EC1010: Electrical and Magnetic Circuits

Introduction

Nagendra Krishnapura
Dept. of EE, IIT Madras

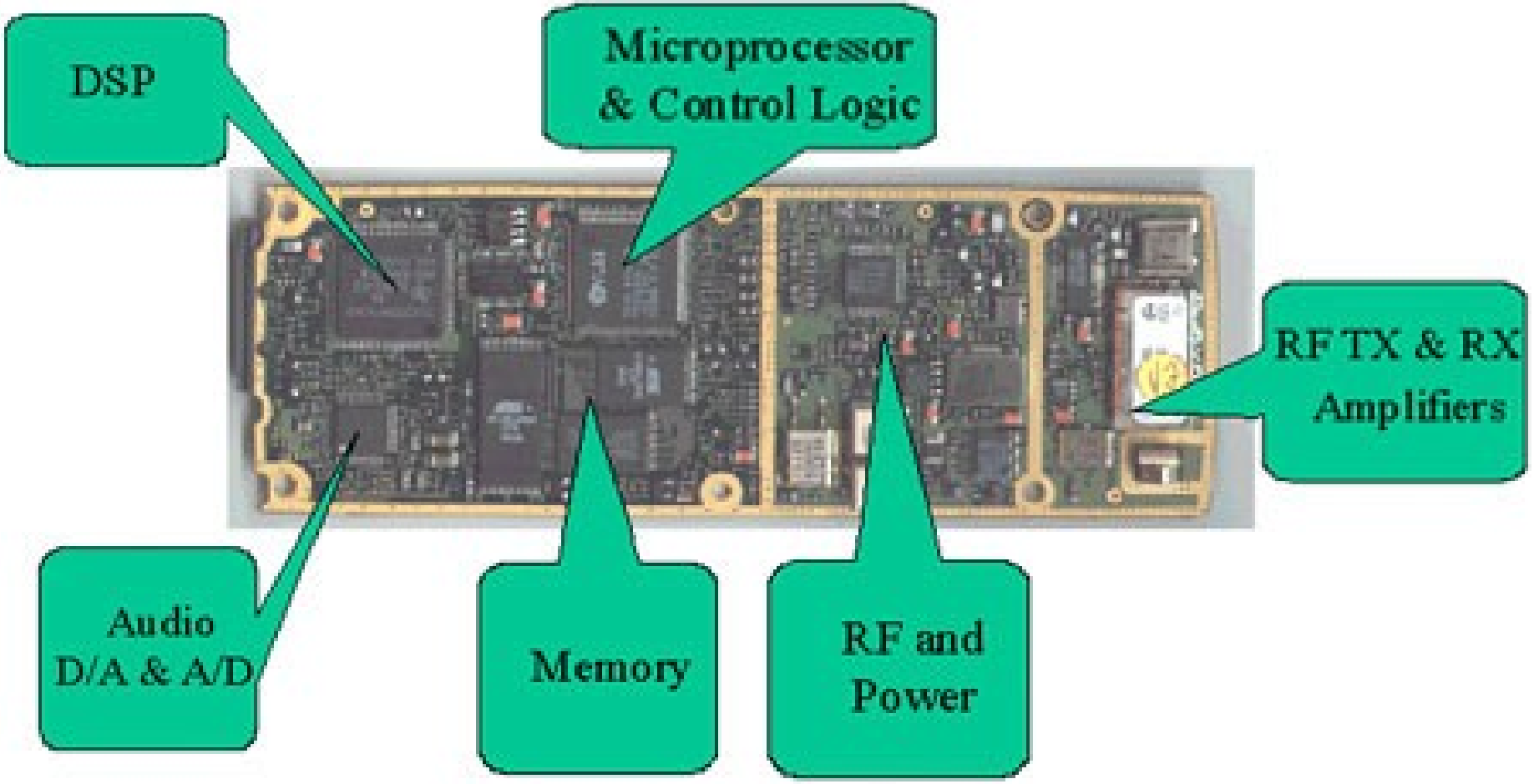
16th January 2014

nagendra@iitm.ac.in
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, ...



[http://static.ddmcdn.com/gif/cell-phone-inside.jpg]

Mobiles, Laptops, Music players, ...

[http://smartech.blogetery.com/files/2008/04/asus-eee-pc-900-inside.jpg]

Transformers, Generators, ...

