

Department of
Mechanical

ENGINEERING



**HANDBOOK
OF
POLICIES AND PROCEDURES**

*Department of Mechanical Engineering
Master of Science in Mechanical Engineering*

Revised May 2010

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I. INTRODUCTION

This handbook was prepared for the purpose of documenting the policies and procedures that apply to the operation of Villanova University's Department of Mechanical Engineering MSME degree program. It provides information on registration procedures, setting up a plan of study, acceptable scholastic performance, thesis procedures, and other requirements that must be met to receive an MSME degree from Villanova's Department of Mechanical Engineering. It is not intended to replace the Villanova University College of Engineering Graduate Program Catalog or other University or College policies or procedures. This manual is intended to supplement those policies and procedures and outline those requirements specific to the Department of Mechanical Engineering. All policies in this manual are subject to revision by the Mechanical Engineering Graduate Committee.

II. DEGREE PROGRAMS IN MECHANICAL ENGINEERING

Master's Degree Options

Villanova University awards the Master of Science in Mechanical Engineering (MSME). Students who are admitted to the Master's program may complete either the thesis option or the non-thesis option. The typical completion time for the MSME degree is two years of full-time study. The degree must be finished within a seven year time frame.

Thesis Option.

The thesis option requires the completion of an independent research project which must be documented in a publishable thesis. Outstanding performance on a thesis demonstrates the ability to work independently on challenging projects and may offer an advantage when applying for a Ph.D. program. Admission to most Ph.D. programs requires that the student provide evidence of the ability to perform independent research. The thesis option requires 24 credits of course work and six credits of thesis research. The thesis option requires the sponsorship of a full-time tenured or tenure-track faculty member who serves as the thesis advisor.

Non-Thesis Option

The non-thesis option requires 30 credits of course work. Students completing the Master's degree part-time and/or by distance education will complete the non-thesis option.

5 year BS/MS Option

Villanova mechanical engineering undergraduates may elect to pursue a 5 year combined BSME/MSME degree program. Students apply into this program in the spring of their junior year. Applicants must have a 3.25 GPA or higher. This program requires that the students take three graduate level classes in the senior year in place of their senior electives. The first graduate course taken

MUST be ME 7000. These three classes will “double count” towards both the BS and MS degree programs. Immediately after graduation students become full-time graduate students. Successful completion of the program requires completion of one summer course the summer after the BSME graduation, three courses in the fall and three in the following spring. All 5 year BS/MS students will be automatically considered for financial support as described in Section VII of this manual. They will join the regular pool of graduate applicants applying for financial support for the fall semester following their BSME graduation. The 5 year BS/MS program is typically a non-thesis option program, although on rare occasion a thesis is completed. 5 year BS/MS students are subject to all policies documented in this handbook including the policy on “Undergraduates Enrolled in Graduate Classes” (see section V). Acceptance into the 5 year BS/MS program is a non-binding acceptance and students may opt to leave the program after completion of their BSME degree.

III. Student Responsibilities

MSME students are responsible for all the information presented in this handbook. Checklists have been provided in the appendix as a tool to help ensure the requirements documented within this handbook are met on time (Appendices B, C, D).

New Students will need to contact various offices on campus in order to acquire the necessary identification, parking, internet, and payroll documentation. Please refer to New Student Checklist (Appendix B).

IV. ADVISING

Academic Advising

All students are assigned an Academic Advisor when they are admitted to the MSME program. The Academic Advisor assists the student in developing a plan of study, and helps to ensure all departmental rules and regulations are followed. All part-time students and all full-time non-thesis option students are advised by the Graduate Committee Chair, Dr. Santhanam.

Those students completing a thesis and employed as a research assistant within the Department of Mechanical Engineering are under the direct supervision of a tenured/tenure-track Mechanical Engineering faculty member who serves as the Academic Advisor and the Thesis Advisor.

Those students completing a thesis and employed as a research assistant for a Villanova College of Engineering faculty member who is not a member of the Mechanical Engineering faculty must be assigned an Academic Advisor from within the Mechanical Engineering department to ensure that all departmental rules and regulations are followed.

Thesis Advising

All students completing the thesis option will be assigned a Thesis Advisor. The Thesis Advisor will establish the research program and oversee all aspects of

the student's thesis work. The Thesis Advisor is responsible for developing an acceptable thesis project for the student and for ensuring that the student files all necessary thesis documentation in a timely manner. The Thesis Advisor must be a tenured or tenure-track faculty member within the Mechanical Engineering department. However, due to the interdisciplinary nature of research, in certain selected cases, the primary Thesis Advisor may be from outside the Mechanical Engineering department. In these cases, the Thesis Advisor must be a tenured or tenure-track professor within the Villanova College of Engineering. In this case, there must be an Academic Advisor from within the Mechanical Engineering department.

A Thesis Advisory Committee will be established to assist the student in the preparation of the plan of study and to offer advice during the period of graduate work, including research and thesis preparation. The selection of the Thesis Advisory Committee members is done with the recommendation of the Thesis Advisor.

The Thesis Advisory Committee must consist of at least three members: the Thesis Advisor, a second tenured or tenure-track professor from within the Mechanical Engineering Department, and a third tenure/tenure-track professor representing a related area (may be from Mechanical Engineering or from outside Mechanical Engineering). The Thesis Advisory Committee must have at least two Mechanical Engineering faculty members. The Thesis Advisory Committee may be extended to four to meet this requirement if necessary, such as in cases where the primary thesis advisor is from outside Mechanical Engineering.

The Thesis Advisory Committee is formally established by filing the *Appointment of Thesis Advisory Committee* form (**Appendix E**). This form must be completed by the beginning of the second semester of full-time study.

V. PLAN OF STUDY (POS)

General

As each MSME degree program is tailored to the individual's needs and interests, a proposed program of study is required for all MSME students to ensure all departmental regulations are met within the planned coursework. This plan of study must be developed in consultation with the Academic Advisor within the first semester of enrollment.

All MSME students must complete the *MSME Plan of Study form* (**Appendix E**) which details the 30 credits to be taken for degree completion. This form must be signed by the Academic Advisor and the Graduate Chair and placed in the student file. The POS includes the specific courses the student is expected to complete. Course names and numbers must be filled in along with the expected semester of enrollment.

Requirements for POS

A thesis option Master's program will contain 24 hours (8 courses) of appropriate course work and 6 hours of thesis research (Thesis I and Thesis II). A non-thesis

option will contain 30 hours (10 courses) of appropriate course work. A non-thesis option may include three (3) credit hours from independent study (ME 9000). All Plans of Study must include ME 7000, which is the only required course in the MSME program.

Course work used to satisfy the requirement of one Master's degree cannot be used toward the Plan of Study on another Master's degree. Courses on the Plan of Study may not be taken on a satisfactory/ unsatisfactory basis. All courses (including Thesis I and Thesis II) may only be taken once. The only courses which may be taken more than once are ME 9080 Thesis Continuation and ME 9087 Graduate Practicum Continuation, both of which may be taken only with approval of the Academic Advisor and the Graduate Chair.

