Graduate Student Handbook
PhD Programs
for
Mechanical Engineering

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING
The University of Texas at Arlington
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Contents

Chapter 1

WELCOME !

The faculty, staff and students in the Mechanical Engineering Program would like to welcome you to the master's program in Mechanical Engineering. This handbook is designed to help you get acquainted with the workings of our program. The information in this handbook will let you know what needs to be done, when it needs to be done, where you need to go to get information, and who can help you with problems that may occur. This handbook, the UTA Student Handbook, and the Graduate Catalog will serve as sources of information for you as you progress through our program. *In case of any discrepancy between this document and the graduate catalog, the graduate catalog shall prevail and takes precedence.*

1.1 NAMES YOU SHOULD KNOW

- Graduate Faculty Advisors
  - Dr. Ratan Kumar (A-M)
    306A Woolf Hall
    817-272-0740
    ratan.kumar@uta.edu
  - Dr. Seiichi Nomura (N-Z)
    304D Woolf Hall
    817-272-2012
    nomura@uta.edu

  Most of the decisions you make concerning your academic program will be made with the assistance of the graduate advisors. This includes curriculum,

registration, adding and dropping courses, and completing the necessary paperwork as you pursue your degree. The graduate advisor is your first point of contact for all of these matters.

- Graduate Staff Advisor

  – Ms. Wendy Ryan
  206 Woolf Hall
  817-272-2500
  wendy.ryan@uta.edu

  The Graduate Staff Advisor handles day-to-day operations of many things that graduate students must go thorough including adding/dropping courses, preparing for thesis presentations and graduate admissions. If you prepare a thesis/dissertation presentation, please reach out to the staff advisor to scheduling.

Chapter 2
GETTING STARTED IN THE PROGRAM

2.1 Department Check-in

Upon receiving admission to our program, please contact the graduate staff advisor. The graduate staff advisor will assist you in getting started at UT Arlington.

2.2 Orientation for International Students

All international students must attend a university orientation for foreign students, most often given a week or two before school starts. You will receive a letter directly from the International Office regarding this orientation. This orientation is required before you can be advised and register for classes.

2.3 Students Requiring GESP

Those students who were admitted to the ME Program with an English deficiency must go to the GESP Office and be tested prior to meeting with the ME Graduate Advisor. The ME Graduate Advisor will not advise such students until the GESP Office has provided the results of the GESP tests.

2.4 Meeting with the ME Graduate Faculty Advisor

All new graduate students must meet with the ME Graduate Advisor prior to registering for courses for their first semester. During this visit the program requirements for the Ph.D. degree program will be discussed and you will be advised on course selection for your first semester. Prior to meeting with the ME Graduate Advisor, please review this handbook, the semester ME course offerings, the ME section of the Graduate Catalog, and the MAE Department website, and have a plan for which courses you wish to take. The current semester's schedule of classes gives the exact days and times for registration and should be consulted each semester, not only for registration information, but for advising instructions, as well. The spring schedule is available in mid-October; the summer/fall schedule is available in mid-March. If you have graduate course work from another university, the graduate advisor (with the consent of the chair of the Committee on Graduate Studies) is empowered to waive course requirements if the student can show previous course work which is equivalent to that offered at UTA. This is handled on a case- by-case basis at the time of your initial advisement.

2.5 Registration

Once you have met with the ME Graduate Advisor, you will be cleared for registration. In order to attend any given semester, a student must register and pay fees. ALL REGISTRATION at UTA is done on the UTA website, www.uta.edu/mymav. New students register the week before classes begin. All students must be advised by the Graduate Advisor prior to registration.

2.6 UTA Identification (ID) Card

You will be required to obtain a MAV EXPRESS card from the MavExpress Office, Main Level of the University Center. This card will allow you access to various campus events, the library, and the health center, as well as being a source of identification to verify that you are a UTA student.

2.7 Graduate Teaching and Research Assistants - Payment Procedures

- Criteria for Award of Assistantships

  Award of financial assistance is based solely on merit. A number of graduate teaching assistantships (GTA), graduate research assistantships (GRA), and fellowships are awarded each year. Applicants who demonstrate skills, experience or interests that meet the needs of the ME Graduate Program will be considered for fellowships or assistantships. A typical GTA requires that the assistant spend a up to 20 hours per week helping in undergraduate laboratories, grading undergraduate students ' homework assignments, and other duties specified by the course instructor. A typical GRA requires that the assistant work on the research projects assigned by the professor who is providing the GRA support.

