

Welcome to Graduate Studies

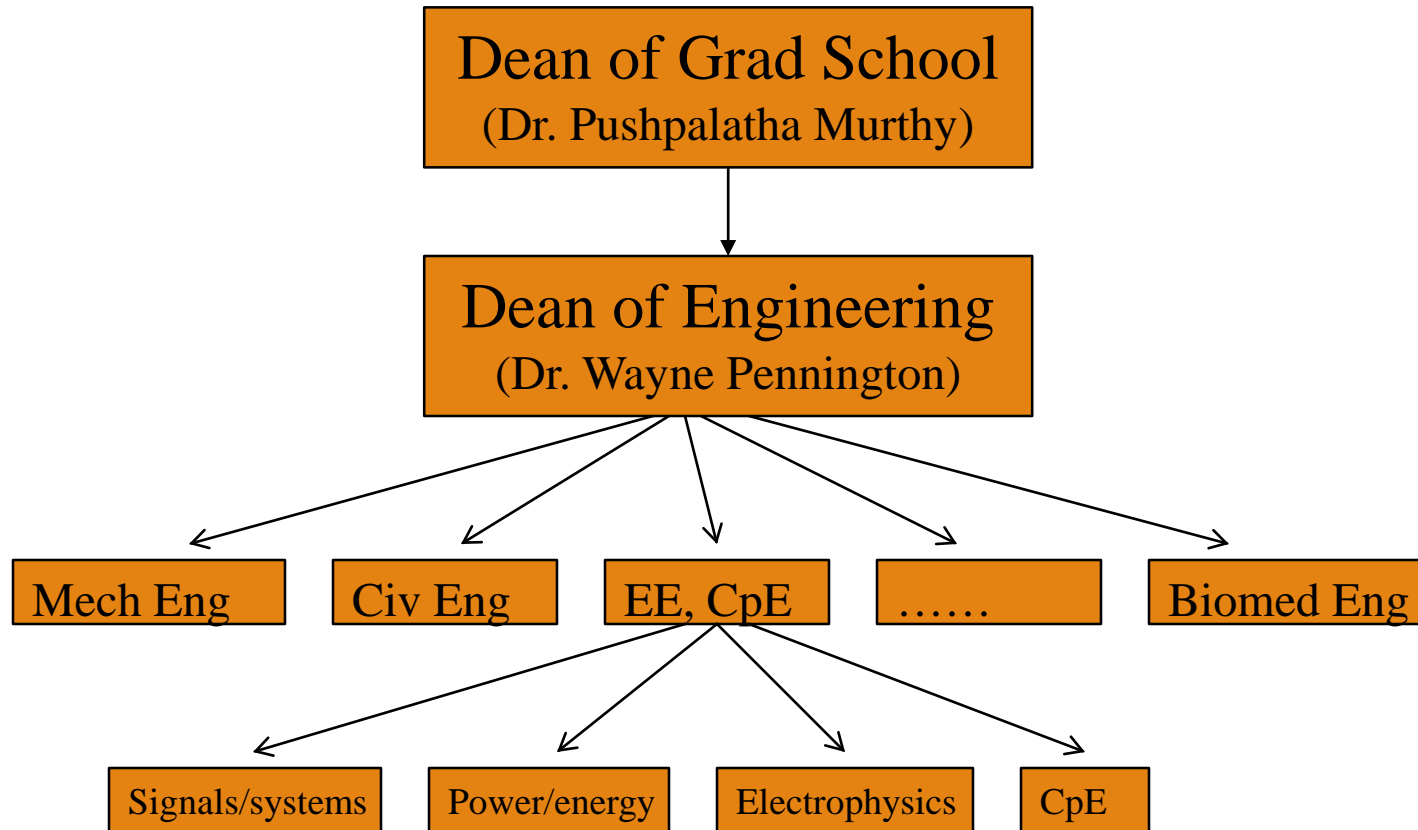
Graduate Student Orientation Electrical & Computer Engineering