[http://i01.i.aliimg.com/photo/v0/110482299/Power_Transformer.jpg]
[http://media.digikey.com/Renders/Johanson%20Tech%20Renders/2.45GHz%20Balun6.jpg]

What is EC1010 all about?

- Anaysis 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

- http://teachingexcellence.mit.edu/inspiring-teachers/amar-bose-6-312-lecture-01-introduction
- http://teachingexcellence.mit.edu/inspiring-teachers/amar-bose-6-312-lecture-27-personal-reflections

Announcement

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

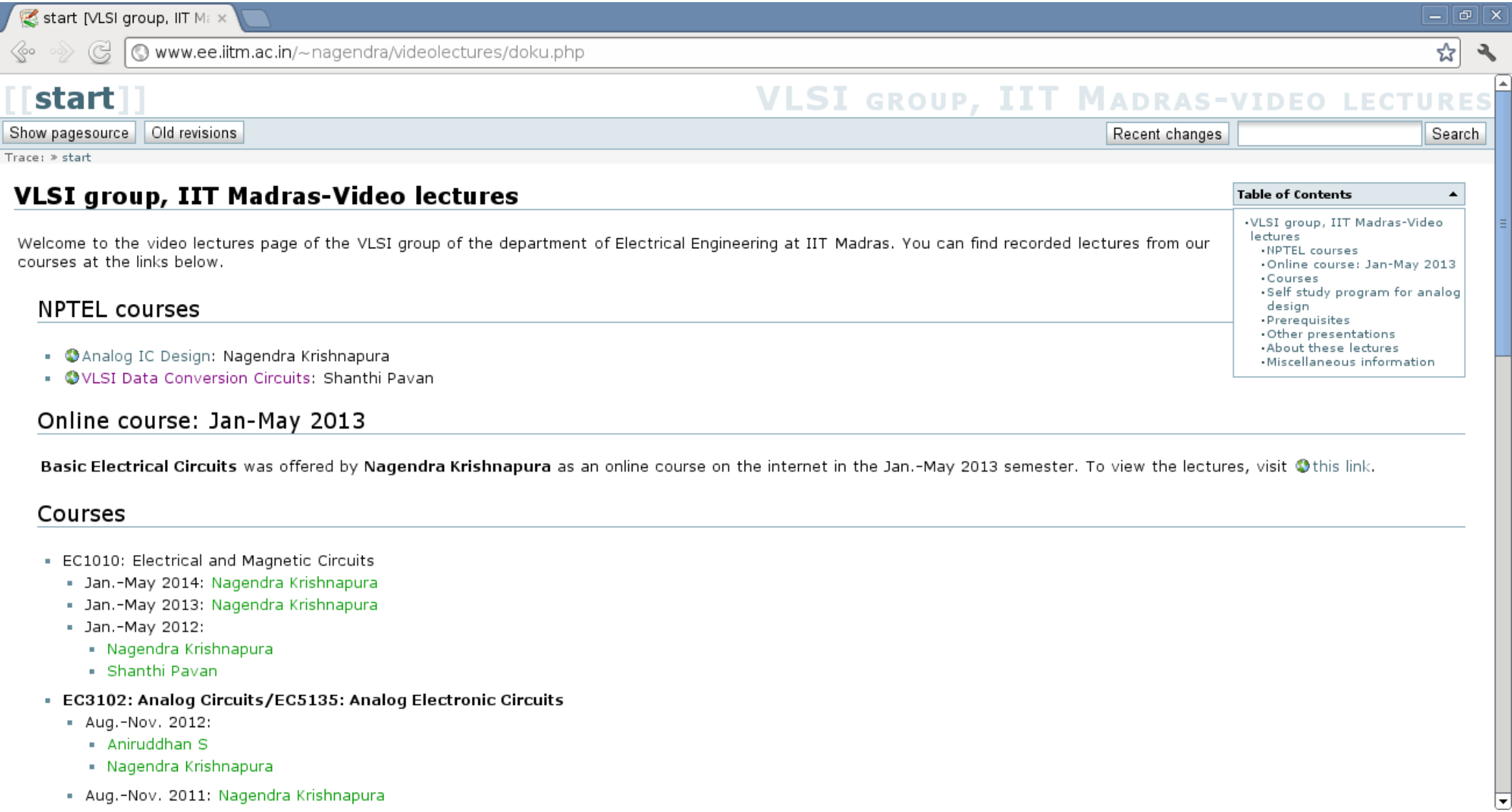
Resources

- 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
  - Hayt, Kemmerly, and Durbin, *Engineering Circuit Analysis*, 7th Edition, McGraw Hill 2006.
- Extras: NPTEL(http://nptel.iitm.ac.in)
  - SC Dutta Roy, *Circuit Theory*, http://nptel.iitm.ac.in/video.php?subjectId=108102042