Transfer Courses

A maximum of six credits may be transferred into the Plan of Study from an ABET accredited College or University. Transfer courses placed on the Plan of Study receive the credit, but the grade is not calculated into the GPA. The following rules apply when using transfer courses on the Plan of Study:

1. All post baccalaureate and transfer courses used on an M.E. Plan of Study must have a grade of B or better.
2. A maximum of six (6) semester hours of graduate course work may be transferred from another institution or degree awarding program. Completed courses must have advance approval by the Graduate Committee Chair by utilizing the *Transfer Course Approval form (Appendix E)*.
3. The credit of the transfer course is not recorded on the transcript until the course is listed on the approved POS and the official transcript from the institution has arrived.

Courses External to the Mechanical Engineering Department

Up to six (6) credits from other Villanova College of Engineering departments and/or Villanova College of Liberal Arts Science/Mathematics Departments may be included on the POS with approval of both the Academic Advisor and the Graduate Committee Chair. Any graduate level course included in a Plan of Study must be both quantitative and technical in content. Any transfer credits count against the "out of department" course allotment. An *External Course Approval form (Appendix E)* must be completed and approved prior to registration.

Certain courses in other departments have been found to duplicate material taught in ME 7000 and as such, are not eligible for the MSME POS. These include:

EGR 8000	Engineering Mathematics
ECE 8001	Engineering Math I
ECE 8002	Engineering Math II

Thesis Credits

All students completing the thesis option must register for 6 credits of thesis research. This is satisfied by Thesis Research I and Thesis Research II. Each of these classes may be taken only once. It is expected that the student will be ready to defend the thesis at the conclusion of the semester in which Thesis Research II is taken. In certain cases, the thesis may not be completed within this semester and with the approval of the Thesis Advisor, the student may register for Thesis Continuation. All students completing the Thesis option must file two forms: *Application for Approval of Thesis Topic (Appendix E)* and *Appointment of Thesis Advisory Committee (Appendix E)* no later than the end of the first semester of full-time study.

Independent Study

Independent Study is intended to provide an in-depth learning experience for non-thesis option graduate students outside of the normal classroom experience. Students wishing to pursue an Independent Study must identify a willing faculty sponsor, and in conjunction with the sponsor fill out form *ME 9000 Independent Study Proposal (Appendix E)*. This form must be approved by both the Graduate Committee Chair and the Department Chair prior to registration. Independent studies are to be completed within one semester. Only under extenuating circumstances will an extension of no more than one semester be granted. A comprehensive report is due at the completion of the Independent Study for review by the faculty sponsor and the graduate program chair.

Deadlines for Filing the POS

Full-time students are required to submit a Plan of Study before registration for their second semester of full-time graduate study. Part-time students must complete a Plan of Study before completing nine (9) credit hours in the program. Students failing to meet the above requirements will not be permitted to complete their registration for the following semester. The Plan of Study may be modified as needed after it is filed and/or approved. Students must bring a copy of their POS to each advising meeting.

Changes to the POS

After approval, the courses listed on the POS must be completed before certification for graduation can be granted. Changes to the approved POS may be made as necessary by completing the form *Amendments to the Plan of Study (Appendix E)*. This form may be used to delete and/or add courses, or to change the choice of non-thesis or thesis options. Courses may not be removed from the POS after a grade has been received. Any changes required in the Plan of Study must be made by mid-term of the semester in which the degree is expected.

Policy on Undergraduates Enrolling in Graduate Classes

Undergraduates may take graduate courses if they have senior status and a GPA greater than 3.25. Students must fill out a "Permission to take graduate course" form, and get approving signatures from the department graduate committee chair and the College of Engineering Associate Dean for Academic Affairs.

Undergraduates may take a maximum of two graduate courses in any semester. If an undergraduate takes a graduate class, in that semester s/he is limited to taking a maximum of 16 credit-hours of work, unless the graduate committee chair grants a special exception.

Up to nine credits of graduate courses taken by undergraduates may double count towards both the bachelor's degree and the master's degree, whether or not a student is formally enrolled in a five year bachelor's-master's program. Any additional graduate courses taken while an undergraduate will count toward the undergraduate requirements and be included in the student's undergraduate record, but it will not be allowed to "transfer" or count toward a subsequent graduate degree.

VI. REGISTRATION

General Registration Regulations

Students must consult their Academic Advisor each semester to choose courses for registration. Student must bring the POS form and any other necessary forms (such as the External Course Approval form or Transfer Course Approval form) to their advising appointment. Students are advised to register well in advance of the first week of classes. After meeting with their Academic Advisor, students may register on-line through NOVASIS (www.novasis.villanova.edu) using the PIN provided by their advisor, or by completing a registration form which is available in the ME office.

Regulations for full-time Enrollment

Full-time study is based on the number of credit hours carried in a given session (semester). Nine credit hours is the full-time certification standard for graduate students. However, students working as teaching or research assistants are considered to be full-time with 6 or more credits. Students finishing a thesis may carry less than 9 credits during semesters focused on research work. Various fellowships and sponsoring agencies may have differing definitions of "full-time" status; students need to verify the requirements with sponsors of their support.

Immigration laws may also have different requirements for international students regarding full-time enrollment throughout the academic year. International students are responsible for verifying their own immigration status and are encouraged to consult with the International Student's Office.

Registration Timing

Registration for Summer Session and Fall Semester begins after the second week in March, and registration for Spring Semester begins the second week of October. Adding and dropping courses may be done through the end of the first

week of class for each semester. **Note: Any drop/add or registration changes require the explicit approval of the student's Advisor.**

VII. FINANCIAL SUPPORT

Types of Financial Support

Financial support opportunities available to students include: Research Assistantships, Graduate Assistantships and Tuition Scholarships.

Assistantships and scholarships are competitive awards based on academic merit. Awards are typically offered in March/ April for the Fall semester and in early January for the Spring semester. A more detailed description of each type of supported is available below.

Research Assistantships

Research Assistantships (RA) are obtained directly from faculty members who hold external research contracts and grants. Research Assistantships typically provide all tuition credits, plus a monthly stipend. Summer pay may or may not be included depending on funding availability. This must be clarified with your faculty sponsor.

These appointments are arranged by direct contact with faculty in your area of interest, and are typically available only to full-time thesis option students. The work completed is expected to lead to a Master's Thesis. Faculty providing Research Assistantships will serve as the student's Academic and Thesis Advisor. The period of support will vary depending on the availability of funds and the student's research performance.

Research Assistantships require a minimum of 20 hours per week spent on independent research, and often much more. Duties will vary from week to week depending on research needs. The Thesis Advisor will set the schedule and may require additional work at times to meet certain external deadlines set by funding agencies. The schedule set by the Thesis Advisor is paramount and the Research Assistant must not make any travel plans without clearing them with the Thesis Advisor.

Research Assistantships may be made available at any time of year as funds become available. Poor academic or research performance will lead to the termination of the Assistantship.

Graduate Assistantships

Graduate Assistantships (GA) are similar in many ways to Research Assistantships, with the exception that they are provided by the department instead of through individual faculty members' grants. Graduate Assistantships provide tuition plus a stipend during the academic year only. Summer pay is not included, but may be provided by individual faculty members if funds permit. This must be clarified through discussion with the Thesis Advisor. However, even if not paid, it is expected that students will remain on campus through the summer

working on their thesis research as a condition of their academic year stipend and tuition waiver. Summer tuition credits may be offered if a summer course meets a student's POS requirements.

