

课程大纲

COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	超低功耗数字电路设计 Ultra-Low Power Digital Circuit Design
2.	课程性质 Compulsory/Elective	选修 Elective
3.	课程学分/学时 Course Credit/Hours	3/48
4.	授课语言 Teaching Language	英语 English
5.	授课教师 Instructor(s)	林龙扬 Longyang Lin
6.	是否面向本科生开放 Open to undergraduates or not	否 No
7.	先修要求 Pre-requisites	无 None
8.	教学目标 Course Objectives	
	<p>本课程旨在为超低功耗数字电路设计方法提供全面的介绍。本课程将从亚阈值电路工作原理出发，涵盖晶体管模型、最小能量工作点、数字电路逻辑、亚阈值储存单元等电路和系统设计层面的内容。这是一门帮助研究生了解前沿数字电路设计方法以及提升对数字电路设计理解的课程。</p> <p>This course aims to provide a comprehensive introduction to ultra-low power digital circuit design. Starting from the transistor sub-threshold operation, this course covers both the circuit and system design aspects, including EKV model of MOSFET, minimum energy operation, digital logic, sub-threshold memories, and so on. This is an introductory course for research students who are interested in the cutting-edge digital circuit design methodologies and eventually improving the understating of digital circuit design.</p>	
9.	教学方法 Teaching Methods	
	理论讲授 Lectures, 课题讨论 Tutorials, 学生报告 Presentations	
10.	教学内容 Course Contents	
	(如面向本科生开放, 请注明区分内容。 If the course is open to undergraduates, please indicate the difference.)	
	Section 1	亚阈值电路设计起源 Origins of Sub-threshold Circuit Design
	Section 2	EKV MOSFET 模型 EKV Model of MOSFET
	Section 3	课题讨论及辅导 Tutorial
	Section 4	数字电路最小能量工作点-1 Minimum Energy Operation-1

Section 5	数字电路最小能量工作点-2 Minimum Energy Operation-2
Section 6	课题讨论及辅导 Tutorial
Section 7	数字逻辑设计-1 Digital Logic Design-1
Section 8	数字逻辑设计-2 Digital Logic Design-2
Section 9	课题讨论及辅导 Tutorial
Section 10	亚阈值内存设计-1 Sub-Threshold Memories-1
Section 11	亚阈值内存设计-2 Sub-Threshold Memories-2
Section 12	课题讨论及辅导 Tutorial
Section 13	亚阈值模拟电路设计-1 Analog Circuits in Weak Inversion-1
Section 14	亚阈值模拟电路设计-2 Analog Circuits in Weak Inversion-2
Section 15	课题讨论及辅导 Tutorial
Section 16	前沿电路设计方法- ISSCC 文章鉴赏-1 Cutting-Edge Circuit Design – ISSCC paper review -1
Section 17	前沿电路设计方法- ISSCC 文章鉴赏-2 Cutting-Edge Circuit Design – ISSCC paper review -2
Section 18	前沿电路设计方法- ISSCC 文章鉴赏-3 Cutting-Edge Circuit Design – ISSCC paper review -3
Section 19	前沿电路设计方法- ISSCC 文章鉴赏-4 Cutting-Edge Circuit Design – ISSCC paper review -4
Section 20	前沿电路设计方法- ISSCC 文章鉴赏-5 Cutting-Edge Circuit Design – ISSCC paper review -5
Section 21	学生报告 Student Presentations
Section 22	学生报告 Student Presentations
Section 23	学生报告 Student Presentations
Section 24	学生报告 Student Presentations

11.	课程考核 Course Assessment
	考查 出勤 Attendance 20% 课堂表现 Class Performance 30% 期末报告 Presentation 50%
12.	教材及其它参考资料 Textbook and Supplementary Readings
	Wang, Alice & Calhoun, Benton & Chandrakasan, Anantha. (2006). <i>Sub-threshold Design for Ultra Low-Power Systems</i> . 10.1007/978-0-387-34501-7.