东北大学秦皇岛分校本科课程教学大纲

一、课程基本信息

<table>
<tr><td>开课单位</td><td colspan="3">计算机与通信工程学院</td><td>课程代码</td><td colspan="5">3100114002</td></tr>
<tr><td>中文名称</td><td colspan="8">电子工程高级实践</td></tr>
<tr><td>英文名称</td><td colspan="8">Applications Studio</td></tr>
<tr><td>总学时</td><td>3W</td><td rowspan="2">理论学时</td><td rowspan="2">0</td><td rowspan="2">实验学时</td><td rowspan="2">0</td><td rowspan="2">上机学时</td><td rowspan="2">0</td><td rowspan="2">设计学时</td><td rowspan="2">3W</td><td rowspan="2">课外学时</td><td rowspan="2">0</td></tr>
<tr><td>学　分</td><td>3</td></tr>
<tr><td>课程类型</td><td colspan="8">☐理论课程　☐理论（含实验）课程　☑实践类课程</td></tr>
<tr><td>课程类别</td><td colspan="8">☐通识类 ☐学科基础类　☐专业方向类　☑实践类</td></tr>
<tr><td>适用专业</td><td colspan="8">通信工程　Communication Engineering</td></tr>
<tr><td>先修课程</td><td colspan="8">C++程序设计基础　Fundamentals of C++ Programming</td></tr>
<tr><td>建议开课学期</td><td colspan="8">☐1-1 ☐1-2 ☐2-1 ☑2-2 ☐3-1 ☐3-2
☐4-1 ☐4-2 ☐5-1 ☐5-2 ☐*（代表每学期都开设）</td></tr>
<tr><td>考核方式</td><td colspan="3">☐考试 ☑考查</td><td>成绩分制</td><td colspan="4">☑百分制 ☐五级制 ☐二级制</td></tr>
<tr><td>使用教材</td><td colspan="8">无 None</td></tr>
<tr><td>参考书及教学资源</td><td colspan="8">1、 https://lms.cloudcampus.com.cn/courses/31
2、 https://lms.cloudcampus.com.cn/courses/81</td></tr>
<tr><td>其他说明</td><td colspan="8">无</td></tr>
</table>

二、课程简介

中文描述

本课程为东北大学悉尼智能科技学院大二年级第二学期的一门必修的实践类课程。本课程不是传统的课程讲授与指导的课程。本课程的目的是提供一个环境，让学生能够将他们拥有或可以获得的知识转化为他们可以做的事情。项目的各个阶段是学生学习如何将他们所学到的专业知识应用到可以实现的具体项目工程上。这些阶段遵循评估、设计和实施的经典工程范式。

在电子工程高级实践这门课程中，学生专注于学习实现所选产品基本功能所需的基础知识和技能。课程强调创造力和探索不同方法，既要培养技术专长，又要培养团队合作、沟通和项目管理能力。

学生应该利用电子工程高级实践这门课程的机会，通过学习个人感兴趣的工程项目或特定的主题学习，扩展从其他课程科目中获得的知识。

English Description

This is a studio subject. It is not a conventional subject guided by a curriculum. Its purpose is to provide an environment in which students can translate the knowledge they have or can gain into what they can do. The stages of the projects are the means by which students learn how to apply their knowledge to what they can achieve. The stages follow the classic engineering paradigm of assess, design, and implement.

In the Fundamentals Studio, students focus on learning fundamental knowledge and skills needed to achieve the basic functionality of their chosen product. There is an emphasis on creativity and exploration of different approaches, both in developing technical expertise, as well as teamwork, communication, and project management.

Students should use this as an opportunity to extend the knowledge gained from other coursework subjects by learning new topics of personal interest.