Prof. Mike Roggemann, Prof. John Pakkala
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Purpose of today's meeting

- We are here to discuss the ECE Department policies and rules which will lead (most of) you to success in your graduate studies, and to introduce you to the initial set of key people.
- We'll discuss where you should go for information.
- Our overarching goal is to help you become independent!
- ***Help you understand that your academic success is our highest priority!***

Organizational Chart



Introduction:

- Dr. Mike Roggemann: Director of the Graduate Program in ECE, and Chair of the ECE Graduate Programs Committee.
 - First speaker of the committee which develops the departmental graduate program policies, manages the Ph.D. qualifying exam, etc.
 - Manages admissions for Ph.D. students.
- Dr. John Pakkala: Advisor for the course work MS students, also teaches in the controls area:
 - Standing member of the Graduate Programs Committee.
 - Monitors your registration issues and monitors progress towards your degree, assists in dealing with academic underperformance issues.
 - Manages most of the admissions for MS students.
- Dr. Glen Archer: Boss of the teaching labs and manager of the TA's.
- Ms. Joan Becker: Grad program coordinator
 - Submits paperwork once YOU fill it out.
 - Take all forms to her for signatures!
 - Works with Dr. Pakkala and me from Admission through Graduation for each of you
 - ***Be NICE to HER!***

Graduate School – What to expect

- Smaller size classes, and... everybody in there is above the average of your undergraduate days. The expectations are higher and the topics both deeper and broader. You have top students with whom to study and collaborate.
- We expect you to take an active role in your education. Anticipate what needs to be done. Ask questions during lecture, see your professors outside of class, dig into the literature – don't be intellectually lazy! **Grad school is not a spectator sport!**
- There will be more open-ended problems and projects, with larger scope and longer deadlines. These may challenge your time management skills – don't wait until the last second!
- Stress concept-based approaches (instead of procedural), abstract thinking, reward for developing creative innovative approaches.
- Communications – develop excellent speaking and writing skills.
- Research – scientific method, make an advancement on existing state of the art.
- ***Professor will create an environment (lecture, lab, research) for you to succeed, to be successful -> you need do the rest.***

Research Thrust Areas

- Computer Engineering
- Signals and Systems
- Power and Energy Systems
- Electro-physics
- Graduate course offerings generally follow the research areas.

ECE Graduate Programs

Master of Science (MS) Program

Doctor of Philosophy (Ph.D.) Program

The ECE Graduate Program

- The minimum University degree requirements linked off the Graduate School's Degree Requirements webpage:
<http://www.mtu.edu/gradschool/administration/academics/requirements/>
- The ECE department may have additional (more specific) requirements than those of the MTU Graduate School: <http://www.mtu.edu/ece/graduate/>
- Note that in some cases there are both university and departmental policies that might seem inconsistent at first glance. University policies establish a minimum set of expectations for every program, but individual programs can, and in our case do, have higher requirements. When in doubt, you can generally assume the departmental policies apply... And check with Ms. Becker!
- The student is responsible for following all rules and getting everything done in time.
- The M-Forms and D-forms are available at the Graduate School webpage:
<http://www.mtu.edu/gradschool/administration/academics/forms-deadlines/>

When the rules change....

- The rules for graduation evolve slowly over time as we make adjustments based on our experience, and outside influences from year to year.
- You are subject to the rules as they exist TODAY
- Therefore, save a copy of these rules, as posted on:
<http://www.mtu.edu/ece/graduate/electrical/>

for when you graduate. Note, both EE and CompEng are covered on this page.

What courses do I take first term?

