物联网工程

一、培养目标

本专业培养具有良好的人文、科学与工程素养，系统掌握计算机、信息与通信领域的数理基础，具备科学研究能力；具有坚实的专业理论知识、良好的科学思维方法和系统的工程实践技术，具备工程创新能力；能够综合运用学科基础知识与工程技术解决复杂工程问题，了解工程项目实施流程与多学科合作方式，具备项目管理能力；至少熟练掌握一门外语，了解物联网工程相关领域的国际发展前沿，具备国际视野与合作能力的专门人才。

二、基本规格要求

物联网工程专业本科毕业生应具有如下基本素质与能力：

1. 研究与分析方法：能够应用数学、自然科学与工程科学的基本原理，搜索相关文献，定义与分析复杂物联网工程问题；能够采用恰当的知识和方法对于复杂物联网工程问题进行研究，包括设计实验、分析与解释数据，并通过信息综合得到合理的结论。

2. 设计与实践能力：能够设计复杂物联网工程问题的解决方案，设计满足特定需求的系统、部件或过程，并能够适当考虑公共健康、安全、文化、社会以及环境等因素；能够针对复杂物联网工程活动，研制、选择与运用适当的技术、资源和现代工程与信息技术工具，并能够理解其局限性。

3. 组织与管理素养：能够在具有多样性和多学科背景的团队中作为个体、成员或负责人有效地发挥作用；能够就复杂工程活动与同行以及社会公众进行有效的沟通，包括理解和撰写报告，设计文档，做现场报告，理解或发出清晰的指令；掌握并理解工程与管理的原理知识，能够作为团队成员或负责人运用这些知识，在多学科环境中进行项目管理。

4. 社会与环境综合：能够基于与工程相关的环境或背景信息进行合理的思考，对于专业工程实践在社会、健康、安全、法律以及文化诸方面涉及的因素与应承担的责任进行评价；能够理解专业工程解决方案对于社会与环境的影响，能够理解可持续发展的必要性，并具有相关的知识。

5. 学习与合作交流：了解本专业的前沿发展现状和趋势，对终身学习有正确认识，具有不断学习和适应发展的能力；具有人文社会科学素养、社会责任感和工程职业道德；具有国际视野和跨文化的交流、竞争与合作能力。

6. 工程与社会：能够基于工程相关背景知识进行合理分析，评价计算机专业工程实践和物联网系统复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。

7. 环境和可持续发展：能够理解和评价针对物联网系统复杂工程问题的工程实践对环境、社会可持续发展的影响。

8. 职业规范：具有人文社会科学素养、社会责任感，能够在计算机系统工程实践中理解并遵守工程职业道德和规范，履行责任。

9. 个人和团队：能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。

10. 沟通：能够就物联网系统复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令，并具备一定的国际视野，能够在跨文化背景下进行沟通和交流。

11. 项目管理：理解并掌握工程管理原理与经济决策方法，并能在多学科环境中应用。

12. 终身学习：具有自主学习和终身学习的意识，有不断学习和适应发展的能力。

三、培养特色

本专业在教育部本科专业目录中属于计算机类专业，培养方案以计算机类专业工程教育认证要求为准则，结合本校实际制定；夯实计算机、网络与通信学科核心基础知识，注重物联网工程实践能力，培养科学研究与技术创新素养，加强学科交叉与国际交流特色，重点突出嵌入式移动计算、计算机网络通信、无线传感器、智能信息处理等专业方向。

四、学制、毕业基本要求及学位授予

1. 本科基本学制 4 年，弹性学习年限 3—6 年，按照学分制度管理。

2. 物联网工程专业学生毕业最低学分数为 165 学分，其中各类别课程及环节要求学分数如下表：

课程类别	通识必修	学门核心	学类核心	专业核心	专业选修	通识选修	集中实践	合计
学分数	24	24	29	18	32	8	30	165

3. 学生修满培养方案规定的必修课、选修课及有关环节，达到规定的最低毕业学分数，并修完规定必修但不记学分的所有课程和环节，德、智、体合格，即可毕业。满足学位授予相关文件要求的，授予工学学士学位。