三、课程目标

1、知识目标：

1-1：掌握完成工程项目的一般过程，了解完成过程中所需要的相关专业基础知识。

1-2：理解并掌握工程项目的基础原理和方法，了解应用原型。

1-3：模型或者原型的构建，根据计划满足产品的要求。

2、能力目标：

2-1：在创造力培养，探索新的方法，培养团队意识方面获得提升。

2-2：根据计划，确定产品所需要的需求，并制定产品需求来满足这些需求。

2-3：展示学生的基本知识，技能和工程记录技能的进步。

2-4：提升团队有效合作的方式，具备解决复杂工程问题的能力。

3、德育/素养目标：

3-1：具有正确的价值观和社会责任感，培养优秀的职业道德和行为规范。获得良好的口头和书面沟通能力，团队协作意识和人际交往能力。

3-2：提高学生的创新意识，不怕困难和有效解决实际问题的能力

3-3：拥有良好的跨文化和领域的沟通能力，培养能对专业领域的任务进行合理的规划，分解任务并按时、高效率和高质量完成的能力。

表 1 课程目标与毕业要求的对应关系

毕业要求	指标点	课程目标	关联 (H/M/L)
1、工程知识:能够将数学、自然科学、工程基础和专业知识用于解决复杂工程问题。	指标点 1-3:了解本专业涉及相关行业的发展趋势以及相关产业的运营模式，具备在本专业相 关领域进行工程设计、技术创新的能力。	1-1，1-2，1-3，2-1，3-1	H
2、问题分析：能够应用数学、自然科学和工程科学的基本原理、方法和手段，识别、表达、并通过文献研究分析复杂工程问题，以获得有效结论。	指标点 2-2：能够应用数学、自然科学和工程科学的基本原理、方法和手段，针对实际复杂工程问题设计针对性的技术方案，并综合运用文献、科学理论和技术手段予以解决。	1-2，1-3，2-2	M
3、设计/开发解决方案:能够设计针对复杂工程问题的解决方案，设计满足特定需求的系统、 单元或流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境 等因素。	指标点 3-1:能够设计针对本专业相关复杂工程问题的解决方案，能够设计和开发实现特定功 能、满足特定需求的信息传输、信号处理或网络通信系统;	1-2，1-3，2-1，2-4	M
4、研究:能够基于科学原理并采用科学方法对复杂工程问题进行研究，包括设计实验、分析 与解释数据、并通过信息综合得到合理有效的结论。	指标点 4-1:能够基于科学原理并采用科学方法，在本专业相关理论指导下对复杂工程问题设计实验进行研究;	1-1，1-2，2-4,3-3	M
5、使用现代工具:能够针对复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程 工具和信息技术工具，包括对复杂工程问题的预测与模拟，并能够理解其局限性。	指标点 5-2:熟悉解决本专业相关复杂工程问题所需的技术和资源，能够运用现代信息技术进 行文献检索和资料查询，获取专业解决方案;	1-2，2-2,3-2	H
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。	指标点 9-2:具有良好的跨文化、跨领域沟通交流能力，适应本专业相关行业的团队协作机制， 积极主动的在团队中发挥作用。	1-4，2-1，2-2，2-3,3-2,3-3	H

10、沟通：能够就本专业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。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。	指标点 10-2：熟练掌握英语，能够在本专业相关领域进行有效的技术沟通和交流。	2-2,2-3, 3-2,3-3	H
11、项目管理与财务：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。	指标点 11-1：掌握基本的工程管理原理和经济决策方法，能对通信相关领域的新技术、新应用进行技术分析和比较；	2-3,2-4, 3-2,3-3	H

四、主要教学内容

（一）实践教学 Practice

Unit Title1：Introduction（支撑教学目标 1-1、2-1、2-2、3-1、3-2、3-3）

【1】知识点：

(1) Subject journey.

(2) Introduction to the SW and HW used during the subject.

(3) Personal Design Journal and Group Learning Contract.

【2】学习目标：

理解：Methods and principles of engineering practice; Subject overview and requirements.

掌握：Personal Design Journal and Group Learning Contract..

【3】重点内容：

How to write Personal Design Journal and Group Learning Contract.

【4】难点内容：

Making Project proposal.

【5】思政案例：

Cultivate correct values and social responsibility and cultivate excellent professional ethics and codes of conduct. Cultivate the spirit of not being afraid of difficulties, not afraid of failure, daring to try, and facing difficulties, and cultivate their own good qualities of care and patience in the learning process.

Unit Title2：Detailed introduction to the course product（支撑教学目标 1-2、2-1、2-2、3-1、3-2）

【1】知识点：

(1) Application of Trello and other tool for Personal Design Journal.

