

7513ENG

Integrated Circuit Design

Semester 2 2009

Academic Organisation:	Griffith School of Engineering
Faculty:	Science, Environment, Engineering and Technology
Credit point value:	10
Student Contribution Band:	Band 2
Course level:	Postgraduate
Campus/Location/Learning Mode:	Nathan / On Campus / In Person
Convenor/s:	Prof Sima Dimitrijevic (Nathan)
Enrolment Restrictions:	Restricted: Approval from Head of School
This document was last updated:	16 June 2009

BRIEF COURSE DESCRIPTION

This course provides an introduction to CMOS Integrated Circuit Design. Students will be exposed to topics in CMOS logic design, and both digital and analog circuit design.

Prerequisites: Knowledge of fundamentals of logic design, and transistor level circuit analysis and design.

Incompatibles: 7001MEE VLSI Logic Design, 7002MEE VLSI Design Techniques and 7005MEE CAD and VLSI Design, 7501ENG VLSI Logic Design and 7502ENG VLSI Design Techniques.

SECTION A – TEACHING, LEARNING AND ASSESSMENT

COURSE AIMS

7531 MEE provides an introduction to CMOS Integrated Circuit design. Students will be exposed to topics in mixed-signal circuit design. It is intended that this course will provide a useful insight both for students contemplating postgraduate study/careers in the field of VLSI design; and also for those who wish to increase their understanding of the internals of components used in board and system designs.

This course is a final year elective for students taking the Computer Engineering and Communications Engineering Majors offered in the Bachelor's program. It takes concepts introduced in the earlier electronics courses, and develops them to an advanced level. It will be also be of interest to students who are planning to pursue a Research Higher Degree in this field.

LEARNING OUTCOMES

Upon successfully completing this course, students will:

1. Be able to design, simulate and test CMOS logic circuits using various simulation softwares such as Electric CAD, Magic VLSI, Spice and verilog modelling.
2. Understand various design issues and concepts in digital and analog systems designs.
3. Develop problem solving skills and debugging skills on VLSI circuit physical and behavioural problems.
4. Be able to undertake design and laboratory work, individually and in a team, and to successfully present their electronic designs in written form.

In addition to the specific course objectives, overall program objectives of developing the students' teamwork and presentation skills, will be pursued at every opportunity.

CONTENT, ORGANISATION AND TEACHING STRATEGIES

Teaching of this course is organized as:

26 x 1 hour lectures

12 x 4 hour laboratories

The lectures will serve to explain the concepts presented in the textbook, and provide practical methods for ensuring reliable designs. The laboratory sessions will provide the means for students to implement the design methods presented in the textbook and lectures. The course will be supported by industry standard commercial CAD tools for design, synthesis, simulation, verification, and implementation.

Contact Summary

Students are expected to attend all lectures and laboratory sessions. In particular, students are required to present their laboratory results to the Laboratory Demonstrator during the scheduled session. This must occur **before** the due date for submission of the associated laboratory report for assessment.

CONTENT SUMMARY

The content is divided into four module blocks, each block concluding with a feedback test. The blocks are as follows:

Module	Lecture Content	Weighting %	Reading
1.	CMOS circuit design MOSFET Device and its properties, and Spice Modelling Fabrication and Layout of CMOS Inverter and buffer design issues Layout rules and signal integrity issues Digital circuits, Place and Route Low power design	60	Chip design for submicron VLSI : CMOS layout and simulation / John P. Uyemura. CMOS VLSI Design Harris and Weste , Textbook
2.	Mixed-signal circuits Switching circuits and OpAmps	30	CMOS mixed-signal circuit design / R. Jacob Baker. CMOS VLSI Design Harris and Weste , Textbook
3.	System design using Verilog/SystemC Design and verification methods	10	Lecture notes will be provided

ASSESSMENT

Item	Assessment Task	Length	Weighting	Total Marks	Relevant Learning Outcomes	Due Day and Time
1.	Project	12 weeks	60.00%	60/100	1, 2, 3	As advised by the lecturer
2	Final Exam	2 hours	40.00%	40/100	1, 2, 3	Final-examination period

Assessment Details

This course is about learning basic design issues and related concepts at two different levels of abstraction, from circuit level to system level. As a result, the assessment will be focused largely on the ability of the students to learn practical issues in the area of VLSI circuits. A higher weighting is given to the laboratory work and students are encouraged to take up design projects. Throughout the semester the students will find various challenges, quizzes and design problems that will not be included in formal assessment, but rather will focus to give students feedback and update their understanding. The final

exam will cover the entire topics listed in the learning outcomes targeting some interesting design level problems.