- First, you must know what program you have joined: MS-A, B, D or PhD?
- What are the requirements of that program? See the department grad program web page and the (very important) degree Self Audit spreadsheet available on the web at: <http://www.mtu.edu/ece/graduate/advising/>
- Consult registrar's office web page for courses offered, which semester, course pre-reqs, etc.
- Consult with person teaching the course(s) if questions remain
- If a section is full, only the instructor can allow more students
- Note: International students may only take 3 on-line credits per semester
- See the schedule of classes at https://www.banweb.mtu.edu/pls/owa/bwckgens.p_proc_term_date

Suggested First Semester Courses in Signals and Systems

- EE5500 – Probability, and Stochastic Processes
- EE5715 – Linear Systems Theory and Design
- EE5522 – Digital Image Processing
- EE5726 – Embedded Sensor Networks
- EE5900 – Fourier Optics
- Math – Linear algebra, real analysis, scientific computing, numerical PDE's, etc.

Suggested First Semester Courses in Power and Energy

- There are two paths: Energy generation and distribution, and power electronics.
- You should work with the faculty in the power and energy area to determine what is best for you.
- EE5200 – Advanced Methods in Power Systems
- EE5227 – Advanced Power Electronics
- EE5230 – Power Systems Operations
- EE5251 – Distribution Engineering
- Math – Linear algebra, real analysis, scientific computing, numerical PDE's, etc.

Suggested First Semester Courses in Electro-Physics

- EE5410 - Engineering Electromagnetics
- EE5430 - Electronic Materials
- EE547- Semiconductor Fabrication, and Fabrication Lab courses.
- Math – Linear algebra, real analysis, scientific computing, numerical PDE's, etc.

Suggested First Term Courses in Computer Engineering

- EE5500 – Probability and Stochastic Processes
- CS4321 - Introduction to Algorithms
- CS5321 – Advanced Algorithms
- Any Relevant Math (linear algebra, statistical processes, ...)

Summary

- All of this is summarized at:

<http://www.mtu.edu/ece/graduate/sequences/>

Graduation Requirements for an MS
Degree in
Electrical & Computer Engineering
at
Michigan Tech

MS Degree Options

- Master of Science in Electrical & Computer Engineering:
 - Thesis Option (Plan A)
 - Report Option (Plan B)
 - Coursework Option (Plan D)

MS Degree Requirements

- Fill out Patent, Research and Proprietary Rights form.
- Choose an Advisor if Plan A or B (good mutual match).
- Plan out your course of study [self audit].
- Complete 30 Total approved credits.
- Grades of BC or better in all EE/In Department courses.
- Grades of C or better for non-major courses.
- **Note: all of the MS degree paths allow some 4000-level credits to be applied to the degree. It is very important that you understand that the intent is for these credits to be used to broaden your educational experience, not repeat subjects you had as an undergrad. Dr. Pakkala can help you to interpret the details of this policy, and some of you have likely heard from him already!**
- **You must maintain 3.0 GPA, and 3.0 GPA is the minimum to graduate.**

MS Degree Requirements (cont.)

- Choose an Option (Plan A, B, or D)
- Present a Research/Project Proposal (A or B)
- Complete a Thesis or Project (A or B)
- File the MS Degree Schedule [Form M4]
- Logically 'AND' each requirement; MUST USE degree Self audit Spreadsheet
- Complete an Oral Thesis or Project Defense (Plan A or B)
- File the Oral Examination [Forms M5 & M6] (Plan A or B) or Form M6 (Plan D)

Spreadsheet for degree Self Audit

- Found on all ECE webpages, under Quick Links, Self Audit
- Fill it out (read directions and list courses in the order completed)
- Send it to Joan (jebecker@mtu.edu)
- Forms will be signed if courses meet requirements
- ECE (all) grad courses listed at:

https://www.banweb.mtu.edu/pls/owa/stu_ctg_utils.p_online_all_courses_gr#EE

MS Thesis Option (Plan A)

