

# Graduate Studies Handbook

University of Notre Dame  
Department of Aerospace and Mechanical Engineering

2008 – 2009 Academic Year

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## I. INTRODUCTION

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This handbook describes the policies and procedures for graduate studies in the Department of Aerospace and Mechanical Engineering of the University of Notre Dame. It emphasizes issues that are particular to the AME department. It details some general issues that are described in other sources. The most important of these other information sources is the University of Notre Dame Graduate School's annual *Bulletin of Information*, which is the primary source of policies pertaining to all graduate students at the University. Graduate students are expected to familiarize themselves with these policies. Nothing herein, in previous handbooks or on-line is to be interpreted as contrary to the regulations of the Graduate School.

An additional source of information is the *Graduate and Professional Student Handbook* that is published yearly by the Graduate School as it provides information on student services, student life and student government. In particular students should review this document and be aware of the policies regarding discriminatory and sexual harassment as they will be serving in positions of teaching authority at times during their graduate program. All students were provided a copy of this *Handbook* upon admission.

At the departmental level, all policy-making and administrative authority on graduate studies resides in the graduate studies committee, composed of the department chair, the director of graduate studies and elected department faculty members. The student's primary contact for all matters in graduate school is a faculty member who serves as the student's research advisor. Any policy question or administrative matter that cannot be resolved by the student and advisor should be referred in writing to the graduate studies committee via the Director of Graduate Studies. During the 2007-08 academic year Dr. Glen Niebur will serve as the Director of Graduate Studies (DGS).

These policies apply to all students enrolled during the 2008-2009 academic year. They are subject to change and may be different from policies published in previous years. An electronic version of this handbook is available at <http://ame.nd.edu/graduate/Handbook08-08.pdf>. More general information on the AME department can be found at <http://ame.nd.edu>.

Topics covered in this handbook include the basic responsibilities of graduate students, requirements for the M.S. and Ph.D.

programs, and items related to selected facilities and services available in the Department and University. A number of other important documents and directives are listed in the Table of Contents in the form of URL's and each student is encouraged to review these documents. Often answers to questions regarding the graduate program can be found by contacting Ms. Nancy Davis, the AME graduate program administrative assistant. Her office is Rm. 153 Multidisciplinary Research.

This handbook is intended to provide general guidelines for graduate students and it is recognized that exceptions will occur. All students are expected to have read these guidelines. If under any circumstances they wish to take exception to or deviate from these guidelines, they should secure prior written approval from the graduate studies committee and ensure that the approval is recorded in their permanent file. It is much safer and wiser to secure approval PRIOR to taking exception to a directive than after.

### *Appeals and Grievances*

Appeals of decisions related to academic matters, grievances of course grades or conduct, conflicts between students and advisors, or other issues that affect a student's degree progress will be addressed by the Graduate Studies Committee. Students wishing to file a formal grievance or appeal should do so in writing to the director of graduate studies *or* to the department chair. The student should indicate the nature of the problem, the date(s) the problem occurred, the grounds upon which the appeal is based, background information that the student considers important and the relief requested. The matter will then be submitted to the graduate studies committee, and acted on in no more than 15 working days. If the student feels the resolution is inadequate, they may appeal the decision to the graduate school by following the formal procedures. (<http://graduateschool.nd.edu/pdf/brochure.grad.appeal.pdf>).

## II. BASIC RESPONSIBILITIES

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Most full-time students receive a monthly stipend from the department. Funds for these stipends typically come from the externally funded grants and contracts of the student's advisor or from internal sources through the Graduate School. It is expected that full-time students receiving financial support from the University devote their entire professional

efforts to research, teaching, and course work within the University.

Students are allowed the following University holidays: Thanksgiving and the following Friday, Christmas Eve through New Year's Day, Good Friday and Easter Monday, Memorial Day, and Independence Day. Students are expected to be present during Fall Break, Spring Break, and breaks before each semester and summer session. Any extra vacation time during periods in which the student is receiving financial support must be approved by the student's advisor. Students receiving University support as a Teaching Assistant (TA) must be available throughout the semester, through the end of final exams, to support the courses for which they have responsibility. Any absence from campus by a TA during the semester must be approved in writing by the student's research advisor, the instructor in the course for which the student is serving as a TA and the department chair.

Those students who are receiving stipend support in any form from the University must receive approval from their advisor and the Director of Graduate Studies prior to pursuing *any* employment outside the Department.

#### *Registration and enrollment*

**A full-time graduate student is required to register for 12 credit hours during the fall and spring semesters during each semester in residence.** These 12 credits will be a mix of course work and research credits, as the Graduate School allows a maximum of 9 hours of graduate level course work per semester. Once a student has satisfied the course work and total credit requirements for the degree they are seeking, the student may take fewer than 12 hours and be designated as a full-time student.

All graduate students must both register and enroll before each spring and fall semester to maintain student status; otherwise they have to apply for re-admission. The only exception is for officially approved leaves of absence. Students are required to register and enroll for the summer session *only* if they intend to graduate during that session, or if they wish to take a course offered in the summer session (the latter only with the consent of both their advisor and the department chair). For entering students, registration and enrollment is done two days prior to the beginning of classes. For continuing students, registration is in the middle of the prior semester, with the subsequent enrollment the day before classes begin. It is important for most students beyond the first year to register for research credit in

AME68691 (M.S.) and AME98991 (Ph.D.). Students should consult the department's graduate administrative assistant as to how many hours of credit for which to register. Course selections should be made during registration after consultation with the advisor.

Graduate students are allowed to audit AME graduate courses and to do so they must register for the course and contact the registrar to indicate audit status. This course, with an audit designation, does appear on the student's official transcript and thus if a student registers in a course with the audit status but does not regularly attend the course, the faculty teaching the course are instructed to remove the student from the official course roster. If one enrolls as an auditor in a course, one needs to actually audit the course for it to appear on your transcript.

On occasion students spend part of their graduate program in a non-resident status. A student should carefully discuss all aspects of such an arrangement with their research advisor prior to departure. Students who leave prior to completing their degree program and graduating must realize that in order to eventually receive their degree they must be registered as a student in the semester prior to the graduation. If they are in a non-resident status and wish to complete their program and graduate, they will be responsible for the tuition costs associated with that registration.

#### *GRE 60501*

All first-year students must register for GRE 60501, which is offered only during the summer. It is the student's responsibility to determine the scheduling for this special course and to arrange any personal activities or vacation in a way that will allow attendance during the summer between their first and second year. This course is subject to summer tuition, which must be applied for through the summer session office. Forms are distributed in late February and due back to the summer session office no later than March 31. Failure to apply may result in the student being responsible for the cost of summer tuition.)

#### *Satisfactory progress toward your degree*

Each student's progress towards their degree will be reviewed annually by the student's advisor in conjunction with the graduate studies committee. Continued financial support, both stipend and tuition, are dependent upon successful performance in research, course work, assistance in teaching as well as the availability of funds. While the department will endeavor to maintain or

increase the stipend level, it cannot be guaranteed that the level of support will remain constant or increase.

