Department of Electronics
Program Orientation
September 5, 2017
9:15-10:15 am

Prof. N. Tait: Chairman
Prof. R. Gauthier, Associate Chair (EE SREE Undergraduate)
Prof. T. Smy (Eng. Phys. Undergraduate)

Location
MC 5050 EE SREE
MC 5010 End. Phys.

9/4/2017
DEPARTMENT OF ELECTRONICS
doe.carleton.ca

- Main Office: Mackenzie Building 5170
- Departmental Chair: Niall Tait
- Associate Graduate Chair: Len MacEachern
- Associate Undergraduate Chair: Robert Gauthier
- Departmental Administrator: Blazenka Power
- Graduate Assistant: Anna Lee
- Administrative Assistant: Sylvie Beekmans
- 24 faculty members, ~800 full time undergraduate students
• Programs are offered in collaboration with other academic units
• Electronics is the administrative lead or home department for:
  • Electrical Engineering
  • Engineering Physics
  • Sustainable and Renewable Energy Engineering A.
• For help or advice with these programs contact the Associate Undergraduate Chair (Prof. Gauthier). For help or advice with specific courses, you may need to contact the instructor or department offering the course.
• The Department of Electronics isn’t just about undergraduate programs:
  • Student organizations
    • IEEE student branch
    • Carleton University Robotics Club
    • Carleton Student Engineering Society
    • https://carleton.ca/engineering-design/community/clubs-and-societies/
  • Research
    • Microfabrication
    • Integrated circuit design
    • Microwaves and electromagnetics
    • Optics and photonics
    • Power and Energy
    • Electronic Design Automation
WATCH OUT

• Can’t study all the time!!!

• Can’t party all the time!!!

• It is very difficult to find the right balance!!!
ADVICE FOR SUCCESS

• Be aware of important dates and deadlines
• Know the regulations of your program (read the appropriate sections of the undergraduate calendar)
• Stay “on-stream” (scheduling and prerequisites)
  • Pass all of your courses
  • Do not postpone courses (including complementary studies electives)
  • Hand in reports and assignments on time
• For each hour of lecture time, allocate one hour of study time (yes that’s a lot of hours – but you are in a tough engineering program that leads to eventual P. Eng. designation and rewarding career)
• Have fun as well -- get involved with Carleton clubs and join in student activities
ACADEMIC INTEGRITY STANDARDS

- See 14.0 of Academic Regulations (in calendar) for details
- **Plagiarism** (presenting another person’s ideas or work as your own) (Internet, journals, books)
- **Unauthorized** cooperation or collaboration
- **Misrepresentation** (admission documents, medical certificates, etc.)
- **Impersonation** (student card, computer account, etc.)
- **Obstruction** and **interference** (tampering with equipment, data etc.)
- **Disruption** of classroom activities
- Improper access to- or dissemination of **confidential information**
- **Assistance** in violation of the standards of academic activity (eg. allowing another student to copy lab report, or assignment)
- Violation of regulations for **tests and examinations** (unauthorized memoranda or communication, copying)
- Will not be tolerated and there are a range of punishments if offence proven
- Engineering is a **profession** with a strong code of ethics.

Topic examined and explained in Faculty address
TODAY’S SESSION

• First year objectives
• The engineering method
• Important dates
• Program structure
• Common questions
FIRST YEAR OBJECTIVES (CAPA)

• **Completion**: Must complete all required first year courses before you can take any second year courses!

• **Attendance**: Students are expected to attend all classes and labs, but it’s your responsibility and liability!

• **Performance**: Aim for the highest achievement in all courses, get help early!

• **Attitude**: Work first, then play, and at all times be Professional Engineers In training
• Throughout all engineering programs, beginning in first year, you will be taught the *engineering method or approach*.

• The engineering method is a disciplined approach to problem solving which consists of:

  1) **Defining** the problem and solution requirements properly;

  2) Making any suitable and justifiable **assumptions** necessary to solve the problem;

  3) Proposing different solutions and **evaluating** their relative merit with regards to meeting requirements, cost, timeline, and safety;

  4) **Solving** the problem while assessing and mitigating against risk of failure and harm to the public.

