课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	Introduction to Electronic Design Automation 电子设计自动化(EDA)基础
2.	**课程性质** **Compulsory/Elective**	专业选修 Elective
3.	**课程学分/学时** **Course Credit/Hours**	3/48
4.	**授课语言** **Teaching Language**	英语
5.	**授课教师** **Instructor(s)**	陈全
6.	**先修要求** **Pre-requisites**	半导体器件基础 电路设计理论 大学数学 线性代数
7.	**教学目标** **Course Objectives**	

本课程旨在为现代芯片设计的 EDA 工具的基本算法和方法提供简单而全面的介绍。它涉及了芯片设计从系统设计到制造和测试的整个 EDA 工作流程的几乎所有方面。这是一门主要帮助学生了解 EDA 是什么以及 EDA 软件如何工作的入门课程，同时也帮助他们提高对集成电路和系统的理解和设计能力。

This course aims to provide a simple yet comprehensive introduction to fundamental algorithms and methods that constitute the core of EDA tools for modern IC design. It touches almost all aspects of the EDA workflow that brings a chip design from system level specification to manufacturing and testing. This is an introductory course for students who are interested in getting to know what EDA is and how EDA software works, which is also helpful to IC circuit and system designs.

通过本课程的学习，学生可以

了解 EDA 工具在各种数字/模拟电路设计中的角色

了解 EDA 技术中的各种基础概念，如逻辑综合，布局布线，验证， 模拟及 RF 仿真，以及 TCAD 仿真

了解以上 EDA 工具里面的核心算法和方法

了解当今 EDA 主流工具以及应用

将 EDA 领域的知识与实际 IC 设计建立联系

Understand the role of design automation tools in various realms of digital/analog design.

Understand the various concepts like logic synthesis, placement & routing, verification, analog/RF simulation, and TCAD simulation.

Understand the core algorithms and methodologies that form the engine for such design automation tools.

Get to know contemporary EDA tools and their applications

Connect the knowledge of EDA to practical IC designs

8.	**教学方法** **Teaching Methods**	
	理论课为主，结合实际应用激发学生兴趣 Focus on theoretic study, and stimulate students' interest with practical application	
9.	**教学内容** **Course Contents**	
	Section 1	Overview of IC design and EDA IC 设计及 EDA 概览
	Section 2	System-level design 系统设计 （1）
	Section 3	VHDL basics (1) VHDL 简介（1）
	Section 4	VHDL basics (2) VHDL 简介（2）
	Section 5	VHDL basics (3) VHDL 简介（3）
	Section 6	Logic synthesis (1) 逻辑综合 （1）
	Section 7	Logic synthesis (2) 逻辑综合 （2）
	Section 8	High-level synthesis 高级综合
	Section 9	Functional & timing verification 功能及时序验证
	Section 10	Tutorial 辅导
	Section 11	Mid-term exam 期中考试
	Section 12	Physical design (1) 物理设计 （1）
	Section 13	Physical design (2) 物理设计 （2）
	Section 14	Physical design (3) 物理设计 （3）
	Section 15	Physical design (4) 物理设计 （4）
	Section 16	Circuit simulation (1) 电路仿真（1）
	Section 17	Circuit simulation (2) 电路仿真（2）

	Section 18	RF simulation 射频仿真
	Section 19	TCAD simulation (1) TCAD 仿真（1）
	Section 20	TCAD simulation (2) TCAD 仿真（2）
	Section 21	Physical verification 物理验证
	Section 22	Conclusion & Outlooks 结论与展望
	Section 23	Tutorial 辅导
	Section 24	Final exam 期末考试

10. 课程考核
Course Assessment

平时作业（4 次）Assignments （4 times）	20%
期中考试 Mid-Term Test	30%
期末考试 Final Exam	50%

11. 教材及其它参考资料
Textbook and Supplementary Readings

（教材）Essential Electronic Design Automation (EDA), Mark D. Birnbaum (https://www.amazon.com/Essential-Electronic-Design-Automation-EDA/dp/0131828290)

Digital Design and Computer Architecture, David Harris and Sarah Harris, Elsevier

Electronic Design Automation for IC Implementation, Circuit Design, and Process Technology 2nd Edition, by Luciano Lavagno, Igor L. Markov, Grant Martin, Louis K. Scheffer, CRC Press

SPICE Simulation Fundamentals: http://www.ni.com/en-us/innovations/white-papers/06/spice-simulation-fundamentals.html

Electronic design automation (Wiki): https://en.wikipedia.org/wiki/Electronic_design_automation