- <http://www.mtu.edu/ece/graduate/electrical/>
- This plan requires a research thesis prepared under the **supervision of an advisor**. A thesis describes a research investigation and its results. The minimum requirements are as follows:
- A minimum of 30 approved credits is required
 - 20 credit minimum of course work
 - 12 credit minimum [EE5000-6000 series](#)
 - 1 credit of [Advanced Responsible Conduct of Research Training](#); An on-campus, approved course is required. See <http://www.mtu.edu/research/administration/integrity-compliance/responsible-conduct/training/courses/>
 - 9 credit maximum 4000 series
 - 3 credit minimum 4000 or higher level courses outside the department
 - 3 credit maximum EE 5805 (directed study)
 - 3 credit maximum of Co-op credits
 - 6 to 10 Research credits [EE 5990](#)
- Approval of your Advisor
- All EE/In Department courses must have a grade of 'BC' or better; Non EE/In Department courses must have a grade of 'C' or better.
- Must maintain a university cumulative GPA of 3.0 or above.

MS Report Option (Plan B)

- <http://www.mtu.edu/ece/graduate/electrical/>
- This plan requires a report describing the results of an independent study project. Of the minimum total of 30 credits, at least 24 must be earned in course work other than the project.
- A minimum of 30 approved credits is required
 - 24 credit minimum of course work
 - 12 credit minimum [EE5000-6000 series](#)
 - 1 credit of [Advanced Responsible Conduct of Research Training](#); An on-campus, approved course is required. See <http://www.mtu.edu/research/administration/integrity-compliance/responsible-conduct/training/courses/>
 - 12 credit maximum 4000 series
 - 3 credit minimum 4000 or higher level courses outside the department
 - 3 credit maximum EE 5805 (directed study)
 - 3 credit maximum of Co-op credits
 - 2 to 6 project credits [EE 5991](#)
- Approval of your Advisor
- All EE courses must have a grade of 'BC' or better; Non EE courses must have a grade of 'C' or better.
- Must maintain a university cumulative GPA of 3.0 or above.

MS Coursework Option (Plan D)

- <http://www.mtu.edu/ece/graduate/electrical/>
- This plan requires the minimum of 30 credits be earned through course work. Research credits taken by students in Plan D may not be counted as course-work credits.
- A minimum of 30 approved course work credits is required
 - 18 credit minimum [EE5000-6000 series](#)
 - 1 credit of Advanced Responsible Conduct Research; [Advanced online CITI training course](#) (free)
 - 9 credit maximum 4000 series
 - Seminar not required, but up to 2 credits allowed
 - 3 credit minimum 4000 or higher level courses outside the department
 - 3 credit maximum EE 5805 (directed study)
 - 3 credit maximum of Co-op credits
- Approval of your Advisor
- All EE courses must have a grade of 'BC' or better; Non EE courses must have a grade of 'C' or better.
- Must maintain a university cumulative GPA of 3.0 or above.

Timeline / Deadlines for MS Students

- Look carefully at the timelines for each of the three MS degree options.
 - <http://www.mtu.edu/gradschool/administration/academics/timeline/>
- Make sure that in your final semester, you meet the Deadlines to complete a degree in '*your graduating semester*'. Not meeting deadlines will delay your graduation.
 - <http://www.mtu.edu/gradschool/administration/academics/forms-deadlines/>

There is a tremendous amount of information that you should be moderately familiar with now, and in more detail as you progress.

Ph.D. Degree Program
in
Electrical & Computer
Engineering
at
Michigan Tech

Ph.D. Degree Coursework Requirements

- There are requirements imposed by both the Graduate School and the ECE Department for the Ph.D.
- Details of the Grad school requirements listed at:
<http://www.mtu.edu/gradschool/administration/academics/requirements/phd/>
- Details of the ECE Department requirements listed at:
<http://www.mtu.edu/ece/graduate/electrical/>
- Summary of coursework requirements follows.

Graduate School Coursework Requirements for Ph.D.

- **Minimum requirements**

- Programs may have stricter requirements than listed here and may require more than the minimum numbers of credits listed here.
- Thirty credits beyond the bachelor's degree are required for a master's degree.
- Thirty credits beyond the master's degree are required for a PhD.
- Maximum of 12 credits may be at the 3000 or 4000 level (with program approval).
- MEng allows a maximum of 14 credits at the 3000 or 4000 level.
- One-third of the non-research credits may be transfer credits as long as they were not applied toward another degree.
- Research credits are the only non-graded classes that may be counted toward a degree.
- All credits must meet the [Scholastic Standards](#) of the Graduate School in order to be counted toward the credit requirements.

