Graduate School in ECE
Senior Meeting

Dr. William A. Davis
Faculty Representative

vt.ece.gradadm@vt.edu
Admissions Specialist
Graduate Advising Office

Senior Meeting
3 November 2010
GRADUATE SCHOOL

- Why?
- Selecting a Grad School
- Applying
- Financial Aid
- Going to Grad School – What is it like?

--Virginia Tech (included throughout presentation)-->
Why should you consider Graduate School?

• To attain a deeper understanding of your field

• To satisfy your career goals

• To earn more money
Why: Graduate School gives additional career options

- **BS** => manufacturing, sales, marketing, & product support
- **MS min** => Most positions in management, research, development, & design
- **Ph.D. required** => If you want to teach at a university or focus on research

- **NOTE**: Graduate school gives *more options* for career advancement, but may *limit* you geographically (specific job locations by area)
Why: Graduate School is profitable (in the long run)

- Typical starting salaries (2005) – varies with locale:
  - B.S. ~ $55 K
  - M.S. ~ $66 K
  - Ph.D. ~ 70-90 K
  (Academic – typically 9 month appointments)

- Higher salaries must be weighed against 2 or more years of lower income

- Over the course of career, studies show significantly higher earnings for advanced engineering degrees
How do you choose a Graduate School?

• **Quality** of your graduate education depends on more than a top 25 ranking for the program. It depends on:
  – the specific *department* within engineering
  – the specific *program* within ECE
  – the specific *professors* who will teach and advise you

• Look as closely as you can at faculty and programs you will be working with
  – *visit* to look at the university & *meet* with faculty
Choose: Information Sources

- **Starting Point:** NOT *U.S. News*
- “Peterson's Guide to Graduate School”
- March Issue of “Engineering Education”
  - Look at dissertation and research areas, funding, etc
- College Catalogs (most online):
  - Areas of interest
  - Courses
  - Thesis subjects
- Professional Journals (IEEE, …) & Conference digests:
  - Topics
  - Professors
- Graduate School: [http://www.grads.vt.edu/](http://www.grads.vt.edu/)
- World Wide Web: ([http://www.<ece(or ee)>.<school>.edu](http://www.<ece(or ee)>.<school>.edu))
  - [http://www.ece.vt.edu/graduate](http://www.ece.vt.edu/graduate)
How do you apply to Graduate School?

• Most application **deadlines** in December/January for fall admission (Dec 31)

• Applications will ask for:
  – UG *transcript* and *GPA*
  – Graduate Record Examination (*GRE*)
  – Letters of *recommendation* (2 or 3)
  – *Statement* of professional goals/research interests
  – Desired funding

• *Much now collected online*
Apply: Other Typical Application Items

- Personal info, Citizenship, Veteran
- Where (campus) & When (Start Semester)
- Desired Degree, Dept, Area of concentration
- Universities attended, GPA (Major/Last 60), Degree (Transcripts)
- Emergency Contact – In case there are questions – faculty, etc.
- E-mail
Typical Application Questions

- Why do you want to undertake graduate work?
- What do you expect to derive from your program of study?
- If you have a concentration in mind, briefly outline your interests in this area.
- What do you expect to contribute as a student and subsequently as a member of the profession?

**CAREFUL**
Apply: Common Admission Standards (Virginia Tech Example)

- GPA: 3.4 preferred for MS admission (last 60 hrs)
  3.0 minimum for MEng
  3.5 minimum for direct-Ph.D. and PhD admission
  >3.5 Dual Registration (last UG semester)
  >3.3 Overall, 3.5 last 60 – UG/G

- Strong recommendation letters are desired (Some or all from professors)

- Undergraduate research/work experience may help, particularly a Coop experience

- Having skills that match existing or proposed faculty research is important

  --NOTE: Faculty may have input, but do not admit--
Can I get paid to go to grad school? … YES!

• Fellowships
  – some Fellowships may be awarded by department to incoming students (e.g., Bradley Fellowships)
  – DoD, NSF, NIH, … (see Grad School for list)

• Research assistantships
  – awarded by individual faculty to work on a specific research project
  – faculty are often hesitant to award GRAs to a new student in their first semester of graduate school

• Teaching assistantships
  – hiring decisions made by departments to assist in grading or laboratory instruction
What is the pay? What is expected?

• Assistantship Stipends are approximately $1500/month, plus tuition & partial medical insurance
  – may be either on a 9 month or 12 month basis

• Fellowships have minimal work expectations other than progress towards your degree

• For teaching and research assistantships, you are expected to work 20 hours per week
  – work you perform for a research assistantship may often (but not always) apply towards your thesis
Other sources of funding

• There are a number of fellowships that are awarded by other agencies (deadlines – NOV)
  – National Science Foundation
  – Department of Defense
  – Specific area societies may sponsor national fellowship competitions (e.g., the IEEE Vehicular Technology Society sponsors the Noble Fellowship)

• Summer internships/co-op
  – A valuable way to mix industry experience with academics
  – Often leads to an offer of full-time employment
More Information

– Companies
– NSF
– DoD
– Other Federal and State Agencies
– Educational Foundations
– Department/Faculty

http://www.grads.vt.edu/graduate_catalog/fin.jsp
How does graduate school differ from undergraduate school?