五、课程设置及学分分布

（一）通识教育课程〔必修 24＋（6）学分＋选修 8 学分〕

通识教育课程包括必修和选修两部分。通识选修课程按《湖南大学通识选修（文化素质教育）课程方案》实施，通识必修课程如下：

编码	课程名称	学分	备注
GE01101	毛泽东思想和中国特色社会主义理论体系概论	3＋（3）	
GE01039	思想道德修养与法律基础	1.5＋（1.5）	
GE01100	形势与政策	0.5＋（1.5）	
GE01102	中国近现代史纲要	2	
GE01103	马克思主义基本原理（上）	2	
GE01104	马克思主义基本原理（下）	2	
GE01012（－15）	大学英语	8	
GE01107（－13）	心理素质与生涯发展	1	
GE01089（－92）	体育	4	

（二）学门核心课程（24 学分）

编码	课程名称	学分	备注
GE03025	高等数学 A（1）	5	
GE03025	高等数学 A（2）	5	
GE03003	线性代数 A	3	
GE03004	概率论与数理统计 A	3	
GE03005	普通物理 A（1）	3	
GE03006	普通物理 A（2）	3	
GE03007	普通物理实验 A（1）	1	
GE03008	普通物理实验 A（2）	1	

（三）学类核心课程（29 学分）

编码	课程名称	学分	备注
CS04022	高等程序设计	4	
CS04001	离散数学	4	
CS04002	数据结构	4	
CS05054	数字电路与逻辑设计	4	
CS04023	计算机系统	4	
CS05052	算法分析与设计	4	全英文授课
CS04021	程序设计实验	2	
CS04024	数字系统实验	1	
CS04025	计算机系统原理实验	2	

（四）专业核心课程（18 学分）

编码	课程名称	学分	备注
CS04007	操作系统原理	4	
CS05077	电路分析（含“电路实验”）	3	
CS05014	嵌入式计算机系统	3	
CS05078	计算机网络系统结构	4	
CS05079	操作系统实验	2	
CS05080	网络原理与系统实验	2	

（五）专业选修课程（32 学分）

（1）专业限选课（11 学分）

本专业学生必须选修以下课程，以强化专业基础，总计 11 学分。

编码	课程名称	学分	备注
CS06168	信息与通信的数学基础	4	
CS06169	信号处理基础（含“信号处理实验”）	3	
CS06170	无线网络与移动计算	4	

（2）专业任选课（21 学分）

专业任选课程采用方向分组与跨组任选相结合的方式实施。学生先选定某个分组的所有 4 门课程，然后跨组（或跨专业）选修 3 门课程，共 7 门课程，总计 21 学分，以培养专业方向系统能力、拓展专业知识与技能，课程及分组如下：

编码	课程名称	学分	备注
CS06153	计算机系统设计	3	嵌入式系统组
CS06154	嵌入式数据库系统	3	
CS06168	可重构计算技术	3	
CS06169	现代嵌入式系统设计	3	
CS05007	计算机系统结构	3	体系结构组
CS06157	SOC 设计与实现	3	
CS06158	微处理器设计（含“微处理器设计实验”）	3	
CS06170	VLSI 计算机辅助设计	3	
CS06160	组合最优化理论与算法	3	智能系统组
CS06161	数字图像处理	3	
CS06171	机器学习与大数据分析	3	
CS06172	智能图形算法（英文）	3	

续表

编码	课程名称	学分	备注
CS06164	物联网导论	3	物联网络组（本专业学生建议选修“物联网导论”、“RFID 与传感器原理”与“无线传感器网络”三门课程。）
CS06165	物联网通信技术	3	
CS06166	RFID 与传感器原理	3	
CS06176	无线传感器网络	3	

注：1）鼓励学生自主选修本专业或跨专业选修类课程，学分不少于应选学分的 50％。

2）在读期间参加学科竞赛或公开发表学术论文等经学院认定（详见《湖南大学信息科学与工程学院学术研究成果分类指导意见和技术创新成果指导意见》）可以申请替代选修 2 学分。