- U.S. Students

  U.S. students must also attend an orientation session for all new employees. You will need to bring your social security card and your Texas driver 's license or some other I.D. THIS SESSION IS MANDATORY AND YOU WILL NOT GET PAID UNLESS YOU ATTEND. The session takes about one and one half hours to complete.

- International Students

  You will first need to go to the International Office with your visa to obtain an Identity and Employment Authorization letter. This letter certifies that you have a visa and that you are allowed to work in the U.S. You must take this letter to the Office of Human Resources (J.D. Wetsel Service Bldg. (corner of Mitchell & Davis Streets) along with your passport and social security card (if you have one) to set up an orientation session given to all new employees. This session is mandatory, and you will not get paid unless you attend. This session takes about one hour. If you do not have a social security card, you must return to personnel after you receive your card and show it to them. ALL students that will be paid in any way must have a social security number. Most international students will have to apply for a card and this should be done as soon as possible. Applications must be delivered in person to the Tarrant County Court House in Fort Worth (819 Taylor Street) or to the Arlington office of the Social Security Administration. At

the international student orientation session held by the International Office, you can fill out an application for a social security number and that office may arrange to take students to Fort Worth to submit the form. If you are unable to go at that time, you can go any time on your own. It takes about 2 weeks to get your card, but you can call, after several days, and receive your number only; you cannot be paid until you get your social security number.

English Proficiency. Before being appointed to an assistantship at UT Arlington, a student whose native language is not English must demonstrate acceptable skill with spoken English. An applicant who is a non-native speaker of English must submit a TOEFL iBT score of at least 23, or a score of at least 7 on the Speaking section of the IELTS, or take and pass the UTA Developmental English course to meet this requirement. Only official scores provided directly to UT Arlington by ETS or IELTS are acceptable. The English proficiency requirement will be waived for non-native speakers of English who possess a bachelor's degree from an accredited U.S. institution.

Chapter 3

UNIVERSITY FACILITIES

A campus map can be found in the University Catalog. Some of the more important facilities are listed below.

3.1 Office of Research and Graduate Studies (Graduate School)

The Office of Graduate Studies is located in Davis Hall Room 348.

3.2 Libraries

The University has three libraries, the Central Library, the Science and Technology Library, and the Architecture and Fine Arts Library. A full description of the library system is given in the graduate catalog. Library contact for Engineering is Martin Wallace, martin.wallace@uta.edu, 817-272-3924.

3.3 Computer Labs

For computer resources available on campus, please visit OIT website. The department has its own computer lab located at 320 Woold Hall. The opening hours are posted at the door. Students can enter the lab by swiping their ID cards.

3.4 Key/Card Access

A Key Request Form should be obtained from Danette Stille in Room 204-Woolf Hall. The person authorizing your key/card access should sign the form. After all signatures are obtained, return the form to Room 204-Woolf Hall for processing.

3.5 Mailboxes

ME graduate student (with GTA appointments) mailboxes are located in Room 204 Woolf Hall. Please check your mailbox daily since you will be notified of important happenings by notice in your mailbox.

3.6 Health Center

A health center is available to meet your medical needs. A full description of the services offered by the health center can be found in the graduate catalog.

3.7 University Center

The University Center has numerous facilities and offices of interest to all students. In it are private dining-meeting rooms, lounges, ballrooms, food service areas, a post office, general store, ATM, gallery, and video room. The center is also home to campus student organizations, the Student Congress, the Graduate Student Council and the Student Activities Board. The Housing Office is also located in the Center.

3.8 International Office

The International Office is located in the Swift Center at 1022 UTA Blvd. Website. Hours of Operation: Monday - Friday from 8:00am - 5:00pm Phone: 817-272-2355 Email: international@uta.edu

Chapter 4

REQUIREMENTS OF THE DOCTORAL PROGRAM

As in any doctoral program, you will be required to accomplish a number of tasks before being awarded your degree. In this section the entire process will be outlined step by step. PLEASE read this carefully and refer to it often: The deadlines stipulated here are not to be taken lightly and the responsibility for adhering to them lies primarily with you. The following describes the expected course of events for a typical full-time student.