Resources: TAs

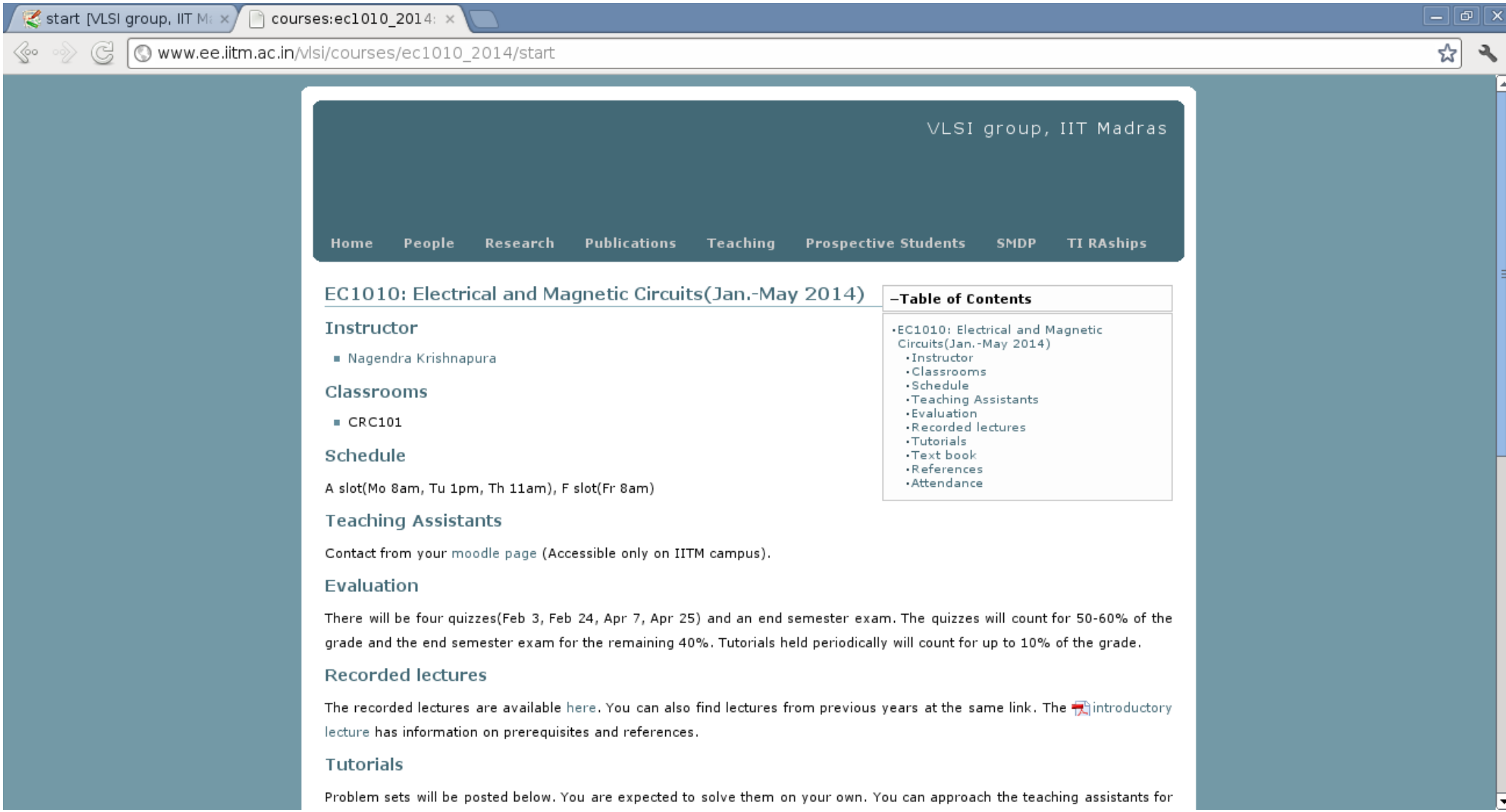
- Visiting hours: TBA, venue: EE Dept. library
- Use moodle forum to reach the TAs