（六）集中实践环节（30 学分）

课程编码	课程名称	学分	备注
GE01040	军训、军事与国防（含军事理论）	0	
CS10018	入学教育与物联网专业导论	0	
GE09030	中文写作实训	1	一年级夏季学期
GE09028	英文应用写作实训	1	
GE09001	程序设计	2	
CS10019	电子系统设计	2	二年级夏季学期
CS10020	软件设计	2	
CS10021（22）	专业综合设计	4	三年级夏季学期 （院定专业综合设计课题选 1）
CS10023	毕业实习	2	第 8 学期
CS10032	物联网系统实验	2	特色实践课程
CS10026	毕业设计（含导师课程）	14	包含 2 个学分的导师课程。导师课程是“导师制”的具体任务，本课程须是以项目驱动、“CDIO”模式、讨论方式教学，每岗每届指导学生共 3—6 人。课程内容包含：本科生学业指导、一年级与二年级学生夏季学期设计课程监管、三年级学生夏季学期设计课程指导、四年级本科生毕业实习与毕业设计指导。

六、课程责任教师一览表

序号	姓名	职称	学历学位	专业特长	课程（专业核心、专业选修、通识选修）
1	李仁发	教授	博士	嵌入式系统与 CPS	计算机系统
2	邝继顺	教授	博士	集成电路测试	数字逻辑、SOC 设计与实现
3	赵　欢	教授	博士	智能信息处理	计算机系统
4	彭蔓蔓	教授	博士	计算机体系结构	计算机组成与设计
5	罗　娟	教授	博士	物联网与云计算	物联网导论、物联网工程设计与实现
6	吴　强	副教授	博士	先进计算	计算机组成与设计、计算机系统结构
7	尤志强	副教授	博士	集成电路设计	数字逻辑
8	谢　鲲	副教授	博士	无线传感器网络	计算机网络系统结构
9	杨　磊	副教授	博士	分布式计算	计算机网络系统结构、分布式计算系统
10	王汉武	副教授	博士	无线通信技术	无线网络与移动计算

续表

序号	姓名	职称	学历学位	专业特长	课程（专业核心、专业选修、通识选修）
11	李　蕊	讲师	博士	实时系统	操作系统
12	刘　彦	讲师	博士	CPU 设计	计算机系统、可重构计算技术
13	黄丽达	讲师	硕士	实时计算	计算机系统、实时计算系统设计
14	袁文澹	讲师	博士	数字系统设计	微电子电路、电子系统设计
15	凌纯清	讲师	硕士	数字系统设计	数字逻辑、电子系统设计
16	肖　玲	讲师	博士	可穿戴计算	无线网络与移动计算、物联网通信技术
17	付　彬	讲师	博士	无线通信与网络	物联网导论、RFID 与传感器原理

七、专业责任教授

序号	姓名	职称	学历学位	专业特长	承担授课课程
1	罗　娟	教授	博士	物联网与云计算	物联网导论、物联网工程设计与实现

Internet of Things Engineering

Ⅰ. Objects

On the basis of "Engineering Education Certification Standards", our target is to culture undergraduate students with the good qualities on humanity, science and engineering, as well as solid mathematical foundation on the areas of computer, information, and communication sciences to support their researches. We demand the students should have solid theoretical knowledge on their majors, scientific ways of thinking, and technologies of engineering practice, that prompt them to make engineering innovations on their areas. Moreover, the students should have the abilities to solve complex engineering problems by using their professional knowledge and engineering technology. Also, they need to understand the process of project implementation and the cooperation ways among partners from multiple disciplines so that they can in charge of projects by themselves. Finally, we need the students to master at least one foreign language, have an international vision, and know the international forefront on the field of the internet of things engineering, that will help them to make a cooperation with international partners.

Ⅱ. Basic Requirements

The undergraduate students of the internet of things engineering should have the following qualities and abilities:

1. Research and Analysis Methods: The students need to have the abilities to make use of the knowledge from mathematics, natural and engineering science, search relevant literature, as well as define and analyze complex problems in the internet of things engineering. They can also employ appropriate knowledge and methods to do researches on complex engineering problems, such as using experimental design, data analysis and explanation etc., and finally make a reasonable conclusion by using information induction.

