctoral degrees, including any which may have been transferred from another institution, must have been registered for and completed within the ten (10) years immediately preceding the date of completion of requirements for the degrees.

5. Requirements for the Master of Science Degree

Completion of the GRE is not required for incoming students with a BS degree in Mechanical Engineering from the University of Maine whose GPA is greater than 3.3. The requirements for completion of the MS degree are as follows:

1. Minimum of 30 semester credits of graduate work in an approved course of study.

2. Minimum of 24 semester credits earned at the University of Maine (21 while in graduate program).

3. Minimum of 16 semester credits earned at the University of Maine (not including thesis or independent study credits) in 500 level (and above) formally taught courses.

4. Presentation of at least one seminar in MEE 696.

5. Completion of INT 601 Responsible Conduct of Research (or equivalent) 1-credit

6. Completion of thesis credits, minimum five of the thirty credits.

7. Submission of the thesis. Submission of both paper and electronic copies of the thesis is required for graduation from the Mechanical Engineering Department.

8. Final thesis defense.

Non-Thesis Option: In some cases graduate students may decide that a non-thesis option is preferable given their career objectives. This decision should be made early in the graduate program so that a reasonable program of study can be defined to meet the student's objectives. A minimum of thirty hours of class work is required for the non-thesis option. This course work must form a comprehensive and meaningful program of study. In addition, a candidate for a non-thesis MS degree must pass a comprehensive examination which will review the course work and evaluate the student's ability to apply his or her knowledge to solutions of advanced engineering problems. The structure of the examination is based on the program of study and the faculty committee.

Students are required to declare their intent to seek either the thesis or non-thesis master's degree at the beginning of their program of study. Students in the non-thesis M.S. option may switch into the thesis option by notifying the graduate coordinator of the change, provided that they have identified a thesis advisor, formed a thesis committee, and have worked out a plan of study with their thesis advisor. A student in the thesis option will not be permitted to switch to the non-thesis option if the student has received financial support from the department. This condition will be relaxed only under extraordinary circumstances by a committee consisting of the graduate coordinator, the student's thesis advisor and a third faculty member.

Thesis: A properly typed, acceptable thesis must be submitted to the student's committee **at least two weeks** before the final examination. The candidate must submit to the Graduate School Office two unbound copies (on bond paper) of the thesis. Exact dates are available each semester from the Graduate School or from the Graduate Coordinator. The student must also submit one unbound copy (also on bond paper) to the Department to be bound and placed in Departmental Library.

Final Thesis Defense: The defense is given at the end of the Master's Degree Program. The defense is open to all members of the Mechanical Engineering Faculty. It is the student's responsibility to notify the Mechanical Engineering Faculty of the time and place of the defense through an appropriate announcement. The student is required to bring the required forms to the final examination. The committee signs this form at the end of the examination.

6. Requirements for the Doctor of Philosophy Degree

The Ph.D. degree differs in context as well as practice from all other academic degrees. The objective of the Ph.D. is to demonstrate the ability to perform original research.

1. A minimum of 60 semester credits of graduate work is required in an approved course of study. The course of study is expected to support the thesis research and to demonstrate depth of knowledge in the area of specialization.

2. Completion of INT 601 Responsible Conduct of Research (or equivalent) 1-credit, if not previously completed under an MS or other degree.

3. A minimum of 30 semester credits must be earned at the University of Maine, all of which must be in 500 level and above classes. Of the 30 credits, a maximum of 11 of the credits will be thesis credits (12 if INT 601 is not required).

4. Presentation of at least one seminar in MEE 696.

5. A minimum of 2 semesters of registration for thesis credits is required after admission to candidacy.

6. A passing grade on the Examination for Admission to Candidacy by the appointed examination committee for the faculty of Mechanical Engineering.

7. Completion of the progress review form by the dissertation committee each semester after admission to candidacy or presentation of research progress by the student to the majority of the committee members every semester to ensure adequate progress on the dissertation.

8. It is required that at least one refereed journal publication and one high quality, full length conference paper must be accepted in the field of research in order to obtain a Ph.D. degree. The conference paper may be substituted by a refereed journal paper. The work of the Ph.D. candidate must represent a substantive portion of the research in these publications. Prior to defending the dissertation, the above required papers must have final acceptance from the journal/conference as evidenced by letters from the journal editor/conference organizer or page proofs. The quality of the journal/conference, the value of the candidate's contribution and acceptability of the documentation will be judged by the committee.

9. Presentation and acceptance of the Dissertation Proposal by the full committee.

10. Successful Dissertation Defense that is approved by the full committee.

11. Submission of the Dissertation. Submission of both paper and electronic copies of the dissertation is required for graduation from the Mechanical Engineering Department.

The Dissertation is a major effort in which the doctoral candidate undertakes a program of

work that will result in a significant contribution to fundamental knowledge in engineering. In general, such a program will involve consideration of a challenging problem utilizing analytical, experimental, and/or design techniques. The objective, on the one hand, may be to determine and explain the behavior of a simple system, or on the other, to bring into logical order the techniques of a field which has suffered random growth. The results of the Dissertation will be new analytical knowledge, experimental knowledge, or a combination of these. Whatever its nature, the dissertation topic must provide an opportunity for the candidate to make an original contribution to the field.

Examination for Admission to Candidacy (Old Policy)
(Students entering the MEE PhD program before summer 2019 may elect to use either the old or new policy)

Purpose: To test the candidate's graduate level understanding in Mechanical Engineering and to determine the candidate's "breadth" of knowledge in Mechanical Engineering. The examination determines the candidate's background and qualifications to continue with a program of study leading to the Doctor of Philosophy Degree in the Department of Mechanical Engineering. Upon completion of the exam, the committee determines if the student's background and preparation are sufficient for further work in the area.

Scheduling:
The admission to candidacy exam typically will be scheduled twice per year, if required. Exact dates will be determined by the graduate coordinator. Exams can be scheduled in August and during the winter break period (typically the last week in December thru mid-January). To initiate the process, the student is required to notify the graduate coordinator and their advisor 1-month prior.