The students enrolled in 7513ENG is waived from submitting laboratory reports, instead they are required to do a larger project that will account for 60% of the total marks. The project reports need to be handed over during the last lecture in the 12th week. In addition they are required to attend all the laboratory sessions. The topic of the project must be approved by the lecturer prior to the last lecture hour in the second week.

Assessment Criteria

To be eligible for a passing grade in this course, students are required to achieve: an overall mark of 50% or more, attend all laboratories, submit laboratory reports and project reports.

Return of Assessment Items

The marked laboratory reports will be returned to the students normally at the next scheduled laboratory sessions, or as advised by the laboratory supervisor. The feedback test results will be provided to students normally at the next scheduled lecture session. This course is web supplemented. All the textbooks are available in the library. The details of the other supplementary materials will be discussed during lecture hours.

GRADUATE SKILLS

Graduate Skills	Taught	Practised	Assessed
Effective communication (written)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Effective communication (oral)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Effective communication (interpersonal)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Information literacy	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Problem solving	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Critical evaluation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Work autonomously	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Work in teams	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Creativity and innovation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ethical behaviour in social / professional / work environments	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Responsible, effective citizenship	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

TEACHING TEAM

Course Lecturer	Nathan
Course Lecturar	Dr. Alex P. James
Email	a.james@griffith.edu.au
Office Location	N74 1.11
Phone	(07) 373 58008
Fax	(07) 373 58021
Consultation times	Anytime by e-mail ; anytime during working hours by phone and office visits (subject to availability);
Course Convenor	Nathan
Campus Convenor	Professor Sima Dimitrijevic
Email	S.Dimitrijevic@griffith.edu.au
Office Location	N74 1.23
Phone	(07) 373 55068
Fax	(07) 373 58021
Consultation times	Anytime by e-mail (most suitable for specific technical or admin questions); anytime during working hours by phone and office visits (subject to availability); scheduled meetings on either individual or group basis can be organised on request.

COURSE COMMUNICATIONS

The first contact with the course convenor is during the formal lecture/revision contact hours. Contact by e-mail or phone to ask questions (both technical and related to the course administration) is encouraged. Emailed queries are nominally answered as soon as being read (usually within ½ day). The lecturer is available for consultation at times that are displayed on the lecturers office notice board. Nonscheduled office visits for short questions is acceptable. Face-to-face meetings on either individual or group basis can be organized on request. This course is web supplemented. The details will be provided during the lecture hour.

TEXTS AND SUPPORTING MATERIALS

1. Weste N., Harris D., 2005, CMOS VLSI Design: A Circuit and Systems Perspective, Addison- Wesley (Third Edition)
2. John P. Uyemura, Chip design for submicron VLSI : CMOS layout and simulation.
3. R. Jacob Baker, CMOS mixed-signal circuit design.

Support Materials Required

1. Electric VLSI: <http://www.staticfreesoft.com/productsFree.html>
2. Magic VLSI: <http://opencircuitdesign.com/magic/>
3. LtSpice: <http://www.linear.com/designtools/software/ltspace.jsp>

Other tools

Multi-colored pens or sketch pens, Scientific calculators, and formula-sheets (provided during lecture hours).

SECTION B – ADDITIONAL COURSE INFORMATION

Students should contact the lecturer for further information about this course.

SECTION C – KEY UNIVERSITY INFORMATION

ACADEMIC MISCONDUCT

Students must conduct their studies at the University honestly, ethically and in accordance with accepted standards of academic conduct. Any form of academic conduct that is contrary to these standards is academic misconduct, for which the University may penalise a student. Specifically it is academic misconduct for a student to:

present copied, falsified or improperly obtained data as if it were the result of laboratory work, field trips or other investigatory work;

include in the student's individual work material that is the result of significant assistance from another person if that assistance was unacceptable according to the instructions or guidelines for that work;

assist another student in the presentation of that student's individual work in a way that is unacceptable according to the instructions or guidelines for that work;

cheat; (Cheating is dishonest conduct in assessment);

plagiarise (Plagiarism is knowingly presenting the work or property of another person as if it were one's own.)

Visit the University *Policy on Academic Misconduct* for further details.

HEALTH AND SAFETY

Griffith University is committed to providing a safe work and study environment, however all students, staff and visitors have an obligation to ensure the safety of themselves and those whose safety may be affected by their actions. Staff in control of learning activities will ensure as far as reasonably practical, that those activities are safe and that all safety obligations are being met. Students are required to comply with all safety instructions and are requested to report safety concerns to the University.