All new full-time applicants for each Fall semester who meet the application deadline in mid-January will automatically be considered for a Graduate Assistantship. The number offered varies from year to year depending on the availability of funds and are awarded on a competitive basis. The period of funding will vary depending on funds available and the student's performance/progress.

Students receiving GAs are assigned to a supervising professor who becomes the student's Academic and Thesis Advisor. GAs require a minimum of 20 hours per week (and often more) spent on independent research supervised/ directed by the Thesis Advisor. Work completed is expected to lead to a Master's Thesis. Duties will vary from week to week depending on research needs. The Thesis Advisor will set the schedule and may require additional work at times to meet certain external deadlines set by funding agencies. The schedule set by the Thesis Advisor is paramount and the Research Assistant must not make any travel plans without clearing them with the Thesis Advisor.

Poor academic or research performance will lead to termination of the Assistantship.

Tuition Scholarships

Tuition Scholarships (TS) are awarded by the Mechanical Engineering Department. Tuition Scholarships cover academic year tuition, but do not include a stipend. All new full-time applicants for each Fall semester who meet the application deadline in mid-January will automatically be considered for a Tuition Scholarship. The number available varies from year to year and they are awarded on a competitive basis. The period of funding is for one semester at a time and includes the Fall/ Spring semesters only. Summer courses are not covered.

Students receiving a TS are assigned as Teaching Assistants or undergraduate laboratory instructors. Students are assigned to individual faculty members who become the work supervisor. Tuition Scholars are expected to work a minimum of 10 hours per week, which may vary depending on course requirements throughout the semester. Duties of Teaching Assistants may include grading, proctoring exams, holding problem sessions, and other course-related work. All TS are required to proctor freshman exams and other exams, and to assist with senior capstone project presentations and any other jobs as requested by the Graduate Chair.

Poor academic or research performance will lead to termination of the scholarship.

Fellowship Limitations

Assistantships and scholarships do not cover university fees or provide health insurance. Students are responsible for securing their own health insurance. All foreign students are responsible for ensuring their own immigration/visa status and are encouraged to consult with the International Student's Office (Connelly Center 2nd floor, 610-519-4095) as necessary.

Assistantships and scholarships may not be used to cover the tuition cost of ME 9086 ME Graduate Practicum which is required for foreign students wishing to work at jobs external to Villanova University. International students may not secure jobs external to the University without the explicit approval of their Academic and/or Thesis Advisor.

Students receiving Assistantships or Scholarships are not permitted to take courses by Distance Learning.

Fellowship Requirements

All students supported under any type of Assistantship or Scholarship are expected to achieve a B or better in all courses, and as appropriate, to maintain progress in the assigned research program. Failure to do so will result in termination of support.

All funded students are **required** to attend all Mechanical Engineering department seminars and are encouraged but not required to attend all Thesis Defenses. Students must regularly check their Villanova email account for notice of these events. A sign-in sheet will be provided at each event.

Office Space

An attempt will be made to provide all funded students with desk/office space. Availability of office space may vary from semester to semester. Students receiving office space are responsible to keep it neat and clean. Failure to do so will result in loss of office privileges.

VII. ACADEMIC REQUIREMENTS

General Academic Requirements

All graduate students must maintain a grade point average of B (3.00 GPA) or better. Grades of A or B are expected from graduate students in all classes. The GPA must be above 3.0 to graduate. The GPA calculation for graduate students includes all grades earned in 7000 and 8000 level courses taken while enrolled as a graduate student.

Students must attend all classes. Arriving on campus after the semester has started is not allowed unless the student has received the express written consent of the graduate chair, and all course instructors PRIOR to making any travel plans. If part-time students must miss class due to work travel requirements, it must be cleared with the professor prior to departure.

Semester Grade Review

The Mechanical Engineering Graduate Committee and/or Graduate Committee Chair reviews graduate student performance each semester for all students in the ME graduate program. Should the student fail to perform, in either coursework or research, at a level acceptable to his/ her Thesis Advisory Committee or to the ME Graduate Committee, he or she may be asked to discontinue graduate study at Villanova. The Graduate Committee Chair will send notification letters to those students not maintaining a 3.00 cumulative index and/or failing to make satisfactory progress in their research, and those students will be placed on probation. Unsatisfactory course work and/or research, if continued for a second semester, may lead to dismissal from the Mechanical Engineering Graduate Program.

A student whose cumulative index is below 2.75 after twelve or more semester hours of course work have been completed will be automatically dropped from the program. Should the student's Thesis Advisor notify the ME Graduate committee of unsatisfactory performance on research, the student may be considered for dismissal at the end of any semester.

Academic Integrity

As a community committed to the Augustinian ideals of truth, unity and love, Villanova University prides itself on maintaining the highest standards of academic integrity and does not tolerate any form of academic dishonesty or misconduct. Dishonesty (including plagiarism) in any assignment, test or examination is punishable by the grade of F and is to be reported, through the deans, to the Vice President for Academic Affairs. A second offense will result in the dismissal of the student from Villanova University. Dishonesty or misconduct in research is equally intolerable if not even more so, and may result in the immediate dismissal of the student.

The following are some rules and examples regarding academic dishonesty. Since academic dishonesty takes place whenever anyone undermines the academic integrity of the institution or attempts to gain an unfair advantage over others, this list is not and cannot be exhaustive. Academic integrity is not simply a matter of conforming to certain rules; it must be understood in terms of broader academic purposes of a Villanova education.

Cheating:

While taking a test or examination, students shall rely on their own mastery of the subject and not attempt to receive help in any way not explicitly approved by the instructor; for example, members shall not try to use notes, study aids, or another's work. Such cheating includes trying to give or obtain information about a test when the instructor states that it is to be confidential. It also includes trying to take someone else's exam, or trying to have someone else take one's own exam.

Fabrication:

Students shall not falsify, invent, or use in a deliberately misleading way any information, data, or citations in any assignment or research study. This includes

making up or changing data or results, or relying on someone else's results, in an experiment or lab assignment. It also includes citing sources that one has not actually used or consulted.

Assisting in or contributing to academic dishonesty:

Students shall not help or attempt to help others to commit an act of academic dishonesty. This includes situations in which one student copies from or uses another student's work; in such situations, both students are likely to be penalized equally severely. Students are responsible for ensuring that their work is not used improperly by others. This does not include team projects where students are told by their instructor to work together.

Plagiarism:

Students shall not rely on or use someone else's words, ideas, data, or arguments without clearly acknowledging the source and extent of the reliance or use. The most common way to acknowledge this reliance or indebtedness is to use footnotes or other documentation. It is the students' responsibility to show clearly when and where they are relying on others - partly because others may wish to learn from the same sources from which the original writer learned.

Multiple submission of work:

Students shall not submit academic work for a class which has been done for another class without the prior approval of the instructor. In any assignment, an instructor is justified in expecting that a certain kind of learning will be taking place. Handing in something done previously may preclude this learning. Consequently, if a student hands in work done elsewhere without receiving his or her instructor's approval, he or she will face penalties.