Exam coverage and format:
The examination will be taken in three of four areas of emphasis. The areas of emphasis are (i) mathematics and numerical methods, (ii) solid mechanics and composites, (iii) fluids and thermal sciences, and (iv) vibrations, dynamics and controls. A departmental examiner will be assigned to each of the areas and the student should visit with each examiner several months prior to the exam date to ascertain the scope of the candidacy exam. The three departmental examiners will solicit questions from faculty active in the area of the examination and will prepare the appropriate sections of the exam.

The first part of the exam is written with the student being allowed 48 hours to complete the examination. The graduate coordinator will administer the exam and the timing and procedures must be coordinated with the graduate coordinator. The graduate coordinator may, but will not necessarily, be one of the faculty members submitting questions for the exam. Typically the thesis advisor will not serve on the examination committee unless specific expertise is required for the candidacy exam. The examination will focus on fundamental concepts and

require the candidate to start from the derivation of the theory to the final completion of the questions. The student is judged primarily on approach to the problem and grasp of fundamentals. The questions may focus on the student's area of research, although they are not limited to this area.

The second part of the exam will follow closely the first portion of the exam. This is an oral exam that will be used to further probe the candidate's understanding in the primary area of the research as well as to assess any weaknesses identified in the written portion of the exam. It is expected that the student should be particularly well prepared in the selected field of study and have a strong grasp of the background material required to perform research in the area of the dissertation. A strong knowledge of the relevant literature is also expected of the candidate.

Results: The committee shall:

1. Recommend the student advance to Ph.D. candidacy and approve or change the Program of Study, if the student passes the exam.

   or,

2. Recommend that the student take the examination again, if the student's performance is weak, but the committee feels that the potential exists for satisfactory performance. The program of study may also be modified to accommodate weaknesses and in cases where a particular weakness exists, additional course work with a required minimum grade may be required in lieu of reexamination. In the case of reexamination, a maximum of two attempts may be made to pass the examination.

   or,

3. Terminate the student from the Ph.D. program if the committee feels this is appropriate.

Within 5 business days following the examination, the student will receive formal notification of the outcome of the exam and, if appropriate, will be formally admitted to candidacy in the department. If the candidate wishes to appeal the decision of the examination committee after a second unsuccessful attempt, it must be done in writing within 96 hrs of the committee's decision. The written appeal must clearly and concisely state the grounds for reconsideration of the committee's decision. Upon receiving an appeal, a separate committee consisting of graduate faculty members with expertise in the subject areas will review the written examination, discuss it with the examination committee and render a final decision. The review committee can recommend that the student (i) retake the written and oral examinations, (ii) retake only the oral examination or (iii)

withdraw from the PhD program.

Presentation of the Proposal (Old Policy)

Purpose: The purpose of the presentation proposal is to allow the graduate committee and interested members of the academic community to examine critically and comment on the dissertation work and its significance. This is the point at which the originality of the dissertation research is established. As a result, the proposal must include an extensive literature review of the relevant subject areas. The student will be expected to have a thorough knowledge of all relevant research in the area prior to presenting the proposal and will be questioned on relevant issues.

Structure: The exam presentation begins with the student outlining the plan for Ph.D. research. This presentation should not exceed 30 minutes excluding time for questions. The committee can also question the student during the presentation. The presentation should include a clear and concise thesis statement. The presentation should present all techniques and procedures that will be used to perform the proposed research. The techniques should be presented in sufficient detail that the committee is able to evaluate the appropriateness of the proposed approach. The committee should have a high level of confidence that the approach is a reasonable way in which to explore the thesis statement at the end of the presentation and discussion. For example, the numerical approach to solving a problem must be demonstrated on a canonical problem. This demonstration should be in a manner that makes it clear that the approach is appropriate for the dissertation research. For an experimental dissertation, data must be shown that demonstrates that the technique is applicable to the problem. At the time of the proposal presentation new experimental procedures should not need to be developed prior to completing the dissertation. It is thus not reasonable to try to present the proposal until the research has progressed to a significant degree. As evidence of the timing, it would normally be expected that at least one conference paper would have resulted from the work and that the first results of the dissertation may be in review for one of the required journal publications at the time of the proposal presentation. At the same time, it is not appropriate to present the proposal at a time so late in the program that adjustments and extensions to the research cannot be made by the committee.

A written proposal must be made available to the ME administrative assistant and the committee members along with an announcement of the scheduled date, time and location. Any Mechanical Engineering faculty can request a copy of the proposal prior to the presentation of the proposal.

Qualifying Examination (New Policy)

(Students entering the MEE PhD program in and after summer 2019 must use the new policy)

Purpose

The examination will assess the student's background and qualifications for pursuing the Doctor of Philosophy Degree in the Department of Mechanical Engineering. The objective of the qualifying exam is to evaluate the student's understanding of fundamental knowledge and problem-solving abilities based on undergraduate course work. Although the topics on the qualifying exam are at the undergraduate level, the students are expected to possess a graduate level understanding of the material. This means that they should thoroughly understand relevant assumptions and limitations and demonstrate critical thinking skills.

Exam coverage and format

The examination will be taken in two of four fundamental areas of Mechanical Engineering, i.e., (i) solid and structural mechanics, (ii) fluid mechanics, (iii) thermal sciences, and (vi) dynamics and vibrations. The examination will focus on fundamental concepts and require the student to start from the derivation of the theory to the final completion of the questions. The topics covered in each of the subject areas are listed below.

A departmental examiner will be assigned to each of the areas. The departmental examiners will solicit questions from faculty active in the area of the examination, prepare the appropriate sections of the exam and be responsible for grading the exams. The graduate coordinator may, but will not necessarily, be one of the faculty members submitting questions for the exam. Typically, a student's thesis advisor will not serve as the departmental examiner for a subject area that he/she is examined in unless specific expertise is required for the qualifying exam

The exam is an in-class, closed book, closed notes, and written test that will be administered over a 2-day period with each subject area to be completed in three hours. Students are allowed to bring a calculator and a 8.5"×11" formula sheet (can use both sides) for each subject area. The exam will be administered by the departmental examiners. All work must be shown to receive full credit.