General health and safety information can be obtained from http://www.griffith.edu.au/hrm/health_and_safety/

Information about Laboratory safety can be obtained from http://www.griffith.edu.au/ots/secure/health/content_labsafety.html

KEY STUDENT-RELATED POLICIES

All University policy documents are accessible to students via the University's Policy Library website at: www.griffith.edu.au/policylibrary. Links to key policy documents are included below for easy reference:

[Student Charter](#)

[Student Administration Policy](#)

[Assessment Policy](#)

[Academic Calendar](#)

[Health and Safety Policy](#)

[Academic Standing, Progression and Exclusion Policy](#)

[Policy on Student Grievances and Appeals](#)

[Examinations Timetabling Policy and Procedures](#)

[Guideline on Student E-Mail](#)

[Children on Campus](#)

UNIVERSITY SUPPORT RESOURCES

The University provides many facilities and support services to assist students in their studies. Links to information about University support resources available to students are included below for easy reference:

Learning Centres – the University provides access to common use computing facilities for educational purposes. For details visit www.griffith.edu.au/cuse

Learning@Griffith - there is a dedicated website for this course via the Learning@Griffith student portal.

Student Services facilitate student access to and success at their academic studies. Student Services includes: Careers and Employment Service; Chaplaincy; Counselling Service; Health Service; Student Equity Services (incorporating the Disabilities Services); and the Welfare office.

Learning Services within the Division of Information Services provides learning support in three skill areas: computing skills; library skills; and academic skills. The study skills resources on the website include self-help tasks focusing on critical thinking, exam skills, note taking, preparing presentations, referencing, writing, proof reading, and time management.

SECTION C – KEY UNIVERSITY INFORMATION

ACADEMIC MISCONDUCT

Students must conduct their studies at the University honestly, ethically and in accordance with accepted standards of academic conduct. Any form of academic conduct that is contrary to these standards is academic misconduct and is unacceptable.

Some students engage deliberately in academic misconduct, with intent to deceive. This conscious, pre-mediated form of cheating is one of the worst forms of fraudulent academic behaviour, for which the University has zero tolerance and for which penalties, including exclusion from the University, will be applied.

However the University recognises many students commit academic misconduct without intent to deceive. These students may be required to undertake additional educational activities to remediate their behaviour.

Specifically it is academic misconduct for a student to:

- **Cheat in examinations and tests** by communicating, or attempting to communicate, with a fellow individual who is neither an invigilator or member of staff; by copying, or attempting to copy from a fellow candidate; attempting to introduce or consult during the examination, any unauthorised printed or written material, or electronic calculating or information storage device; or mobile phones or other communication device, or impersonates another.
- **Fabricate results** by claiming to have carried out tests, experiments or observations that have not taken place or by presenting results not supported by the evidence with the object of obtaining an unfair advantage.
- **Misrepresent themselves** by presenting an untrue statement or not disclosing where there is a duty to disclose in order to create a false appearance or identity.
- **Plagiarise** by representing the work of another as their own original work, without appropriate acknowledgement of the author or the source. This category of cheating includes the following:
 1. collusion, where a piece of work prepared by a group is represented as if it were the student's own;
 2. acquiring or commissioning a piece of work, which is not his/her own and representing it as if it were, by
 - purchasing a paper from a commercial service, including internet sites, whether pre-written or specially prepared for the student concerned
 - submitting a paper written by another person, either by a fellow student or a person who is not a member of the University;
 3. duplication of the same or almost identical work for more than one assessment item;
 4. copying ideas, concepts, research data, images, sounds or text;
 5. paraphrasing a paper from a source text, whether in manuscript, printed or electronic form, without appropriate acknowledgement;
 6. cutting or pasting statements from multiple sources or piecing together work of others and representing them as original work;
 7. submitting, as one own work, all or part of another student's work, even with the student's knowledge or consent.

A student who willingly assists another student to plagiarise (for example by willingly giving them their own work to copy from) is also breaching academic integrity, and may be subject to disciplinary action.

Visit the following web sites for further details:

[Institutional Framework for Promoting Academic Integrity among Students](#)
[Academic integrity for students](#)

PLAGIARISM DETECTION SOFTWARE

The University uses plagiarism detection software. Students should be aware that your Course Convenor may use this software to check submitted assignments. If this is the case your Course Convenor will provide more detailed information about how the detection software will be used for individual assessment items.

HEALTH AND SAFETY

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