The most readily used means for assessment of the student's academic progress is through grades assigned in course work. The Graduate School grading system is on a four-point basis. Grades recorded for graduate courses are: A (4.0), A- (3.667), B+ (3.333), B (3.0), B- (2.667), C+ (2.333) and C (2.0) which is considered the lowest acceptable passing grade for graduate students, and F (0.0). The grades of C- and D are not awarded in the Graduate School. The department has adopted grade point average (GPA) standards that are higher than those required by the Graduate School. The department's standards are as follows: As described later, in order to take the Ph.D. Qualifying Examination, a prerequisite for admission to the Ph.D. program, a student must have a minimum GPA of 3.2 in courses taken at Notre Dame that satisfy degree requirements. A student whose cumulative GPA is below 3.0 or whose GPA in any given semester is below 2.5 may be subject to loss of financial support and/or dismissal.

#### *Academic service*

All graduate students are expected to, as part of their professional development, contribute to the academic mission of the Department during the time they are on-campus students. This typically involves working with a faculty member to aid in teaching a course. The graduate student may conduct labs or recitation sessions, grade homework or exams, help develop new learning activities or hold office hours to provide assistance to students. A minimum of four hours per semester is required of all students as part of the academic requirements for a graduate degree in the department. For first year students who receive stipend support from University sources, this responsibility is nominally 8 hours per week. Second year and later students who receive stipend support from University sources, depending upon the level and type of that support, will also be designated as Teaching Assistants and their total commitment is nominally 16 hours per week.

The exceptions are:

1. A first year student who is fully supported by an external grant or contract and must immediately be engaged in their research program is excused from this responsibility in their first year.

2. Ph.D. students at or near the end of their program can petition for a single semester of dissertation writing status. For a graduate student on dissertation writing status whose full stipend support comes from external sources, the 4 hour commitment is waived for one semester. If that student remains on campus in the Ph.D. program after the dissertation semester, they will once again be expected to participate each remaining semester at a level dependent upon the source of their stipend.
3. Ph.D. students who receive full or partial stipend support from University sources can also request dissertation writing status but they will be expected to nominally be engaged for 8 hours each week in activities as a Teaching Assistant during their ABD semester.

#### *Professional Development Activities*

Students are required to participate in two of the activities for public technical discussion offered by the Department. First, all students must enroll in AME 63999, Graduate Seminar, every semester. The guidelines for participation in the Graduate Seminar are distributed at the beginning of each semester.

Second, all students are required to participate in the annual Graduate Student Research Conference that is held each year at a time selected by the organizing students and approved by the Director of Graduate Studies. All students are required to attend this conference and students in their second year and beyond are required to make an oral presentation at or prepare a poster of their research for the conference. The Graduate Student Conference is held on the Monday before the start of fall classes each year.

#### *Office and Laboratory Facilities*

The department supports a number of office complexes and individual research laboratories. Students are responsible for acquainting themselves with and following the proper safety procedures for the laboratories they use. Because the offices and laboratories are diverse in their purposes, procedures, and equipment, specific safety procedures are not listed here. However, all users of these offices and laboratories are to observe the following general safety and security procedures:

- a) Graduate students with a need for routine access into any of the laboratories will be issued a key from the department office. Keys may not be traded among, loaned to,

or passed on to other students and must be returned as soon as the need for regular access has passed.

- b) Users of a laboratory share in maintaining its security and orderly appearance. Laboratory doors are not to be propped open or left unlocked when the laboratory is unattended, and must be locked at the end of the working day. The equipment inside a laboratory is not, in general, insured against theft or damage.
- c) Unauthorized users are not allowed into a laboratory.
- d) Guests may be invited into a laboratory, but may not be left unsupervised. The host is responsible for the guests' safety.
- e) Each student using a laboratory must be acquainted with all the special safety procedures and safety equipment in the laboratory. These include the locations of emergency controls and the locations and use of all safety equipment and first aid supplies. It is essential that students not create hazards for themselves or their co-workers and that all laboratory personnel are able to take prompt, knowledgeable action if a hazardous situation does arise.
- f) Graduate students who supervise undergraduate laboratories assume primary responsibility for safety procedures. If additional safety supplies (such as hard hats or safety glasses) are required, the course instructor should be notified.
- g) Any graduate student developing a new experiment or acquiring new equipment will also be responsible for developing and recording the proper safety procedures associated with the new equipment.
- h) Observed inadequacy of laboratory safety procedures or equipment must be reported immediately to a faculty member or the department chair so that the situation may be corrected.
- i) Violations of safety procedures or the creation of unsafe or unhealthy conditions must be reported to the responsible faculty and department chair. Failure to work safely or to maintain orderly, professional working environments will result in the forfeiture of all office or laboratory privileges.

### **III. DEGREE PROGRAMS**

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This section describes the Department's requirements for the M.S. (thesis), M.S. (non-thesis) and Ph.D. degrees. Additional details of University requirements, including

residency and degree eligibility requirements, are in the *Bulletin of Information*.

#### *Advising*

One of the most important matters for graduate students is the choice of a faculty advisor. This choice can have a great effect on both the student's time in graduate school and long-term career path. Upon entry, graduate students are temporarily advised by their admission advisor or by another faculty member assigned by the department chair. Students are encouraged to speak with the faculty members in the area of their expressed interest in the first few weeks of their first semester. Students will be asked to submit a ranked list of their preferences for potential advisors to the department chair within the first month of the fall semester. Based on this student input, the current faculty needs and available resources, the department chair will assign each student a faculty advisor. While final responsibility for the assignment of an advisor lies with the department chair, in most cases individual students and faculty members make this arrangement without external intervention. If a student has not identified, and has not been accepted by, a research advisor by the end of the second semester in the program, they will be dismissed from the program. If a student is dismissed by an advisor at any time during their studies and cannot secure the support of a new advisor within 6 weeks, they will be dismissed from the program at the end of the current semester.

#### *General Course Guidelines*

Only graduate courses offered by departments in the Colleges of Engineering or Science can be applied to degree requirements. Introductory graduate-level courses are numbered 6XXXX, special graduate courses are numbered 7XXXX, and advanced graduate courses are 9XXXX. With the prior (i.e. prior to taking the course) written approval of the department chair, or the DGS, credit can be received for up to six hours of 40000 or 50000 level courses offered in the Colleges of Engineering and Science for both the M.S. (thesis) and the Ph.D. degree. Students completing the Plan II (non-thesis) M.S. degree can receive credit for up to *nine* hours of 40000 or 50000 level courses with similar written approval. Such credit will not be given for work that is considered remedial. Graduate students who completed undergraduate degrees at Notre Dame, and took graduate level (50000 level or higher) courses that were not used to satisfy

undergraduate degree requirements, can request the graduate studies committee to approve up to 6 credit hours of qualified courses to satisfy graduate degree requirements.

In general students will register for both formal course work and either dissertation or thesis research to fulfill the 12 credit hour requirement to maintain full-time status.

**A. Master's Degree (Plan I – Thesis)**

This section details the requirements for the M.S. (thesis) degree. A minimum of thirty credit hours must be successfully completed of which up to twelve may be research credits (i.e. thesis research credits). No foreign language examination is required.

*Course Requirements for the M.S. Degree (thesis)*

Eighteen credit hours (six classes) of course work are required for the M.S. degree with thesis. The department has established a single core-course requirement that all M.S. (thesis) students must pass or have passed an equivalent course at another institution. The graduate studies committee will judge whether or not courses at other institutions are equivalent. Students must complete and pass one of the following mathematical methods courses in their first year of study:

- AME60611 Mathematical Methods I (fall semester annually)

Or

- CHEG60542 Mathematical Methods in Engineering I (fall semester annually)

Both courses are foundational for graduate studies in engineering with AME60611 being a more advanced course.