Scheduling

The qualifying exam typically will be scheduled twice per year in March and November. Exact dates will be determined by the graduate coordinator in consultation with the examination committee consisting of the departmental examiners. A regular, full time Ph.D. student must take the qualifying exam before starting the third semester of his/her program. All students are required to notify the graduate coordinator of their selection of the two subject areas to be

tested and the test period in their first month of the program.

Results

A score of at least 70% is required to pass the exam in each subject area. In the event of a failed examination, the student has one opportunity to retake the examination (failed subject area only) in the next immediately available test period. A maximum of two attempts may be made to pass the examination. The student will be required to withdraw from the Ph.D. program if he/she fails the second attempt.

Qualifying Exam Topics

(i) Solid and Structural Mechanics

Normal stress and strain; shear stress and strain; stress-strain curves; mechanical properties determined from the stress-strain curve; Hooke's law; stresses, strains and deformation in axially loaded bars; torsional of circular shafts; beams under transverse loads; shear forces, bending moments and deflections in beams; allowable stress and allowable load; buckling of columns; two-dimensional (2D) stress analysis, plane stress and plane strain; principal stresses/maximum shear stress; thin-walled tubes and beams; combined loads; stress concentration; failure theories for brittle and ductile materials; pressure vessels.

References:

Philpot, T.A., 2017, Mechanics of Materials, 4th ed., Wiley.
Goodno, B.J., and Gere, J.M., 2017, Mechanics of Materials, 9th ed., Cengage.
Ugural, A.C., and Fenster, S.K., 2011, Advanced Mechanics of Materials and Applied Elasticity, 5th ed., Prentice Hall.

(ii) Fluid Mechanics

Fluid properties; flow patterns: streamlines, streaklines and pathlines; hydrostatic pressure distribution; hydrostatic forces on plane/curved surfaces; buoyancy; control volume and surfaces; the integral form of mass conservation/linear momentum/energy equation; the Bernoulli equation; the differential equation of mass conservation/linear momentum/energy equation; the Navier-Stokes equations; stream function; dimensional analysis and similarity; viscous flow in ducts; laminar pipe flow; turbulent pipe flow; minor loss in pipe systems; flow past immersed bodies; the boundary layer equations.

References:

White, F. M., 2016, Fluid Mechanics, 8th ed., McGraw-Hill.
Pritchard, P. H., and Mitchell, J. W., 2015, Fox and McDonald's Introduction to Fluid Mechanics, 9th ed., Wiley.

Munson, B. R., Rothmaye, A. P., and Okiishi, T. H., 2012, Fundamentals of Fluid Mechanics, 7th ed., Wiley.

(iii) Thermal Sciences

Thermodynamics:

First law of thermodynamics; Efficiency; Specific heats and thermal energy; Flow work and enthalpy; Energy balance of closed systems; Conservation of energy and mass for control volumes; Thermodynamic cycles including gas, vapor, and refrigeration cycles; Second law of thermodynamics; Entropy; Phase-change systems; Heat of reaction; Energy analysis of reacting systems; Combustion.

References:

Cengel, Y.A., and Boles, M.A., Thermodynamics: An Engineering Approach, 8th ed. McGraw Hill.
Borgnakke, C., and Sonntag, R.E., Fundamentals of Thermodynamics, 8th ed. Wiley.

Heat Transfer:

Fourier heat conduction; Heat transfer coefficients; Thermal conductance and thermal resistance; Forced convection; Natural convection; Nusselt number; Heat exchangers; Radiation and the Stefan-Boltzman Law.

References:

Sucec, J., 1999, Heat Transfer, Jaico Publishing House.
Bergman, T.L., Lavine, A.S., Incropera, F.P., and Dewitt, D.P., Introduction to Heat Transfer, 6th ed. Wiley.
Cengel, Y.A., and Gahajar, A.J., Heat and Mass Transfer, 4th ed. McGraw Hill.

(iv) Dynamics and Vibrations

Dynamics:

Kinematics of a particles; kinetics of a particle: force and acceleration; kinetics of a particle: work and energy; kinetics of a particle: impulse and momentum; planar kinematics of a rigid body; planar kinetics of a rigid body: force and acceleration; planar kinetics of a rigid body: work and energy; planar kinetics of a rigid body: impulse and momentum.

References:

R. C. Hibbler, 2016, Engineering Mechanics: Dynamics, 14^{th} edition, Pearson /Prentice Hall.

Vibrations:

Free vibration of single-degree-of-freedom systems: free vibration of an

undamped translational system, free vibration of an undamped torsional system, response of first-order systems and time constant, free vibration with viscous damping; Harmonically excited vibration: equation of motion, response of an undamped system under harmonic force, response of a damped system under harmonic force, response of a damped system under the harmonic motion of the base; response under a general periodic force: first-order systems, second-order systems; two-degree-of-freedom systems: equations of motion for forced vibration; free-vibration analysis of an undamped system; torsional system.

References:

S. S. Rao, 2017, Mechanical Vibrations, 6th edition, Pearson Publishers.
D. J. Inman, 2014, Engineering Vibration, 4th edition, Pearson Publishers.

Candidacy Examination (New Policy)

(Students entering the MEE PhD program in and after summer 2019 must use the new policy)

Ph.D. students will complete a candidacy exam typically before the end of their fourth semester. This is an oral exam that will be administered by the student's advisory committee and will cover aspects of mechanical engineering related to the student's area of interest as defined by the thesis project. This oral exam will require that students to demonstrate a mastery of the underlying theory specific to their dissertation research, and establish the originality of the proposed dissertation research.

The student should consult with his/her Advisor regarding the nature and structure of the examination process. The exam will probe the student's understanding of the primary area of research. It is expected that the student will be particularly well prepared in the selected field of study and have a strong grasp of the background material required to perform research in the area of the dissertation.

