

西安交通大学《概念建模工具》课程教学大纲

一、课程基本信息

I. Basic Information

| | | | |
|------------------------------------|--|---------------------|----|
| 课程名称 Course Title | 概念建模工具 Concept Modeling Tools | | |
| 课程编号 Course Number | | | |
| 课程学分 Credits | 3 | 总学时 Credit Hours | 64 |
| 学时分配 Assignment of Credit Hours | 理论:____ 实验:____ 上机:____ 课外:____ (课外学时不计入总学时) Lecture: 32 Studio: 32 Practice in the IT room: 0 Extracurricular: 0 | | |
| 课程类型 | <input type="checkbox"/> 公共课程 Public Course <input type="checkbox"/> 通识课程 General Education Course <input type="checkbox"/> 学科门类基础课 <input type="checkbox"/> 专业大类基础课 <input checked="" type="checkbox"/> 专业核心课 Specialized Core Course <input type="checkbox"/> 专业选修课 Specialized Elective Course <input type="checkbox"/> 集中实践 Intensive Practice | | |
| 开课学期 | <input type="checkbox"/> 1-1 <input checked="" type="checkbox"/> 1-2 <input type="checkbox"/> 2-1 <input type="checkbox"/> 2-2 <input type="checkbox"/> 3-1 <input type="checkbox"/> 3-2 <input type="checkbox"/> 4-1 <input type="checkbox"/> 4-2 <input type="checkbox"/> 5-1 <input type="checkbox"/> 5-2 | | |
| 先修课程 Prerequisites | <ul style="list-style-type: none"> - Engineering Drawing - Basics on Design Sketch | | |

| | |
|--|---|
| <p>教材、参考 书及其他资料</p> <p>Materials (Textbook, Bibliography or Referencing and Supplementary Materials)</p> | <p>[序号] 作者 1, 作者 2.教材名称.出版地: 出版者, 出版年.</p> <p>例: [1] 刘国钧, 陈绍业.电路分析.北京: 高等教育出版社, 1994.</p> <p>[1] Author 1, Author 2. Title of the textbook. Publication place: publisher, year of publication.</p> <p>Textbook: Essential skills for 3D modeling, rendering, and animation</p> <p>Author(s): Nicholas Bernhardt Zeman</p> <p>Publisher: Taylor & Francis, Year: 2015</p> <p>Software: Autodesk Alias AutoStudio</p> |
|--|---|

二、课程目标及学生应达到的能力

II. Course Objectives and Expected learning outcomes

(工科专业对标工程教育认证标准中专业毕业要求的 12 条具体指标点, 其他专业对标行业/评估标准中专业毕业要求的具体指标点)

By the end of this course, students will be able to:

1. describe and explain the role of different types of digital 3D models in the industrial design process
2. communicate design ideas using 3D digital models as 3D sketches

3. develop models to simulate rigid body using 3D digital surface modelling techniques that allow to describe complex shapes that need a continuous check both on aesthetic quality and on accuracy

4. develop models to simulate non rigid body using a mix of subdivision & surface modelling techniques that allow to describe very flexible shapes

5. know the methodologies to setup and to transfer 3D digital models to 3D printers and to CAD software for engineering

课程目标与专业毕业要求的关联关系

Correlation between course objectives and graduation requirements
for the program

毕业要求：

Students of this program should meet the following graduation requirements:

A. Master extensive theories on engineering and technology, humanities, social sciences, natural sciences, etc., demonstrate high scientific literacy, strong humanistic and artistic dispositions, and physical and mental well-being;

B. Have solid theoretical knowledge of industrial design, and master the knowledge related to product and its development, design, aesthetics, engineering, technology, management, planning, teamwork, professional

ethics, etc.;

C. Master methods and skills of industrial design and related fields, be able to apply multidisciplinary knowledge into reality, and have strong expression, creation, practical, problem analysis and solving skills in the field of design;

D. Have good communication skills, teamwork spirit, a strong sense of social responsibility, and international vision, and be capable of applying interdisciplinary knowledge in pioneering work.

| 毕业要求 课程目标 | A | B | C | D |
|--------------|---|---|---|---|
| 1 | H | M | L | H |
| 2 | L | M | H | M |
| 3 | L | M | H | L |
| 4 | L | M | H | L |
| 5 | M | H | H | M |

注：毕业要求中 A、B、C、D、E、F、G、…对应毕业要求中各项具体内容。课程目标与专业毕业要求的关联关系用 H/M/L 标注。

Note: A, B, C and D indicate the specific aspects of the graduation requirements. H, M and L refer to a strong, medium and weak correlation between the course objectives to the graduation requirements respectively.

