ELEC870

High Performance IC Design

S2 Day 2019

School of Engineering

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General Information

Unit convenor and teaching staff
Convenor
Sudipta Chakraborty
sudipta.chakraborty@mq.edu.au
Level 1, 50 WTR
Tuesday, 11am-12noon, Lecture room (12 Second Wy 407 Tutorial Rm)

Co-convenor
Debabrata Karmokar
debabrata.karmokar@mq.edu.au
Level 1, 50 WTR
Tuesday, 11am-12noon, Lecture room (12 Second Wy 407 Tutorial Rm)

Credit points
4

Prerequisites
Admission to MEng and 12cp at 600 level or above

Corequisites

Co-badged status

Unit description
From modern telecommunications to tablet computing and from mobile handsets to the cloud, the limits of integrated circuit technology are being pushed to the limits of what is possible in terms of speed, size, and power. Beyond the IC itself, packaging concerns, both electrical and thermal, provide additional constraints in the design of the modern high performance integrated circuit. This unit will be taught from the research of both resident and visiting staff as well as from the latest research around the world.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Develop an understanding of different semiconductor technologies

Ability to perform integrated circuit (IC) design in multiple semiconductor technologies

Develop proficiency in using standard electronic design automation (EDA) tools for IC design with multiple technologies

Develop proficiency in circuit simulator to understand technology trade-offs

Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

General Assessment Information

Student Responsibilities

Students are advised to check their iLearn for lecture materials/notes, assignment and report submission deadlines, marking rubrics, laboratory worksheets, assignment questions, tutorial materials, important announcements etc.

Students must familiarize themselves and adhere to the **University policy and procedures**.

Late submissions and Resubmissions: Students must submit their reports and assignments electronically through iLearn. Late submissions (of reports and assignments) will incur a 20% reduction in marks per day. Extenuating circumstances will be considered upon lodgment of a formal notice of disruption of studies. Resubmissions of work will not be allowed after the submission deadline.

Practical Session: Practical sessions will be run in week 1.

Consultation hours: Tuesday 11 am - 12 noon, Lecture Room (12 Second Wy 407 Tutorial Rm). Contact the convenor by email and arrange for consultation beforehand.

Quizzes: The dates and duration of the quizzes will be announced on iLearn, two weeks in advance.

Final Exam: All students must sit for the final exam. Final exam due date will be announced later. The duration of the final exam will be 2 hours.

Grading and Passing requirement for unit: In order to pass this unit, students must achieve **an overall passing grade of 50%**. For further details about grading, please refer below in the policies and procedures section.

Assessment Tasks

Name	Weighting	Hurdle	Due
Presentation and Assignment	10%	No	Week 3
Report on Design Work	20%	No	Week 7 and 12
Assignment	10%	No	Week 10

Name	Weighting	Hurdle	Due
Quizzes	15%	No	During lecture
Final examination	30%	No	To be confirmed
Lab participation	15%	No	Throughout the semester

Presentation and Assignment

Due: **Week 3**
Weighting: **10%**

Presentation in the lab and submit a report by Friday 11 pm of Week 3.

On successful completion you will be able to:

- Develop an understanding of different semiconductor technologies
- Develop proficiency in using standard electronic design automation (EDA) tools for IC design with multiple technologies
- Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

Report on Design Work

Due: **Week 7 and 12**
Weighting: **20%**

Two reports, each worth 10%. Report submission deadlines are Friday 11 pm of Week 7 and 12.

On successful completion you will be able to:

- Ability to perform integrated circuit (IC) design in multiple semiconductor technologies
- Develop proficiency in using standard electronic design automation (EDA) tools for IC design with multiple technologies
- Develop proficiency in circuit simulator to understand technology trade-offs
- Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

Assignment

Due: **Week 10**
Weighting: **10%**

Submit a report by Friday 11 pm of Week 10.

On successful completion you will be able to:

- Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

Quizzes

Due: **During lecture**
Weighting: **15%**

Three quizzes in total, each 5%, to be conducted during the lecture.

On successful completion you will be able to:

- Develop an understanding of different semiconductor technologies
- Ability to perform integrated circuit (IC) design in multiple semiconductor technologies
- Develop proficiency in using standard electronic design automation (EDA) tools for IC design with multiple technologies
- Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

Final examination

Due: **To be confirmed**
Weighting: **30%**

Must attend the final exam.

On successful completion you will be able to:

- Develop an understanding of different semiconductor technologies
- Ability to perform integrated circuit (IC) design in multiple semiconductor technologies
- Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

Lab participation

Due: **Throughout the semester**
Weighting: **15%**

Graded based on Lab performance throughout the semester.