• Smaller classes - more personal contact
• You will spend more time on fewer classes
  – 9-18 credit hrs => a full load
  – 12 credit hrs (Required of funded students)
• Much of the learning takes place outside formal classroom settings
  – seminars, meetings, one-on-one conversations with students and faculty, projects
• You will start to create knowledge in addition to absorbing it: Research
What are the requirements for graduate degrees?

At VT ECE:

• M.S. Degree (& Accelerated Undergraduate/Grad – UG/G)
  – 21 credits plus completion of a thesis (9 hrs) & 2 Seminar credits

• M.Eng. Degree
  – Non-thesis option: 27 credit hours & project (3 hrs) & 2 Seminar credits

• direct-Ph.D. Degree (& Accelerated UG/Grad)
  – Completion of 30 course credit hours (36 recommended) (& 2 Seminars)
  – Completion of a dissertation

• Ph.D. Degree
  – 15 additional credit hours beyond MS (36 total + MS thesis) & Seminars
  – Completion of a dissertation
How long does it take to earn a degree?

- **MS & MEng:** 1-2 years
  - “UG/G”: 1-1.5 after BS (up to 12 hrs at BS)
  - Dual: Start MS during BS (Last Semester)

- **direct-Ph.D.:** 3-4+ years

- **Ph.D.:** 2-3+ years beyond an MS
Should I choose the thesis (MS) or non-thesis (MEng) option?

• Advantages of non-thesis option
  – writing a thesis may take more effort than 9 credit hours
  – a fixed graduation date may be “guaranteed”

• Advantages of thesis option
  – learn much more
  – develop a mentoring relationship with your advisor
  – added advantage in job placement (some employers will not consider non-thesis students)

• Some schools strongly encourage one option or the other (VT offers both, but encourages the thesis option).
What is research and how do I get started?

• Research: look at problems & fundamentals people haven’t answered yet
  – May be applied or abstract
• Start: Read key papers in area
• Try implementing techniques in the papers yourself
• Pretty soon you will be asking questions:
  – Could I substantially simplify approach?
  – Could I solve the problem for practical parameters?
  – Is there a fundamental approach that saves time and $$?
What is a thesis?

• Report that describes research work of a masters student.
• Usually presents a result that is *slightly* different than anyone has presented before.
• Length: 50 pages or more typical
  – Introduction (what problem is considered)
  – Literature Survey (what related work has been done)
  – Approach (what technical methods are you using)
  – Results (discuss the implications of your findings)
  – Conclusions (what was accomplished and what remains to be done in the future …)
What is a dissertation?

- More extensive thesis written by a Ph.D. student

- A dissertation should introduce *new ideas* that advance the current state of knowledge in an area
  - most dissertations result in publications that are reviewed by other outstanding researchers in the field

- Length: 100 pages or more typically
  - format is similar to a thesis, but the depth is greater in each of the areas and addresses fundamentals
What are the perks that come with successful research?

- Publication of your work in journals that is recognized by your peers
- Travel to conferences to present your work to colleagues
- Meetings with sponsor companies
- Patents for new ideas and copyrights for new software that may generate royalties
PhD Exams - typical

• Qualifying: Basically Entrance Confirmation

• Preliminary: Area Qualification & Dissertation Proposal

• Final: Defend your work and GRADUATE!!
What is a thesis or dissertation ‘defense’?

• Faculty advisory committee (3 for MS, 5 for Ph.D.)

• Submit thesis or dissertation to committee for their review (2-3 weeks before defense)

• Defense: A 40-60 minute presentation to the committee followed by questions

• Committee will suggest revisions before the thesis or dissertation receives final approval
  – Revisions usually are minor - 1 week of work
  – Extremely rare that the committee completely rejects a thesis (advisor should not have allowed defense)
A typical MS program

- **Year 1 Fall Semester:**
  - 12 hrs class, attend seminars, work as GTA, select advisor
- **Year 1 Spring Semester:**
  - 6 hrs class, 6 hrs research, attend seminars, work as GTA/GRA
- **Year 1 Summer:** internship with industry (or complete MS – 1 class and thesis)
- **Year 2 Fall semester**
  - 6 hrs class, 6 hrs research (thesis topic), work as GRA
- **Year 2 Spring Semester (if not completed)**
  - no classes, work as GRA, write and defend thesis
A typical direct-Ph.D. program

• Year 1
  – take 2 to 3 classes per semester and start research topic
  – select advisor (may already have)

• Year 2
  – take 2 to 3 class per semester/pass Ph.D. Qualifying Examination

• Year 3
  – take no classes
  – select dissertation topic/pass Ph.D. Preliminary Examination

• Year 4
  – take no classes
  – complete and defend dissertation at Final Defense
A typical Ph.D. program

• Year 1
  – Take 2 classes per semester/pass Qualification exam
  – Begin research
  – Select advisor

• Year 2
  – Continue research
  – Finalize dissertation topic/pass Preliminary Exam
  – Take 1 class per semester

• Year 3
  – Take no classes
  – Complete and defend dissertation => Final Defense
• Changing Schools
• Subject focus, not US News & World Report Ranking
• Often get paid
• MS Thesis recommended - often required
• More specialization
• MS becoming a must
• Course load typically 9-12 hours
How to be Successful in Grad School

• Always work hard to maintain a good GPA
• Network and interact with other students in classes
• Start looking for an advisor ASAP
• Interact with as many professors as possible
• Finalize your advisor by the *middle* of semester 1
• If thesis, finalize your research topic by end of semester 1
• For thesis option, be persistent in completing your research topic
Grad School?

QUESTIONS?