三、教学内容简介

III. Description of teaching contents

| 章节顺序 | 章节名称 Chapter Title | 知识点 Teaching Points | 参考学时 Credit Hours |
|------|-----------------------------------|---|----------------------|
| 1 | Interaction in a 3D virtual space | <ul style="list-style-type: none"> • Introduction to Computer Aided Industrial Design • How to build basic shape models in a 3D space • Controlling and organizing geometries • Introduction to Bézier/NURBS curves | 16 |
| 2 | Sketch modelling | <ul style="list-style-type: none"> • Introduction to subdivision surfaces • The basics of sketch modelling • Advanced use of sub-d • Intermediate exam nr. 1 | 16 |
| 3 | Accurate surface modelling | <ul style="list-style-type: none"> • Introduction to Bézier/NURBS surfaces • Trimmed surfaces & circular fillets • Alignment & continuity • Blend surfaces | 16 |
| 4 | From CAID to CAD and RP | <ul style="list-style-type: none"> • From surfaces to solids and vice versa • Rapid prototyping • A full design flow simulation • Intermediate exam nr. 2 | 16 |

四、教学安排详表

IV. Teaching Arrangements

| 序号 | 教学内容 Teaching contents | 学时分配 Cred | 教学方式 Teaching | 教学要求 (知识要求及能力要求) Learning Objectives | 对课程目标的支撑关系 |
|----|---------------------------|--------------|------------------|--|------------|
|----|---------------------------|--------------|------------------|--|------------|

| | | it Hou rs | Methods | (knowledge objective & ability objective) | Related to which Course Objective |
|---|---|-----------------|-------------------------|--|--|
| 1 | Interaction in a 3D virtual space | 16 | Theory & Practice | <ol style="list-style-type: none"> 1. To describe and explain the different types of digital models used in industrial design 2. To produce basic shapes in a 3D virtual space 3. To dimension and to place geometries in a 3D space | 1, 2, 3 |
| 2 | Sketch modelling | 16 | Theory & Practice | <ol style="list-style-type: none"> 1. To describe and explain the subdivision surface method to build digital models 2. To create basic models using subdivision surface tools 3. To work on sketch models to communicate a design idea | 1, 2, 4 |
| 3 | Accurate surface modelling | 16 | Theory & Practice | <ol style="list-style-type: none"> 1. To describe and explain the surface modelling software tools based on Bézier and NURBS data 2. To create free form curves and surfaces 3. To understand the three main continuity levels in the adjacent surfaces transition 4. To verify both on aesthetic quality and on accuracy of a digital model | 1, 3, 4 |
| 4 | From CAID to CAD and RP | 16 | Theory & Practice | <ol style="list-style-type: none"> 1. To understand the constraints and the opportunities in moving a model from a surface (CAID) to a solid (CAD) software modeler 2. To be able to setup a model properly for the realization of a physical prototype (RP) 3. To understand the full process from sketch to CAD | 1, 3, 5 |

注：对课程目标的支撑关系可填写大纲中第二部分课程目标的相应序号。

The column *Related to which Course Objective* can be filled in with the number of the corresponding course objective in Part II.

五、实践环节

V. Studio/Lab

| 实验编号 No. | 实验名称 Subject Name | 实验内容 Contents | 教学方法 Teaching Methods | 对课程目标的 支撑关系 Related to which Course Objective |
|-------------|----------------------|------------------|-----------------------------|---|
| 1 | n/a | | | |
| 2 | n/a | | | |
| 3 | n/a | | | |

注：对课程目标的支撑关系可填写大纲中第二部分课程目标的相应序号

The column *Related to which Course Objective* can be filled in with the number of the corresponding course objective in Part II.

六、课外学时分配

VI. Extracurricular Practice

| 章节顺序 | 内容 Contents | 参考学时 Credit Hours | 对课程目标的 支撑关系 Related to which Course Objective |
|------|-------------|----------------------|---|
| 1 | n/a | | |
| 2 | n/a | | |
| ... | | | |

注：对课程目标的支撑关系可填写大纲中第二部分课程目标的相应序号。

The column *Related to which Course Objective* can be filled in with the number of the corresponding course objective in Part II.

七、考核方式及成绩构成

VII. Evaluation and Composition of Grades

平时： _____ %, (包含： xxxx)

实验 (上机)： _____ %; (包含： xxx)

期末： _____ %

This course includes multichoice test on theoretical aspects and practice tests: 20 % for ongoing assignments, 25 % for the mid-term practical test, 25 % for the end-term practical test, and 30 % for theoretical test at the final exam.

<本部分构成及考试方式可根据具体课程定制> Depending on the course

大纲制定者： Fausto Brevi

大纲审核者： _____

最后修订时间： _____ 年 ____ 月 ____ 日