(2) Individual surveys and start creating Group Learning Contracts.

(3) Concept of Group Learning Contract.

【2】学习目标：

理解：Concept of Group Learning Contract; Trello or other tool for Personal Design Journal.

掌握：Application of Trello and other tool for Personal Design Journal.

【3】重点内容：

Application of Trello and other tool for Personal Design Journal.

【4】难点内容：

Concept of Group Learning Contract.

【5】思政案例：

Familiar with cross-cultural and cross-domain effective communication and communication methods, and master effective ways to acquire knowledge.

Unit Title3：Team and Product selection（支撑教学目标 1-3、2-1、2-3、3-1、3-2）

【1】知识点：

(1) Details of products.

(2) the Product Proposal writing.

(3) Implement of Group Learning Contract.

【2】学习目标：

理解：Team and Product selection; Details of products.

掌握：The specific software and hardware used in the assignment of the subject.

【3】重点内容：

The specific software and hardware used in the assignment of the subject.

【4】难点内容：

The use of specific software and hardware used in the assignment of the subject

【5】思政案例：

Cultivate a holistic view of subject application, encourage students to innovate and solve problems.

Unit Title4：Work on Product Proposal（支撑教学目标 1-3、2-3、3-1、3-4）

【1】知识点：

(1) Preparation of Group Learning Contracts.

(2) Individual Learning Activities and “Teach the team” Activities.

(3) Product Proposal agreed to by the lecturer and product owner.

【2】学习目标：

理解：Preparation of Group Learning Contracts; Details of products; Individual Learning Activities and “Teach the team” Activities

掌握：Product Proposal agreed to by the lecturer and product owner.

【3】重点内容：

Submit PDJ Weekly Progress;.

【4】难点内容：

Product Proposal agreed to by the lecturer and product owner.

【5】思政案例：

By presenting specific engineering projects, the course contrasts China's past technological backwardness with its current technological leaps. It emphasizes that science and technology are the primary productive forces, thereby inspiring students' sense of responsibility and self-confidence.

Unit Title5：Product design/implementation（支撑教学目标 1-3、2-2、2-3、3-1、3-3）

【1】知识点：

(1) Concept of project、classification and prototypes

(2) Project design and debugging.

(3) Implement of Group Learning Contract.

【2】学习目标：

理解：Team and Product selection; Details of products.

掌握：The specific software and hardware used in the assignment of the subject.

【3】重点内容：

Project design and debugging.

【4】难点内容：

Project debugging

【5】思政案例：

Developing engineering mind, and matching the most appropriate technical approach with task requirements.

Unit Title6：Programming debugging（支撑教学目标 1-2、1-3、2-1、2-3、3-1、3-2）

【1】知识点：

(1) Programming debugging Methods.

(2) Feasibility judgment of system design function realization.

【2】学习目标：

理解：Programming debugging；Feasibility judgment of system design function realization.

掌握：Programming debugging Methods.

【3】重点内容：

Programming debugging Methods.

【4】难点内容：

The use of Programming debugging Methods in the selected projects.

【5】思政案例：

Familiar with cross-cultural and cross-domain effective communication and communication methods, and master effective ways to acquire knowledge.

Unit Title7：Arduino Setup（支撑教学目标 1-2、1-3、2-1、2-3、3-2）

【1】知识点：

(1) The using of Arduino software

(2) The function of Arduino.

【2】学习目标：

理解：Introduction to Arduino and its development history.

掌握：Setup and using of Arduino.

【3】重点内容：

Joint design of software and hardware.

【4】难点内容：

Joint design of software and hardware systems.

【5】思政案例：

By explaining the typical engineering projects of Arduino microcontroller, students can develop their ability to comprehensively apply the knowledge they have learned, stimulate them to integrate the theoretical knowledge they have learned into specific projects, and enhance their interest and enthusiasm in learning professional knowledge.

Unit Title8：Product implementation（支撑教学目标 1-2、2-2、2-3、3-2）

【1】知识点：

(1) Combine the actual modification function.

(2) Revise Group Learning Contract as required.

(3) Revision of product report

【2】学习目标：

理解：Revise Group Learning Contract as required

掌握：Revision of product report.