Other forms of Dishonesty:

Acting honestly in an academic setting includes more than just being honest in one's academic assignments; students are expected to be honest in all dealings with the University. Certain kinds of dishonesty, though often associated with academic work, are of a different category than those listed above. These kinds of dishonesty include (but are not limited to) the following:

Misrepresenting oneself or one's circumstances to an instructor (for example, in requesting a makeup exam or a special due date for an assignment, or in explaining an absence). Forging parts of, or signatures on, official documents (including both university documents, such as drop-add slips or excused absence slips, and relevant outside documents, such as doctors' notes). Taking credit for work in a team-project even when the student has made little or no contribution to the work of the team. Unlawfully copying computer software.

Dismissals

The ME Graduate Committee will take action to dismiss any student from the Mechanical Engineering graduate program who fails to meet the academic requirements or has more than one semester of unsatisfactory research. The Committee's action will take place as soon as practical after grade reports are

received following the end of an academic term. The Graduate Committee will determine the effective date of dismissal. It is understood that dismissal from the graduate program includes termination of any assistantship held by the student in the Department of Mechanical Engineering.

Appeal Process

If a student and the Academic or Thesis Advisor feel that special circumstances are involved in the poor performance of the student, the student may appeal a dismissal by making a written petition to the ME Graduate Committee. A student whose Advisor does not support an appeal may petition the ME Graduate Committee directly. An appeal will be successful only if evidence is presented to show that unusual circumstances were responsible for the student's poor performance and a reasonable chance exists for the student to successfully complete the program.

VIII. DEGREE COMPLETION REQUIREMENTS

General Degree Completion Guidelines

To receive a Master's degree in Mechanical Engineering, the Academic Advisor and/or Thesis Advisory Committee of the student must certify that the student is eligible to be awarded the Master's degree. This certification process depends on whether the student is registered for a thesis or non-thesis option.

Students are eligible to graduate when thirty credits in course work and research have been satisfactorily completed. All courses on the approved Plan of Study must be completed with a minimum cumulative index (GPA) of 3.00. If a student completes 30 credit hours and the GPA is less than 3.0, the student will not graduate. The student will, however, be allowed to take additional courses to attempt to raise the GPA. Whenever the GPA is greater than 3.0 at the end of additional classes the student will be allowed to graduate.

Normally all graduate degree requirements must be completed within a seven (7) year time period. This time period begins upon a student's first registration. If a student does not register for four consecutive semesters, the student is considered to be inactive and must petition for reinstatement to the program.

Non-thesis Option Master's Degree

To complete a non-thesis option MSME, the Academic Advisor must certify that the POS has been satisfied and all requirements have been met for the MSME degree. All students completing the non-thesis Master's degree program must apply for graduation by completing the appropriate forms at the beginning of their final semester (Appendix E). Required forms are:

Graduation Application – this form is used by the Registrar's Office to validate the degree and/or certificate you are seeking, the correct spelling of name as it is to appear on your diploma, and the mailing address to which the diploma is to be sent if you are unable to attend graduation.

Request to Participate in Graduation Ceremonies – this is to be submitted in the event that you have not completed all the necessary requirements to actually receive your diploma, but that you expect to complete the requirements by the next graduation term and wish to ‘Walk’ during the May graduation ceremonies.

Thesis Option Master’s Degree

To complete a thesis option MSME the Academic Advisor must certify that the POS has been satisfied and all academic requirements have been met for the MSME degree, the Thesis Examining Committee must approve the successful defense of the Thesis Research, and the Thesis Advisor, Department Chair and Dean of the College of Engineering must certify the satisfactory completion of the Thesis. All students completing the thesis option Master’s degree program must apply for graduation by completing the application for graduation form at the beginning of their final semester (Appendix E).

Thesis Defense

The Thesis Examining Committee consists of a minimum of three members and is appointed at the request of the student’s Thesis Advisor. The Thesis Examining Committee is normally the same as the student’s Thesis Advisory Committee and is responsible for reading the student’s thesis and conducting the Thesis Defense. A final copy of the thesis in proper format (see Appendix F) **must** be provided to the Examining Committee a minimum of two weeks prior to the Thesis Defense. This 2-week requirement is in place to allow ample time for the Examining Committee to thoroughly read and comment on the thesis and may not be shortened. Any thesis not following the Thesis Format Guidelines (Appendix F) will be rejected.

Two weeks before the desired thesis defense date, the student must submit the ***Request for Scheduling of Thesis Defense***, (Appendix E) to the Mechanical Engineering office which registers the date, time, and location of the defense. When the thesis defense registration is approved and a room location is secured, the student and Thesis Advisor will be notified.

The Thesis Defense consists of a presentation by the student followed by an oral examination by the Thesis Examining Committee. Total time is typically one to two hours. The presentation (typically 45-60 minutes) is open to all who wish to attend, and the questioning is a closed session of the student and the Examining Committee. Questioning may cover both the thesis content and the relevant coursework to ensure a mastery of the fundamentals of mechanical engineering. Final presentations should be well-prepared and succinct. Allow ample time for questions.

After the Thesis Defense, the student will revise the thesis according to the requirements of the Thesis Examining Committee and submit the revised thesis for final approval by the Thesis Advisor. Upon final approval by the Thesis Advisor, the thesis must be approved by the Mechanical Engineering Department Chair and finally by the Dean of the College of Engineering. Only upon the

receipt of these approvals is the thesis considered complete and the student approved for graduation.

Upon completion the student must submit four copies of the approved thesis printed on high quality paper as per the thesis format guidelines (Appendix F) and one copy of the thesis in pdf form on CD to the M.E. Office for binding. The student is responsible for the cost of printing the thesis on high quality paper. It is strongly recommended that this be done at Staples, OfficeMax, FedEx office or another professional print shop. The department will graciously cover the cost of binding the thesis.

Due to the need for thesis revisions following the Thesis Defense and the requirement for review and approval by the Mechanical Engineering Department Chair and Dean of the College of Engineering, the last date for scheduling a thesis defense is the 12th week of the final semester (three weeks before classes end). A checklist and a flowchart documenting all requirements with time limits to be met can be found in Appendix C.

Appendix A: Mechanical Engineering Contact Directory

Chair, Department of Mechanical Engineering

*Dr. C. Nataraj
Tolentine 131
610-519-4994
c.nataraj@villanova.edu*

Chair, Mechanical Engineering Graduate Committee

*Dr. Sridhar Santhanam
Tolentine 113C
610-519-7924
sridhar.santhanam@villanova.edu*

Administrative Assistant

*Ms. Robin Hoose
Tolentine 131
610-519-4981
robin.hoose@villanova.edu*

Office of International Students

*Hubert Whan Tong
Connelly Center, 2nd Floor
610-519-8017
hubert.whantong@villanova.edu*

Graduate Programs Coordinator

*Leslie McNamee
College of Engineering
CEER 302A
610-519-5840
leslie.mcnamee@villanova.edu*