The following Table illustrates a “typical” program for an M.S.-Thesis student.

**TYPICAL MASTER'S PROGRAM (Thesis)**

|                            |               |  |
|----------------------------|---------------|--|
| <b>1<sup>st</sup> Year</b> | <b>Fall</b>   | <b>Courses: 9 hrs<br/>Research: 3 hrs</b>    |
|                            | <b>Spring</b> | <b>Courses: 9 hrs<br/>Research: 3 hrs</b>    |
|                            | <b>Summer</b> | <b>Research<br/>GRED60501<br/>(if req'd)</b> |
| <b>2<sup>nd</sup> Year</b> | <b>Fall</b>   | <b>Research: 6 hrs</b>                       |

*Thesis Preparation*

All M.S. (thesis) students must write a thesis that is generally completed during the third or fourth semesters. The final version of the thesis must conform to the requirements as outlined on the Graduate School's web page:

<http://graduateschool.nd.edu/html/current.students/checklist.html>.

All theses *must* be checked by the Graduate School for conformity to the guidelines before final submission (see Shari Hill in the Graduate School).

When the thesis is complete, the student's advisor signs it to indicate final approval and its readiness for the committee of readers. The readers are selected by the student in conjunction with the advisor and submitted to the graduate studies committee for approval. There are at least two readers, besides the advisor, who are members of the AME Graduate Faculty. The graduate studies committee must approve readers who are not on the Department's faculty. To be accepted, the thesis must be approved by at least two readers. The advisor may not be one of the official readers. The readers report their decision on the appropriate form to the Graduate School.

*Final Examination and Degree Candidacy*

Application to degree candidacy for the M.S. (thesis) degree is completed at the same time the M.S. (thesis) oral examination is conducted.

The final comprehensive examination for the M.S. (thesis) degree is an oral examination and covers the area of the thesis. It is scheduled upon the request of the student, but will not be given less than one week from the time that the completed thesis is made available to the examining committee. This committee will consist of a minimum of three faculty members, normally the thesis advisor plus the two readers.

The examination begins with a thirty to forty minute presentation by the candidate. This presentation is open to the public. The presentation should review the major elements of the thesis and should be primarily directed to the thesis readers. After the presentation, the thesis advisor calls for questions from members of the committee as well as the general audience. Additional questioning by the committee may be conducted in private after excusing the public audience. After the examination, the thesis advisor may excuse

the candidate and call for discussion followed by a vote of committee members. A candidate passes upon either the unanimous consent or the consent of all except one member of the committee.

#### *Publication of the Thesis*

The Master's thesis serves as the scholarly record of the student's research, and should be published and disseminated. After the oral examination and approval of the thesis format by the Graduate School, the AME Department requires the student to upload a clear, print-quality PDF version of the complete thesis to the Library's electronic submission website at <http://etd.nd.edu>. Note that the PDF upload version requires the advisor-signed title page. The Library system allows students to have control over the electronic release of their thesis to protect their intellectual property where appropriate. This policy allows all AME M.S. theses to be available on-line.

The Graduate School currently requires that students submit either two printed manuscripts OR one clear print-quality PDF document. The AME policy satisfies the Graduate School policy at no cost to the student. This policy provides for the greatest exposure and accessibility for the AME archive of theses. (Note: the AME department will no longer require that students submit any print copies for binding.) It is the responsibility of the individual research advisors and graduate students to support the cost, produce and distribute any bound or readers copies of the student's thesis. Any questions regarding Graduate School thesis rules should be submitted to Shari Hill (1-7545) in the Graduate School.

#### **B. Master's Degree (Plan II – Non-thesis)**

This section gives the specific requirements for the M.S. (non-thesis) degree. The M.S. (non-thesis) degree is generally not an option for students receiving financial support from the department. Students receiving financial support from the department must obtain the approval of their advisor and the department chair prior to matriculating in the M.S. (non-thesis) program.

#### *Course Requirements for the M.S. Degree (non-thesis)*

A minimum of thirty credit hours of course work must be taken to receive this degree. Of these, up to six credit hours may be taken as non-thesis research (i.e. AME687XX) or if the student began working on a thesis and

a decision is made to terminate their program with a non-thesis MS degree, they can also use thesis research credits (AME68691) to satisfy this six-hour requirement at the discretion of the graduate studies committee.

#### *Degree Candidacy and Final Examination*

Application to degree candidacy for the M.S. (non-thesis) degree is completed at the same time the M.S. (non-thesis) oral examination is conducted.

The final comprehensive examination for the M.S. (non-thesis) degree is an oral examination by a committee of department faculty. It is scheduled upon the request of the student, but will not be given less than one week from the time that the student notifies the examining committee. This committee will consist of a minimum of three faculty members, normally the faculty advisor plus the two other AME Graduate faculty members. Permission to include others on the committee must be granted by the graduate studies committee.

The examination begins with a presentation of thirty to forty minutes by the candidate. The presentation topic/focus will be decided upon by the student and their advisor. After the presentation, the faculty advisor calls for questions from members of the committee. After the examination, the faculty advisor may excuse the candidate and call for discussion followed by a vote of committee members. A candidate passes upon either the unanimous consent or the consent of all except one member.

#### **C. Master of Engineering in Mechanical Engineering**

This degree is intended for students who are interested in engineering management, and combines courses from the Mendoza College of Business with traditional engineering courses. A total of 24 credits of course work are required. Details on the program are provided in a separate handbook. Specific information about the MEME degree requirements can be found online at <http://ame.nd.edu/graduate/MEMEProgram.pdf>.

#### **D. Doctor of Philosophy**

This section describes the requirements for the doctoral degree. Students entering with an M.S. degree should note some deviations from this program given on page 10. The M.S. degree is not a prerequisite for the Ph.D. program.

## TYPICAL DOCTORAL PROGRAM

|                |        | <i>Students entering with B.S.</i>                   | <i>Students entering with M.S.*</i>                  |
|----------------|--------|--|--|
| 1st Year       | Fall   | Courses: 9 hrs<br>Research: 3 hrs                    | Courses: 6 hrs<br>Research: 6 hrs                    |
|                | Spring | Courses: 9 hrs<br>Research: 3 hrs<br>QUALIFYING EXAM | Courses: 9 hrs<br>Research: 3 hrs<br>QUALIFYING EXAM |
|                | Sum    | Research<br>GRED 60501                               | Research<br>GRED 60501                               |
| 2nd Year       | Fall   | Courses: 6 hrs<br>Research: 6 hrs                    | Courses: 6 hrs<br>Research: 6 hrs                    |
|                | Spring | Courses: 6 hrs<br>Research: 6 hrs                    | Research: 10 hrs<br>CANDIDACY                        |
|                | Sum    | Research   | Research   |
| 3rd Year       | Fall   | Courses: 6 hrs<br>Research: 6 hrs                    | Research: 1 hr                                       |
|                | Spring | Courses: 6 hrs<br>Research: 6 hrs<br>CANDIDACY       | Research: 1 hr                                       |
|                | Sum    | Research   | Research<br>Ph.D. DEFENSE                            |
| 4th - 5th Year | Fall   | Research: 1 hr                                       |  |
|                | Spring | Research: 1 hr                                       |  |
|                | Sum    | Research<br>Ph.D. DEFENSE                            | <i>*assuming 24 credits transferred</i>              |

A total of seventy-two semester credit hours (including both course credits and research credits) are required for the Ph.D. degree. Each first year graduate student **must register for 12 credit hours each semester**. This will include a combination of course work and research. Eighteen credit hours of course work applicable to the Ph.D. degree, excluding research credits, is required in the first year for students receiving support from University sources. First year students supported in full by external funding can take fewer course credits, and more research credits, with the approval of their research advisor, though care should be taken that they

are still prepared to take the qualifying examination described below at the end of their first year of studies. Students are expected to complete all degree requirements in approximately five years.