Prerequisite coursework

Prerequisites of the candidacy exam include a minimum of 9 semester credits (not including thesis or independent study credits) at 500 level (or above) formally taught MEE courses. At least one of the courses must be a core course in the student's area listed below. MEE courses taken in the student's MS program may be used to meet the core course requirement. Moreover, approved equivalent transfer courses from other institutions may be used to meet the prerequisite requirements. However, courses taken in the MS program cannot be used to meet the minimum 9 credits requirement. The students should consult with their advisor and the advisory committee, and select the graduate courses that will best prepare them for their dissertation research and the candidacy exam. The prerequisite courses must be approved by the student's advisor and the advisory committee. The core courses in each area are

Thermal & Fluid Sciences – Thermal Sciences:
MEE 501 Macroscopic Thermodynamics,
MEE 536 Advanced Heat Transfer I

Thermal & Fluid Sciences – Fluid Mechanics:
MEE 557 Introduction to Continuum Mechanics,
MEE 562 Advanced Fluid Mechanics

Mechanics of Solids and Structures:
MEE 557 Introduction to Continuum Mechanics,
MEE 554 Elasticity

Dynamics and Controls:
MEE 557 Introduction to Continuum Mechanics,
MEE 573 Advanced Vibrations I

Dissertation proposal

In addition to completion of the prerequisite coursework, a 10 to 15-page written dissertation proposal is required as part of the candidacy exam. The proposal should describe the work that has been completed to date and proposed work that will be completed for the dissertation. It must include an extensive literature review of the relevant subject areas. The student will be expected to have a thorough knowledge of all relevant research in the area prior to presenting the proposal and will be questioned on relevant issues. The proposal must be made available to the ME administrative assistant and the committee members along with an announcement of the scheduled date, time and location at least two weeks in advance of the candidacy exam. Any Mechanical Engineering faculty member can request a copy of the written proposal prior to the presentation of the proposal to the committee.

Exam format

The exam will be a 2-hour oral exam administered in two segments. In the first segment, the student will present his/her dissertation proposal. The second segment will consist of questions on the research proposal and examinations in areas relevant to the student's research. The Advisor will chair the candidacy examination committee and can ask questions and participate in the exam.

The proposal presentation begins with the student outlining the plan for Ph.D. research. The presentation will in general be 30 to 45 minutes long and will cover what is in the proposal. The presentation should contain a clear and concise thesis statement and include all techniques and procedures that will be used to perform the proposed research. The techniques should be presented in sufficient detail that the committee is able to evaluate the appropriateness of the proposed approach. The committee should have a high level of confidence that the

approach is a reasonable way in which to explore the thesis statement. The oral presentation portion of the examination is open to all students and faculty.

The second segment of the candidacy examination is closed to only the student and the Advisory Committee. During this portion, the Advisory Committee may question the student about the dissertation proposal. In addition, the Advisory Committee will question the student in areas relevant to the student's research and related fields.

Results

After completing the oral examination, the Advisory Committee will determine the outcome. A student may be awarded a pass, conditional pass, or failure. A conditional pass may require the satisfactory completion of additional course work, preparation of written reports, or other academic tasks. In the event of a failed examination, the student has one opportunity to retake the examination within 6 months after a failure. If the student fails the candidacy examination a second time, the Advisory Committee will recommend that the student withdraw from the doctoral program. If the student passes the candidacy examination, the academic advisor will notify the Graduate School that the student has completed the candidacy exam and is now a Ph.D. Candidate.

Defense of the Dissertation

Purpose: The purpose of the dissertation defense is to allow faculty members and the public to examine critically and comment on the dissertation work and its significance.

Scheduling: Upon completion of the research, the candidate must furnish to each committee member a preliminary copy of the dissertation **at least two weeks** before the scheduled date of the final examination. In some cases, additional time should be provided for the external reviewer because of scheduling conflicts. After careful study, and possible conferences with the candidate and other committee members, each member will make a recommendation as to the appropriateness of scheduling of the final defense. Upon approval of the committee, the candidate may schedule the dissertation defense. It is the student's responsibility to notify the Mechanical Engineering Faculty of the date and location of the dissertation defense.

Common courtesy to both the candidate and committee dictates that the committee be given, but take no more than, one week to reach an initial decision on the acceptability of a student's dissertation. In the event that the candidate does not receive approval to schedule the public defense, the committee will make suggestions to the candidate regarding required changes to the dissertation.

After the committee has tentatively accepted the thesis the defense may be

scheduled and the Graduate School must be notified using Form 19 (Tentative Thesis Acceptance).

Procedure: Final examinations are open to the public and are conducted in a formal and professional manner. The dissertation defense should be publicized both within the department and in the university community. It is the responsibility of the candidate for the degree to ensure that all interested parties within the university community are informed of the time and location of the defense. This notification should specifically include researchers and students in other departments that are doing related research. The student's graduate thesis advisor will again be responsible for bringing the student's file (with necessary forms) to the presentation. To begin the presentation, the major professor introduces the candidate. The candidate then presents the findings of the doctoral research to the committee and the public. After the presentation, questions are invited from all present.

Results: Upon completion of the public question and answer period, the committee members and other members of the Mechanical Engineering Faculty who are present at the defense will go into closed session. The committee members will decide whether to accept or reject the dissertation. If the dissertation is accepted, the committee members will sign Form 20. If the dissertation is rejected, the committee members will than make appropriate recommendations to the student, who must then complete the required revisions. Another dissertation defense may or may not be scheduled, as determined by the committee.

6.1 Policy for Selection of Doctoral Students as Teaching Assistants

Incoming doctoral students need to demonstrate at least two years of research funding for their doctoral research beyond TA funding alone. Use of TA funding for doctoral students is acceptable for the following situations. 1) Bridge funding while waiting for approved research funding to commence; 2) Funding needed for student to complete degree after research funding lapses (max one year), 3) Funding to allow the student an opportunity to teach a course.

7. Satisfactory Progress

Any student not making satisfactory progress as determined by his or her graduate committee, or whose cumulative grade point average is less than B (3.0), shall be placed on academic probation. Probation can result in discontinuation of financial support, additional requirements for the student’s progress reporting and/or dismissal.

Newly admitted students will not be placed on probation until after completion of 12 credits or two semesters, whichever comes first. A student's individual graduate advisory

committee, or an appropriate departmental graduate committee, may recommend immediate dismissal upon finding that the student is making unsatisfactory progress toward the degree and that satisfactory progress cannot reasonably be anticipated.