Appendix B: New Student Checklist

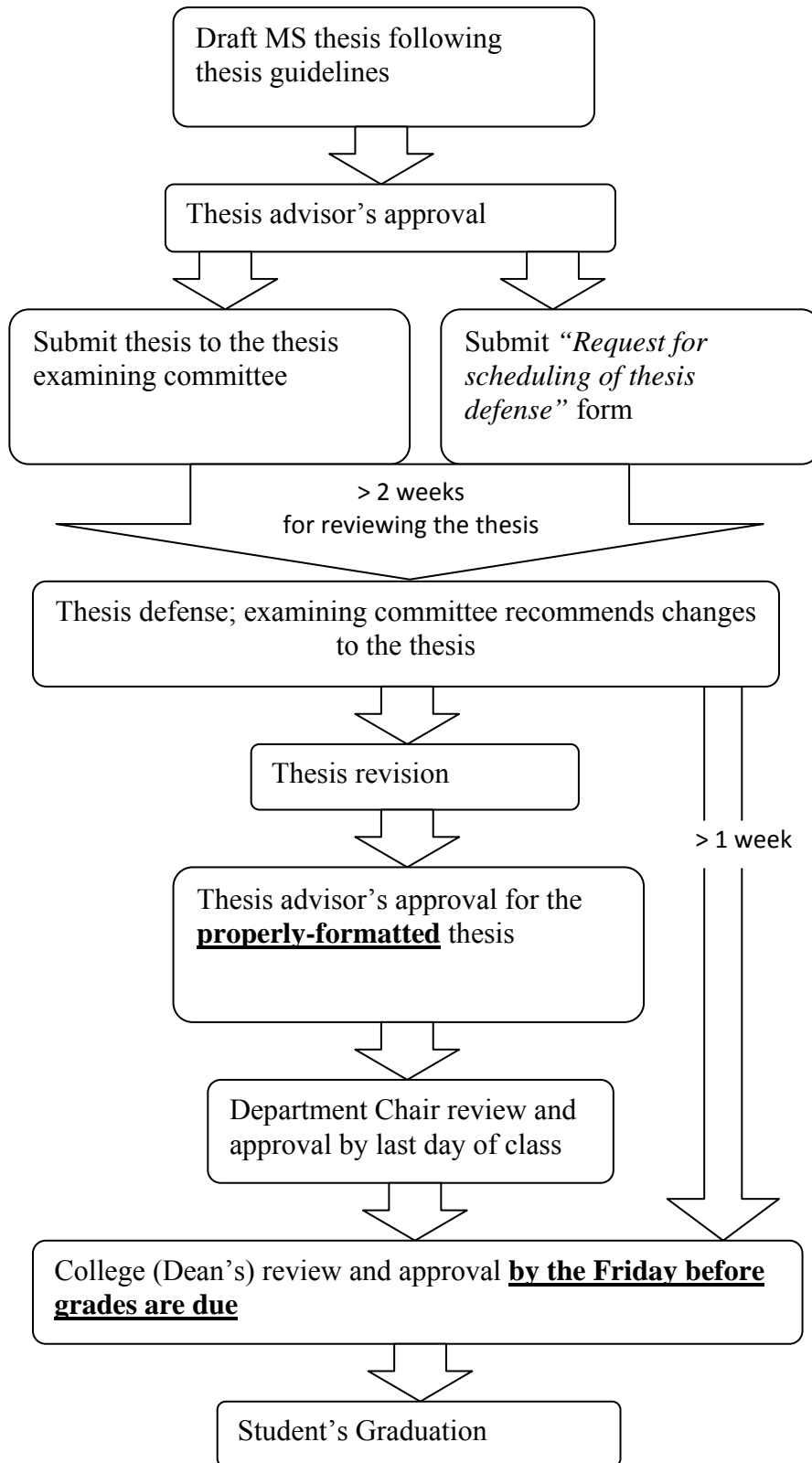
- ___ 1. Check in with the Mechanical Engineering Department (Tolentine 131).
- ___ 2. Consult with Graduate Committee Chair to register for the first semester's courses.
- ___ 3. International students- check in with the International Student Office (Connelly Center, 2nd floor). Obtain social security card information and other important information.
- ___ 4. If applicable, complete necessary paperwork in the Mechanical Engineering office to receive fellowship stipend. A local address and cell phone numbers/home(local) numbers are needed.
- ___ 5. Obtain Wildcard at the Wildcard Office located in Dougherty Hall.
- ___ 6. Contact University Information Technologies (UNIT) to obtain access to your e-mail and NOVASIS accounts (Vasey Hall HelpDesk).
- ___ 7. If applicable, apply for parking pass for Main Parking Lot at the Department of Public Safety in Farrell Hall.

Appendix C: Program Checklist for Thesis Option Students

- _____ 1. First Semester of Study: Read this handbook and the relevant sections of the Villanova University College of Engineering Graduate Program Catalog, if you have not done so already.
- _____ 2. First Semester of Study: Meet with your Academic/Thesis Advisor and complete the Plan of Study form. Obtain signature of graduate program chair on Plan of Study form and turn in to the M.E. office.
- _____ 3. First Semester of Study: Define your thesis topic/thesis research with your Thesis Advisor and complete the *Application for Approval of Thesis Topic* (**Appendix E**) Obtain signature of graduate program chair on “Application for Approval of Thesis Topic” and submit to M.E. office.
- _____ 4. First Semester of Study: Complete *Appointment of Thesis Advisory Committee* (**Appendix E**) Obtain the approvals of your thesis committee members, reflecting their agreement to serve on your committee on the “Appointment of Thesis Advisory Committee” form. Obtain signature of graduate program chair on “Appointment of Thesis Advisory Committee” form and submit it to M.E. Office.
- _____ 5. First-Fourth semesters of Study: Complete coursework on Plan of Study.
- _____ 6. First-Fourth semesters of Study: Complete Thesis Research.
- _____ 7. Final Semester 1st week: Obtain final approval of Graduate Program Chair on completed plan of study form.
- _____ 8. Final Semester 2nd week: Apply for graduation by completing all required forms for graduation.
- _____ 9. Final Semester 4th week: Submit final draft thesis to Thesis Advisor following all thesis guidelines in Appendix F.
- _____ 10. Final Semester 6th week: Thesis Advisor returns final set of comments to student for thesis revision.
- _____ 11. Final Semester 8th week: Student finishes final set of thesis revisions prior to thesis defense and submits to Thesis Advisor.
- _____ 12. Final semester 9th week: Thesis Advisor finishes final read-through of draft thesis and approves thesis for distribution to Thesis Examining Committee.

- _____13. Final semester 10th week: Student distributes copies of thesis to thesis Examining Committee and completes “Request for Scheduling of Thesis Defense” form. Requested thesis defense date must be a minimum of 2 weeks after distribution of thesis Examining Committee and must accommodate schedules of all Examining Committee members.
- _____14. Final semester 12th week: Conduct Thesis Defense. Ensure that Thesis Advisor obtains necessary Thesis Defense Approval forms from the M.E. main office and returns them completed at the conclusion of the defense.
- _____15. Final semester 13th week: Complete final edit of thesis including all changes/revisions requested by Thesis Examining Committee.
- _____16. Final semester 14th week: Submit a copy of the revised thesis to Thesis Advisor for final approval.
- _____17. Final semester 15th week: Thesis Advisor approves final thesis and signs “Final Thesis Approval” form.
- _____18. Final semester last day of classes: Submit four copies of final approved thesis on high quality paper per thesis guidelines (Appendix F) and one copy of the pdf thesis on CD to M.E. main office for Department Chair approval and binding. The student is responsible for the cost of printing the thesis on high quality paper. It is strongly recommended that this be done at Staples, OfficeMax, FedEx office or another professional print shop. The department will graciously cover the cost of binding the thesis.
- _____19. Final semester Friday before grades are due: Thesis sent to Dean’ office for final approval and student cleared for graduation.

