集成电路卓越计划实验班本科培养计划

Undergraduate Experimental Program in IC Design and Integrated System

一、培养目标

Ⅰ. Program Objectives

培养具备坚实的集成电路与集成系统专业理论基础、工程实践能力和相关创业能力，创新意识、创业素质和综合能力强，具备多学科视野和国际竞争力的光电领域研究型高端工程技术人才。毕业生能在集成电路产业部门、研究院所、高等院校及其相关领域创造性地从事光电信息工程相关的研究、开发和管理等工作。

Aiming at preparing all-rounded, high-quality talents with international competence, this program will enable students to be solid grounded in basic theory, wide-ranged in specialized knowledge, capable of practical work and particularly specialized in Integrated Circuit theories, methods and EDA tools, Integrated System and Information Processing. Students can be fit into jobs in IT department research centers and colleges. They can do research, design and develop the integrated system in Information Science and Technology area.

二、基本规格要求

Ⅱ. Learning Outcomes

毕业生应获得以下几个方面的知识和能力:

1．扎实的数理基础；

2．熟练掌握微电子学与固体电子学、半导体集成电路及嵌入式系统的基本理论和方法；

3．分析解决本学科领域内工程技术问题的能力；

4．了解本学科重大工程技术的发展动态和前沿；

5．外语应用能力强；

6．出色的文献检索、资料综述和撰写科技论文的能力；

7．较好的创业素质，较强的项目协调、组织能力；

8．创新精神强。

As students of this program, you will gain:

1．Solid grounding in maths and physics;

2．Basic theories and methods of Microelectronics and solid state electronics, Integrated Circuits and Embedded System;

3．The competency in solving the problems in specialty of scientific research and engineering;

4．Knowledge of the development of the discipline;

5．Mastery of English;

6．Basic methods of literature survey, file retrieving and scientific thesis writing ability;

7．Solid grounding in humanities and arts and ability of managing and organizing;

8．Innovative thinking.

三、培养特色

Ⅲ. Program Highlights

指导思想：鼓励和引导学生树立“追求卓越、致力创新、自主学习、主动实践”的学习理念，

实行“厚基础、重实践、校企联动、发展个性”的培养理念。

Guiding Ideology: We encourage and guide students to build the learning concept of “pursuit of excellence, devotion to innovation, autonomic learning, and initiative practice”, and execute the talent cultivation based on “emphasis on basis and practice, reinforcement of co-operation between the school and enterprises, and development of personalities”.

培养特色：

Features:

培养对象为面向全校选拔的优秀本科生，规模为 30 人。按学生自愿参加的原则，从大学本科新生中择优遴选有志于从事半导体器件及工艺研究、集成电路设计与集成系统研究的优秀学生，组建集成电路设计与集成系统卓越工程师本科班，按集成电路设计与集成系统专业“卓越工程师班”培养方案进行个性化培养。

30 outstanding undergraduates are to be selected from the whole school. Based on the principle of free will, excellent freshmen will be selected who are willing to devote themselves to researching semiconductor device and process, design and integrated circuit.

采取“4+2”本硕连读培养模式（前四年为本科阶段，后两年为硕士阶段），阶段之间设计相应的竞争分流机制和衔接机制。通过校企联合培养、双导师制等强化工程实践和创新合作能力。

We will adopt “4+2”mode (first 4 years as undergraduate, last 2 years as graduate student), and between the two stages competition and connection mechanism will be executed. Through co-operation between the school and enterprises, and double-tutorial system, students’ practice and innovation ability will be enhanced.

本科教育实行“3+1”培养模式。本科阶段在企业进行工程实践训练的时间累计不少于 1 年。其中，大四下学期在企业进行为期半年的毕业设计，并且从大一开始，利用每年的假期在企业进行专题工程实训，累计超过半年时间。在校学习期间，部分理论课程及实践课程等教学由企业工程师参与讲授，在校进行的项目训练选题来自于企业，并由企业参与成绩评价。

“3+1” mode will be implemented in undergraduate education. Students will cumulatively take at least one year in companies doing engineering practice. The practice time is specifically arranged as follows: ①half a year’s graduation design will be taken in companies in the second semester of the fourth year;②the rest half year will be taken cumulatively in companies for special engineering training during vacations every year. During school time, engineers from enterprises will lecture partial theoretical and practical courses. Training projects will come from companies, which will participate in the evaluation as well.