4.1 Core Areas in the Mechanical Engineering Program

The four core areas in the Mechanical Engineering program along with the recommended courses in each core area are listed below:

1. Fluid Science
    - ME 5313 Fluid Dynamics
    - ME 5342 Gas Dynamics
    - ME 5344 Viscous Flows
2. Design, Mechanics and Manufacturing
    - ME 5310 Finite Element Methods

- ME 5342 Introduction to Robotics
- ME 5311 Structural Dynamics
- ME 5312 Continuum Mechanics
- ME 5339 Structural Aspects of Design

3. Thermal Science

    - ME 5316 Thermal Conduction
    - ME 5317 Convection Heat Transfer
    - ME 5318 Radiation Heat Transfer
    - ME 5312 Advanced Classical Thermodynamics

4. Controls and Systems

    - ME 5303 Classical Methods of Control Systems Analysis and Synthesis
    - ME 5305 Dynamics Systems Modeling
    - ME 5341 Control System Components

4.2 The First Year

All students must be advised by the Graduate Advisor prior to being cleared for registration. First semester, all students must meet with the graduate advisor for this purpose. New students are also required to sign "the Milestone Agreement Form", which is to inform students about the academic milestones that they will be expected to reach in order to earn their Ph.D. degree as well as when they are expected to complete these milestones. In subsequent semesters, students who do not have a supervising professor still need to meet with the graduate advisor; for students who have a supervising professor, this may be accomplished by scheduling an appointment for advising and discussion of any changes to your degree program. Once the desired courses are approved, the advising hold will be removed.

Your first year will be devoted primarily to course work. Full-time students will enroll in a minimum of 9 hours of course work/research per semester in the fall and spring semesters, and 6 hours of course work/research in the summer semester. The courses must be approved by the graduate advisor prior to registration. Students are strongly encouraged to discuss the selection of courses with their supervising professor. The details of the course offerings are listed in the Graduate Catalog,

and the requirements that pertain to you are those listed in the catalog current at the time you enter the Graduate School.

The Graduate Catalog is accessible on-line at this link. Unless you have deficiencies to be made up, you will normally take ME courses in the first semester. The Graduate Studies Office requires that you maintain a 3.0 GPA (on a 4 point scale) in all course work taken as a graduate student. During the first year you must select a research advisor. You are recommended to talk to a large number of faculty members about potential research projects. Faculty profiles are provided on the MAE Website.

BS-PhD Track Students. Special provisions apply to BS-PhD Track students. A BS-PhD student will be required to enroll in at least three hours of research each semester during the student's first two years, receiving a pass/fail grade (no R grade) in these hours. A BS-PhD student must have a faculty research (dissertation) advisor prior to the start of the student's second full semester.

4.3 Degree Requirements

- The Ph.D. degree requires a minimum of 24 hours of graduate-level course work beyond the Master's degree, and will include a scholarly dissertation that provides a significant original contribution to Mechanical Engineering.
- Students who did not satisfy the specific course requirements of Master of Science in Mechanical Engineering (see graduate catalog and Graduate Student Handbook - Masters Program for Mechanical Engineering) are expected to do so during their PhD program.
- All entering students must be proficient in mathematics, engineering analysis, and computer programming. (Students not meeting these requirements may be admitted on a probationary basis and given a plan of remedial undergraduate coursework).
- No graduate credit will be granted for courses that are required in the undergraduate Mechanical Engineering curriculum.
- The doctoral candidates in Mechanical Engineering shall enroll in the Graduate Seminar (ME 5101) a minimum of twice (see course description).

- All candidates are required to select a Supervising Professor and obtain an approved program of work in the second full semester or after 12 hours are completed.
- The Ph.D. degree course requirement can be tailored to satisfy the individual student's aspirations in choice of the area of specialization. However, to meet the educational goals of a broad-based technical background in Mechanical Engineering, it is expected that each student will take sufficient course work to obtain in-depth knowledge in at least two core areas of Mechanical Engineering. Students must take one course each from at least two core areas.
- A summary of the course requirements for students who met ME Master of Science requirements is given below.