2. Design and Practice: The students need to have the abilities to give solutions for problems from the internet of things engineering, and design a system, component or process to meet the specific requirements with the consideration of the public health, safety, culture, society and environmental factors etc. During complex activities in the internet of things engineering, the students can develop the proper technology, or make use of the existing resources and methods to solve problems, and also understand the limitations of these approaches.

3. Organization and Management: The students can effectively play their roles as an individual, members or leaders in a diverse and multidisciplinary team. They can communicate with colleague, the public in a complex engineering activity by using a variety of ways, including writing reports, designing documents, doing oral presentation and issuing a clear instruction. Moreover, the students should understand basic engineering and management knowledge, and use these knowledge to manage projects as a member or leader in a multidisciplinary environment.

4. Social and Environmental Integration: The students have reasonable thinking of engineering-related environmental information, and can make a fair evaluation about engineering practice on its re-

sponsibility and many other factors involved in the areas of sociality, health, safety, law, and culture etc. They also have relevant knowledge to understand professional engineering solutions and their influences on society and environment, as well as the necessity on sustainable development.

5. Learning and Cooperation: The students have an understanding on the frontier development and trend in their majors. They have a correct philosophy of lifelong learning, and can continuously learn and develop. Also, they need to have the high qualities on humanities and social science, be responsible for the society and their jobs, have international views and capabilities to communicate, compete and cooperate with cross-cultural colleagues.

6. Engineering and Sociality: The students have reasonable thinking of engineering-related environmental information, and can make a fair evaluation about engineering practice on its responsibility and many other factors involved in the areas of sociality, health, safety, law, and culture etc.

7. Social and Environmental Integration: The students have relevant knowledge to understand professional engineering solutions and their influences on society and environment, as well as the necessity on sustainable development.

8. Professional Norm: The students are encouraged to enrich the quality of humanity and social science, to enhance the social responsibility. In addition, the students should understand and obey the professional ethic and standard.

9. Personal and Teamwork: The students should have the ability to cooperate with team members from different education background and act as different roles.

10. Communication: The students need to have the abilities to effectively communicate and exchange with industry peers and the public about complex engineering in computer systems, including report writing and design document, statement, clear expression or to respond to commands. And have a certain international perspective, can communicate and exchange in the cross-cultural context.

11. Project Management: The students are encouraged to understand and master the engineering management principle and economic decision-making method, and can be applied in many subjects environment.

12. Life-long Learning: The students should have the ability of self-learning and accept the idea of life-long learning.

Ⅲ. Program Traits

This major belongs to the computer major in the undergraduate major directory from the Ministry of Education. The cultivation program is formulated according to the criterion of professional computer and engineering requirements as well as considering the actual environments of our school. We demand our students have a core foundation on the knowledge from computer, network and communication majors, emphasize their engineering practices on the internet of things engineering, and train their abilities on scientific researches and technological innovations. We also strengthen the interdisciplinary and international exchange, and highlight some research directions such as embedded system and SOC design, computer network communication, wireless sensor, intelligent information processing and so on.

Ⅳ. Degree Requirements

1. An undergraduate student is expected to graduate in four (4) years preferably, and is also allowed to graduate within the periods between three (3) to six (6) years according to the student's

performance in the academic credit system.

2. The minimal requirement for the academic credits is 165 credits totally for the students from the internet of things engineering major. The detailed requirements for each kind of the specific courses are listed in the following table:

Course categories	Core courses General	Core courses Domain	Core courses Discipline	Core courses Major	Electives Major	Electives General	Collective Training	Total
Credit requirements	24	24	29	18	32	8	30	165

3. A student can graduate if he/she fulfills the course study of core courses, electives, and other courses as specified in the program, and satisfies the basic requirements on morality, intelligence, and health. We will confer the Bachelor Degree of Engineering on students if they satisfy the requirements of degree according to the related policies.

Ⅴ. Curriculum

1. General Education Courses〔required 24＋(6) ＋ elective 8 credits〕

The general education courses consist of required courses and elective courses. General education electives are designed according to the *Curriculum Design of General Education Electives of Hunan University*. Required general education courses are illustrated in the following table.

