

## 课程详述

### COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	<b>课程名称 Course Title</b>	工业产品设计方法与实践 Industrial Product, Design & Development Methods
2.	<b>授课院系 Originating Department</b>	创新创业学院 ICOLLEGE
3.	<b>课程编号 Course Code</b>	IN0004
4.	<b>课程学分 Credit Value</b>	2
5.	<b>课程类别 Course Type</b>	通识通修选修课程 General Education (GE) Elective Courses
6.	<b>授课学期 Semester</b>	秋季学期 Fall semester
7.	<b>授课语言 Teaching Language</b>	中文 CHINESE
8.	<b>授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation &amp; Contact (For team teaching, please list all instructors)</b>	张冬 ZhangDong, 创新创业学院 ICOLLEGE, zhangd6@sustc.edu.cn, 13323587131
9.	<b>实验员/助教、所属学系、联系方式（请列出本课所有教辅人员） Tutor/TA(s), Contact (Please list all)</b>	尹明 YinMing, 创新创业学院 ICOLLEGE, yinm@mail.sustc.edu.cn
10.	<b>选课人数限额(可不填) Maximum Enrolment (Optional)</b>	40

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other (Please specify)	总学时 Total
学时数 Credit Hours	16		32		48

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	有基本的编程基础（不限编程语言种类） Fundamental programming basics (Any programming languages)
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	
14. 其它要求修读本课程的学系 Cross-listing Dept.	

### 教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives	<p>工业产品设计涉及到机械工程、电子技术、信息技术、传感器技术、自动控制技术、人机工程学、美学等多学科，是多学科知识的综合运用。本课程从工业产品设计的基本方法出发，融合理论教学和实例教学，通过实验和引导性实验强调对学生综合实践能力和工程能力的训练和培养。</p> <p>Industrial product design involves many disciplines such as mechanical engineering, electronic technology, information technology, sensor technology, automatic control technology, ergonomics and aesthetics etc., is a comprehensive application of multidisciplinary knowledge. This course starts from the basic method of industrial product design, integrating theoretical teaching and example teaching, and emphasizes the training and cultivation of students' comprehensive practical ability and engineering ability through experiments and guided experiments.</p>
16. 预达学习成果 Learning Outcomes	<p>通过学习本课程，使学生了解和掌握工业产品设计中常用的机械装置、控制电路和软件算法等工具，结合实验和引导性实验培养学生的工业产品设计能力和新产品开发能力，初步让学生学会设计工业产品。</p> <p>This course can enable the students to understand and master the tools such as mechanical devices, control circuits and software algorithms etc. commonly used in industrial product design, train the ability of industrial product design and new product development through experiments and guided experiments, and initially let students learn to design industrial products.</p>
17. 课程内容及教学日历（如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人） Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)	

## 一、教学日历 Calendar

教 学 内 容	讲授	实验/实践	合计
第一讲：常用开源软件开源硬件概述与使用 Lecture 1 Overview and Use of Open Source Software, Open Source Hardware	2	4	6
第二讲：数字图像处理概述与实践 Lecture 2 Overview and Practice of Digital Image Processing	2	4	6
第三讲：机器人技术与学科竞赛 Lecture 3 Robotics and Discipline Competition	2	4	6
第四讲：无人机技术与学科竞赛 Lecture 4 Drone Technology and Discipline Competition	2	4	6
第五讲：机械加工基础与实践 Lecture 5 Basic Principles and Practices of Mechanical Machining	2	4	6
第六讲：3D 打印基础与实践 Lecture 6: Basic Principles and Practices of 3D Printing	2	4	6
第七讲：深度学习概述与实践 Lecture 7: Overview and Practice of Deep Learning	2	4	6
第八讲：学科竞赛综述 Lecture 8: Summary of Discipline Competition	2	4	6
合 计	16	32	48

## 二、课程内容 Content

### 第一讲 常用开源软件、开源硬件概述与使用

#### Lecture 1 Overview and Use of Open Source Software, Open Source Hardware

内容：1、开源软件基本概念和发展史；2、开源硬件基本概念和发展史；3、常用开源软件；4、常用开源硬件；5、实验基于 Linux 的开源软件的安装和实验；6、Arduino、树莓派等开源硬件实验。

Contents: 1. Basic concepts and history of open source software; 2. Basic concepts and history of open source hardware; 3. Commonly used open source software; 4. Commonly used open source hardware; 5. Installation and experiment of the open source software experimental based on Linux; 6. Open source hardware experiments e.g. Arduino, Raspberry Pi etc.