APPENDIX A

LIST OF MEE GRADUATE COURSES

Research Methods, Thesis and Independent Study

INT 601	Responsible Conduct of Research*	MEE 696	Mechanical Engineering Graduate Seminar
MEE 500	Research Methods		
MEE 699	Graduate Thesis	MEE 697	Mechanical Engineering Projects

General

MEE 557	Introduction to Continuum Mechanics	MEE 644	Mechanical Engineering Analysis I
MEE 559	Engineering Optimization	MEE 549	Numerical Methods in Engineering

Mechanics of Solids and Structures

MEE 546	Finite Elements in Solid Mechanics	MEE 555	Smart Materials
MEE 550	Mechanics of Laminated Composite Structures	MEE 558	Mechanical Behavior of Materials
		MEE 646	Advanced Finite Elements in Solid Mechanics
MEE 552	Aircraft and Automobile Structures		
MEE 554	Theory of Elasticity	MEE 658	Theory of Plates and Shells

Thermal & Fluid Sciences

MEE 501	Macroscopic Thermodynamics	MEE 564	Fluid Structure Interaction
MEE 536	Advanced Heat Transfer I	MEE 565	Offshore Floating System Design
MEE 560	Computational Methods in Fluid Dynamics	MEE 588	Advanced Thermodynamics II
		MEE 638	Advanced Heat Transfer II
MEE 562	Advanced Fluid Mechanics		

Dynamics and Controls

MEE 547	Flight Dynamics and Control of Aircraft	MEE 551	Robot Dynamics and Control
		MEE 573	Advanced Vibrations I
MEE 548	Spacecraft Orbit and Attitude Dynamics and Control	MEE 574	Advanced Vibrations II

*Required

APPENDIX A1

From a B.S. in MET toward acceptance into the MS in ME Degree Program

Undergraduate Courses required BEFORE starting MS Program

(Other entrance requirements must also be met for acceptance into the program)

Mechanical Engineering Requirement	MET Program Requirement	MUST TAKE
ENG101	ENG101	
GEE 101	MET121 – Technical Drawing	
MAT126		MAT126 (4 cr)
MEE101	MET100 – Intro to Mech. Eng. Technology	-----
PHY121	PHY107 - Technical Physics I	Waive if B or better
COS215	COS220 – Programming in C++	COS204 (1 cr)
MAT127		MAT127 (4 cr)
MEE150	MET150 - Statics	Waive if B or better
PHY122	PHY108 Technical Physics II	Waive if B or better
CHY121/123	CHY121/123	-----
MAT228		MAT228 (4 cr)
MEE230	MET233 – Thermal Science	Waive if B or better
MEE251	MET219 - Strength of Materials	MEE251 (3 cr)
ECE210	EET330 - Elec. Apps.	-----
MAT258		MAT258 (4 cr)
MEE231	MET236 - Thermal Applications	MEE231(3 cr)
MEE270	MET317- Dynamics	MEE270 (3 cr)
ECE211 (MEE4XX)		MEE4XX* (3 cr)
MAT332		MAT332 (3 cr)
MEE340	MET107/108 Machine Tool Labs	-----
MEE360	MET325 – Fluid Flow Technology	MEE360 (3 cr)
MEE380	MET462 – Design I	Waive if B or better
ENG317	ENG317	-----
MEE320	MET355 – Eng. Materials	MEE320 (3 cr)
MEE341	MET234 – MET Lab I	Waive if B or better
MEE381	MET463 – Design II	Waive if B or better
MEE456		MEE456 (3 cr)
MEE342	MET471 – MET Lab II	Waive if B or better
MEE387		MEE387 (4 cr)
MEE432		MEE432 (3 cr)
MEE343		MEE343 (2 cr)
MEE388		MEE388 (4 cr)
Design Elective		(3 cr)
Design Elective		(3 cr)

* To be determined

APPENDIX A2

From a B.S. in a related engineering field toward acceptance into the MS in ME Degree Program

Undergraduate Courses required BEFORE starting MS Program

(Other entrance requirements must also be met for acceptance into the program)

Expected B.S. Background Courses (or equivalent)

- MAT228 Calculus III
- MAT258 Introduction to Differential Equations with Linear Algebra
- PHY121, PHY122 Physics

Engineering Courses (or equivalent)

- MEE150 Statics
- MEE270 Dynamics (requires MEE150 + MAT 228)
- MEE230 Thermodynamics 1 (requires MAT127)
- MEE251 Strength of Materials (requires MAT 127 + MEE150)
- MEE360 Fluid Mechanics (requires MEE230 + MEE270)
- MEE370 Controls (requires MEE 270 + ECE 209 + MAT 258),

  Or MEE471 Mechanical Vibrations (requires MEE 270 + MAT 258)

APPENDIX A3

From a B.S. in a general science field toward acceptance into the MS in ME Degree Program

Undergraduate Courses required BEFORE starting MS Program

(Other entrance requirements must also be met for acceptance into the program)

Expected B.S. Background Courses (or equivalent)

- MAT228 Calculus III
- MAT258 Introduction to Differential Equations with Linear Algebra
- PHY121, PHY122 Physics

Engineering Courses (or equivalent)

- MEE150 Statics
- MEE270 Dynamics (requires MEE150 + MAT 228)
- MEE230 Thermodynamics 1 (requires MAT127)
- MEE251 Strength of Materials (requires MAT 127 + MEE150)
- MEE360 Fluid Mechanics (requires MEE230 + MEE270)
- MEE370 Controls (requires MEE 270 + ECE 209 + MAT 258),

  Or MEE471 Mechanical Vibrations (requires MEE 270 + MAT 258)
- MEE381- Design II (requires MEE 251)

APPENDIX B

STYLE RECOMMENDATIONS AND FORMAT REQUIREMENTS FOR THESES AND DISSERTATIONS

For format required in the preparation of the thesis and dissertation please see the additional University of Maine style documentation. The intention of these guidelines is to provide additional information that may be helpful for graduate students in mechanical engineering. IN all cases of notation, formatting and referencing, a stylebook of some type should be used. The particular stylebook is not specified, but support for the reference format etc. used in the thesis may be required.