Master of Science Degree – 30 Total Credits

Three Core Courses (9 credits)
Two Math/Engineering Analysis Courses (6 credits)
Three Elective Courses (9 credits)
ME 5698 or 5398 (Thesis) in last semester (6 credits)

The Master of Engineering (M.Eng.) Degree in Mechanical Engineering is an engineering practice-oriented program. A minimum of 30 credit hours is required as follows:

- Three core courses
  - One course each from three core areas.
- Two math/engineering analysis courses.
  - ME 5331 Analytical Methods in Engineering
  - ME 5332 Engineering Analysis
- Five elective courses
  - If you want to take a course outside the department, you must consult with the Graduate Advisor.

A summary of the course requirements for M.Eng. Students is given below.

Master of Engineering Degree – 30 Total Credits

Three Core Courses (9 credits)
Two Math/Engineering Analysis Courses (6 credits)
Five Elective Courses (15 credits)

For both the M.S. and the M. Eng. degrees, the balance of the required coursework hours may be chosen in consultation with the Supervising Professor and/or Graduate Advisor to meet the student's needs and interests.

- Qualifying Exam: see below
- Comprehensive Exam: see below
- Dissertation Defense: see below

4.4 B.S. to Ph.D. Track

- In addition to the requirements listed above for the a B.S.-Ph.D. Track student will be required to enroll in at least three hours of research each long semester during the student's first two years, receiving a pass/fail grade (no R grade) in these hours. A student may be exempted from enrolling in research hours in the student's initial semester.
- A B.S.-Ph.D. Track student must have a faculty research (dissertation) advisor prior to the start of the student's second full semester.
- A summary of the course requirements for students who are in the BS-PhD track is given below.

BS-PhD Track – 65 Total Credits

Three Core Courses (9 credits)
One Additional ME Course (3 credits)
Two Math/Engineering Analysis Courses (6 credits)
Eight Elective Courses (24 credits)
Two Seminar Courses - ME 5101 (2 credits)
One Dissertation Course ME 6999, 6399, 7399 (9 credits)
Four Research Courses – ME 6397, every long semester for first 2 years (12 credits)

Final course requirements are determined by the student's supervising committee. In addition, a student must pass three examinations before being awarded the Ph.D. degree: the Qualifying Exam, the Comprehensive Exam, and the Final Exam (or Dissertation Examination).

4.5 M.S. to Ph.D. Track

- 8 courses in ME or other relevant programs
- If MS course requirements were not met
  - At least 2 should be from two different core areas
  - At least 2 should be from math/engineering analysis (ME5331, ME5332)
  - 2 graduate seminars (ME5101 three times)
  - Complete Coursework within 2 years
- Qualifying Exam
  - at the end of the 1st semester
- Comprehensive Exam
  - 1st semester of the 3rd year
- Dissertation

  - 9 credit hours (ME6699, ME6999, ME7399) o Dissertation defense at the end of the 3rd year
  - M.S.to Ph.D. Track students must have a faculty research (dissertation) advisor prior to the start of the student's second full semester.

- A summary of the course requirements for students who are in the MS-PhD track is given below.

MS Course Requirement Met – 35 Total Credits

8 ME Related Courses (24 credits)
Two Seminar Courses - ME 5101 (2 credits)
One Dissertation Course ME 6999, 6699, 7399 (9 credits)

MS Course Requirement NOT Met – 35 Total Credits

Two Core Courses (6 credits)
Two Math/Engineering Analysis Courses (6 credits)
Four ME Related Courses (12 credits)
Two Seminar Courses - ME 5101 (2 credits)
One Dissertation Course ME 6999, 6699, 7399 (9 credits)

4.6 Research

Research for the Ph.D. program will begin usually by the end of the first year of course work, and will continue until your research advisor and dissertation committee think that you are ready to defend your work. In or before your last semester, you must file the Application for Candidacy and Final Program of Work, downloadable from this site (not working for now.).

4.6.1 Qualifying Exam:

All students entering the Ph.D. program are required to take the Ph.D. Qualifying Exam. Students admitted into the ME Ph.D. program with MS degree in Mechanical Engineering or equivalent must take the qualifying exam at the end of the 1st semester. Students admitted into ME B.S.-Ph.D. program must take the qualifying

exam within the first year. This exam is offered twice per year, during the week preceding the start of classes for the fall and spring semesters. Possible outcomes of this evaluation are: 1) continuation in the doctoral program, 2) approval to continue with certain specified remedial work, 3) failure with approval to retake, 4) termination in the program.