### 第二讲 数字图像处理概述与实践

#### Lecture 2 Overview and Practice of Digital Image Processing

内容：1、数字图像处理基本概念；2、数字图像处理常用算法；3、基于 Python 和 OpenCV 的数字图像处理；4、实验使用 Python 和 Opencv 进行数字图像处理。

Contents: 1. Basic concepts of digital image processing; 2. Common algorithms for digital image processing; 3. Digital image processing based on Python and OpenCV; 4. Experiments using Python and Opencv for digital image processing.

### 第三讲 机器人技术与学科竞赛

#### Lecture 3 Robotics and Discipline Competition

内容：1、机器人技术概述；2、机器人学科竞赛概述；3、机器人学科竞赛实例剖析；4、实验设计自己的实体机器人或者仿真机器人。

Contents: 1. Overview of robotics; 2. Overview of robotics competitions; 3. Example analysis of robotics disciplines; 4. Experimental design of their own physical robots or artificial robots.

### 第四讲 无人机技术与学科竞赛

#### Lecture 4 Drone Technology and Discipline Competition

内容：1、无人机基本概念；2、无人机学科竞赛概述；3、滑翔翼无人机开发基础；4、四旋翼无人机开发基础；5、实验动手设计简单无人机系统

Contents: 1. Basic concepts of drones; 2. Overview of drone competitions; 3. Development basis of glider-wing drones; 4. Development basis of four-rotor drones; 5. Simple hands-on drone system design for experiments.

### 第五讲 机械加工基础与实践

#### Lecture 5 Basic Principles and Practices of Mechanical Machining

内容：1、CAD制图基础；2、OpenScad平面绘图基础；3、激光切割机原理；4、实验设计简单机械装置，并采用激光切割成型。

Contents: 1. CAD drawing basis; 2. OpenScad Plane drawing basis; 3. Principles of laser cutting machine; 4. Experimental design of simple mechanical device and properly shaped by laser cutting.

### 第六讲：3D打印基础与实践

#### Lecture 6: Basic Principles and Practices of 3D Printing

内容：1、3D打印基础；2、OpenScad 3D绘图基础；3、3D打印机原理；4、实验设计3D模型并且进行3D打印成型。

Content: 1. 3D Printing basis; 2. OpenScad 3D Drawing basis; 3. 3D Printer principle; 4. Experimental design of 3D models and 3D printing.

### 第七讲：深度学习概述与实践

#### Lecture 7: Overview and Practice of Deep Learning

内容：1、深度学习概述；2、Keras基础；3、深度学习实例；4实验实现一个基于Keras的基本深度学习应用。

Contents: 1. Deep learning overview; 2. Keras basics; 3. Deep learning examples; 4. Experiment to realize an application of basic deep learning based on Keras.

### 第八讲：学科竞赛综述

#### Lecture 8: Summary of Discipline Competition

内容：1、机器人、无人机类专项竞赛概述；2、挑战杯类综合赛事竞赛综述；3、电子设计、数学建模类基础能力型竞赛综述；4、实践：根据自身情况制定一个竞赛参赛方案。

Contents: 1. Summary of special competitions for robots and drones; 2. Summary of multi-competitions for

challenge cup competitions; 3. Summary of basic competence competitions for electronic design and mathematical modeling; 4. Practice: Formulating a competition based on their own situation Program.

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

**教材 Textbook:**

- 1、《Python 机器学习及实践：从零开始通往 Kaggle 竞赛之路》范淼等 著清华大学出版社，2016
- 2、《Arduino 权威指南》，[美] Michael Margolis 著；杨昆云 译，人民邮电出版社，2015（第2版）

**参考资料 Reference :**

- 1、《无人机 DIY 一册通》，[美] 约翰·贝克托（John Baichtal） 著；姚军 译，人民邮电出版社，2016
- 2、《深度学习 [deep learning]》，[美] Ian, Goodfellow, 等著，人民邮电出版社，2017
- 3、《Deep Learning with Keras》，Antonio Gulli 等著，Packt Publishing, 2017

<b>教学评估 ASSESSMENT</b>				
19. 评估形式 Type of Assessment	评估所需时间 Duration	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		10%		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects		45%		
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		45%		
其它（可根据需要 改写以上评估方 式） Others (The above may be modified as necessary)				

20. 记分方式 **GRADING SYSTEM**

- A. 十三级等级制 **Letter Grading**  
 B. 二级记分制（通过/不通过） **Pass/Fail Grading**

**课程审批 REVIEW AND APPROVAL**

21. 本课程设置已经过以下责任人/委员会审议通过  
**This Course has been approved by the following person or committee of authority**