GENERAL REQUIREMENTS

Paper

Paper must be white, 50% or more cotton or rag content, 20 pound bond, 8 1/2 11 inches in size. Do not use line paper, erasable paper, perforated paper or paper hole punched for a binder.

Font

Fonts that are similar to standard typefaces are preferred. In particular Times New Roman or similar typefaces are typically used. Italic type may be used for foreign words, citation of titles and special emphasis. Typical type size is 10 or 12 characters per inch.

Margins

The left-hand margin must be at least 1-1/2". The right-hand, top and bottom margins are normally 1". The top margin of the first page of the preliminaries, chapters, appendices and bibliographies must be 2 inches.

Spacing

Double-spacing. However, footnotes, bibliography, table and figure captions, and data within large tables are to be single-spaced. Footnotes and bibliography are separated by double-spacing. Lengthy descriptions in the appendix may also be single-spaced.

End of page

- The last word on a page may not be divided.
- When it is necessary to divide a paragraph at the end of a page, at least two lines should appear at the bottom of the page and two at the top of the following page.
- A heading (or subheading) at the bottom of a page requires two lines of text following the heading and at least two lines on the next page.

Visual quality

The print must be letter quality. Dot matrix print of any type is inadequate. Final copies are high quality. Be sure the copies have not picked up spots or smudges during reproduction. Figures, printouts, spectra, etc. are clear and easy to read. These often do not reproduce well. There is no tape, white-out, handwritten information, etc. on the copies. Tape and white-out will crack and fall off over time and handwriting smears and fades. Color should be used sparingly and when required to communicate ideas that are difficult to convey with a grayscale image. For example, stress plots or temperature plots of a system are well suited to the use of color. Lines on x-y plots should be in gray scale with different line styles for different lines on the plot. This will allow the graph to be copies using a standard copy machine without loss of information.

Submission

Submit two unbound copies of the thesis or dissertation to the Graduate School Office by the deadline date for that term. A plain white flyleaf should be on the top and bottom of the document. The unbound copies must be submitted in separate manila envelopes with name, department, degree and term of graduation written on the outside of the envelopes. Doctoral candidates must submit three extra title pages, one extra abstract, one extra signature page, Survey of Earned Doctorate Form, University Microfilm Form, Dissertation Release Form, and a cashiers check or money order for $50 made payable to University of Maine for the microfilming fee. Master's candidates must submit two extra title pages and one extra signature page. Signature pages must carry original signatures in ink. The graduate School verifies that title, abstract and signature page information conform to the record system of the University. The student then delivers the thesis copies to the University Libraries.

FORMAT AND STYLE REQUIREMENTS

A typical thesis[1] is made up of three main parts: preliminaries, text and supplementaries. Each part may be organized as shown below.

Preliminary pages

- Flyleaf
- Title page
- Copyright page (optional)
- Signature page
- Abstract
- Acknowledgments (optional)
- Preface (optional)
- Autobiography (optional)
- Dedication (optional)

[1]In this document, thesis is used to refer to both a thesis and a dissertation.

- Table of Contents
- List of Tables (optional)
- List of Figures (optional)
- Nomenclature (optional)
- List of Keywords (optional)
- Other Preliminaries (optional)

Text Supplementaries
- References or bibliography
- Appendices (optional)
- Glossary (optional)
- Flyleaf

Preliminary Pages

Except flyleaf, title page and copyright page, all the preliminary pages must be numbered with lower case Roman numerals at the bottom. Headings for all preliminary pages must be centered and in uppercase. Headings must be centered in the 6 by 9 inches area within the margins.

Flyleaf

Each thesis must have a flyleaf (a blank sheet, no page number assigned) at the beginning and the end of the thesis.

Title page

A sample title page is available from the graduate school. The date shown must be the term and year of graduation in which the student is officially graduating. The title should be concise and definitive (with key words appropriate for retrieval purposes). It must not exceed 10 words. If necessary, a subtitle may be added. Note that the title page does not have a page number.

Signature page

A sample signature page is available from the graduate school. This page must be numbered with small Roman numeral ii. One must use the word "thesis" for masters work and "dissertation" for Ph.D. work. The print should match the print used in the text. Original signatures (in ink) must appear on both copies submitted with the thesis. The date on the signature page is the month, day, and year the page was signed.

Abstract

The first page of the abstract must be numbered with small Roman numeral iii. For Ph.D. dissertations, an additional abstract no longer than 350 words, excluding title and identification must be submitted for use in the microfilming process.

Table of contents

A table of contents listing headings, subheadings and sub-subheadings must be included with page numbers.

Nomenclature

Nomenclature should follow customary usage (see American National Standards Institute (ANSI) recommendations). The nomenclature list must be in alphabetical order (capital letters first, followed by lowercase letters), followed by any Greek symbols, with subscripts and superscripts last, identified with headings. Symbols that cannot be typed may be carefully handwritten in black ink.

Text

Use of units

SI units should ordinarily be used. When U.S. customary units are given preference, the SI equivalent shall be provided in parentheses or in a supplementary table. When preference is given to SI units, the U.S. customary units may be given in parentheses or omitted. For complete details regarding SI usage, consult ASME SI-1, ASME Orientation and Guide for the Use of SI (Metric) Units.

Pagination

The main text must be numbered with Arabic numerals. First pages of chapters, appendices and bibliographies are either left unnumbered (though a number is always assigned) or numbered at the bottom. All other text pages may have numbers placed either top or bottom, and either centered on the text or aligned at the right margin of the text. Page numbers may be inside or outside the top or bottom margins, but never less than 1/2 inch from the edge of the page. If inside the margin, the number should not be more than 1 line below the top margin or above the bottom margin. There should never be less than 1 blank line between the first or last text line and the page number.

Numbering

Chapters should be numbered as "1. Introduction". Numbering of headings, sub-headings, sub-subheadings, equations and figures must be consecutive within each chapter. All numbering must include a preceding chapter number, e.g., (3.4) would be the fourth equation in chapter three. Headings should be numbered as follows:

n.m	Heading
n.m.o	Subheading
n.m.o.p	Sub-subheading

where n, m, o, and p are the chapter, heading, subheading, and sub-subheading number. Note that, except for chapters, numbers should not conclude with a period (e.g., 2.4 is correct, 2.4. is incorrect).