Code	Course Title	Credit(s)	Remarks
GE01101	Introduction to Maoism and Theoretical System of Socialism with Chinese Characteristics	3＋(3)	
GE01039	Moral Cultivation and Law Basics	1.5＋ (1.5)	
GE01100	Current Situation and Policies	0.5＋ (1.5)	
GE01102	Outline of Modern Chinese History	2	
GE01103	Fundamentals of Marxism Ⅰ	2	
GE01104	Fundamentals of Marxism Ⅱ	2	
GE01012(－15)	College English	8	
GE01107(－13)	Psychological Health & Career Planning	1	
GE01089(－92)	Physical Education	4	

2. Core courses: domain (24 credits)

Code	Course Name	Credit(s)	Remarks
GE03025	Advanced Mathematics A(Ⅰ)	5	
GE03025	Advanced Mathematics A(Ⅱ)	5	
GE03003	Linear Algebra A	3	
GE03004	Probability Theory and Statistics A	3	
GE03005	General Physics A(Ⅰ)	3	
GE03006	General Physics A(Ⅱ)	3	
GE03007	General Physics lab A(Ⅰ)	1	
GE03008	General Physics lab A(Ⅱ)	1	

3. Core courses: discipline (29 credits)

Code	Course Name	Credit(s)	Remarks
CS04022	Advanced Programming	4	
CS04001	Discrete Mathematics	4	
CS04002	Data Structure	4	
CS05054	Digital Circuit and Logic Design	4	
CS04023	Computer System	4	
CS05052	Algorithms Design and Analysis	4	Course Taught in English
CS04021	Programming Experiment	2	
CS04024	Digital System Experiment	1	
CS04025	Computer System Principle Experiment	2	

4. Core courses: major (18 credits)

Code	Course Name	Credit(s)	Remarks
CS04007	Operating System Principle	4	
CS05077	Circuit Analysis (Including Circuit Experiment)	3	
CS05014	Embedded Computer System	3	
CS05078	Computer Network System Structure	4	
CS05079	Operating System Experiment	2	
CS05080	Network Principle and System Experiment	2	

5. Electives: major (32 credits)

(1)Major restricted electives(11 credits)

In order to strengthen the knowledge base, students in the internet of things engineering major are required to take these electives, for a total of 12 credits

Code	Course Name	Credit(s)	Remarks
CS06168	The Mathematical Basis of Information and Communication	4	
CS06169	Signal Processing Basis (including Signal Processing Experiment)	3	
CS06170	Wireless Network and Mobile Computing	4	

(2)Major non-restricted electives(21 credits)

Major non-restricted electives are implemented as groups. Students of the internet of things engineering major should take all the four (4) courses in one group and then take three (3) courses from other groups or even from other majors, with a total of seven (7) non-restricted electives and 21 credits at least. These selection strategy will help students cultivate their abilities in professional systems and expand their professional knowledge and skills. The non-restricted electives and their groups are listed in the following table:

Code	Course Name	Credit(s)	Remarks
CS06153	Computer System Design	3	Embedded system group
CS06154	Embedded Databases System	3	
CS06168	Reconfigurable Computing Technology	3	
CS06169	Modern Embedded System Design	3	
CS05007	Computer System Architecture	3	Architecture group
CS06157	SOC Design and Implementation	3	
CS06158	Microprocessor Design (Including Microprocessor Design Experiments)	3	
CS06170	VLSI Computer Aided Design	3	
CS06160	Combinatorial Optimization Theory and Algorithm	3	Intelligent system group
CS06161	Digital Image Processing	3	
CS06171	Machine Learning and Big Data Analysis	3	
CS06172	Intelligent Graphics Algorithm (in English)	3	
CS06164	Introduction to the Internet of Things	3	The internet of things group (Students of the internet of things engineering major are advised to take "Introduction to the internet of things", "RFID and Principle on sensors" and "Wireless sensor network")
CS06165	Communication Technology of the Internet of Things	3	
CS06166	RFID and Principle on Sensors	3	
CS06176	Wireless Sensor Network	3	

Note: 1) Students are encouraged to sign up for elective within and across their majors, with the credit hours no less than 50% of the total required credit hours.