4.6.2 Dissertation Committee:

Prior to the comprehensive exam, the student with consultation with his/her research advisor should set up his/her dissertation committee. The dissertation committee must be composed of at least five members but not more than six, of whom four must be faculty members of the Mechanical and Mechanical Engineering (MAE) Department. The chair of the committee must be a member of the Mechanical Engineering (ME) Faculty and is usually the research advisor of the student. As such, the chair of the committee is a full-time faculty member of the MAE Department, including tenure-track, tenured, and Professors-in-Practice who participate substantially in the Mechanical Engineering program. At least one member of the committee must be non-MAE. Should there be an External or Special Member, that person will be the sixth member of the committee and should have prior approval from MECAP (Mechanical Engineering Committee on Academic Programs).

4.6.3 Note:

Professors-in-Practice cannot be Chair (sole supervisor) of the committee. They can serve as Co-Chair (Co-Supervisor)

4.6.4 Comprehensive Exam:

Students are eligible to take the comprehensive examination after satisfying all requirements stipulated by the Qualifying Exam Committee and giving evidence to their doctoral committee of adequate academic achievement by having completed all or most coursework requirements. The comprehensive examination is used to determine if the student has the necessary background and specialization required for the dissertation research and if the student can organize and conduct the research. An applicant must pass this examination to be admitted to candidacy for the Ph.D. degree.

4.7 Dissertation defense

The final requirement for the Ph.D. degree is the submission and oral defense of a dissertation which describes the results of your work. The dissertation committee should have the same members who served in your comprehensive exam. You should refer to the Graduate Studies Thesis and Dissertation Forms (click here.) when writing your dissertation to ensure that an acceptable format is used. A copy of the dissertation must be given to each committee member two weeks in advance of the exam. This copy should be in a form so that it could be turned in as the final version. It should not be left for the committee to make major corrections and revisions in spelling, syntax, organization, or content of the dissertation. A dissertation in need of major rewriting will result in automatic failure at the first oral defense. At the oral defense you will give a brief presentation of your research and answer questions from the committee and the audience. After the public part of the exam, there will be a final question-and- answer session that involves only the student and the committee. Following the oral defense, the Dissertation Defense Report must be submitted to the graduate school. You must see that any conditions placed on passing are meet in the time allowed and to the satisfaction of the committee members. Failure of the defense will result in the scheduling of a second defense within three months. Failure of that defense will result in dismissal from the program.

4.8 Graduating Semester

In the semester that you plan to graduate, there are several important deadlines that you must meet and fees that are to be paid. You should check the Graduate School's website (not working for now) for these deadlines and fees. A graduation checklist is provided at this website. The Application for Graduation and

Thesis and Dissertation Data Sheet are additional forms that are filed during the graduating semester.

4.9 Forms

The Graduate School maintains a complete list of downloadable forms at the following website: not working for now.

4.10 Miscellaneous

4.10.1 Academic Probation

A graduate student whose cumulative grade point average falls below a 3.00 in all graduate courses, be they graduate or undergraduate level, taken while enrolled as a UT Arlington graduate student will be placed on academic probation. The student must attain a grade point average of at least 3.00 in the next semester he or she is enrolled or be subject to dismissal. Undergraduate courses or graduate courses graded P, R, I or W or courses that do not provide graduate credit (see Courses Not Providing Graduate Credit) cannot be used to remove the condition of academic probation.

4.10.2 Dismissal

Students have the initial responsibility to recognize when they are having academic difficulties and are expected to initiate steps to resolve the problem. When a student is in academic difficulty, and dependent upon the severity of the problem, the student may receive an oral warning and/or written statement of the problem and required corrective actions from his or her program. Failure to take these corrective actions can result in termination from the degree program. A student who has been dismissed from the Graduate School for failure to remove the condition of academic probation by meeting the 3.0 grade-point average requirement may be readmitted for further graduate study in the same or in a different program only if a Petition to the Graduate Faculty has been approved by the appropriate Committee on Graduate Studies and the Dean of Graduate Studies. A student can be dismissed from a degree program not only for failure to maintain an adequate grade point average, but also for such reasons as unsatisfactory progress toward a degree as defined by the department or program, inability to pass a comprehensive examination, failure to prepare or to defend a thesis or dissertation in a satisfactory manner or complete thesis or dissertation work in an acceptable amount of time. Termination due to inadequate academic progress is a decision made by the program's or department's Graduate Advisor and Graduate Studies Committee. A student's thesis/dissertation committee may recommend termination for failure to prepare a thesis/dissertation proposal, prospectus or final draft in a satisfactory manner or failure to complete work in an acceptable amount of time to the program's Graduate Advisor and Graduate Studies Committee. Such decisions to terminate a student must be communicated to the Dean of Graduate Studies by

