EC1010: Electrical and Magnetic Circuits

Introduction

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EC1010: Moodle page
www.ee.iitm.ac.in/courses/ec1010_2014/start
What are E & M Circuits?

- **Electrical Circuits:**
  - Interconnection of Electrical Components
  - All electronic and electrical gadgetry

- **Magnetic Circuits:**
  - Interconnection of Magnetic Components
  - Generators, Motors, Transformers

- Absolutely everywhere around us!
Mobiles, Laptops, Music players, ...


Mobiles, Laptops, Music players, ...
Transformers, Generators, ...
What is EC1010 all about?

- Analysis techniques applicable to all circuits
- Not about any particular circuit
- One of the two most important EE courses (the other being Networks and Systems)
- Pre-requisite for:
  - Networks and Systems
  - Electrical Machines
  - Analog Circuits
  - Placements in core EE companies!
Course topics

- Electrical quantities and elements
- Electrical circuit analysis; Theorems
- One and two port networks; Transformations
- Negative feedback and ideal opamp
- RL, RC, RLC circuits
  - Solving differential equations
  - Forced and natural response
  - Sinusoidal steady state; Phasors
- Polyphase circuits
- Magnetic circuits
Course goals

• Learn circuit analysis and learn it well!
  • **Practice, practice, and practice** problem solving
  • Understand **every step** of problem solving
• Learn about linearity and its implications
• Learn rudiments of nonlinear circuit analysis
Logistics

• **Time table:**
  - A slot (Mo 8am, Tu 1pm, Th 11am, Fr 8am)
  - Classroom: CRC101

• **Evaluation**
  - 4 quizzes (total of 50-60%; Feb. 3, Feb. 24, Apr. 7, Apr 25)
  - End sem (40%)
  - Problem sets (up to 10%)
Logistics-those with F slot clash

- **Time table:**
  - A slot (Mo 8am, Tu 1pm, Th 11am), **F slot** (Fr 10am)
  - Classroom: TBA
Tutorials

- ~ 10 tutorials over the semester
- Problem sets will be posted in advance
- Must solve problems before the tutorial session and bring the solution to class
- Use tutorial sessions for clarifications and understanding difficult concepts
Classroom etiquette and expectations

- Mobile phones off
- 85% attendance
- Don’t enter the class if more than 5 minutes late
- TAs take attendance in the first 5 minutes
- Don't sit in the back rows
- **Must solve problems** given in class
  - Bring your pen, notebook, calculator and **use them**
- **Participate** in classroom Q&A
Classroom participation

- Get your doubts cleared
- Improve your understanding
- Develop (technical) communication skills
  - Poor communication skills—a constant complaint from prospective employers
“Learning” or “Knowing” something

- What does it mean?
“Learning” or “Knowing” something

• Make quantitative predictions about similar or slightly different situations
• Practice solving a variety of problems...
• ...while understanding every step
• Will not happen without your active participation both inside and outside the classroom
Some inspiration

Announcement

- No class on Monday, Jan 20\textsuperscript{th}
- Extra (tutorial) class on Saturday, Jan 25\textsuperscript{th}
  - 9-950am
  - Venue: TBA
Resources

• Class homepage
  • EC1010 page on moodle-Use the forum!
  • http://www.ee.iitm.ac.in/vlsi/courses/ec1010_2012/start

• Lectures recorded in the classroom:
  • http://www.ee.iitm.ac.in/~nagendra/videolectures/

• Textbook

• Extras: NPTEL(http://nptel.iitm.ac.in)
  • SC Dutta Roy, *Circuit Theory*,
http://nptel.iitm.ac.in/video.php?subjectId=108102042
Resources: TAs

- Visiting hours: TBA, venue: EE Dept. library
- Use moodle forum to reach the TAs
Welcome to the video lectures page of the VLSI group of the department of Electrical Engineering at IIT Madras. You can find recorded lectures from our courses at the links below.

**NPTEL courses**

- Analog IC Design: Nagendra Krishnapura
- VLSI Data Conversion Circuits: Shanthi Pavan

**Online course: Jan-May 2013**

Basic Electrical Circuits was offered by Nagendra Krishnapura as an online course on the internet in the Jan.-May 2013 semester. To view the lectures, visit this link.

**Courses**

- EC1010: Electrical and Magnetic Circuits
  - Jan.-May 2014: Nagendra Krishnapura
  - Jan.-May 2013: Nagendra Krishnapura
  - Jan.-May 2012: Nagendra Krishnapura, Shanthi Pavan
- EC3102: Analog Circuits/EC5135: Analog Electronic Circuits
  - Aug.-Nov. 2012:
    - Aniruddhan S
    - Nagendra Krishnapura
  - Aug.-Nov. 2011: Nagendra Krishnapura

- [http://www.ee.iitm.ac.in/~nagendra/videolectures/](http://www.ee.iitm.ac.in/~nagendra/videolectures/)
Course page on VLSI group site

- http://www.ee.iitm.ac.in/vlsi/teaching/start
- http://10.7.51.101/vlsi/teaching/start
Course page on Moodle

- https://courses.iitm.ac.in/
My homepage

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About me

I am an associate professor in the VLSI group of the department of Electrical Engineering of the Indian Institute of Technology, Madras. I work in the area of analog and mixed-signal integrated circuits and signal processing.

I graduated with a Ph.D. from Columbia University, New York in Oct. 2000. I worked at the Columbia Integrated Systems Laboratory under the guidance of Prof. Yannis Tsividis in the area of nonlinear analog signal processing for low power integrated circuits. I obtained my B. Tech. degree in electronics and communications engineering from the Indian Institute of Technology, Madras, in 1996. Between 2000 and 2002, I was a senior design engineer at Celight, Inc. and Multilink (later Vitesse Semiconductor) where

- [http://www.ee.iitm.ac.in/~nagendra/](http://www.ee.iitm.ac.in/~nagendra/)