在学生培养的整个过程中，采用特别设计的含 CDIO 全过程的项目将所学课程串联起来，加强工程项目构思、设计、实现和运作能力的培养和训练。在高年级期间，则通过综合性的项目训练学生综合运用所学知识，创新性的解决工程实际问题的能力。

During the whole talent cultivation process, we will use programs which contain whole procedure of CDIO to connect all the courses, so as to enhance students’ ability to compose, design, realize and operate engineering projects. In the senior grades, we will use comprehensive programs in hope of developing students’ ability to apply their knowledge and solve engineering practical issues innovatively.

充分利用武汉·中国光谷、国家集成电路人才培养基地（武汉）以及武汉光电国家实验室（筹）的多学科创新平台、校企合作渠道和国际交流机会，以及师资队伍构成多样化的特点，培养学生自主创新、主动实践、团队协作和多学科交叉能力，以及国际视野和跨文化交流能力。

Resources including Optical Valley, national IC talent training base (Wuhan), and Wuhan national laboratory for optoelectronics will be fully used, in order to develop students’ ability of innovation,

practice and cooperation as well as their international view and cross-cultural communication.

重视拔尖学生的个性特质，结合相关企业对人才技能的特殊需求，由学业导师和企业导师为学生量身定制个性化的理论、实验和实践训练内容。

Special attention will be paid to the trait of these outstanding students. Combining requirements of enterprises, the two tutors from school and enterprise will make tailored theoretical and practical training courses for students.

四、主干学科

Ⅳ. Academic Discipline

电子与信息科学

Electronic and Information Science

五、学制与学位

Ⅴ. Program Length and Degree

修业年限：四年

Duration: 4 years

授予学位：工学学士

Degrees Conferred: Bachelor of Engineering

六、学时与学分

Ⅵ. Credits Hours and Units

完成学业最低课内学分（含课程体系与集中性实践教学环节）要求：163.5 学分。

Minimum Credits of Curricular(Comprising course system and intensified internship practical training)：163.5 credits

其中，专业基础课程、专业核心课程学分不允许用其他课程学分进行学分冲抵和替代。

Major-related basic courses and core courses cannot be covered using credits from other courses in the program

完成学业最低课外学分要求： 5 学分。

Minimum Extracurricular Credits：5 credits.

1. 课程体系学时与学分

Course Credits Hours and Units

课程类别		课程性质	学时/学分	占课程体系学分比例（%）
通识教育基础课程		必修	1016/64	43.7
		选修	160/10	6.8
学科（专业）基础课程	学科大类基础课程	必修	512/32	21.8
	学科专业基础课程	必修	304/19	13.0
专业课程	专业核心课程	必修	216/13.5	9.2
	专业方向课程	选修	128/8	5.5
合计			2328/146.5	100%

Course Type		Required /Elective	Hrs/Crs	Percentage (%)
Basic Courses in General Education		Required	1016/64	43.7
		Elective	160/10	6.8
Basic Course in Discipline	Basic Course in General Discipline	Required	512/32	21.8
	Basic Course in Discipline	Required	304/19	13.0
Courses in Specialty	Common core Courses	Required	216/13.5	9.2
	Specialty-Oriented Courses	Elective	128/8	5.5
Total			2328/146.5	100

2. 集中性实践教学环节周数与学分

Practicum Credits

实践教学环节名称	课程性质	周数/学分	占实践教学环节学分比例（%）
军事训练	必修	2/1	5.9
电工实习	必修	2/1	5.9
认知实习	必修	1/0.5	2.9
生产实习（社会实践）	必修	3/1.5	8.8
课程设计	必修	10/5	29.4
科研训练	必修	4/2	11.8
毕业设计（论文）	必修	16/6	35.3
合计		17	100

Course Type	Required/ Elective	Weeks/Credits	Percentage (%)
Military Training	Required	2/1	5.9
Electrical Engineering Practice	Required	2/1	5.9
Cognition Practice	Required	1/0.5	2. 9
Engineering Internship (Social Practice)	Required	3/1.5	8. 8
Course Project	Required	10W/5	29. 4
Comprehensive Training	Required	4W/2	11.8
Undergraduate Thesis	Required	16/6	35.3
Total		37/17	100