On successful completion you will be able to:

- Develop an understanding of different semiconductor technologies
- Ability to perform integrated circuit (IC) design in multiple semiconductor technologies
- Develop proficiency in using standard electronic design automation (EDA) tools for IC

design with multiple technologies
- Develop proficiency in circuit simulator to understand technology trade-offs
- Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

Delivery and Resources

Various sources will be used as content of the course. These include books, research papers, and application notes.

Reference books:

- I. D. Robertson and S. Lucyszyn (Eds), "RFIC and MMIC Design and Technology," The Institution of Engineering and Technology (IET), 2011.
- Michael Steer, “Microwave and RF Design - A Systems Approach,” Scitech Publishing.
- David M Pozar, "Microwave Engineering," Wiley.

Other useful readings:

- Sedra & Smith, “Microelectronic Circuits,” Cambridge University Press.
- iLearn links: Technical Papers, Application Notes.
- IEEE Xplore: A wide range of technical papers are available.

Software:

- AWR will be used in the practical lab sessions.

Other required resources:

- Scientific calculators, log books.

Unit Schedule

Refer to iLearn and lecture notes for the unit schedule.

Learning and Teaching Activities

Report writing

Report writing is an important professional activity of engineers and researchers. Students will submit reports on their design work. A guideline for the report writing will be discussed in the lecture and the lab. Submissions are expected to be typed in a logical layout and sequence. All reports must be submitted electronically through iLearn. Marking rubric for report will be posted on iLearn.

Tutorials

In the tutorials, students will get the opportunity to develop their problem solving capabilities through various exercises. They will also be able to ask for advice from the lecturer or tutor.

Assignments

Problem solving capabilities and critical thinking of the students will be tested through assignments. Deadline of the assignments will be available on iLearn. The assignments must be submitted in pdf format through iLearn. The reports and assignments will undergo automatic plagiarism check and must adhere to the Macquarie University academic integrity policy. Details of the academic penalties for academic dishonesty can be found in the “Policies and Procedures” section of the Unit Guide.

Presentation

Through presentations, students will be able to enhance their effective communication skills to the stakeholders. Students will demonstrate their ability to explain their design work, research on the relevant designs in different semiconductor technologies. Presentations are expected to meet professional standard.

Quiz

Knowledge and skills of the subject will be tested through quiz. Analytical, critical and integrative thinking will be enhanced through quizzes. Quizzes will be conducted during lecture time in the lecture room. The dates and duration of quizzes will be announced on iLearn two weeks in advance.

Lab work

Students are advised to attend each lab session. They will be able to explore different circuits to accomplish their design work individually. Students are expected to take initiatives to try different designs in the lab. Students must maintain a logbook to keep a record of their lab work. If someone is unable to attend a session, please let us know in advance, provide a valid reason with poof. An average mark may be allocated to the student for valid cases.

Final exam

All the students must attend the final exam. Knowledge acquired by the students throughout the semester will be judged in the final examination. Date of the final exam will be announced later.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy

- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide

appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- Develop an understanding of different semiconductor technologies
- Ability to perform integrated circuit (IC) design in multiple semiconductor technologies
- Develop proficiency in using standard electronic design automation (EDA) tools for IC design with multiple technologies
- Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

Assessment task

- Lab participation

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Develop an understanding of different semiconductor technologies

- Ability to perform integrated circuit (IC) design in multiple semiconductor technologies
- Develop proficiency in using standard electronic design automation (EDA) tools for IC design with multiple technologies
- Develop proficiency in circuit simulator to understand technology trade-offs

Assessment tasks

- Assignment
- Quizzes
- Final examination

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Ability to perform integrated circuit (IC) design in multiple semiconductor technologies
- Develop proficiency in circuit simulator to understand technology trade-offs

Assessment tasks

- Presentation and Assignment
- Assignment
- Quizzes
- Final examination
- Lab participation

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- Develop an understanding of different semiconductor technologies
- Ability to perform integrated circuit (IC) design in multiple semiconductor technologies

- Develop proficiency in using standard electronic design automation (EDA) tools for IC design with multiple technologies

Assessment tasks

- Presentation and Assignment
- Report on Design Work
- Final examination
- Lab participation

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcome

- Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

Assessment tasks

- Presentation and Assignment
- Report on Design Work

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcomes

- Ability to perform integrated circuit (IC) design in multiple semiconductor technologies
- Develop proficiency in circuit simulator to understand technology trade-offs
- Demonstrate self-learning, time-management, technical report writing, project management (individually and as a group)

Assessment tasks

- Presentation and Assignment

- Report on Design Work
- Assignment
- Lab participation

Changes from Previous Offering

- AWR will be used as the electronic design automation (EDA) tool in the lab.
- Assessment tasks have been revised.