• The engineering method differentiates engineering students from pure math and science students – you will be conditioned to **become a professional who must take responsibility for your work and its consequences to the public**.
ELECTRICAL AND COMPUTER ENGINEERING

The Hardware-Software Spectrum

More Hardware Oriented

More Software Oriented

Lead Department

Department of Electronics

Department of System and Computer Engineering

The Programs

Engineering Physics

Electrical Engineering

Communications Engineering

Biomedical and Electrical Engineering

Computer Systems Engineering

Software Engineering

New

Sustainable & Renewable Energy Engineering

Program Coordinators

Electrical → R. Gauthier

Eng.-Phys → T. Smy

SREE-A → R. Gauthier

Co-Op → S. Gupta

9/4/2017
• Prerequisite Consequences

- specified prerequisites must be completed before some courses can be taken; failure to complete prerequisite courses has consequences in timely completion of your program.

In engineering, upper-year courses depend upon the knowledge you have acquired and developed from lower-level courses. This concept is applied through a system indicating which prerequisite courses must be successfully completed in order to be eligible for enrollment in your preferred upper-year courses.

https://engineerscanada.ca/accreditation/accreditation-resources?page=/e/files/guideline_admission_with.pdf&from=
Early entry from high-school with > 85% in core math and science (can do work term 1) Late entry with B+ average in study terms 1, 2, and 3 (do work terms 2-6)
ACADEMIC PERFORMANCE EVALUATION

• Occurs after each Winter term (section 7.0 of University Regulations)

• Outcomes are Good Standing, Academic Warning, Continue in Alternate, or Dismiss from Program

• Academic Warning means the cumulative grade point average (CGPA) is low. (need 5.0 to graduate)

• If the warning is not converted to good standing after the next evaluation a Continue in Alternate is assigned

• If CGPA < 1.0 then the decision will be Dismiss from Program

https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/acadregsuniv7/
<table>
<thead>
<tr>
<th>Program credits completed</th>
<th>Honours</th>
<th>Architecture (Design), B.I.D. programs</th>
<th>Engineering programs</th>
<th>15.0 credit General</th>
<th>20.0 credit Major, B.I.T.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 to 5.0</td>
<td>Overall 4.00</td>
<td>Overall 3.00</td>
<td>Overall 4.00</td>
<td>Overall 3.00</td>
<td>Overall 3.00</td>
</tr>
<tr>
<td>5.5 to 10.0</td>
<td>Overall 4.50 Major 5.50</td>
<td>Overall 3.50</td>
<td>Overall 4.50</td>
<td>Overall 3.50 Major 3.50</td>
<td>Overall 3.50 Major 3.50</td>
</tr>
<tr>
<td>10.5 to 15.0</td>
<td>Overall 5.00 Major 6.00</td>
<td>Overall 3.50</td>
<td>Overall 5.00</td>
<td>Overall 4.00 Major 4.00</td>
<td>Overall 3.50 Major 3.50</td>
</tr>
<tr>
<td>15.5 or more</td>
<td>Overall 5.00 Major 6.50</td>
<td>Overall 4.00</td>
<td>Overall 5.00</td>
<td>Overall 4.00 Major 4.00</td>
<td>Overall 4.00 Major 4.00</td>
</tr>
<tr>
<td>Graduation</td>
<td>Overall 5.00 Major 6.50</td>
<td>Overall 4.00</td>
<td>Overall 5.00</td>
<td>Overall 4.00 Major 4.00</td>
<td>Overall 4.00 Major 4.00</td>
</tr>
</tbody>
</table>
### Calculate your GPA

- **STEP 1:** List all of the courses you’ve attempted, the corresponding credit values (0.5 credit or 1.0 credit), and your final grades.
- **STEP 2:** Record the grade points earned for each course and add them up. **Remember** 0.5 credit courses are worth half of the point value (i.e. B+ are 9.00 points for a 1.0 credit, but 4.50 points for 0.5 credit course).
- **STEP 3:** Add up the number of credits that you’ve taken.
- **STEP 4:** Divide the total number of grade points by the total number of credits.

### Table: How to Calculate Your GPA

<table>
<thead>
<tr>
<th>Course</th>
<th>Final Grade</th>
<th>Credit Value</th>
<th>Corresponding grade point</th>
</tr>
</thead>
<tbody>
<tr>
<td>INAF 5200</td>
<td>B+</td>
<td>0.5</td>
<td>4.5</td>
</tr>
<tr>
<td>INAF 5320</td>
<td>B-</td>
<td>0.5</td>
<td>3.5</td>
</tr>
<tr>
<td>INAF 5110</td>
<td>A-</td>
<td>0.5</td>
<td>5.0</td>
</tr>
<tr>
<td>INAF 5450</td>
<td>B</td>
<td>0.5</td>
<td>4.0</td>
</tr>
<tr>
<td>INAF 5560</td>
<td>B+</td>
<td>1.0</td>
<td>9</td>
</tr>
</tbody>
</table>

**Total credits: 3.0**

**Total grade pts: 26.0**

**Overall CGPA**: 26.0/3.0 = 8.7
POTENTIAL REWARDS

• Graduating students in any undergraduate degree will have exceptional academic achievement recognized if the student:
  1. Has completed at least 10.0 credits toward the degree at Carleton University, and
  2. For the designation High Distinction, has an Overall CGPA equal to or greater than 10.40.
  3. For the designation Distinction, has an Overall CGPA less than 10.40 and equal to or greater than 9.80.

