

EE6306 Digital Integrated Circuit Design (39 hours)

Acad Unit: N.A.
Prerequisite: EE6604
Effective: AY2002-03
Last update: 14 August 2012

OBJECTIVE

The objective of this course is to provide students with a basic understanding of the integrated-circuit (IC) devices, namely the bipolar transistor and MOSFET. Some second order transistors' effects will be discussed. The basic silicon devices processes, the working principle of CMOS logic circuits (both static and dynamic) as well as the consideration for power will all be covered. Following the basic devices, the BiCMOS devices that is used in niche areas of digital IC design, will be discussed. The issues of low voltage and low power, as well as the sensitivity analyses of such circuits will be presented. The layout design rules is also covered in the course before introducing the Sub-System Design in Digital Circuits

In the Design Methodologies topic, the concepts on design flow, design analysis, verification, different implementation approaches, design synthesis and test methods are discussed. The objective is to provide the students with clear concepts on these topics.

All of these topics serves as important background to our present day devices and help to form a strong foundation for the learning of future newly developed semiconductor devices and their applications. Finally, this course together with the Analog IC Design and RF IC Design courses provide a comprehensive study of integrated circuit design for graduate students.

DESIRED OUTCOME

Through this course, students are expected to achieve a basic understanding of transistors' device physics, as well as the secondary effects of these devices. Students should be able to draw the layout for a block of CMOS circuit at the end of the course. The working mechanism of CMOS circuits (both static and dynamic) as well as the consideration for power should be better appreciated. Finally, they should be able to design digital CMOS circuits with low power considerations. Ultimately, it is hoped that the course would help to arouse students' interest in the subject and to further motivate them into developing their career in the area of IC designs.

OTHER RELEVANT INFORMATION

This course is intended for graduate students. The prerequisites for understanding the course are: a bachelor degree in Physics or in Electrical and/or Electronic engineering.

CONTENT

Review of Integrated Circuit Fundamentals. Layout and Design Issues. CMOS Digital

Circuits. BiCMOS Digital Circuits. Sub-System Design in Digital Circuits. Design Methodologies.

ASSESSMENT SCHEME

Continuous Assessment	20%
Final Examination	80%

TEXTBOOKS

Ming-Bo Lin, Introduction to VLSI Systems: A Logic, Circuit and System Perspective, CRC Press, Taylor and Francis Group, 2012.

Neil HE Weste and David M Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 4th edition, Addison-Wesley, 2011.

Jan M. Rabaey, A Chandrakasan, and B Nikolic “Digital Integrated Circuits”, 2nd edition, Prentice Hall, 2003.

REFERENCES

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