3. 课外学分

Extracurricular Credits

序号	名 称	要 求		课外学分
1	社会实践活动	提交社会调查报告，通过答辩者		1
		个人被校团委或团省委评为社会实践活动积极分子者，集体被校团委或团省委评为优秀社会实践队者		2
2	英语及计算机考试	全国大学英语六级考试	获六级证书者	2
		全国计算机等级考试	获二级以上证书者	2
		全国计算机软件资格、水平考试	获程序员证书者	2
			获高级程序员证书者	3
			获系统分析员证书者	4
3	竞赛	校级	获一等奖者	3
			获二等奖者	2
			获三等奖者	1
3	竞赛	省级	获一等奖者	4
			获二等奖者	3
			获三等奖者	2
		全国	获一等奖者	6
			获二等奖者	4
			获三等奖者	3
4	论文	在全国性刊物发表论文	每篇论文	2-3
5	科研	视参与科研项目时间与科研能力	每项	1-3
6	实验	视创新情况	每项	1-3

注：各院（系）应视具体情况，自行制定本院（系）课外活动和社会实践内容、形式及要求；院（系）在制定课外活动学分时，应参照课内学分和全校性课外活动要求记载学分；参加校体育运动会获第一名、第二名者与校级一等奖等同，获第三名至第五名者与校级二等奖等同，获第六至第八名者与校级三等奖等同。

No.	Extracurricular Activities and Social Practice	Requirements		Extracurricular Credits
1	Activities of Social Practice	Submit report and pass oral defense		1
		Entitled as Activist by the Communist Youth League of HUST or Hubei Province; Membership of the group which is entitled as Excellent Social Practice Group by the Communist Youth League of HUST or Hubei Province		2
2	Examinations in English and Computer	CET-6	Win certificate of Band-6 or higher	2
		National Computer Rank Examination	Win certificate of Band-2 or higher	2
		National Computer Software Qualification	Win certificate of programmer	2
			Win certificate of Advanced Programmer	3
			Win certificate of System Analyst	4
3	Competitions	University Level	Win first prize	3
			Win second prize	2
			Win third prize	1
		Provincial Level	Win first prize	4
			Win second prize	3
			Win third prize	2
		National Level	Win first prize	6
			Win second prize	4
			Win third prize	3
4	Papers	Those whose thesis appears in national publications	Per piece	2~3
5	Scientific Research	Depending on both the time spent in and ability demonstrated in scientific research project	Each item	1~3
6	Experiments	Depending on innovative extent	Each item	1~3

Note: In HUST Sports Meeting, the first and the second prize, the third to the fifth prize, and the sixth prize to the eighth prize are deemed respectively the first prize, the second prize and the third prize of university level.

七、主要课程

Ⅶ. Main Courses

计算机组成原理 Principles of Computer Organization、处理器体系结构 Processor Architecture、嵌入式系统原理与设计 Principles and Design of Embedded System、数字信号处理 Digital Signal Process、半导体物理 Semiconductor Physics、半导体器件物理 Physics of Semiconductor Devices、硬件描述语言与数字系统设计 Hardware Description Language and Design of Digital System、微电子工艺学 Microelectronic Process、数字集成电路基础 Fundamentals of Digital Integrated Circuit、CMOS 模拟集成电路 CMOS Analog Integrated Circuit.

八、主要实践教学环节（含专业实验）

Ⅷ. Practicum Module (experiments included)

新生专业认知实践 Professional Cognition Practice for Freshmen、电工实习 Electrical Engineering Practice、集成电路设计与集成系统专业实验 Specialized Experiments of IC Design and Integrated System、软件课程设计 Course Project for Software Design、数字集成电路课程设计 Course Project for Digital IC、模拟集成电路课程设计 Course Project for Analog IC、集成电路制造工艺课程设计 Course Project for IC Fabrication Process、嵌入式系统课程设计 Course Project for Embedded system、专业实习 Professional Social Practice、科研训练项目 Research Project、毕业设计 Undergraduate Thesis

九、教学进程计划表

Ⅸ. Course Schedule

院（系）：光学与电子信息学院　　专业：集成电路设计与集成系统

School (Department): School of Optical and Electronic Information　　Specialty: Integrated Circuit Design and Integrated System