The dates listed in the checklist above to be met in the final semester are the final date by which the task must be accomplished. Students are strongly encouraged to have their thesis done in advance of these dates to avoid a last minute rush and panic as the semester winds down. It must be noted that the “drop-dead dates” schedule presented here for the final semester is aggressive and assumes minimal required editing of the thesis by the student at this point. It is assumed that the student has prepared several drafts which have been reviewed by the Thesis Advisor prior to the final draft version submitted in the 4th week of the final semester. Any significant edits or rework required at this point may delay graduation by a semester. The two-week minimum time for the Thesis Examining committee to review the thesis prior to defense may not be shortened, and the dates for submission of final approved proper format thesis to the Mechanical Engineering Department Chair and the Dean of the College of Engineering are not flexible. Failure to meet these dates will delay graduation by a semester.



Appendix D: Program Checklist for Non-Thesis Option Students

- ___ 1. Read this handbook and the relevant sections of the Villanova University College of Engineering Graduate Program Catalog, if you have not done so already.
- ___ 2. Meet with your Academic Advisor and complete the Plan of Study form, obtain the signature of the graduate program chair and turn in to the M.E. office before the end of the first semester of full-time study or before the end of 9 credits of part-time study.
- ___ 3. Complete coursework on Plan of Study.
- ___ 4. Obtain final approval of Graduate Program Chair on completed plan of study form.
- ___ 5. Apply for graduation by completing all required forms for graduation by the 2nd week of the semester in which you intend to graduate.

Appendix E: Forms

1. MSME Plan of Study
2. Permission to change the MSME Plan of Study
3. Transfer Course Approval
4. ME 9000 Independent Study Proposal
5. External Course Approval
6. Application for Approval of Thesis Topic
7. Appointment of Thesis Advisory Committee
8. Request for Scheduling of Thesis Defense
9. Request to participate in graduation ceremonies (walkthrough only)
10. Graduation Application
11. Graduation Employment Survey

Villanova University
 Department of Mechanical Engineering
MSME Plan of Study

Last Name: _____ First Name: _____

Date: _____

 See MSME Handbook of Policies & Procedures for guidelines concerning Program of Study requirements.

Course Number	Course Title	Credits	Semester/ Year
1. ME 7000	Advanced Engineering Analysis		
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Check all that apply:

- This is the first submission of Plan of Study
- This is an update to Plan of Study
- I have received official permission to change my Plan of Study
 (Attach Permission to Change Plan of Study Form)

Approvals:

Academic Advisor

Date

MSME Graduate Program Chair

Date

Villanova University
Department of Mechanical Engineering

Permission to Change Plan of Study

Date: _____

Last Name: _____ First Name: _____

Reason for change

Attach to the revised "MSME Plan of Study Form"

Student Signature

Date

Approvals:

Academic Advisor

Date

MSME Graduate Program Chair

Date

Villanova University
Department of Mechanical Engineering

Transfer Course Approval

Date: _____

Last Name: _____ First Name: _____

I request to have the following course (s) transferred to my MSME Plan of Study:

Institution	Course/ Title Number	Grade	Equivalent Villanova Course Title/ Number

Notes

- (1) An official transcript and course catalog description must be attached to this form.
- (2) If course(s) are approved, student must re-submit MSME Plan of Study with above courses included.

Student Signature

Date

Approvals:

Academic Advisor

Date

MSME Graduate Program Chair

Date

Villanova University
Department of Mechanical Engineering
ME 9000 Independent Study Proposal

STUDENT: _____ DATE: _____
SEMESTER: _____ CUM. GPA: _____

Your proposal for your independent study project must be attached to this form. The proposal must include a description of the proposed topic of study (see list of possible topics below), the methodology for proposed work, a timeline for the work and the expected output of the independent study. The output of the study must be either a well-documented report of the work and its conclusions and/or a technical paper which will be submitted to an engineering conference or journal. Independent studies without an output will not be approved, and the independent study will not be complete until the final report/paper is received and approved by the Graduate Chair and/or committee.

Independent Study Advisor:

Independent Study Topic/Title:

Any Independent Study must be completed within one semester. In exceptional cases, with the approval of both the Independent Study Advisor and the Graduate Chairman, an extension of one semester will be granted. Only upon approval will the student be allowed to register for Independent Study Continuation.

Student's Signature

Date

Faculty Signature/Acceptance of Student Plan

Date

Approval: Graduate Committee Chair

Date

1. Solving an industrial problem, particularly if funded through a small grant not sufficient for a full-fledged thesis support (applied research).
2. A small research project not suitable for a full thesis.
3. Developing a detailed computer program to obtain solutions for some theory taught in a graduate class, which can be used in future classes.
4. Setting up a complex piece of lab equipment and/or developing experimental work for use in future lab-teaching or research.
5. Feasibility studies for some novel idea proposed by the student (like setting up a small automated plant), based on engineering principles the student has theoretically studied.
6. Work-based projects, relating to a student's current (part/full time) job, which can expand the student's understanding of his/her work and which may involve partial research.
7. Literature survey, plus an experimental plan if applicable, for a future long-term research project (by the advisor)

Villanova University
Department of Mechanical Engineering

External Course Approval

Date: _____

Last Name: _____ First Name: _____

I request to take the following courses outside the M.E. Department and have them included in my MSME Plan of Study:

Department	Course/ Title Number	Justification for inclusion in MSME Plan of Study

Note

If course(s) are approved, student must re-submit MSME Plan of Study with above courses included.

Student Signature

Date

Approvals:

Academic Advisor

Date

MSME Graduate Program Chair

Date

Villanova University
Department of Mechanical Engineering

Application for Approval of Master's Thesis Topic

Date: _____

Last Name: _____ First Name: _____ M.I.: _____

I wish to submit for approval, the following master's Thesis topic:

An abstract which outlines the topic and the approach to be taken in addressing this problem must be attached.

Student Signature

Date

Approvals:

Thesis Advisor

Date

MSME Graduate Program Chair

Date

Villanova University
Department of Mechanical Engineering

Request for Scheduling of Thesis Defense

Last Name: _____ First Name: _____ M.I.: _____

Thesis Title: _____

Requested Date _____ Time: _____
Day & Date

Confirmed Date/Time/Location: _____
To be completed by M.E. Office administrative staff

My Thesis Examining Committee is: _____

Approvals:

Thesis Advisor _____
Date

MSME Graduate Program Chair _____
Date

M.E. Office Administrative Staff _____
Date

ENGINEERING STUDENTS
REQUEST TO PARTICIPATE IN GRADUATION CEREMONIES

NAME _____

BANNER ID _____ DATE _____

MAJOR _____

LOCAL/SCHOOLADDRESS _____

LOCAL PHONE NUMBER _____

COURSES NEEDED TO GRADUATE

1. _____

2. _____

3. _____

THIS IS A REQUEST TO PARTICIPATE IN GRADUATION CEREMONIES. I UNDERSTAND THAT I WILL NOT RECEIVE A DIPLOMA NOR WILL MY NAME BE INCLUDED IN THE LIST OF GRADUATES THIS SPRING.