【3】重点内容：

Combine the actual modification function.

【4】难点内容：

Combine the actual modification function according the selected projects.

【5】思政案例：

Be aware of the significant meanings of engineering project design in society economic development.

Unit Title9：Joint debugging of software and hardware（支撑教学目标 1-3、2-1、2-3、3-1、3-3）

【1】知识点：

(1) Fixing program running and hardware problems.

(2) UI Configuration and Extension Activities.

【2】学习目标：

理解：Joint debugging of software and hardware;

掌握：Methods of fixing program running and hardware problems.

【3】重点内容：

Fixing program running and hardware problems.

【4】难点内容：

Fixing program running and hardware Methods in the selected projects.

【5】思政案例：

Familiar with cross-cultural and cross-domain effective communication and communication methods, and master effective ways to acquire knowledge.

Unit Title10：Feasibility judgment of system design function realization（支撑教学目标 1-3、2-3、2-3、3-1、3-3）

【1】知识点：

(1) UI setup and refinement.

(2) Modify requirements that are not relevant to the actual operation.

【2】学习目标：

理解：Feasibility judgment of system design function realization.

掌握：UI setup and refinement; Modify requirements that are not relevant to the actual operation.

【3】重点内容：

Modify requirements according to the selected project

【4】难点内容：

Modify requirements that are not relevant to the actual operation

【5】思政案例：

By explaining the debugging and testing process of a typical project, students can cultivate their basic scientific literacy, enhance their patience and rigor in the face of specific engineering projects, and be able to carry out basic engineering debugging and testing

（二）实验教学

None

五、教学安排与学时分配

Unlike conventional subjects guided by a curriculum, our subject's purpose is to provide an environment in which students can translate the knowledge they have or can gain into what they can do. The stages of the projects are the means by which students learn how to apply their knowledge to what they can achieve. The stages follow the classic engineering paradigm of assess, design, and implement.

In the Fundamentals Studio, students focus on learning fundamental knowledge and skills needed to achieve the basic functionality of their chosen product. There is an emphasis on creativity and exploration of different approaches, both in developing technical expertise, as well as teamwork, communication, and project management.

Students should use this as an opportunity to extend the knowledge gained from other coursework subjects by learning new topics of personal interest.

The allocation of class hours is shown in Table 3.

表 3 学时分配表

讲 课 内 容		学时				
		讲课	实验	实践	设计	实践
Unit title1	Subject journey, Introduction to the course and the provided product list	0	0	0	0	2
Unit title1	Introduction to the SW and HW used during the subject	0	0	0	0	2
Unit title2	Team creation，Introduction to Trello or other tool for Personal Design	0	0	0	0	6
Unit title3	Team and Product selection and Start the Product Proposal	0	0	0	0	4
Unit title4	Individual Learning Activities and “Teach the team” Activities	0	0	0	0	4
Unit title5	Project design and debugging	0	0	0	0	4
Unit title6	Product implementation	0	0	0	0	6
Unit title7	Fixing program running problems	0	0	0	0	8
Unit title8	Feasibility judgment of system design function realization	0	0	0	0	4
Unit title9	Fixing program running problems and hardware debugging problems	0	0	0	0	4
Unit title10	Final Product Presentations, Complete and submit Group Final	0	0	0	0	4
小计		0	0	0	0	48
总计	48（3W）					

六、教学方法

1、Multi-media-based lecturing

2、Combining theory with industrial practical problems

3、Knowledge delivery with ethic education

4、Problem-based learning

七、成绩评定

The Assessment of this subject is composed of the final marks and the behavior marks.

1、Behavior(30%)

This part of assessment contains PDJ and students course attendance, the result type is marks, the percentage of the assessment is 30%.

2、Final(70%)

The final assignment is divided into four parts: written report, functional demonstration, group study contract GLC and product proposal, the result type is marks, the percentage of the assessment is 70%.

八、评价及持续改进

1、The subject coordinator shall be responsible for the syllabus discussion and improvement, and the revised version shall be submitted to deputy dean (teaching affairs) for reviewing then to executive dean for approval

2、The subject coordinator shall revise the syllabus based on the teaching content, effect and result distribution while optimize the assessment measures.

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批准： 史闻博

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