Headings and subheadings

Each chapter must be started on a new page. The top margin must be 2 inches. Subheadings within a chapter do not begin on a new page unless the preceding page is filled. Style for

subheadings is optional, but style should be consistent throughout the thesis. Headings or subheadings at the bottom of a page require two lines of text following the heading and at least two lines on the next page.

Equations

The number should be enclosed in parentheses and set flush right in the column on the same line as the equation. It is this number that should be used when referring to equations within the text. When referring to equations in the text, the reference should be eqn. (n.m). Note that the "e" is small unless it begins a sentence, in which case the entire word "Equation" should be written out. In all mathematical expressions and analyses, any symbols (and the units in which they are measured) not previously defined in the nomenclature should be explained. An extra line of space should be left above and below a displayed equation or formula.

Figures

Figures (graphs, line drawings, photographs, etc.) should follow immediately after first mention in the text or on the next page. If they are placed on the next page -- continue the text to the bottom of the preceding page. Do not leave a space (gap) on the page where the figure was first mentioned. Figures should be numbered consecutively according to the scheme discussed above, with chapter and figure number, e.g., Fig. 4.2. The number and title of a figure should be placed below the figure. When referring to this figure in the text, the reference should be Fig. 4.2. Note the use of the capital "F", and as for equations, the entire word "Figure" should be written out if it begins a sentence. Each figure should have a caption consisting of the figure number and a brief title. No one figure should be larger than the page size; folded pages are not acceptable. Two lines of space should be left between figures and text.

Color: Colors will not reproduce in the microfilming process: instead they will appear as varying shades of gray. If microfilmed copies are to be of great importance, it might be wise to follow the suggestions below:

(1) Lines on a graph should be identified by labels or symbols rather than colors.
(2) Shaded areas will have better contrast if cross-hatching is used instead of color.
(3) Photographs should be professional quality black and white. Color photographs should be reprinted in black and white by a photo lab.
(4) The required electronic copy must include all of the photos in the paper copy.

Photographs: Photographs should be clear and sharp with a glossy finish, with scales included as needed; photostatic prints and halftones from printed reproductions do not reproduce satisfactorily. Photocopies are not acceptable.

Photomounting: A dry-mount process, cold-mount process, or archival quality tape may be used to mount photographs 6 9 inches or smaller on the same quality paper used for the thesis. The technique used for mounting photographs and other illustrations is crucial. Most methods of adhesion are not suitable for long-term storage. Many glues will harden and crack

over time and can discolor the paper and mounted item. Because of this, mounted objects can easily be lost or rendered illegible. Rubber cement, cellophane tape, glue sticks, white glue and aerosol spray glues are not allowed for affixing photos or other objects as they deteriorate rapidly.

Tables

Tables should follow immediately after first mention in the text or on the next page. If they are placed on the next page -- continue the text to the bottom of the preceding page. Do not leave a space (gap) on the page where the table was first mentioned. Tables should be numbered consecutively according to the scheme discussed above, with chapter and figure number, e.g., Table 4.2. The number and title of a table should be placed above the table. When referring to this figure in the text, the reference should be Table 4.2. Note the use of the capital "T". Each table should have a caption consisting of the table number and a brief title. No one table should be larger than the page size; folded pages are not acceptable. Two lines of space should be left between tables and text.

Broadside tables and figures

In order to fit large tables or figures on a page, it is sometimes necessary to place them broadside. The binding margin for such a table or figure must be 1 1/2 inches and all other margins must be no less than 1 inch. The top margin and page number location must be the same as on a regular page. The table or figure and caption will be read by turning the page 1/4 turn clockwise. Broadside tables may also be split on a facing page. This rule does not apply to broadside figures.

Footnotes and endnotes

Footnotes are referenced with superscript numerals and are numbered consecutively throughout the entire thesis and they must appear at the bottom of the page on which the reference is made. Footnotes are separated from a full page of text with a single line 1 1/2 inches long (beginning at the left-hand margin), one double space below the text. The footnote itself begins one double space below the line, is paragraph indented, is preceded by a superscript numeral, and is single-spaced with double spacing between footnotes. In a chapter which has a short last page, the line and footnote(s) are placed at the bottom of the page. Two or more short footnotes may be placed on the same line if there are at least six spaces between the footnotes. (For more information about footnotes and endnotes see the "Thesis Manual" published by the Graduate School.)

Supplementaries

References or bibliography

Text Citation Within the text, references should be cited by giving the last name of the author(s) and the year of publication of the reference. The year should always be enclosed in parentheses; whether or not the name of the author(s) should be enclosed within the parentheses depends on the context. The two possibilities are illustrated below.

It was shown by Prusa (1983) that the width of the plume decreases under these conditions.

or

It has been shown that the width of the plume decreases under these conditions (Prusa, 1983).

In the case of two authors, the last names of both authors should be included in the citation, as shown in the above examples, with the word "and" separating the two authors. In the case of three or more authors, only the last name of the first author of the reference should be included, as shown in the above examples, with the other authors being denoted by "et al." In the case of two or more references with the same author(s) and with the same year of publication, the references should be distinguished in the text by appending a lowercase letter "a" to the year of publication of the first cited, a letter "b" to the second cited, etc. The references should follow the examples shown above.

List of References References should be arranged in alphabetical order according to the last name of the author, or the last name of the first-named author for papers with more than one author. Each reference should include the last name of each author followed by his initials.

Reference to journal articles, papers in conference proceedings, or any other collection of works by numerous authors should include:

. the year of publication
. the full title of the cited article
. the full name of the publication in which it appeared
. the volume number (if any)
. the inclusive page numbers of the cited article

Reference to textbooks, monographs, theses, and technical reports should include:

. the year of publication
. the full title of the publication
. the publisher
. the city of publication
. the inclusive page numbers of the work being cited

In all cases, titles of books, periodicals, and conference proceedings should be underlined or in italics. A sample list of references in which these forms are illustrated follows.