- **Not allowed to count towards Ph.D:**

- Courses numbered below 3000
- Audited courses
- Continuous enrollment courses (ex: UN5951, UN5953)
- Non-research courses taken for a pass/fail courses
- Credits applied toward another degree

Ph.D. Degree Requirements

Other Requirements

Fill out Patent, Research and Proprietary Rights form.

Complete [Advanced Responsible Conduct of Research Training](http://www.mtu.edu/research/administration/integrity-compliance/responsible-conduct/training/courses/); An on-campus, approved course is required. See <http://www.mtu.edu/research/administration/integrity-compliance/responsible-conduct/training/courses/>

Pass the Ph.D. qualifying examination and other examinations as explained later.

- Look carefully at the [Doctor of Philosophy](http://www.mtu.edu/gradschool/administration/academics/timeline/) timeline.
 - <http://www.mtu.edu/gradschool/administration/academics/timeline/>
- Make sure that in your final semester, you meet the Deadlines to complete a degree in *'your graduating semester'*. Not meeting deadlines will delay your graduation.
 - <http://www.mtu.edu/gradschool/administration/academics/forms-deadlines/>

Ph.D. Qualifying Examination [D4]

- You must have an advisor before taking this exam.
- Qualifying exam consists of the following two parts:
 - Written exam, questions from 3 grad-level courses.
 - Oral – To test student’s grasp of fundamentals, ability to solve problems on the spot, and ability to research, write, and defend a technical paper.
 - See following slides for presentation of the qualifying exam policy.
- Details given at
<http://www.mtu.edu/ece/graduate/advising/qualifying-exam/>
- A maximum of two attempts are allowed.
 - The first attempt must be made by the third semester. (Summer semesters are not counted).
 - This exam is typically offered twice per year, early in the Fall and Spring semesters.

Ph.D. Written Qualifying Exam-1

Written Exam:

The written exam will be a three hour closed book, closed notes exam covering graduate material drawn from the list of classes included in this section. The instructors writing the various parts of the exam have the option of allowing calculators which are provided by the department to perform the computations.

A single departmental exam will be developed prior to the exam date, and provided to each student. Students may only attempt three parts – partial completion of more than three parts is not allowed. Students must indicate on the exam cover sheet which three sections should be graded.

Ph.D. Written Qualifying Exam-2

To pass the written part students must compile a score of 210 or more by completing three of the exams from the following list of graduate classes, which are offered every year:

- EE5715: Linear Systems
- EE5500: Probability and Stochastic Processes
- EE5527: Digital Communications
- EE5410: Engineering Electro-magnetics
- EE5430: Electronic Materials
- EE5200: Advanced Methods in Power Systems Analysis
- CS5321: Advanced Algorithms
- EE5496: GPU and Multicore Programming

Ph.D. Written Qualifying Exam-3

The exams will be graded on a 100 point scale, and the scores will be summed. Scores greater than or equal to 210 will be considered a passing score.

For scores in the range of 180 to 209, the GPC will make an assessment to determine if the oral exam will be allowed, or if the written exam must be re-taken, on a case by case basis. If the GPC allows the oral exam to proceed in this case it will be deemed a “weak pass” of the written exam, and the oral exam guidelines for weak pass, described below, will be implemented.

Ph.D. Oral Exam

Students with a passing score in the written part will proceed to the oral part of the qualifying exam. The oral part of the qualifying exam will be administered by the advisor and members of the research committee from the ECE department, and such outside reviewers as may be added by the GPC or the research advisor.