the Chairman of the Graduate Studies Committee with required justification. The Graduate Dean will review the case make the final decision. The student may continue enrollment until the Dean finalizes the termination decision. Students failing to pass a comprehensive examination or thesis/dissertation defense may be terminated upon the recommendation of the examining committee. Such decisions are indicated on the Comprehensive Examination Report or Final Defense Report which are returned to the Dean of Graduate Studies. The Graduate Dean will notify the student formally of the program's or department's decision.

Appendix A

ME PhD Qualifying Exam Guidelines

The Qualifying Exam is a written test of the student's capability to successfully pursue the Ph.D. degree program and aids in developing a program of study appropriate for the student. Students are examined in two of the following four core areas:

1. Dynamics and Control
2. Fluid Science
3. Mechanical Design, Robotics, Dynamics
4. Solids and Structures
5. Thermal Science

A.1 Procedure

1. The Ph.D. Qualifying Exam in Mechanical Engineering will be held during the week before start of classes for the Fall and Spring Semesters.
2. Candidates for the Qualifying Exam must notify the Graduate Advisor by completing ME PhD qualifying exam registration form no later than one month prior to the scheduled examination week of their intent to take the exam and identify the two subject areas in which to be examined. The

selection of the areas must have approval of the student's supervising professor.

3. Each exam will be between two & three hours in duration and will be closed book. A list of important equations will be provided.
4. The examination schedule will be posted one week prior to the exam.

A.2 Qualifying Examination Report

The qualifying examination report must be filed in the Graduate School by the ME qualifying examination committee after the qualifying exam. Results of the qualifying examination may be:

1. Approval to continue in the doctoral program;
2. Approval to continue with specified remedial work;
3. Failure, but with permission for reevaluation after a specified period; or
4. Failure and dismissal from the program.

A.3 Syllabus for Each Exam

Suggested reference materials and a list of topics for each exam are provided below. Please see this page for updates to this page.

A.3.1 Dynamics and Control Exam

Faculty Providing Questions for the Exam: Profs: Bowling, Dogan, Hullender, Shiakolas, Subbarao, Woods

UG Courses Covering Material:

- MAE 3319 (Profs. Hullender, Woods) Dynamic System Modeling and Simulation
- MAE 4310 (Profs. Dogan, Hullender, Subbarao, Shiakolas) Introduction to Automatic Control

- MAE 4301 (Prof. Bowling) Analytical and Computational Dynamics

GR Courses Discussing Material:

- ME 5303 (Prof. Hullender) Dynamics System Modeling
- ME 5305 (Prof. Shiakolas) Classical Methods of Control Systems Analysis and Synthesis
- ME 5338 (Prof. Bowling) Analytical and Computational Dynamics

The following information is in addition to the information currently in the PhD Handbook on the topics covered and suggested textbooks.

Topics:

- Multibody Dynamics
- Kinematics (position, orientation, generalized coordinates)
- Kinetics (force, mass, acceleration)
- Equations of motion

Textbooks:

- N. Nise, "Control Systems Engineering," Current Edition, Wiley.
- Dorf and Bishop, "Modern Control Systems," Current Edition, Pearson.
- R. C. Hibbeler, "Engineering Mechanics: Dynamics,", 13th Edition, Pearson, 2013.
- A. Bowling, "Vector Mechanics: A Systemic Approach," 2nd Edition, Aqualan Press, 2016 (interested students should contact Prof. Bowling).

A.3.2 Fluid Science Exam

Basic Fluid Mechanics Concepts

- Conservation of mass, momentum, and energy
- Constitutive equations, angular velocity, vorticity, rate of strain
- Streamlines, pathlines, and streaklines
- Reynolds ' transport theorem and material derivative
- Bernoulli equation
- Fluid statics
- Dimensional analysis & similitude
- Control volume analysis
- Stream & potential functions

Viscous Incompressible Flows

- Pipe flow
- Moody chart
- Major and minor losses
- Navier-Stokes solutions (Flows of Couette, Poiseuille, etc.)