STUDENT'S SIGNATURE _____

CHAIRPERSON'S APPROVAL (MAJOR) _____

DEAN'S APPROVAL _____

PLEASE SEND COMPLETED FORM TO:
207 DOUGHERTY HALL
ATTN: JoAnne Stadnicar

REV. 11/2004



Graduation Application

Type or print your name exactly how you want it to appear on your diploma. Be sure to indicate upper and lower case letters, accents and other punctuation, and spacing.

Date: _____

Name as you want it to appear on your diploma:

Banner ID: _____

Degree in: _____

I should be awarded the degree dated: September _____ December _____ May _____
(year) (year) (year)

Address to which diploma should be sent if to be mailed.

Street Address Line 1 _____
Street Address Line 2 _____
City _____
State, Zip _____
Telephone Number _____

Post Graduation Employment

Name of Employer _____
Title or Position _____

Undergraduate Graduation Information:

Name of Undergraduate Institution _____
Name of Bachelor's Degree _____
Date Received: _____

Student Signature

Date

Faculty Advisor's Signature

Date

Note: If your degree is not awarded on the date stated on this form, you must reapply.

Villanova University
Department of Mechanical Engineering

MSME Graduation Employment Survey

Please complete the following confidential information.

Name: _____

Address: _____

Telephone: _____

Degree granted: ____ Master's ____ Ph..D Degree Date: _____

Employment information:

I am leaving Villanova for:

- ___ an industrial position in research with _____
- ___ an industrial position in marketing with _____
- ___ an industrial position in design/ development with _____
- ___ a Ph.D. degree in engineering at _____
- ___ an MBA at _____
- ___ a faculty position at _____
- ___ a government position at _____
- ___ other (explain) _____

My position title will be: _____

My starting salary range will be:

- ___ \$40,000.....45,000
- ___ \$45,10050,000
- ___ \$50,100.....55,000
- ___ \$55,100.....60,000
- ___ \$60,100.....65,000
- ___ \$65,100.....70,000
- ___ \$70,100.....75,000
- ___ \$75,100.....80,000
- ___ \$80,100.....85,000
- ___ \$85,100.....90,000
- ___ \$90,100.....95,000
- ___ \$95,100.....100,000
- ___ \$100,100.....105,000
- ___ \$105,100.....110,000
- ___ \$110,100.....115,000
- ___ \$115,100.....120,000
- ___ \$120,000.....or more

Appendix F: Format Requirements for Master's Thesis

The thesis format requirements documented here are required for all final copies of an MSME thesis. Any thesis not following these guidelines will be rejected and your graduation date may be jeopardized. Please save yourself and your advisor time and trouble by strictly following these format guidelines for all versions of your thesis.

General Thesis Format Requirements

Paper – This requirement for paper type applies to the absolute final version of the thesis which is submitted to the Mechanical Engineering office for binding. All other preliminary versions may be printed on standard paper. Final version paper must be 16(or 20) lb quality bond paper, with a minimum of 25% cotton content. Paper should be white, not off-white or ivory. When printing, make sure that the watermark is right side up. Copies printed out on the department copy machine are unacceptable. The student is responsible for the cost of printing the thesis on high quality paper. It is strongly recommended that this be done at Staples, OfficeMax, FedEx office or another professional print shop. The department will graciously cover the cost of binding the thesis.

Margins – Minimum margins are required to ensure that your thesis is readable when bound, and that it may be photocopied or archived on microfilm. Minimum margins are 1.5 inches on the left side of the page and 1.0 inch on the other edges. You are encouraged to increase these minimum margin requirements by 0.1 inch to be on the safe side. Note that the page number should be no more than 0.5 inch from any edge.

Paragraph Format – Use double spacing. Justify all paragraphs to both left and right margins to create a clean look. Indent the first line of every paragraph.

Font – Use 12 point font for all text. Use a standard font such as Times New Roman.

Headings – Headings for chapters and subsections must be standard in format throughout the thesis. Use boldface, underlining, indentation, and capitalization for emphasis. Chapter titles should appear at the top center of the first page of the chapter.

Page Numbers – For the main text, number all pages beginning with the first page of the first chapter. The page number should be centered at the bottom of the page. All page numbers should be oriented the same, even for landscape pages. Appendices should also have page numbers, and should be numbered by continuation after that last chapter, or by using a separate set of page numbers for each appendix (A-1, A-2, A-3, etc. for Appendix A; B-1, B-2, B-3, etc. for Appendix B; etc.). All introductory material, except for the title and signature pages (and dedication page if included), should also be given a page number in lower case roman numerals at the bottom center of the page (for all pages). Begin with the Acknowledgements page, but include the other pages in the count (The Acknowledgements page should thus be either page iii or page iv).

Figures and Tables - Figures and tables are an integral part of your thesis. Be sure that formatting is neat and consistent. For figures, use only high-quality digital photographs and neat drawings (generally an AutoCAD or MS Office drawing). For tables, use bordering for emphasis as appropriate. Make sure that all text in tables and figures is legible. Work tables and figures into the text; do not group them at the end of a chapter. All figures and tables

should be captioned and numbered using a chapter number-figure number format such as Table 4.6 or Figure 3-2. Table captions should be placed above the table, while figure captions should be placed below the table.

Organization of the Thesis

The thesis should generally consist of the following sections, arranged in the order listed. A sample of all elements appears at the end of this Appendix.

Title Page – The key elements of the title page include the title, department, degree, student name, and if desired, the copyright.

Signature Page – The signature page should include the title of your thesis, your name, and space at the bottom of the page for the signatures of your Thesis Advisor, the Mechanical Engineering Department Chair, and the Dean of the College of Engineering.

Dedication Page – This page is optional. If desired, you may dedicate your work to an individual who is important in your life, such as a spouse, child or parents.

Acknowledgements – This page is optional. If desired, you may acknowledge those who assisted and supported you in the completion of your thesis, such as your advisor, the faculty, your sponsoring agency if applicable, your fellow graduate students, the shop personnel and your family.

Abstract – The abstract should be a concise summary of the work presented in your thesis. It should summarize what you did and the major conclusions. Only key details which explain the constraints of the work should be included. This section is limited to one page.

Table of Contents – The table of contents should list chapter titles and subheadings, with page numbers right justified. A series of dots or blank space may be used between the listed heading and the page number corresponding to it. All introductory material (prior to the main body of the text) should also be listed in the table of contents using lower case roman numerals.

List of Tables – In a format similar to the table of contents, list all tables and corresponding page numbers.

List of Figures – In a format similar to the table of contents, list all figures and corresponding page numbers.

Nomenclature – In table format list all variable and abbreviations used in the text. Provide three columns with the variable, its meaning, and its units. Place all variables in alphabetized order with English variables first from a - z, followed by Greek variables from alpha - omega. Following all variables you may provide a list of variable subscripts if necessary.

Text (Main Body) – This section should be broken down into as many subheadings as necessary. Common subheadings include:

Introduction: Lay out the premise of your topic and some general background.

Literature Review: Provide an overview of all prior work published on this topic and place your own work in context of the existing work. This section is commonly concluded with a concise statement of the work done for this thesis noting the uniqueness of the work in context of the existing work on the topic.

Experimental Equipment and Method (or Computational Methods, or Analytical Basis): Describes how the thesis work was completed with enough details for any

researcher to read this section and be able to duplicate the work for verification of your data and conclusions. This is commonly broken down into many subsections.