Videolectures page



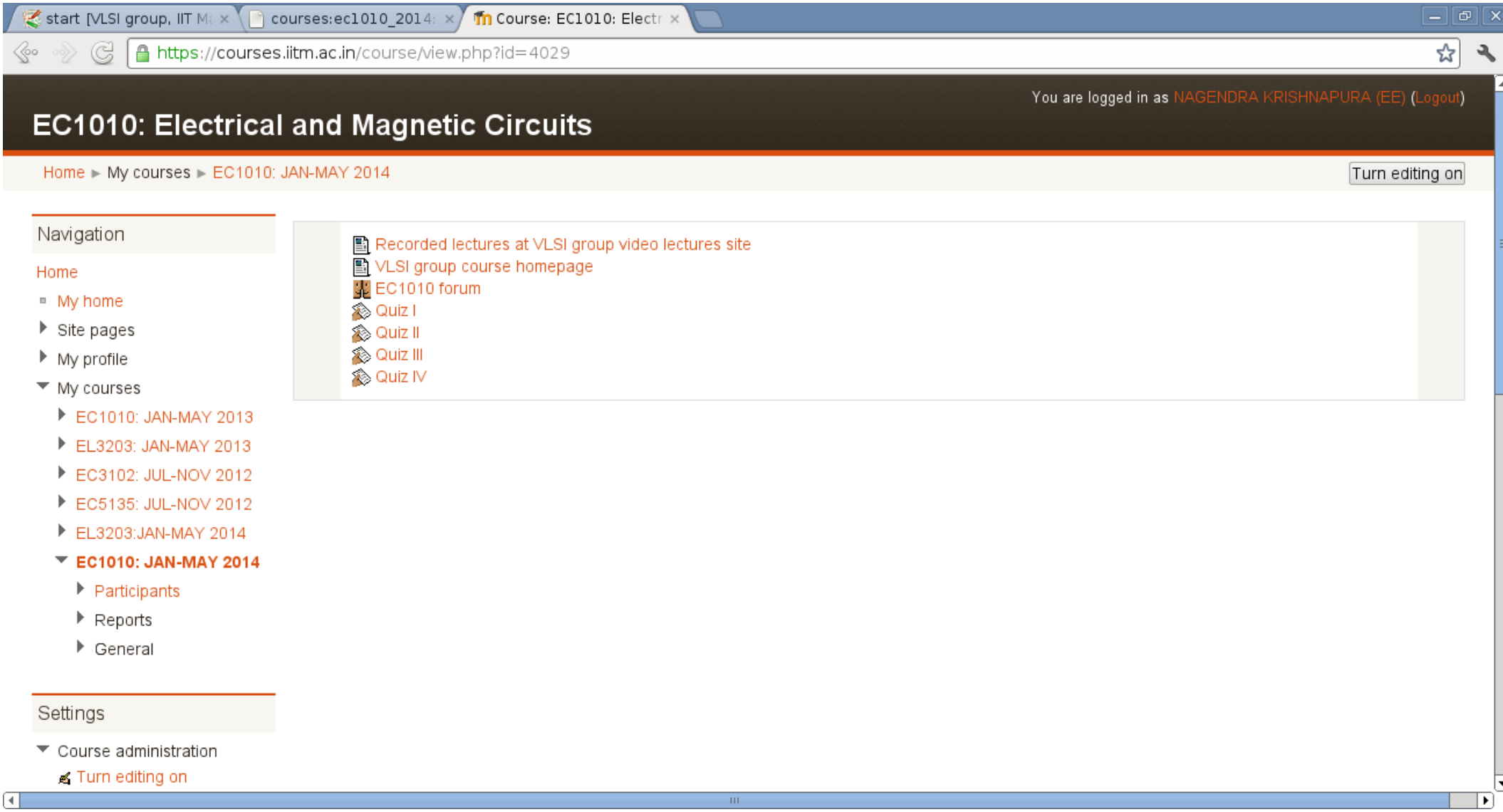
- http://www.ee.iitm.ac.in/~nagendra/videolectures/
- http://10.21.2.66/~nagendra/videolectures/

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

- http://www.ee.iitm.ac.in/~nagendra/