Suggested Textbook:

"Fundamentals of Fluid Mechanics," by B. R. Munson, D. F. Young, and T. H. Okiishi Chapters 1-6.

A.3.3 Mechanical Design, Robotics & Dynamics Exam

Drs. Bowling, Kim, Kumar, Shiakolas

Textbooks:

- R. L. Norton, "Machine Design: An Integrated Approach," Fifth Edition, Pearson, 2014. (Focus: Part I, Chapters 5 & 6, Shafts, Gears, and Springs)
- R. L. Norton, "Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines," Fifth Edition, McGraw- Hill, 2012. (Focus: Chapters 2, 4, 5, 6, 7, 8, 11)
- J. Craig, "Introduction to Robotics," Third Edition, Addison- Wesley, 1989. (Focus: Kinematics, Control)
- R.C. Hibbeler, "Engineering Mechanics: Statics," Thirteenth Edition, Pearson, 2013. (Focus: Free Body Diagram, Distributed Loads, Truss Design)
- R.C. Hibbeler, "Engineering Mechanics: Dynamics," Thirteenth Edition, Pearson, 2013. (Focus: Planar Motion, Kinematics, Velocity, Acceleration, Mass, Inertia, Forces, Moments, Equations of Motion)
- A. Bowling, "Vector Mechanics: A Systematic Approach," Second Edition, Aqualan Press, 2016. (Focus: Part I: Kinematics, Velocity, Acceleration, Mass, Inertia, Forces, Moments, Equations of Motion)

A.3.4 Solids and Structures Exam

Please see this page.

A.3.5 Thermal Science Exam

Heat Conduction:

- Steady state heat conduction in one-dimension
- Heat conduction in two or more independent variables
- Unsteady heat conduction (lumped capacitance concept)
- Transient solutions with separation of variables

Analytic Solutions to Problems of Forced Convection

- Heat and momentum transfer for laminar and turbulent flow inside tubes
- Heat and momentum transfer for laminar and turbulent external boundary layers

Heat Transfer by Free Convection

- Analytical solutions of free convection past vertical plane surfaces
- Mixed free and forced convection

Thermodynamics

- First law for a control volume
- Steady state steady flow assumptions
- Uniform state uniform flow assumptions
- Second law for a control volume
- Enthalpy, internal energy, entropy
- Specific heats
- Work and heat

Applied Thermodynamics

- Cycles (Rankine, Carrot, refrigeration, vapor compression, Diesel, Otto) and applications
- Gas mixtures (water vapor and air mixture)

Suggested Textbooks:

- "Thermodynamics: An Engineering Approach," by Yunus Cengel and Michael Boles; McGraw Hill 8th or 9th edition.
- "Fundamentals of Heat and Mass Transfer," by Incropera et. al.; Wiley. 7th or 8th edition.

Appendix B

ME PhD Comprehensive Exam Guidelines

The Office of Graduate Studies of the University of Texas at Arlington requires all doctoral students to pass a Comprehensive Exam. In the Mechanical Engineering Program, this exam consists of both a written document and an oral presentation of the student ?s proposed dissertation research. Students are eligible to take the Comprehensive Examination after giving evidence to their doctoral committee of adequate academic achievement by having satisfied all requirements imposed by the Qualifying Evaluation and completed all or most coursework requirements. The comprehensive examination is used to determine if the student has the necessary background and specialization required for the dissertation research and if the student can organize and conduct the research. An applicant must pass this examination to be admitted to candidacy for the Ph.D. degree.

The comprehensive examination usually marks the end of formal coursework and the beginning of concentrated work on dissertation research and preparation. The student must be enrolled in the Graduate School in the semester in which he/she takes the exam. For most students the Comprehensive Exam ordinarily will be taken during the student ?s second year of doctoral studies. At this point a doctoral student should have commenced concentrated work on dissertation research under a faculty advisor and established a Comprehensive Exam Committee in accordance with the requirements set in section "Dissertation Committee". Once the committee is established, the student should file with the Office of Graduate Studies "Request for the Comprehensive Examination" form.

The Comprehensive Examination may result in: (1) unconditional pass and recommendation to proceed to the next phase of the program; (2) approval to

remain in the program but a requirement to meet certain specified additional criteria; (3) failure, but with permission to retake the examination after a period specified by the examining committee; or (4) failure with recommendation not to continue in the program.