### *Course Requirements for the Ph.D. Degree*

Students should meet with their admission advisor at the beginning of their first semester to prepare an individual course of study for the first semester. A permanent research advisor is normally assigned during the first semester. The research advisor will then work with the student to plan the remainder of their program.

The department has established core course requirements that each Ph.D. student must complete and pass – or have passed the equivalent of at another institution. The graduate studies committee will judge whether or not courses at other institutions are equivalent.

#### 1. Mathematical Methods I

Students must complete and pass one of the following mathematical methods courses:

- AME 60611 Mathematical Methods I (fall semester annually)
- or
- CHEG 60542 Mathematical Methods in Engineering I (fall semester annually)

AME 60611 is strongly recommended, as the qualifying examination in applied mathematics will be based on the material presented in this course.

#### 2. Mathematical Methods Elective

Students must complete and pass a second 3-credit course in mathematics. Students whose studies are concentrated in the aerodynamics, heat transfer or fluid mechanics fields are advised to complete AME 60612 in their second semester of study. Students in other research areas should consult with their advisor to determine the most appropriate course for their field of study. Candidate courses that satisfy the mathematics elective requirement include:

- AME 60612 Mathematical Methods II (spring semester annually).
- 60000 level or higher courses in the Department of Mathematics; see Appendix D for the approved list of courses.
- 60000 level or higher applied mathematics courses in the College of Engineering;

requires prior approval of the graduate studies committee.

### 3. Numerical Methods

Students must complete and pass a 3-credit course in numerical methods. Candidate courses that satisfy the numerical methods elective requirement include:

- AME 60614 Numerical Methods - ODE and PDE techniques
- CSE 60113 Numerical Methods and Computation - Large-scale linear systems
- AME60613 Finite Elements in Engineering - a Finite-Elements course
- AME 60644 Finite Elements in Structural Mechanics - a Finite-Elements course
- Other courses approved by the graduate studies committee. If a student wishes to take another course to satisfy this core requirement, they should submit a request in writing to the graduate studies committee prior to taking the course.

The student must complete a minimum of thirty-nine course credit hours, which include nine hours from the core courses and eighteen hours in a **major area** defined by the advisor and student. At least nine credits must be in a second, **coherent area of study** different from the major area of study. At least six credits must be from courses **outside the AME department**. An individual course can be used to satisfy both the out-of-department requirement, and a core course or secondary area course requirement. In addition, the student should take any other courses deemed necessary by their advisor or the Candidacy Examination committee. There is no foreign language requirement.

The final program of courses must be approved by the advisor and the director of graduate studies prior to taking the candidacy exam. See appendix F.

#### *Ph.D. Qualifying Examination*

The Ph.D. Qualifying Examination is a written examination. The purpose of the exam is to determine a student's proficiency in selected topics at a level consistent with that generally expected for a graduate student in the department, and thereby determine if a student should be formally admitted to the Ph.D. program. The qualifying examination is given once a year at the end of the spring semester. The examination for students entering fall semester 2008 will be conducted on May 20, 21, and 22, 2009.

In order to enter the Ph.D. Program, students are required to take this examination after completing two semesters, or after three semesters if they initially enrolled in the spring. The summer term is not counted for this purpose. Under *exceptional circumstances*, a student can petition to take the Qualifying Examination at the end of their second year of studies.

In order to be eligible to take this examination, the student must have a minimum GPA of 3.2 in those courses that satisfy degree requirements. The GPA is calculated base only on courses taken in the graduate program at Notre Dame. Students who do not meet the GPA requirement at the time when they are scheduled to take the Qualifying Examination are ineligible for the Ph.D. program.

The examination consists of three written sections. One section is in mathematical methods, and the other two are in fundamental areas of engineering from the following list:

- Aeronautics
- Controls/Robotics
- Design
- Dynamics/Kinematics
- Fluid Mechanics
- Heat Transfer/Thermodynamics
- Materials
- Solid Mechanics

Additional areas may be added, and a final list along with suggested study material and the scope of each examination will be distributed during the month of September.

In general, the content to be covered on the examination is that of a typical upper-level undergraduate elective course. Students should be able to demonstrate a level of knowledge of the material reflecting a maturation of understanding over their first year in graduate school. As such, it may involve advanced applications or derivations of the underlying theory.

Students will be required to designate the two discipline areas in which they will be tested by April 24, 2009. The students should discuss with their advisors the examination areas most appropriate for their program and their background. The students will then complete a form indicating which examination areas they have selected. This form represents their advisor's approval of the subject areas and the advisor's willingness to work with the student in their Ph.D. program.

Students should choose their courses carefully in the first year in order to have adequate preparation for the Qualifying Examination. Specifically, the Mathematics examination will cover material from the course AME 60611 (Mathematical Methods I), and students who do not take this course (*e.g.* students electing to transfer this credit from another institution) should familiarize themselves with the content and scope of the course. If there is a doubt that they have the proper background, the student should consider any number of alternatives including: auditing the course, or a self-review using the same or a similar textbook used in the course. For the other area examinations, students may wish to take a course in the area to refresh their skills, or develop a deeper understanding.

Students and their advisors will be notified of the outcome of the exam within three weeks of the completion of the exam. On occasion marginal student's performance on a specific examination may warrant certain remedial actions such as the requirement to take a specific course (and achieve at least a specified grade) or an oral re-examination. Students who fail the exam on the first attempt, can petition (in writing) the graduate studies committee to re-take the exam in the subject areas they failed the following year.

#### *Admission to the Doctoral Program*

The graduate studies committee will make the decision to accept the student into the doctoral program after reviewing the student's academic record and the Qualifying examination results.

Admission to the degree program does not constitute admission to degree candidacy for which additional requirements are described below.

#### *Ph.D. Candidacy Examination*

The Ph.D. Candidacy Examination should normally be successfully completed near the end of the third year in residence for students entering with their B.S. degree and prior to the fifth semester for students entering with their M.S. degree. The examination *must* be completed by the end of the eighth semester to satisfy graduate school regulations.

This examination is administered by the Candidacy committee, which consists of 1) the student's advisor(s), 2) at least three other faculty members, who will also serve as dissertation readers, selected by the student with the approval of the advisor(s), the graduate studies committee, and the Graduate School, and 3) a non-voting chair who is

appointed by the Graduate School. Unless special circumstances warrant, at least two of the three readers on the candidacy committee should be from the AME department graduate faculty.