2) Students who take part in computer competitions or publish technical papers can apply to substitute two selective credit hours (see instructions of academic research and techniques invocation of the college of computer science and electronic engineering, hunan university).

6. Collective training (30 credits)

Code	Course Name	Credit(s)	Remarks
GE01040	Military training, Military Affairs and National Defense (including Military Theory)	0	
CS10018	University and "the Internet of Things" Major Introduction	0	
GE09030	Practices for Chinese Writing	1	Summer semester of the first year of study
GE09028	Practices for English Writing	1	
GE09001	Practices for Programming	2	
CS10019	Practices for Digital Systems Design	2	Summer semester of the second year of study
CS10020	Practices for Software Design	2	
CS10021(22)	Major Specific Integrated Design	4	Summer semester of the third year of study (Choosing 1 project from the college's list)
CS10023	Internship for Graduation Project	2	Spring semester of the forth year of study

Cont

Code	Course Name	Credit(s)	Remarks
CS10032	Internet of Things System Experiment	2	Major specific practices
CS10026	Graduation Project(including Mentor Courses)	14	Mentor courses (2 credits) are included. Mentor courses are the tasks of the mentor system. These courses are project-driven with "CDIO" model, and are taught by discussions. Everymentor takes charge of 3—6 students of each class year. The course contents include: academic guidance for undergraduate students, monitoring on summer semester design courses for first and second year undergraduate students, mentoring on summer semester design courses for third year undergraduate students, mentoring on graduation project and internship for forth (final) year undergraduate students.

Ⅵ. Major Course Teachers

No.	Name	Title	Education	Research Domain	Courses
1	Li Renfa	Professor	Ph. D	Embedded System and CPS	Computer system
2	Kuang Jishun	Professor	Ph. D	Integrated Circuit Testing	Digital Logical, SOC Design and Implementation
3	Zhao Huan	Professor	Ph. D	Intelligent Information Processing	Computer System
4	Peng Manman	Professor	Ph. D	Computer Architecture	Computer Organization and Design
5	Luo Juan	Professor	Ph. D	The Internet of Things and cloud Computing	Introduction to the Internet of Things, Design and Implementation of Internet of Things
6	Wu Qiang	Associate Professor	Ph. D	Advanced Computing	Computer Organization and Design, Computer System Architecture
7	You Zhiqiang	Associate Professor	Ph. D	Integrated Circuit Design	Digital Logical
8	Xie Kun	Associate Professor	Ph. D	Wireless Sensor Network	Computer Network
9	Yang Lei	Associate Professor	Ph. D	Distributed Computing	Computer Network, Distributed Computing System
10	Wang Hanwu	Associate Professor	Ph. D	Wireless Communication Technology	Wireless Network and Mobile Computing
11	Li Rui	Lecturer	Ph. D	Real-time System	Operating System

Cont

No.	Name	Title	Education	Research Domain	Courses
12	Liu Yan	Lecturer	Ph. D	CPU Design	Computer System, Reconfigurable Computing Technology
13	Huang Lida	Lecturer	Master	Real-time Computing	Computer System, Real-time Computing System Design
14	Yuan Wendan	Lecturer	Ph. D	Digital System Design	Microelectronic Circuit, Digital System Design
15	Ling Chunqing	Lecturer	Master	Digital System Design	Digital Logic, Digital System Design
16	Xiao Ling	Lecturer	Ph. D	Wearable Computing	Wireless Network and Mobile Computing, Communication Technology of the Internet of Things
17	Fu Bin	Lecturer	Ph. D	Wireless Communications and Networks	Introduction to the Internet of Things, Principle on RFID and Sensors

Ⅶ. Professors-in-charge

No.	Name	Title	Education	Research Domain	Courses
1	Luo Juan	Professor	Ph. D	The internet of things and cloud computing	Introduction to the Internet of Things, Design and Implementation of Internet of Things

（翻译人：李智勇）