

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.	课程名称 Course Title	高等图形学与 CAD Advanced Graphics and Computer Aided Design
2.	授课院系 Originating Department	机械与能源工程系 Department of Mechanical and Energy Engineering
3.	课程编号 Course Code	ME211
4.	课程学分 Credit Value	2
5.	课程类别 Course Type	通识选修课程 General Education (GE) Elective Courses
6.	授课学期 Semester	秋季 Fall
7.	授课语言 Teaching Language	中英双语 English & Chinese
8.	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 & Contact (For team teaching, please list all instructors)	魏艳 南方科技大学 机械与能源工程系 Department of Mechanical and Energy Engineering
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	30

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	ME102 (CAD 与工程制图)
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

The activity of mechanical engineers has been changed during the last decade because the computer became an integral part of the design process. The engineers can solve more complex tasks with more effective and productive work. The aim of this course is to overview the basis of computer aided engineering design techniques with focus on feature based parametric modelling of complex 3D models. The course also covers reverse engineering and cellular structure regards to additive manufacturing. The course is delivered through lectures, labs and projects.

在过去的十年中，计算机建模成为设计过程的一个很重要的组成部分，机械工程师的活动发生了变化，工程师可以通过更有效和高效的工作来解决更复杂的任务。本课程的目的概述计算机辅助工程设计技术的基础，重点讲述复杂三维模型建构方式（实体建模、边界建模、逆向工程和数学方程建模）及对应建模软件的操作（SolidWorks, 3ds Max, Geomagic Design X），该课程还涵盖了逆向工程和增材制造中优化多孔模型的建模。本课程以课堂讲解为主线，学生主要通过上机操作以及自选项目来完成课程的学习。

16. 预达学习成果 Learning Outcomes

1. 学生在 CAD 环境中学习关于实体建模和工程设计的基础知识，掌握有效利用 SolidWorks 来创建满足设计意图且可轻松适应不断变化的需求的强大设计。

2. 学习使用不同的设计软件 (SolidWorks, 3ds Max, Geomagic Design X 等), 可确保为更复杂的设计优化问题提供有效和高效的工作

1. Students will study topics fundamental to solid modelling and engineering design in a CAD environment. Effective uses of SolidWorks to create robust designs that capture design intent, are producible, and easily adapted to changing requirements will be a key objective.

2. Learn to use different software tools ensure effective and productive work for more complex problems

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.)

理论课内容:

一、简介: CAD 辅助设计, CAD 系统的分类, 应用领域, 新产品的创造和开发过程, 产品的发展, 3D 模型建构方式及对应建模软件 (2 学时)

Introduction: CAD-computer aided design, Classification of CAD systems, Areas of application, Process of new product creation and development, 3D models creating methods and the related CAD software

二、几何构造模型: 线框建模; 曲面建模; 实体建模 (2 学时)

Geometric modelling: Wireframe modelling Surface modelling, Solid modelling

三、基于特征的几何造型、特征-构件建模 (2 学时)

Feature-Based geometric modelling, Features-Component modelling

四、钣金零件的建模: 基于制造的零件, 钣金特征, 平面模型计算 (2 学时)

Modelling of Sheet Metal Parts, Manufacturing based design, Sheet metal features, Flat pattern calculation

五、曲面建模: 曲面描述的数学基础, CAD 系统中典型的曲面及建构 (2 学时)

Surface modelling: Mathematical base of the surface description, Applied surfaces in the practice of the CAD Typical surface-operation in the CAD systems

六、工程装配图: 装配方法基础, 装配的非几何参数, 装配-几何关系, 装配-运动关系, 装配结构 (2 学时)

Engineering, assembly modelling: Introduction to the assembly methods, Non-geometric parameters of the assembly, Assembly-Geometric relationships, Assembly-kinematic relationships, Assembly-other relationships, Assembly structure

七、逆向工程技术: 背景, 3D 扫描技术, 点云操作, CAD 建模与重建 (2 学时)

Reverse Engineering Technology: Definition and background, Reverse Engineering Process, 3D scanning, Point cloud manipulation, CAD modelling, reconstruction, Verification

八、增材制造中的多孔优化结构: 简介, 结构设计 (2 学时)

Cellular structures for additive manufacturing: Introduction to Additive manufacturing, Design for additive manufacturing

上机课内容:

二维草图和三维模型数据的相互转化, 放样生成复杂模型 (2 学时)

Import and Export-2D and 3D Translation, Advanced lofting exercise

模具工具箱, 铸造零件, 复杂草图, 拔模分析 (2 学时)

Mold Tools, cast part, complex draft and draft analysis

设计表的配置 (2 学时)

Configurations with Design Tables

方程, 扫描生成复杂模型 (2 学时)

Equations, Modelling complex parts using sweeps

高等钣金设计 (2 学时)

Advanced Sheet Metal Design

装配和绘图自动化, 设计表 (2 学时)

Assembly and Drawing Automation, Design Tables

自由曲面 (2 学时)

Freeform Surface

群组, 捕捉模式, 点云操作, 拟合均匀曲线 (2 学时)
Capture mode, point cloud operation, curve fitting

派生曲线, 投影曲线到曲面, 曲面上构造 3D (2 学时)
Curves derivation, project curves to surfaces, construct 3D solid model with surfaces

放样, 扫描曲面, 剪辑曲面 (2 学时)
Manipulate surfaces with Loft, sweep, and clip commands

曲面分割, 修建曲面, 曲面匹配 (4 学时)
Surface segmentation, surface modification and matching

曲面与点云误差, 点云排序, 反射及反射线 (2 学时)
Error between surface and points cloud, point cloud sorting, reflection

点阵结构 (2 学时)
Lattice structure

蜂窝结构, 泡沫结构 (2 学时)
Honeycomb structure, Foam Structure

逆向工程, 三维扫描仪 (2 学时)
Reverse Engineering, 3D Scanner

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

1. 《逆向工程基础及应用实例教程》，张晋西，郭学琴，张甲瑞等，清华大学出版社，2011
2. Cellular Materials in Nature and Medicine, Lorna J. Gibson, Michael F. Ashby and Brendan A. Harley, Cambridge

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance				
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects		20%		
平时作业 Assignments		60%		
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		20%		

其它（可根据需要
改写以上评估方
式）
Others (The
above may be
modified as
necessary)

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20. 记分方式 GRADING SYSTEM

<input checked="" type="checkbox"/> A. 十三级等级制 Letter Grading <input type="checkbox"/> 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

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