For students with a passing score on the written part, the oral exam will consist of a presentation on a research topic assigned by the research committee. No original content is expected in the presentation. However, a deep understanding of the topic is expected to be demonstrated, and the student is expected to be able to field and extemporaneously address questions from the exam committee. There is no set duration for this exam, though as a general rule we anticipate that on the order of 30 minutes for presentation and 30 minutes for questions will suffice. The research committee will determine whether the student passed.

For students who attained a weak pass of the written part, the oral exam will have a two parts:

The first part will address shortcomings in performance on the written part, and may include faculty members selected by the GPC to evaluate performance.

The second part will be administered by the research committee, as described above for students who passed the written part.

Other Ph.D. Examinations

- **Research Proposal Examination [D6]**
 - Oral presentation of dissertation proposal and an oral examination on the proposed research by the advisory committee.
 - This must be passed before the end of the sixth semester. (Not counting summer semesters)
- **Final Oral Examination [D8]**
 - Public presentation and defense of the dissertation research.

Procedure for Ph.D. Students

First Semester

- Work with your advisor. This is an important choice – should be a topic of mutual interest, with the possibility of original, significant research being done in the timeline of a Ph.D.
- Create a tentative study plan including plans for taking the qualifying examination.
- Register for the second semester courses.
- Submit final official transcripts to graduate school showing proof of your previous degrees (if not from MTU or unless done previously).
- Fill out the Patent, Research and Proprietary Rights form.

Dissertation/thesis/report

- Most challenging document you've ever planned, organized, and written.
- Generally contains things that have been published in peer reviewed publications.
- Must be text-book perfect.
- Follow Graduate School guidelines.
- Follow departmental and advisor guidelines.
- Consistent notations, equation editor, professional graphics.
- Lots of good examples from past students.
- Will likely get lots of help from your advisor and committee.

Academic Integrity

- [Graduate School: Professional Conduct – Academic Integrity](http://www.admin.mtu.edu/usenate/policies/p109-1.htm) (academic misconduct, plagiarism, cheating, fabrication, falsification, sanctions)
<http://www.admin.mtu.edu/usenate/policies/p109-1.htm>
- Office of Academic and Community Conduct [Academic Integrity \(Video Presentation by Academic & Community Conduct Director, Robert Bishop\)](#)
 - MTU Policy on Scientific Misconduct
[http://www.mtu.edu/research/administration/integrity-compliance/pdf/Misconduct in Research Scholarly Creative Endeavors Policy.pdf](http://www.mtu.edu/research/administration/integrity-compliance/pdf/Misconduct%20in%20Research%20Scholarly%20Creative%20Endeavors%20Policy.pdf)
- Plagiarism
 - Definition: Presenting another's work as your own.
 - Thus, always reference the source to your numbered Reference List.
 - Use quotation marks or “block quotation” for direct quotes.
- Expect ZERO tolerance for gross infractions.

Cooperative Employment

- Administered by Career Services, NOT ECE!!!
- Intern or co-op jobs can give good summer income and professional experience.
- Difficult for Plan A or Plan B Masters students, or for PhD students. Your research project schedule (and your Advisor!) may not allow you to just come and go as you please. Exception: if employer is sponsoring your research.
- International students should arrange as a Graduate Coop / CPT.
- If you also work Fall or Spring semester, you run risk of missing required courses while away from campus – Be careful! Coordinate with your advisor.
- As a general rule, Co-ops beyond the scope of the guidelines listed previously, and for applicants not qualified due to poor grades will not be approved.

Conclusion

- Your academic success is our highest priority!
- Grad school will challenge you and reward you in ways you probably have not imagined yet. “Buckle up!”
- While academic success should be your main priority, the campus and the community have a huge number of opportunities to explore your other interests, to share culture (and food!) from your home country with others, etc.
- I refer you to: <http://www.mtu.edu/student-activities/>
- On this page is a tab for “Registered Student Organizations”. There are tons – probably something there for just about everyone!
- General questions? (Please reserve things that apply only to you for a one-on-one with Dr. Pakkala, Ms. Becker, or Dr. Roggemann)