• These recognitions of exceptional merit will be recorded on the student's transcript and diploma.
  • Co-op placements

• To be admitted and remain in COOP the students CGPA must be 8.0 or higher

• **Need at least B+ (9.0) for graduate studies (highly competitive)**
THREE FAILURES RULE

• In Engineering, a student who fails the same course three times must leave the degree with status Continue in Alternate or Dismissed from Program (see 7.1.2 of University Regulations)

• May still apply to other programs in Carleton University

https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/acadregsuniv7/
DISCREDITS

• Discredits can be acquired in a number of ways
  • a course registration that results in a grade of F.
  • See regulation 6.3 in the undergraduate calendar

• Students are permitted 5.0 credits of discredits. Upon reaching 5.5 discredits, students are removed from their program and a “CA” Continue in Alternate decision will be applied to their records.

https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/acadregsuniv2/

https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/acadregsuniv6/#6.3
YOUR PROGRAM

• **Engineering is a 4-year program** – You can tailor it somewhat to your interests through choice of electives and possible minor area (math / business are popular)

• **You manage your own time.** You often have hours between classes; class times vary throughout the day and evening and you spend only 15 to 20 hours each week in class and labs...don’t let that fool you– the work load out of class is heavy.

• **You must balance your responsibilities and set priorities.**

• **You must act ethically** – you are engineers-in-training – a profession with ethical and moral obligations to serve the public. Plagiarism and cheating are dealt with severely.

• **You make your own schedule in the future semesters**

• **Graduation requirements are complex.** You are expected to know those that apply to you. Read the calendar regulations and see your advisor for answers to questions
### IMPORTANT DATES

<table>
<thead>
<tr>
<th>Event</th>
<th>Fall Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes begin</td>
<td>September 6</td>
</tr>
<tr>
<td>Last day to register</td>
<td>September 19</td>
</tr>
<tr>
<td><strong>Last day to withdraw (full fee adjustment)</strong></td>
<td>September 30</td>
</tr>
<tr>
<td><strong>Fall Break</strong></td>
<td>October 23 - 27</td>
</tr>
<tr>
<td>Last day to submit PMC request</td>
<td>November 10</td>
</tr>
<tr>
<td>Classes end / last day to withdraw</td>
<td>December 8*</td>
</tr>
<tr>
<td><strong>Final Examinations</strong></td>
<td>December 10 - 22</td>
</tr>
<tr>
<td>University closed</td>
<td>December 25 – January 1/18</td>
</tr>
<tr>
<td><strong>January 19 – 21 / 26 - 28</strong></td>
<td>Deferred Examinations</td>
</tr>
</tbody>
</table>

PMC: Paul Menton Centre  
https://carleton.ca/PMC/  
https://carleton.ca/registrar/registration/dates-and-deadlines/

* Classes follow Monday schedule
<table>
<thead>
<tr>
<th>Event</th>
<th>Fall Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes begin</td>
<td>January 8</td>
</tr>
<tr>
<td>Last day to register</td>
<td>January 19</td>
</tr>
<tr>
<td><strong>Last day to withdraw (full fee adjustment)</strong></td>
<td>January 31</td>
</tr>
<tr>
<td><strong>Winter Break</strong></td>
<td>February 19 - 23</td>
</tr>
<tr>
<td>Last day to submit PMC request</td>
<td>March 9</td>
</tr>
<tr>
<td>Classes end / last day to withdraw</td>
<td>April 8*</td>
</tr>
<tr>
<td><strong>Final Examinations</strong></td>
<td>April 14 - 26</td>
</tr>
<tr>
<td><strong>Deferred Examinations</strong></td>
<td>May 18 – 29</td>
</tr>
</tbody>
</table>

★ PMC: Paul Menton Centre
https://carleton.ca/PMC/

* Classes follow Friday schedule

https://carleton.ca/registrar/registration/dates-and-deadlines/
COMMON QUESTIONS

• **Program Transfer** - normally requires GPA of 8.0 (B) or better to transfer from one program to another + space in program