课程类别 course type	课程性质 required/ elective	课程代码 course code	课程名称 course name	学时 hrs	学分 crs	其中 Including			设置学期 semester
						课外 extra-cur.	实验 exp.	上机 operation	
通识教育基础课程 General Education Core Curriculum	必修 Required	0301902	思想道德修养与法律基础 Morals & Ethics & Fundamentals of Law	40	2.5	8			1
	必修 Required	0100721	中国近现代史纲要 Survey of Modern Chinese History	32	2	8			2
	必修 Required	0100932	思政课社会实践 Social Practice of Ideological and Political Theories Course	24	1.5	20			2
	必修 Required	0100733	马克思主义基本原理 Theory of Marxism	40	2.5	8			3
	必修 Required	0100322	毛泽东思想和中国特色社会主义理论体系概论 General Introduction to Mao Zedong Thought and Socialist Theory with Chinese Characteristics	56	3.5	0			4
	必修 Required	0100741	形式与政策 Situation and Policy	32	2	14			1-6
	必修 Required	0510071	中国语文 Chinese	32	2	10			1
	必修 Required	0508454	综合英语（一） Comprehensive English （Ⅰ）	32	2				1
	必修 Required	0508464	综合英语（二） Comprehensive English （Ⅱ）	32	2				2
	必修 Required	0508472	综合英语（三） Comprehensive English （Ⅲ）	16	1				3
	必修 Required	0508482	综合英语（四） Comprehensive English （Ⅳ）	16	1				4
	必修 Required	0400111	大学体育（一） Physical Education（Ⅰ）	32	1				1
	必修 Required	0400121	大学体育（二） Physical Education（Ⅱ）	32	1				2
	必修 Required	0400131	大学体育（三） Physical Education（Ⅲ）	32	1				3
	必修 Required	0400141	大学体育（四） Physical Education（Ⅳ）	32	1				4
			人文社科类选修课程 Electives in Humanities and Social Science	160	10				1-8
	必修 Required	0700011	微积分（一）（上） Calculus（Ⅰ）	88	5.5				1
	必修 Required	0700012	微积分（一）（下） Calculus（Ⅱ）	88	5.5				2

续表

课程类别 course type	课程性质 required/ elective	课程代码 course code	课程名称 course name	学时 hrs	学分 crs	其中 Including			设置学期 semester
						课外 extra-cur.	实验 exp.	上机 operation	
通识教育基础课程 General Education Core Curriculum	必修 Required	0700054	线性代数 Linear Algebra	40	2.5				1
	必修 Required	0700063	概率论与数理统计（三） Probability and Mathematics Statistics (Ⅲ)	40	2.5				2
	必修 Required	0705971	复变函数与积分变换 Complex Function and Integral Transform	40	2.5				3
	必修 Required	0700081	数理方程与特殊函数（一） Equations of Mathematical Physics & Special Functions (Ⅰ)	40	2.5				4
	必修 Required	0700048	大学物理（一） Physics (Ⅰ)	64	4				2
	必修 Required	0700049	大学物理（二） Physics (Ⅱ)	64	4				3
	必修 Required	0706891	物理实验（一） Physical Experiments (Ⅰ)	32	1		28		2
	必修 Required	0706901	物理实验（二） Physical Experiments (Ⅱ)	32	1		20		3
	必修 Required	1100011	军事理论 Military Theory	16	1				1
	必修 Required	0800033	软件技术基础 Technology Software programming	64	4			20	1
	必修 Required	0701732	科学思维与研究方法 Scientific Thoughts and Research Methods	16	1				1
	必修 Required	0833031	工程导论 Introduction to Engineering	16	1				2
学科大类基础课程 Discipline-related General Courses	必修 Required	0801665	工程制图（一） Engineering Graphics (Ⅰ)	40	2.5				1
	必修 Required	0800113	电路理论（三） Circuit Theory (Ⅲ)	88	5.5				3
	必修 Required	0803054	电路测试实验 Circuit Measurement Experiment	32	1		32		4
	必修 Required	0800773	数字电路与逻辑设计（一） Digital Circuit and Logic Design (Ⅰ)	56	3.5				4
	必修 Required	0800124	模拟电子技术（二） Analog Electronics (Ⅱ)	56	3.5				4
	必修 Required	0807635	电子测试与实验技术 Electronic Testing and Experiment Techniques	48	1.5		48		5
	必修 Required	0800455	信号与线性系统 Signal and Linear System	56	3.5			4	3
	必修 Required	0801614	计算机组成原理 Principles of Computer Organization	56	3.5				6
	必修 Required	0808466	单片机原理及应用 Principle and Application of Single Chip Microcomputer	56	3.5				5