To initiate the Candidacy process, the student should consult with their advisor(s) to select members of a Candidacy committee. The student then obtains a form from the department and completes it with the names of the committee members. Care should be exercised in the selection of the voting members, as they, along with the advisor(s), will also serve as the voting members in the Ph.D. Dissertation Defense. A candidate must petition the graduate studies committee for any change in the composition of the committee after passage of the Candidacy Examination. Only in extraordinary circumstances will the graduate studies committee approve a change. Examples of circumstances under which a change would likely be approved include serious illness or permanent departure from the University, and it should be emphasized that final approval of a change can only come from the Graduate School. An extended leave by a member of the committee will only be accepted as a need for a change if evidence is given that an acceptable communication link cannot be established for the examination to take place.

If a student wishes to include someone from outside of the University on their committee, they should see the graduate program administrative assistant, as it requires approval of the Graduate Studies Committee. In general, individuals from outside the University should be on the faculty at another university, or otherwise have a record of scholarly activity.

The Candidacy Examination itself consists of both written and oral parts. It is the student's responsibility to schedule both. The oral examination is scheduled only after passage of the written portion. The Graduate School requires notification 10 business days, excluding holidays, prior to the scheduled oral examination date in order to appoint an outside chair. However, if the student and advisor wish to find their own outside chair, this time can be reduced to 5 business days, excluding holidays.

The purpose of the written examination is to verify the student's capability of conducting Ph.D. level research within his or her area of specialization. The format of the written part will be decided by the student's committee and takes the form of *one of* a problem, project, a review of the student's written candidacy

proposal, or other research publications. Each member of the committee will report the results (i.e. pass or fail) of the written portion of the examination on a Written PhD Candidacy Examination verification form, which can be obtained through the graduate administrative assistant. Only when this form has been signed by all the committee members and returned to the department can the Graduate School be requested to schedule the oral part of the examination.

The oral examination explores the feasibility, originality, and significance of the proposed Ph.D. dissertation topic. The oral examination will cover material in the written dissertation proposal and can include questions which are generally relevant to the student's area of research but which are not specifically related to the dissertation proposal. This proposal should be submitted to each member of the Candidacy Examination committee at least two weeks prior to the oral examination. Typically the dissertation proposal consists of about twenty pages of text, wherein the dissertation topic, plan of research, and significance of expected original contributions of the research are summarized.

Both portions of the Candidacy Examination are passed or failed by a vote of the Candidacy Examination committee. To pass, the student must receive the support of at least all members except one. In the case of a failure, the student may be allowed one re-examination by the department chair upon recommendation of a majority of the Candidacy Examination committee members and the approval of the Graduate School.

#### *Master's Degree Option*

A doctoral student who has successfully completed all parts of the doctoral Candidacy Examination may receive a non-thesis Master's degree upon the student's request and the recommendation of the student's advisor, the DGS, and the department chair. Note that it is the policy of the University to not award duplicate degrees. A student who has a Master's degree in aerospace *or* mechanical engineering, whether from Notre Dame or another institution *will not* be awarded a Master's degree on completion of the Candidacy examination.

#### *Students entering with an M.S. Degree*

There are some modifications which apply only to those students with either an M.S. degree from another University or who hold an M.S. degree from Notre Dame but who are

coming back after an absence from the University.

A request to the graduate studies committee for transfer of up to 24 credits from a master's degree obtained within a period no longer than five years prior to admission to Notre Dame may be made. To receive credit for a graduate course taken elsewhere, the course will need to be a graded, graduate-level, academic course in engineering or science, that would normally be considered as part of our graduate academic course requirements. The student must have achieved a grade of a B or better. Pass/fail courses, research credits, M.S. thesis writing credits, or other credits not related to formal course work cannot be transferred. The graduate studies committee will make a determination if any of these credits can additionally satisfy the mathematics, numerical methods, or out-of-department course requirements. A maximum of 6 hours of graduate course credit may be accepted from the graduate courses completed elsewhere if no graduate degree was earned.

For those students entering with M.S. degrees, the Qualifying Examination should be taken at the earliest opportunity. If a student has not attempted the Qualifying Examination before the start of their third semester, or has not passed before the start of their fourth semester, they will be dismissed from the program.

The Candidacy Examination should be taken prior to the fifth semester. Without exception, students *must* take and pass their candidacy exam no later than their 8<sup>th</sup> semester or they forfeit their academic and financial eligibility. It is expected that the student will finish the requirements for the Ph.D. in approximately three years.

It is the policy of the University and of the Department that duplicate degrees are not awarded. If a student holds a Master's degree in aerospace *or* mechanical engineering, they *cannot* be awarded a Master's degree on completion of the candidacy examination. There are no exceptions to this policy.

#### *Preparation of Dissertation*

After the completion of research, the student will prepare a written dissertation. The final version of the dissertation must conform to the requirements as outlined on the Graduate School's webpage:

[http://graduateschool.nd.edu/html/current\\_students/checklist.html](http://graduateschool.nd.edu/html/current_students/checklist.html). Dissertations must be checked for conformity to the formatting standards before final submission (see Shari Hill in the Graduate School). To avoid

problems, students should use the Microsoft Word® document templates or LaTeX class files supplied by the Graduate School.

When the dissertation advisor(s) is/are satisfied that the dissertation is in suitable form, the advisor(s) will sign a distribution form, available from the department, releasing the dissertation for distribution to the three or more official dissertation readers. The Ph.D. candidate will deliver this signed form to the department's graduate administrative assistant, who will then issue the Ph.D. reader's card to the candidate. It is the responsibility of the candidate to deliver the required copies of the dissertation along with the appropriate reader's card to their readers.

The dissertation defense may not be scheduled sooner than six weeks from the date the graduate studies administrative assistant receives the dissertation distribution form. It is expected that during this time each reader will carefully read the dissertation then meet individually with the candidate and discuss suggested or necessary changes to be made before the oral defense. The oral examination will not be scheduled until all the Ph.D. reader's cards have been signed and returned to the graduate studies administrative assistant. It is expected that all readers will have met with the candidate at least two weeks prior to the scheduled date of the oral defense and have reported their approval or disapproval at least one week prior to the scheduled date of oral defense. Only a dissertation unanimously and unconditionally approved by the three readers may be defended.

#### *Defense of Dissertation*

The purpose of the Ph.D. Dissertation Defense is to explore the originality and significance of the candidate's dissertation. The defense examination committee includes at least the three official readers, the research advisor, and a non-voting chair appointed by the Graduate School. It is the candidate's responsibility to determine a mutually agreeable time for the defense. The scheduled date and time, accompanied with the readers' cards, are returned to the Graduate School at least 10 business days, excluding holidays, prior to the defense of the dissertation. The Graduate School then selects the committee chair from an outside department. The defense is open to the public and fellow graduate students are encouraged to attend. The candidate should post the time and place one week in advance of the defense. The candidate should reserve a room for the defense and

provide necessary audio-visual equipment; assistance in the scheduling matters can be obtained from the department's administrative staff.

The examination begins with a summary presentation of thirty to forty minutes by the candidate. The presentation should review the major elements of the dissertation. After the presentation, the chair calls for questions from members of the general audience. Final questioning by the committee will be conducted in private upon excusing the public audience. After the examination is completed, the chair will excuse the candidate and call for discussion followed by a vote of committee members. A candidate passes when at least all except one committee member approves the defense of the work. The chair sends a written report of the examination's overall quality and of the voting results to the Graduate School.