The student must set the exam date with the agreement of the committee members and file the“ Request for the Comprehensive Examination ”form with the Office of Graduate Studies at least 14 days prior to the exam date. The exam specifically involves evaluation of the student ’ dissertation research proposal. A written proposal document is to be provided to all committee members at least 7 days prior to the exam date. On the day of the exam, the student is to provide the committee members copies of the presentation material that is to be covered. This document details guidelines for students in preparing the written proposal.

B.1 Written Proposal Format

The dissertation research proposal needs to be presented in a succinct manner. Pages should be standard letter size with margins of 1 inch at the top, bottom, and on each side. The type font size must be no smaller than 12, and the line spacing must be double-spaced. Students are encouraged to adopt, as appropriate, format and styles required by the Office of Graduate Studies for dissertations (click here).

The proposal should typically contain the following sections with suggested contents:

- Title Page
  - The proposed research title should be brief, clear, and unambiguous.
  - Use words that clearly reflect the focus of your proposal.
  - Remove words from the title that are unnecessary.
  - Include your name, your advisor ’ name (Committee Chairman), the names of the other members of the Comprehensive Exam Committee, and the date.
- Project Summary
  - The Project Summary provides the reader with a "picture" of your proposal.
  - It must be concise and lay the framework of your proposal.

  - This section should be prepared last, after you have written the rest of the proposal and you have a clear understanding of what follows in the document.
  - Make sure that the reader sees:
    * objectives of the research and expected significance
    * reasons for the research
    * the uniqueness of the work
    * a clear rationale
    * focused ideas
    * a summary of work done thus far
    * a summary of work that remains to be done

- Table of Contents
  - The Table of Contents lists all main sections and subheadings contained in the document, with appropriate page numbers.

- Project Description
  - The purpose of the Project Description is to provide the what, why, and how of the proposal.
  - The Project Description contains all elements that are condensed in the Project Summary.
  - It should contain discussion of:
  - objectives of the research and expected significance
  - reasons for the research
  - the uniqueness of the work
  - what you intend to do and why it is worth doing
  - what you have done to establish the feasibility of what you are proposing
  - how the research will be accomplished
  - relation of your proposed research to the present state of knowledge in the field; cite appropriate references
  - identification of required resources
  - a projected sequence and schedule

  - potential difficulties and limitations and how these will be overcome or mitigated
  - expected results and alternative approaches if unexpected results are found
  - discussion of what work has been done thus far, including experimental procedures, analysis methods, and results
  -
  - contributions: what your work adds to the field of knowledge
  - References
    * The proposal should cite essential references pertinent to the subject being addressed.
    * Every reference cited in the proposal must be listed in this section.
    * Citations must be complete. Include full listing of authors, the title of the article, name of the journal or book, publisher (if a book), volume number, page numbers, and date.
    * Use a consistent bibliographic style.

- Appendices
  - Appendices contain materials too lengthy for inclusion in the text, or not directly relevant.
  - Appendices may be useful for providing raw data, background materials, supplemental tables, figures, derivations, analysis, etc.
  - All material in Appendices must be referred to in the text so readers know why they are there.
  - Each Appendix should have a title.

- Common Shortcomings The following list details common deficiencies in research proposals:
  - It is not clear what hypothesis is being addressed by the proposal.
  - It is not clear that the proposed hypothesis is worth addressing.
  - The case for innovative research (i.e., the contribution) is not made.
  - The proposed research is just a routine application of known techniques.

- The proposer seems unaware of what others have done in this field.
- There is no evidence that the proposer will succeed where others have failed.
- The proposer is attempting too much.
- The approach lacks clear thinking and logical development.
- The resources are not adequate for the proposed research.

- Resources for Writing Proposals and Dissertations

  There are many resources available via the internet for writing proposals and dissertations. In particular, many universities have excellent information via their Office of Sponsored Projects or Graduate School sites. The following is a list of some helpful web sites:

  1. S. Joseph Levine, Ph.D., Michigan State University - "Guide for Writing a Funding Proposal," link.
  2. S. Joseph Levine, Ph.D., Michigan State University - "Guide for Writing and Presenting Your Thesis or Dissertation," link.
  3. Foundation Center - "Proposal Writing Short Course," link.
  4. National Science Foundation (NSF) -"A Guide to Proposal Writing," link.