Discussion of Results: This section contains the presentation and discussion of your results. This commonly includes many tables and graphs, and presents the basis for all the conclusions drawn from your work. This is commonly broken down into many subsections.

Conclusions: This section concisely summarizes all the main conclusions presented in the Discussion of Results. No new data or new conclusions should be presented here. This is simply a summary section for the convenience of the reader.

Future Work: This section proposes new work based on your thesis. What new ideas have you developed and where would you take this work in the future if you could continue it?

References – List references in a standardized format. The format used by the American Society of Mechanical Engineers is encouraged since it will make it easier to adapt your thesis into a journal article at a later date. This standard is detailed below and is available at the ASME website.

(http://www.asme.org/Publications/ConfProceedings/Author/References_2.cfm)

Within the text, references should be cited in numerical order according to their order of appearance. The numbered reference citation should be enclosed in brackets. *Example: It was shown by Prusa [1] that the width of the plume decreases under these conditions.* In the case of two citations, the numbers should be separated by a comma [1,2]. In the case of more than two reference citations, the numbers should be separated by a dash [5-7]. References to cited material should be listed together at the end of the paper. References should be arranged in numerical order according to their order of appearance within the text.

Reference to journal articles and papers in serial publications should include:

- last name of each author followed by their initials
- year of publication
- full title of the cited article in quotes, title capitalization
- full name of the publication in which it appears
- volume number (if any) in boldface (Do not include the abbreviation, "Vol.")
- issue number (if any) in parentheses (Do not include the abbreviation, "No.")
- inclusive page numbers of the cited article (include "pp.")

Reference to textbooks and monographs should include:

- last name of each author followed by their initials
- year of publication
- full title of the publication in italics
- publisher
- city of publication
- inclusive page numbers of the work being cited (include "pp.")
- chapter number (if any) at the end of the citation following the abbreviation, "Chap."

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

- last name of each author followed by their initials
- year of publication

- full title of the cited paper in quotes, title capitalization
- individual paper number (if any)
- full title of the publication in italics
- initials followed by last name of editors (if any), followed by the abbreviation, “eds.”
- publisher
- city of publication
- volume number (if any) in boldface if a single number, include, “Vol.” if part of larger identifier (e.g., “PVP-Vol. 254”)
- inclusive page numbers of the work being cited (include “pp.”)

Reference to theses and technical reports should include:

- last name of each author followed by their initials
- year of publication
- full title in quotes, title capitalization
- report number (if any)
- publisher or institution name, city

Sample References:

- [1] Ning, X., and Lovell, M. R., 2002, “On the Sliding Friction Characteristics of Unidirectional Continuous FRP Composites,” *ASME J. Tribol.*, 124(1), pp. 5-13.
- [2] Barnes, M., 2001, “Stresses in Solenoids,” *J. Appl. Phys.*, 48(5), pp. 2000–2008.
- [3] Jones, J., 2000, *Contact Mechanics*, Cambridge University Press, Cambridge, UK, Chap. 6.
- [4] Lee, Y., Korpela, S. A., and Horne, R. N., 1982, “Structure of Multi-Cellular Natural Convection in a Tall Vertical Annulus,” *Proc. 7th International Heat Transfer Conference*, U. Grigul et al., eds., Hemisphere, Washington, DC, 2, pp. 221–226.
- [5] Watson, D. W., 1997, “Thermodynamic Analysis,” *ASME Paper No. 97-GT-288*.
- [6] Tung, C. Y., 1982, “Evaporative Heat Transfer in the Contact Line of a Mixture,” Ph.D. thesis, Rensselaer Polytechnic Institute, Troy, NY.
- [7] Smith, R., 2002, “Conformal Lubricated Contact of Cylindrical Surfaces Involved in a Non-Steady Motion,” Ph.D. thesis, <http://www.cas.phys.unm.edu/rsmith/homepage.html>

Appendices – Use as many appendices as are necessary and appropriate for your work (after consulting with your thesis advisor). Appendices commonly include such things as Sample Data Files, Computer Programs, Sample Data Reduction, Details of Error Analysis, etc. Label appendices by letter (Appendix A, Appendix B, etc.)

What Happens to My Thesis After Completion?

Your thesis is a permanent archive of your work, and will be available for others to use in future study. A copy will be available in the reference section of Falvey Library. If you choose to copyright your thesis, you must fill out necessary forms with the Library of Congress. Placing the copyright on the first page gives you that option.

Sample Thesis Sections

The following pages include general samples of a properly formatted thesis.

**AN EXPERIMENTAL STUDY INTO THE EFFECT OF JET VELOCITY ON
IMPINGEMENT HEAT TRANSFER FROM POROUS ALUMINUM FOAM**

A Thesis

Presented to

The Faculty of the Department of Mechanical Engineering

Villanova University

In Partial Fulfillment

Of the Requirements for the Degree of

Master of Science in Mechanical Engineering

by

Jane Smith

May 2009

Copyright 2009 by Jane Smith

**AN EXPERIMENTAL STUDY INTO THE EFFECT OF JET VELOCITY ON
IMPINGEMENT HEAT TRANSFER FROM POROUS ALUMINUM FOAM**

by

Jane Smith

May 2009

Sridhar Santhanam, Ph.D.
Thesis Advisor

Date

C. Nataraj, Ph.D.
Chairman, Department of
Mechanical Engineering

Date

Gary A. Gabriele, Ph.D.
Dean, College of Engineering

Date

Dedication

This thesis is dedicated to my parents, whose support helped to make this work possible.

Jane Smith

May 2009

Acknowledgements

I graciously thank my advisor Dr. Katie Brown whose wisdom, guidance and faith in me saw me through the steps of graduation. I would also like to thank her for giving me the opportunity to work with her and also for her help and support during the past two years. I am grateful to Dr. Sam Jones for his valuable suggestions and his timely help. I would also like to thank Mr. Joshua Smith for his help in setting up the apparatus.

I would like to thank Villanova University's Mechanical Department for providing good research facilities and excellent instruction during my course of study.

I would like to thank all my friends and colleagues here at Villanova who helped me during my work.

Jane Smith

May, 2009

ABSTRACT

**AN EXPERIMENTAL STUDY INTO THE EFFECT OF JET VELOCITY ON
IMPINGEMENT HEAT TRANSFER FROM POROUS ALUMINUM FOAM**

by

Jane Smith

Villanova University, 2009

THESIS ADVISOR: Dr. Sridhar Santhanam

This study examined.....

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NOMENCLATURE

A	Area	m^2
d	Jet Diameter	m
h	Heat Transfer Coefficient	W/m-K
k	Thermal Conductivity	W/m ² -K
L	Tube Length	m
Nu	Nusselt Number ($Nu=hd/k$)	Dimensionless
Re	Reynolds Number ($Re=Ud/A$)	Dimensionless
T	Temperature	K
λ	Vortex Spacing	m

1.0 INTRODUCTION

1.1 JET BASICS

Air jets provide an effective means for cooling surfaces of different geometry by increasing convective heat transfer. Jet impingement is one of the oldest and most attractive techniques of intensification of convective processes where convective heating, cooling, or drying is applied.

Jambunathan [1] described turbulent flow of an air jet impinging orthogonally on a plane surface dividing the jet into four zones. Continue the body of the thesis here.....