• **Complementary Studies** - ONLY those courses listed as Approved on the Eng. Academic Support Website for the year in which you take the course.

  https://carleton.ca/engineering-design/current-students/undergrad-academic-support/cse/

• **Basic Science Elective** - ONLY those courses listed as Approved on the Eng. Academic Support Website for the year in which you take the course.

  https://carleton.ca/engineering-design/current-students/undergrad-academic-support/basic-science-elective/
• **Year Standing** - based on number of credits completed counting towards degree

<table>
<thead>
<tr>
<th>Year</th>
<th>Credits Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>First year</td>
<td>Less than 4.0 credits</td>
</tr>
<tr>
<td>Second year</td>
<td>4.0 to 8.5 credits</td>
</tr>
<tr>
<td>Third year</td>
<td>9.0 to 13.5 credits</td>
</tr>
<tr>
<td>Fourth year</td>
<td>14 or more credits</td>
</tr>
</tbody>
</table>

One term course = 0.5 credits

https://carleton.ca/academicadvising/your-academic-audit/year-standing/
COMMON QUESTIONS

- **Year Status** - status is based on number of specific courses that must be completed in each year of program

<table>
<thead>
<tr>
<th>First year</th>
<th>Admission to program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second year</td>
<td>completion of all Engineering science and math courses in first year + all ESL requirements, if an</td>
</tr>
<tr>
<td>Third year</td>
<td>completion of 4.0 credits from second year</td>
</tr>
<tr>
<td>Fourth year</td>
<td>completion of ALL second year + 3.5 credits from third year</td>
</tr>
</tbody>
</table>

https://carleton.ca/engineering-design/current-students/undergrad-academic-support/status-vs-standing/
INTERNET RESOURCES

• University:  www.carleton.ca
• Undergraduate Calendar:  https://calendar.carleton.ca/undergrad/
• Electronics (DOE):  www.doe.carleton.ca
• Systems and Computer Engineering (SCE):  www.sce.carleton.ca
• Engineering Academic Support:  https://carleton.ca/engineering-design/current-students/undergrad-academic-support/

• When contacting faculty and staff by e-mail ALWAYS use your CMAIL account and state your Carleton student number.
SEEKING ADVICE

- Associate Chair (Undergraduate)
- Electrical Engineering (Prof. R. Gauthier)
- Engineering Physics (Prof. Tom Smy)
- SREE Stream A (Prof. R. Gauthier)

https://www.doe.carleton.ca/ugtickets/
SUPPORT FOR FIRST YEAR ENG. STUDENTS

• Elsie MacGill Learning Centre
  • Need help with first-year courses, language skills or general transition issues? Upper-year engineering students and staff from Linguistics and Language Studies are here to answer your questions.

• The Elsie MacGill Learning Centre is a free service provided for all current 1st year Bachelor of Engineering students. The Scholars will assist you with transition to University issues, questions related to any of your core engineering, mathematics and science courses as well as CCDP 2100, and English Language written communication skills matters. This support service complements the normal course support, including PASS for certain courses, available to you.

• Location: 5030 Minto Centre

https://carleton.ca/engineering-design/2016/support-advice-first-year-engineering-students/
HOW TO BECOME A P. ENG.?

• be at least 18 years old
• be of good character
• meet PEO's stipulated academic requirements for licensure (hold an undergraduate engineering degree from a Canadian Engineering Accreditation board (CEAB)-accredited program, or possess equivalent qualifications), and, if required, successfully complete any technical exams.
• fulfill the engineering work experience requirements (demonstrate at least 48 months of verifiable, acceptable engineering experience, at least 12 months of which must be acquired in a Canadian jurisdiction under a licensed professional engineer); and
• successfully complete PEO’s Professional Practice Examination (PPE)
FINALLY …..

• Work hard and enjoy your studies!
• In your future engineering career, continue to study – we teach fundamentals
• Engineering is an exciting and rapidly evolving field. Grasp onto new concepts and ideas – use your engineering analysis skills to bring new designs to reality.
• Be prepared for a lifetime of learning!
Electrical Engineering

Design

Fabricate

Test
Carleton Engineering 1970

IBM1620 mainframe (1MHz clock)

Card punch data input

FORTRAN statement on punched card
Carleton Engineering 1970

Slide rule
(mechanical analog computer)
Multiply and divide only

Wang calculator (4 available)
(Modern) Electrical Engineering

- 1958 - First working integrated circuit (Jack Kilby)
- 1967 - First handheld calculator invented by Texas Instruments (Jack Kilby)
- 1970 - First CD-ROM patented (James Russel)
- 1972 - First home video game system (Magnavox Odyssey)
- 1973 – First modern cell phone (Motorola)
- 1994 – First GPS system working (US DoD)
- ...