Failure of the defense does not necessarily require rewriting the dissertation. In the case of a failure, the student may be allowed a second opportunity to present a defense of their work based upon the recommendation of a majority of the candidacy examination committee members, the department chair and the approval of the Graduate School. Failure in the second defense terminates the candidate's eligibility for a doctorate at the University.

#### *Publication of the Dissertation*

The dissertation serves as the scholarly record of the student's doctoral research, and should be published and disseminated. After the oral defense and approval by the Graduate School the AME Department requires that the student uploads a clear, print-quality PDF version of the complete dissertation to the Library's electronic submission website at <http://etd.nd.edu>. Note that the PDF upload requires the advisor-signed title page. The Library system allows students to have control over the electronic release of their dissertation so as to protect their intellectual property where appropriate. This policy allows all AME Ph.D. dissertations to be available on-line.

The Graduate School currently requires that students submit either two printed manuscripts OR one clear print-quality PDF document. The AME policy satisfies the Graduate School policy at no cost to the student. This policy provides for the greatest exposure and accessibility for the AME archive of Ph.D. dissertations. If bound copies of the dissertation are desired, it is the responsibility of the individual advisors and

graduate students to support the cost, produce and distribute them. Any questions regarding Graduate School dissertation rules should be submitted to Shari Hill (1-7545) in the Graduate School.

#### **IV. FACILITIES AND SERVICES**

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##### **A. Library**

The University Library system consists of a number of libraries. Circulation policies and operating hours are available at each of the libraries. Students should make themselves aware of the resources the libraries provide and become more familiar with them by visiting the University library web site, <http://lib.nd.edu/>.

##### **B. Computing Facilities**

The Office of Information Technologies (OIT) oversees an extensive variety of computers, workstation clusters, and personal computer facilities throughout campus. Many are open year-round, twenty-four hours a day. The University is fully networked and has a wide range of software and printing services available for the use of all students. For a complete current listing of University facilities, which change often, students should visit their web page located at <http://oit.nd.edu>.

The department maintains a number of computers and printers for research, data acquisition, and report preparation. Please see you advisor to determine what resources will be available for you use.

##### **C. Laboratory Facilities**

A variety of research and instructional laboratories exist in the department. These are located primarily on the third floor of Fitzpatrick Hall and Cushing Hall, throughout the lower levels of Fitzpatrick Hall, in the Hessert Laboratory for Aerospace Research and in the College of Engineering Multidisciplinary Research Building (COE-MRB).

##### **D. Office Facilities**

All full-time graduate students have twenty-four hour access to personal office space in Cushing Hall, Fitzpatrick Hall, the Hessert Laboratory or COE-MRB . Offices are typically shared with other students. Most are air-conditioned and have phones for local calls. Each student will also have a mailbox located in or near the main administrative office in the building to which you have been

assigned. Students are encouraged to use their office as a base for carrying out day-to-day academic activities. Students are expected to maintain professional office environments. If this is not the case, based upon the decision of the department chair, a student may lose the opportunity to have an on-campus office.

##### **E. Copying Facilities**

There are a number of copying facilities on campus, with services available at a charge. Many small machines are located in Hesburgh Library and each branch library. The departmental copy machines are located in each of the AME buildings and policies associated with the use of the copy machines are established in each facility.

##### **F. Student Government Service**

Graduate students are responsible for the activities of the Graduate Student Union (GSU). Through a council of elected officers, appointed officers, and representatives from the departments of its constituent colleges, the GSU provides a variety of services and represents its membership on various University councils and committees. It publishes the bimonthly GSU newsletter, conducts a graduate orientation program, and sponsors workshops, travel grants, and various social and cultural activities. The GSU is the graduate students' official liaison with University administration, the Office of Student Activities, and the Library Administration. The GSU finances operations through a yearly fee assessed on all graduate students. The GSU maintains offices in 219 LaFortune Student Center, 631-6963; their website URL is: <http://www.gsu.nd.edu/>.

##### **G. AME Graduate Student Department Organization (GSDO)**

The AME Graduate Student Department Organization (GSDO) encompasses all graduate students in the AME department. The mission of the AME GSDO is to organize and facilitate social events for AME graduate students, provide a forum for the expression of AME graduate student opinions and concerns, as well as aiding in the orientation of new incoming students and the organization of the Fall AME graduate student conference. All graduate students in the AME department are automatically members of the AME GSDO. The GSDO maintains a website at <http://www.nd.edu/~amegsdo>.

## **H. Health, Counseling, Career and Placement, International, and Religious Services**

There are many additional services available to graduate students. Most are described in detail in the *Bulletin of Information* or on the web at : <http://graduateschool.nd.edu/html/current.students/>

University Health Services, located in the University Health Center, 631-7497, provides immediate, follow-up, and ongoing health care. The services provided include outpatient clinics, dispensing medication, administering allergy injections, laboratory and x-ray facilities, and a twenty-five-bed inpatient unit. Health insurance is required of all international and full-time students. The University offers a plan for all students. The student's spouse and children have the option of purchasing health insurance through this plan. More information can be obtained by calling 631-6114. The University Counseling Center, located in the University Health Center, 631-7336, offers professional services to all graduate students and their families.

The University offers a Career and Placement Service, Hesburgh Library Lower Level, 631-5200, to assist in post-graduate placement.

The University supports an International Student Affairs Office, 205 LaFortune, 631-5243, which aids in immigration matters, serves as liaison with sponsoring agencies and governments, and promotes interaction within the University. The International Student Organization (ISO), 204 LaFortune, is a club for interested students.

The University has several excellent athletic facilities, most of which are available free of charge.

Campus Ministry, 103 Hesburgh Library, 631-7800, offers many programs to serve students' spiritual needs. In keeping with the character of the University, most programs are oriented with the Catholic faith; students of other religious traditions are welcome to participate in any of the programs.

**APPENDIX A: ACADEMIC INTEGRITY**

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In questions involving academic integrity the student is referred to the general policy found in the Graduate School *Bulletin of Information*.

The department expects all students to maintain and promote the highest standards of personal honesty and professional integrity. These standards apply to examinations, assigned papers, projects and preparation of the thesis or dissertation. Violation of these standards, which includes, but is not limited to cheating in examinations, plagiarism and fraudulent practices in conducting research or reporting the results of such research, may result in suspension or dismissal.

Within the department, primary authority for judgment and decision on matters of academic integrity lies with the course instructor for issues, which arise in the classroom, or the faculty research advisor for issues that arise in research. Unsettled disputes should be referred first to the director of graduate studies and next to the department chair each of whom can serve as arbiters at the department level. Any further appeal should be directed to the Graduate School.