Sample References

Kwon, O.K., and Pletcher, R.H., 1981, "Prediction of the Incompressible Flow Over a Rearward-Facing Step," Technical Report HTL-26, CFD-4, Iowa State Univ., Ames, IA.

Lee, Y., Korpela, S.A., and Horne, R.N., 1982, "Structure of Multi-Cellular Natural Convection in a Tall Vertical Annulus," Proceedings, 7th International Heat Transfer Conference, U.

Grigul et al., ed., Hemisphere Publishing Corp., Washington, D.C., Vol. 2, pp. 221-226.

Sparrow, E.M., 1980a, "Fluid-to-Fluid Conjugate Heat Transfer for a Vertical Pipe - Internal Forced Convection and External Natural Convection," ASME Journal of Heat Transfer, Vol. 102, pp. 402-407.

Sparrow, E.M., 1980b, "Forced-Convection Heat Transfer in a Duct Having Spanwise-Periodic Rectangular Protuberances," Numerical Heat Transfer, Vol. 3, pp. 149-167.

Tung, C.Y., 1982, "Evaporative Heat Transfer in the Contact Line of a Mixture," Ph.D Thesis, Rensselaer Polytechnic Institute, Troy, NY.

Appendices

Appendices may be treated in a fashion parallel to that of chapters.

RECOMMENDATIONS

Title

Titles should be concise and descriptive. To facilitate indexing, titles should be indicative of the contents. Avoid use of phrases such as "A Study of," "Effect of," "Laboratory Study of," etc. Abbreviations in titles are discouraged.

Abstract

The purposes of an abstract are:

(1) To give a clear indication of the objective, scope, and results of the thesis so that readers may determine whether the full text will be of particular interest to them;

(2) to provide key words and phrases for indexing, abstracting, and retrieval purposes;

The abstract should not attempt to condense the whole subject matter into a few words for quick reading. Note that the abstract is a concise summary of the work, and is in no way an introduction to the work.

Text

Outline: The advantages of preparing an adequate outline before writing the text cannot be overemphasized. In the process of making the outline, ideas are classified and thoughts are ordered into a logical sequence such that by the time the information is ready to be transformed into complete sentences, a good overall mental picture has been formed. In outline form, the sequence of the various items and the progression of thought can easily be adjusted and readjusted until the desired order is obtained; therefore, much writing and rewriting is saved. A proper outline is the framework upon which a good paper is readily written.

Organization: The text should be organized into logical parts or sections. The purpose of the thesis, or the author's aim, should be stated at the beginning so that the reader will have a clear concept of the thesis objective. This should be followed by a description of the problem, the means of solution, and any other information necessary for proper qualification of the results and conclusions presented. Finally, the results should be presented in an orderly form, followed by the author's conclusions.

Style: The chief purpose of the thesis is to convey information to others, many of whom will by far less familiar with the general subject than the author. Care should be taken, therefore, to use simple terms and expressions and to make statements as concise as possible. If highly technical terms or phraseology are necessary, they should be adequately explained and defined. The use of the first person and reference to individuals should be made in such a manner as to avoid personal bias. Company names should be mentioned only in the acknowledgments.

All theses should be concise regardless of length. Long quotations should be avoided by referring to sources. Illustrations and tables, where they help to clarify the meaning or are necessary to demonstrate results properly, are desirable, but they should be kept to a practical minimum. Detailed drawings, lengthy test data and calculations, and photographs that may be interesting, but which are not integral to the understanding of the subject, should be omitted. Equations should be kept to a reasonable minimum, and built-up fractions within sentences should be avoided whenever possible.

Tabulation/Enumeration

Where several considerations, conditions, requirements, or other qualifying items are involved in a presentation, it is often advantageous to put them in tabular or enumerative form, one after the other, rather than to run them into the text. This arrangement, in addition to emphasizing the item, creates a graphic impression that aids the reader in accessing the information and in forming an overall picture. It is customary to identify the individual items as (1), (2), (3), etc., or as (a), (b), (c), etc. Although inclusion of such elements makes the text livelier, care should be taken not to use this scheme too frequently, as it can make the reading choppy and invalidate their purpose and usefulness.

APPENDIX C

Checklist for completion of MS Degree

- ☐ Complete 30 total credits for the degree
- ☐ Of the 30 course credits more than 24 are at the 500 level or above
- ☐ Complete 6 thesis credits for the degree (thesis option only)
- ☐ Submit a complete thesis to all of the committee members. The thesis MUST include all technical details and be a complete document. This includes complete and acceptable references. Incomplete formatting and other related details regarding acknowledgements and other
- ☐ Post notices of defense in ME office and all major areas of the Mechanical Engineering department at least two weeks prior to the defense. The notice should also be placed in faculty mailboxes.
- ☐ Schedule of oral examination form
- ☐ Register for 1 credit in the semester in which you intend to graduate
- ☐ Post notices of defense in ME office and all major areas of the Mechanical Engineering department at least one week prior to the defense. The notice should also be placed in faculty mailboxes.
- ☐ Submit paper copy of the thesis which meets all university and departmental formatting requirements and which is consistent with a style book that is acceptable to the graduate thesis advisor and the department.
- ☐ Submit electronic copy of the thesis to the university library along with all required transfer of copyright forms.Register for 1 credit in the semester in which you intend to graduateGrade awarded in thesis credits for degree (See your graduate thesis advisor)Completion of requirements form submitted to the graduate school (form 21)

Admission to Candidacy:

May 16, 2002

Graduate Student
Mechanical Engineering
5711 Boardman Hall
University of Maine
Orono, Maine 04469-5711

Dear Student:

As a result of the written and oral portion of your examination for admission to candidacy, the committee had determined that you have are (recommend that you advance to Ph.D. candidacy, recommend that the student take the examination again, terminate the student from the Ph.D. program). Based on this result you should complete the atached program of study form in collaboration with your advisor and submit it to the graduate school. If you have any concerns or wish to request a review of your status, please contact the graduate coordinator.

Sincerely,

Graduate Coordinator

Mathematics Examiner

Solid Mechanics Examiner

Dynamics Examiner

Revisions.

March 21, 2016 – Section 6.1 added, Section 5 revised (page 6) to include new criteria for UMaine graduates.