All invented and developed by electrical engineers

Your contribution as EE?
Information Technology Device
Sustainable & Renewable Energy Engineering (SREE)

Stream A: Smart Technologies for Power Generation and Distribution.
• 500AD – first windmills for grinding grain, pumping water
• 1816 - Stirling engine uses biomass as fuel
• 1839 - fuel cell invented
• 1852 – Kelvin invented heat pump
• 1882 – first Edison hydroelectric power plant (60 customers in Manhattan)
• 1883 – first solar cell (selenium/gold)
• 1888 – first windmill to generate electricity
• 1911 – first commercial geothermal power plant
• 1946 – modern semiconductor solar cell invented
• 1957 – first commercial nuclear power station
• Recent – energy harvester IC chips
• ……

Your contribution to develop SREE?
Future Intelligent Energy System

H. Larsen, “The intelligent energy infrastructure system of the future”, Riso DTU
Engineering Physics

In Eng. Phys., we like to “look under the hood”.

Packaged chip

Microphotograph of the chip die.
Engineering Physics

- 1862 – Maxwell’s equations
- 1888 – first radio waves – Hertz
- 1900 – first radio broadcast – Marconi (1901- intercontinental)
- 1904 – thermionic valve or diode invented
- 1905 – theory of relativity, quantum mechanics - Einstein
- 1907 – vacuum tube triode patented
- 1911 – supeconductivity discovered
- 1947 – first semiconductor junction transistor (Bell Labs)
- 1955 – SiO2 as diffusion mask in semiconductor device fabrication
- 1960 – first laser (Maiman - ruby crystal)
- 1962 – first semiconductor laser diode
- 1968 – molecular beam epitaxy invented = very small transistors
- 1971 – first computer on chip (INTEL)
- 2008 – memristor invented
- 2013 – polariton laser demonstrated
Future Technology (Eng. Phy.)

- Development of new technology for biomedical, communications, energy systems, etc.
  - Nanotechnology
  - Negative index materials
  - Micro-Electro-Mechanical Systems (MEMS)
  - Novel bio sensors
  - Photonic devices
  - Quantum computers
  - Flexible displays
  - ????
<table>
<thead>
<tr>
<th>Time</th>
<th>Engineering Programs (see below)</th>
<th>Design Schools</th>
</tr>
</thead>
</table>
| 8:30am - 9:15am | **T-Shirt Distribution**  
Green Space between Minto Building and Residences (rain location: Minto Lobby) | |
| 9:15am - 10:15am| **Faculty Welcome**  
Raven's Nest  
- Aerospace  
- Mechanical  
- Biomedical and Mechanical  
- Sustainable and Renewable Energy: Stream B  
- Computer Systems  
- Communications  
- Biomedical and Electrical  
- Software  
  
**Department Welcome**  
Bell Theatre (Minto CASE 2000):  
- Civil  
- Environmental  
- Architectural Conservation and Sustainability Engineering  
Minto CASE 5000:  
- Electrical  
- Engineering Physics  
- Sustainable and Renewable Energy: Stream A | |
| 10:15am - 10:30am| **Faculty Welcome**  
Architecture Building 204:  
Architecture  
Mackenzie Building 3275:  
Industrial Design  
Mackenzie Building 3380:  
Information Technology | |
| 10:30am - 11:30am| **Department Welcome**  
Bell Theatre (Minto CASE 2000):  
- Aerospace  
- Mechanical  
- Biomedical and Mechanical  
- Sustainable and Renewable Energy: Stream B  
Minto CASE 5000:  
- Computer Systems  
- Communications  
- Biomedical and Electrical  
Mackenzie Building 4499:  
- Software  
  
**Faculty Welcome**  
Raven's Nest  
- Civil  
- Environmental  
- Architectural Conservation and Sustainability Engineering  
- Electrical  
- Engineering Physics  
- Sustainable and Renewable Energy: Stream A | |
| 11:30am - 11:45am| **Travel Time** | |
| 11:45am - 12:15pm| **Lunch**  
Green Space between Minto Building and Residences (rain location: 3rd floor Residence Commons) | |
| 12:45pm - 4:00pm| **Expo Carleton** | |