The Hong Kong University of Science and Technology

UG Course Syllabus Template (Simplified version uploading to SENG website)

CMOS VLSI Design

ELEC 3410

3 Credits

ELEC 2400

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Office Hours: Mondays, 3:30pm-4:30pm

Course Description

Lecture 1 - Course Introduction, Logistics, & Overview of CMOS VLSI Design
Lecture 2 - Diode & MOS Transistor Theory, Part I: Basic Modeling & Operation
Lecture 3 - MOS Transistor Theory, Part II: Second Order Modeling & Advanced Devices
Lecture 4 - CMOS Fabrication, Layout, & IC Packaging
Lecture 5 - CMOS Inverter: DC Characteristics
Lecture 6 - CMOS Inverter: Dynamic Characteristics
Lecture 7 - Midterm Exam
Lecture 8 - Power Consumption
Lecture 9 - Combinational Logic Circuits & Logical Effort
Lecture 10 - CMOS Logic Families
Lecture 11 - Dynamic Logic & Interconnect Analysis
Lecture 12 - Arithmetic Circuits
Lecture 13 - Introduction to Sequential Circuit Design

Laboratory work and the course project will be centered on Cadence industry standard tools using the commercial TSMC 180nm CMOS process.

Assessments:

[List specific assessed tasks, exams, quizzes, their weightage]

Assessment Task	Contribution to Overall Course grade (%)
Course Project	20%
Labs (7 in total)	14%
Mid-term Examination	30%
Final examination	35%
SFQ Submission	1%

Required Texts and Materials

Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, Digital Integrated Circuits – A Design Perspective, Second Edition, Prentice Hall, 2003.

[Optional] Additional Resources

K. Martin, “Digital Integrated Circuit Design”, Oxford, 2000.

K. Abbas, “Handbook of Digital CMOS Technology, Circuits, and Systems”, Springer, 2020.

H. J. M. Veendrick, “Nanometer CMOS ICs: From Basics to ASICs”, 2nd Ed., Springer, 2017.

N. H. E. Weste, D. M. Harris, “CMOS VLSI Design: A Circuits and Systems Perspective,” 4th Ed., Addison Wesley, 2011.

S. M. Kang and Y. Leblebici, “CMOS Digital Integrated Circuits”, 3rd Ed., Mc Graw Hill, 2003.

H. Kaeslin, “Digital Integrated Circuit Design from VLSI Architectures to CMOS Fabrication”, Cambridge University Press, 2008.

J. E. Ayers, “Digital Integrated Circuits: Analysis and Design,” CRC Press, 2005.

I. E. Sutherland, B. F. Sproull, and D. L. Harris, “Logical Effort: Designing Fast CMOS Circuits,” Morgan Kaufmann, 1998.