**APPENDIX B: FACULTY****AEROSPACE AND MECHANICAL ENGINEERING GRADUATE FACULTY (2007-2008)**

| Faculty Member | Doctoral Institution | Year of Ph.D. Graduation | Research Area | Administrative Position (Faculty Office Bldg.) |
|----------------|----------------------|--------------------------|---------------|--|
|----------------|----------------------|--------------------------|---------------|--|

*Full Professors*

|                    |                       |      |                   |                               |
|--------------------|-----------------------|------|-------------------|-------------------------------|
| Hafiz M. Atassi    | U of. Paris           | 1966 | Fluid Mechanics   | (Hess)                        |
| Stephen M. Batill  | Notre Dame            | 1972 | Design            | (On leave)                    |
| Thomas C. Corke    | Illinois Inst. Tech.  | 1981 | Fluid Mechanics   | Director, Hessert Labs (Hess) |
| Patrick F. Dunn    | Purdue                | 1974 | Fluid Mechanics   | (Hess)                        |
| Frank P. Incropera | Stanford              | 1966 | Heat Transfer     | (Fitz)                        |
| Eric J. Jumper     | Air Force Inst. Tech. | 1975 | Aerodynamics      | (Hess)                        |
| Robert C. Nelson   | Penn State            | 1974 | Flight Mechanics  | (Hess)                        |
| Samuel Paolucci    | Cornell               | 1979 | Fluid Mechanics   | (Fitz)                        |
| Joseph M. Powers   | Illinois              | 1988 | Combustion        | (Fitz)                        |
| Timothy Ovaert     | Northwestern          | 1989 | Tribology         | (MRB)                         |
| John E. Renaud     | Rensselaer            | 1992 | Design Automation | Department Chair (Fitz)       |
| Mihir Sen          | M.I.T.                | 1975 | Heat Transfer     | (Fitz)                        |
| Steven B. Skaar    | Virginia Tech.        | 1982 | Dynamics          | (Fitz)                        |
| Flint O. Thomas    | Purdue                | 1983 | Fluid Mechanics   | (Hess)                        |

*Associate Professors*

|                            |                  |      |                      |                                    |
|----------------------------|------------------|------|----------------------|------------------------------------|
| J. William Goodwine (Fitz) | Cal Tech         | 1998 | Robotics             | Director of Undergrad Studies      |
| Robert A. Howland, Jr.     | N.C. State       | 1974 | Dynamics             | (Fitz)                             |
| Scott C. Morris            | Michigan State   | 2002 | Aero Fluids          | (Hess)                             |
| Glen L. Niebur             | Univ. California | 2000 | Biomedical/Mechanics | Director of Graduate Studies (MRB) |
| Ryan K. Roeder             | Purdue           | 1999 | Biomedical/Materials | (MRB)                              |
| Steven R. Schmid           | Northwestern     | 1993 | Tribology            | (MRB)                              |
| James P. Schmiedeler       | Ohio State       | 2001 | Robotics             | (Fitz)                             |
| Michael M. Stanisic        | Purdue           | 1986 | Machine Kinematics   | (Fitz)                             |
| Meng Wang                  | Univ. Colorado   | 1989 | Fluid Mechanics      | (Hess)                             |

*Assistant Professors*

|                  |                   |      |                      |        |
|------------------|-------------------|------|----------------------|--------|
| David Go         | Purdue University | 2008 | Thermal Sciences     | (Fitz) |
| Vikas Tomar      | Georgia Tech      | 2005 | Materials            | (Fitz) |
| Philippe Sucusky | Georgia Tech      | 2005 | Biomedical/Fluids    | (MRB)  |
| Diane Wagner     | Univ. California  | 2002 | Biomedical/Mechanics | (MRB)  |

**Faculty Office Locations:** (Fitz)-Fitzpatrick Hall, (Hess) - Hessert Laboratory, (MRB) - Multidisciplinary Research

**APPENDIX C: 2008-2009 GRADUATE COURSE OFFERINGS<sup>1</sup>**

| <b>Course</b> | <b>Title</b>                       | <b>Instructor</b> | <b>Semester Offered</b> |
|---------------|------------------------------------|-------------------|-------------------------|
| AME60611      | Mathematical Methods I             | Powers            | Fall 2008               |
| AME60614      | Numerical Methods                  | Powers            | Fall 2008               |
| AME60621      | Introduction to Aeroelasticity     | Atassi            | Fall 2008               |
| AME60624      | Continuum Mechanics                | Niebur            | Fall 2008               |
| AME60630      | Microparticle Dynamics             | Dunn              | Fall 2008               |
| AME60631      | Experimental Methods in Fluids     | Morris            | Fall 2008               |
| AME60635      | Intermediate Fluid Mechanics       | Morris            | Fall 2008               |
| AME60641      | Adv. Mechanics of Solids           | Tomar             | Fall 2008               |
| AME60646      | Failure of Materials               | Roeder            | Fall 2008               |
| AME60647      | Powder Processing                  | Roeder            | Fall 2008               |
| AME60672      | Cell Mechanics                     | Wagner            | Fall 2008               |
| AME60674      | Cardiovascular Mechanics           | Ovaert            | Fall 2008               |
| AME77103      | Geometric & Physical Optics        | Jumper            | Fall 2008               |
| AME77104      | Aeroacoustics                      | Wang              | Fall 2008               |
| AME90939      | Thermal Convection                 | Paolucci          | Fall 2008               |
| AME90943      | Fluid Film Convection              | Schmid            | Fall 2008               |
| AME60632      | Physical Gas Dynamics              | Jumper            | Spring 2009             |
| AME60634      | Intermediate Heat Transfer         | Sen               | Spring 2009             |
| AME60636      | Combustion                         | Powers            | Spring 2009             |
| AME60639      | Advanced Aerodynamics              | Atassi            | Spring 2009             |
| AME60643      | Mechanics of Sliding Surfaces      | Ovaert            | Spring 2009             |
| AME60651      | Advanced Vehicle Dynamics          | Nelson            | Spring 2009             |
| AME60654      | Advanced Kinematics                | Stanisic          | Spring 2009             |
| AME60661      | Optimal Design of Machine Elements | Renaud            | Spring 2009             |
| AME60671      | Orthopedic Biomechanics            | Niebur            | Spring 2009             |
| AME90931      | Viscous Flow                       | Corke             | Spring 2009             |
| AME90935      | Turbulence                         | Thomas            | Spring 2009             |
| AME90936      | Computational Fluid Dynamics       | Paolucci          | Spring 2009             |
| AME99999      | Cardio_Vasular Fluids              | Sucoksy           | Spring 2009             |

<sup>1</sup> Proposed as of August 2008. Courses offerings are subject to change due to low enrollment or other circumstances.

## **APPENDIX D: MEDICAL SEPARATION FROM ACADEMIC DUTIES FOR STUDENTS IN THE GRADUATE SCHOOL**

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Students enrolled in the Notre Dame Graduate School who wish to temporarily interrupt their programs for medical reasons must apply to the Graduate School. Students are eligible under this policy if they have a “serious medical condition.” For purposes of this policy, “serious medical condition” means a medical condition that (1) requires multiple day hospitalization OR (2) renders the student unable to engage in coursework and all other Graduate School-related duties for a period of at least ten (10) calendar days. Certification by a physician that the student has a serious medical condition as defined in this policy must be submitted to the Graduate School no less than three months prior to the separation period (for childbirth and other predictable requests) or as soon as the need is foreseen (for emergency requests). In situations involving childbirth, the separation period will generally begin on the actual date of childbirth; in all cases, regardless of the nature of the medical condition, the duration of the separation will be as certified by the physician up to a maximum of 6 weeks. Students may utilize this medical separation policy two non-consecutive times during their graduate studies. Should students need more than 6 weeks at any one time, they must withdraw from the University. Leaves of absence for one semester or more for medical or other reasons are governed by the Graduate School Leave of Absence policy.