续表

课程类别 course type	课程性质 required/ elective	课程代码 course code	课程名称 course name	学时 hrs	学分 crs	其中 Including			设置学期 semester
						课外 extra-cur.	实验 exp.	上机 operation	
	必修 Required	0804663	微机实验 Microcomputer Expreriments	16	0.5				5
	必修 Required	0821752	半导体器件物理 Physics of Semiconductor Devices	56	3.5				5
学科专业基础课程 Basic Subdisciplinary Courses	必修 Required	0800372	量子力学（二） Quantum Mechanics (II)	48	3				3
	必修 Required	0700144	固体物理 Solid State Physics	40	2.5				4
	必修 Required	0704862	半导体物理 Semiconductor Physics	56	3.5				4
	必修 Required	0821271	数字集成电路基础 Fundamentals of Digital Integrated Circuit	56	3.5				5
	必修 Required	0823861	集成电路专业基础实验 Specialized Fundamental Experiments Of IC	48	1.5		48		5
	必修 Required	0823871	处理器体系结构 Processor Architecture	40	2.5				6
	必修 Required	0823882	高频电路基础 Fundamentals of High frequency Circuit	40	2.5				6
专业核心课程 Major-specific Core Courses	必修 Required	0830012	硬件描述语言与数字系统设计 Hardware Description Language and Design of Digital System	32	2				5
	必修 Required	0810834	CMOS 模拟集成电路（I） CMOS Analog Integrated Circuit（I）	40	2.5				5
	必修 Required	0810835	CMOS 模拟集成电路（II） CMOS Analog Integrated Circuit(II)	40	2.5				6
	必修 Required	0804801	微电子工艺学 Microelectronic Process	40	2.5				5
	必修 Required	0821343	嵌入式系统原理与设计 Principles and Design of Embedded System	40	2.5				7
	必修 Required	0814251	集成电路工程前沿技术概论 Frontier Introduction to IC Engineering	24	1.5				7
专业方向课程 Major-specific Electives			专业选修课程 Elective Courses in Specialty	128	8				
	选修 Elective	0813721	微电子器件可靠性技术基础 Fundamental of Microelectronics Devices Reliability Technology	32	2				6
	选修 Elective	0813683	光电子器件导论 Introduction to Optoelectronic Device	32	2				6
	选修 Elective	0813692	化合物半导体器件 Compound Semiconductor Devices	32	2				6
	选修 Elective	0823921	功率集成电路 Power Integrated Circuits	32	2				7
	选修 Elective	0823932	CMOS 射频集成电路 CMOS RF IC	32	2				7

续表

课程类别 course type	课程性质 required/ elective	课程代码 course code	课程名称 course name	学时 hrs	学分 crs	其中 Including			设置学期 semester
						课外 extra-cur.	实验 exp.	上机 operation	
专业方向课程 Major-specific Electives	选修 Elective	0823981	MEMS 系统与应用 MEMS System and Application	32	2				6
	选修 Elective	0810161	多媒体原理与技术 Theory and Technology for Multimedia	32	2				7
	选修 Elective	0800163	数字信号处理 Digital Signal Processing	32	2				6
	选修 Elective	0800433	通信原理 Principles of communication	32	2				6
	选修 Elective	0823991	集成电路封装与系统测试 Package and System Test for IC	32	2				7
	选修 Elective	0832831	微光机电系统 Micro-Optoelectronic-Mechanics Systems	32	2				7
	选修 Elective	0804166	光纤通信技术 Optical Fiber Communication Technology	32	2				6
实践环节 practical training items	必修 Required	1300013	军事训练 Military Training	2w	1				1
	必修 Required	130010a	专业认知实验 Experiments for specialty cognition	1w	0.5				1
	必修 Required	1304411	电工实习 Electrical Engineering Practice	2w	1				4
	必修 Required	1327694	生产实习 Engineering Internship	3w	1.5				6
	必修 Required	1300396	软件课程设计 Course Project for Software Design	2w	1				2
	必修 Required	1300962	数字集成电路课程设计 Course Project for Digital IC Design	2w	1				5
	必修 Required	1300952	模拟集成电路课程设计 Course Project for Analog IC Design	2w	1				6
	必修 Required	1300942	集成电路制造工艺课程设计 Course Project for Process of IC Fabrication	2w	1				5
	必修 Required	1328221	学科交叉综合训练（嵌入式微处理器综合设计与应用）Course Project for Embedded system	2w	1				7
	必修 Required	1328231	科技创新训练实践项目 Science and technology innovation training project	4w	2				4-7
	必修 Required	130004i	毕业设计(论文) Undergraduate Thesis	16w	6				8