Full-time degree-seeking students in their 6<sup>th</sup> year of study or less who are receiving financial aid from the Graduate School or external funds will receive a stipend equal to their normal stipend during their period of separation, for a maximum of 6 weeks paid by the Graduate School. Students will retain

their tuition scholarships, access to on-campus medical facilities, and all other resources available to students during the entire separation period (up to 6 weeks). Students also will be deemed “continuously enrolled” at the University during the entire period of separation.

Teaching Assistant and Research Assistant duties will cease at least during the period of separation. Students are responsible for making arrangements, through their departments, to cover their duties. Students taking classes will be required to make arrangements with individual course instructors for completion of any courses in progress during the leave. Students will be granted the option to re-schedule exams, extend candidacy deadlines or other deadlines not discussed herein. Students are responsible for making arrangements to reschedule exams, extend deadlines and to make up other work not discussed herein. Unlike a regular one-semester leave, time off in conjunction with this policy will count towards the students’ degree time limit of 8 years and university-sponsored funding cap of 6 years.

## **APPENDIX E: MATHEMATICS ELECTIVE COURSES**

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The following courses offered by the Department of Mathematics are accepted to meet the Mathematical Elective Requirement for the Ph.D. degree. No other courses Notre Dame courses will be accepted. Mathematics courses taken at another University as part of an awarded M.S. degree and transferred to Notre Dame may fulfill the mathematics elective requirement.

|            |  |
|------------|--|
| AME 60612  | Mathematical Methods II                                  |
| Math 60210 | Basic Algebra I  |
| Math 60620 | Basic Algebra II   |
| Math 60350 | Real Analysis I  |
| Math 60360 | Real Analysis II   |
| Math 60370 | Basic Complex Analysis I                                 |
| Math 60380 | Basis Complex Analysis II                                |
| Math 60430 | Basic Topology I   |
| Math 60440 | Basic Topology II  |
| Math 60510 | Basic Modern Logic I                                     |
| Math 60520 | Basic Modern Logic II                                    |
| Math 60610 | Discrete Mathematics                                     |
| Math 60620 | Optimization   |
| Math 60630 | Geometric Methods for Dynamical Systems                  |
| Math 60650 | Applied Analysis   |
| Math 60660 | Differential Manifolds                                   |
| Math 60850 | Probability  |
| Math 60860 | Stochastic Modeling                                      |
| Math 60920 | Probabalistic Aspects of Linear Control and Optimization |
| Math 60950 | Topics in Applied Partial Differetial Equations          |

**APPENDIX F: COURSE CHECKLIST FOR CANDIDACY EXAMINATION**

Name: \_\_\_\_\_ Student ID: \_\_\_\_\_

Advisor: \_\_\_\_\_

Date of Qualifying Exam: \_\_\_\_\_

Instructions: Complete this form and submit to Nancy Davis at the time your qualifying exam is scheduled. Descriptions of the course requirements can be found in the Graduate Studies Handbook.

Core Courses (Math I, advanced mathematics, numerical methods):

| Course #  | Term and year* | Grade |
|-----------|----------------|-------|
| AME 60611 |                |       |
|           |                |       |
|           |                |       |

Major area:  
\_\_\_\_\_

Major area courses (at least 6):

| Course # | Term and year* | Grade |
|----------|----------------|-------|
|          |                |       |
|          |                |       |
|          |                |       |
|          |                |       |
|          |                |       |
|          |                |       |
|          |                |       |
|          |                |       |

Secondary area:  
\_\_\_\_\_

Secondary area courses (at least 3):

| Course # | Term and year* | Grade |
|----------|----------------|-------|
|          |                |       |
|          |                |       |
|          |                |       |
|          |                |       |

Out of Department Courses (at least 2):<sup>†</sup>

| Course # | Term and year* | Grade |
|----------|----------------|-------|
|          |                |       |
|          |                |       |
|          |                |       |
|          |                |       |

\* Enter planned completion date if not yet taken. Note that any proposed courses listed on this form must be taken prior to graduation, or an amended form must be submitted and approved by the director of graduate studies.

<sup>†</sup> Courses used to satisfy the core requirements and secondary area of study may be used to satisfy the requirements for out-of-department courses. Out-of-department courses must not be cross-listed as AME courses.

Student signature: \_\_\_\_\_ Date: \_\_\_\_\_

Advisor signature: \_\_\_\_\_ Date: \_\_\_\_\_

Director of Graduate Studies: \_\_\_\_\_ Date: \_\_\_\_\_

**APPENDIX G: REQUEST TO TRANSFER COURSES**

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Name: \_\_\_\_\_ Student ID: \_\_\_\_\_

Advisor: \_\_\_\_\_

Instructions: Complete this form and submit to Nancy Davis before the completion of your first academic year of study. Attach a copy of your academic transcripts, and a syllabus for each course. If you believe the course satisfies the mathematics, numerical methods or out-of-department requirements, indicate so in the *Requirement* column

| Institution | Course # | Course Name | Term and year | Grade | Requirement |
|-------------|----------|-------------|---------------|-------|-------------|
|             |          |             |               |       |             |
|             |          |             |               |       |             |
|             |          |             |               |       |             |
|             |          |             |               |       |             |
|             |          |             |               |       |             |
|             |          |             |               |       |             |
|             |          |             |               |       |             |

Student signature: \_\_\_\_\_ Date: \_\_\_\_\_

Advisor signature: \_\_\_\_\_ Date: \_\_\_\_\_

Director of Graduate Studies: \_\_\_\_\_ Date: \_\_\_\_\_

**APPENDIX H: IMPORTANT DATES FOR THE 2008-2009 ACADEMIC YEAR**

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**Fall Semester 2008**

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|  |                 |
|--|-----------------|
| AME New graduate student orientation                             | August 22, 2008 |
| 2008 AME Graduate student conference                             | August 25       |
| First day of class   | August 26       |
| Last day for course changes                                      | September 3     |
| Deadline to submit dissertation to readers                       | October 31      |
| Preliminary Format Check (mandatory)                             | November 16     |
| Last day for Ph.D. dissertation defense for (January Graduation) | December 5      |
| Last day for Master's thesis defense                             | December 5      |
| Submission of completed theses/dissertations to Graduate School  | December 12     |

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**Spring Semester 2009**

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|   |                      |
|---|----------------------|
| Qualifying examination (retakes only)                           | January 10, 11, 2008 |
| First day of class  |                      |
| Last day for course changes                                     | January 21           |
| Deadline to submit dissertation to readers                      | March 2              |
| Preliminary Format Check (mandatory)                            | March 21             |
| Last day for Ph.D. dissertation defense (May graduation)        | April 9              |
| Last day for Master's thesis defense                            | April 9              |
| Submission of completed theses/dissertations to Graduate School | April 17             |

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**Summer 2009**

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|   |   |
|---|---|
| Qualifying examination for first year students                  | May 20, 21, 22  |
| GRED 60501 (required for first year students)                   | See <a href="http://kaneb.nd.edu/">http://kaneb.nd.edu/</a> |
| Deadline to submit dissertation to readers                      | June 9  |
| Preliminary Format Check (mandatory)                            | June 27   |
| Last day for Ph.D. dissertation defense (August graduation)     | July 17   |
| Last day for Master's thesis defense                            | July 17   |
| Submission of completed theses/dissertations to Graduate School | July 24   |
| 2008 AME Graduate Student conference                            | August 24, 2009   |

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