

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	制造过程仿真与数据分析 Manufacturing Process Simulation and Data Analysis				
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	ME354				
4.	课程学分 Credit Value	2				
5.	课程类别 Course Type	专业选修课 Major 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)	路冬 机械与能源工程系 13732970595 lud@sustech.edu.cn				
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	曾千里/机械与能源工程系/zengql@sustech.edu.cn 黄渊建/机械与能源工程系/huangyj@sustech.edu.cn				
10.	选课人数限额(可不填) Maximum Enrolment (Optional)					
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

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**

通过本课程的学习，使学生具备运用 CAD/CAM/CAE 软件仿真制造过程的能力。将制造过程用数字化的方式描述，包括零件三维图形的建立、数控代码的生成及切削过程的仿真等。锻炼学生定义问题、简化问题及分析问题的能力。

Through this course, students will have the ability to use CAD/CAM/CAE software to simulate the manufacturing process. Describe the manufacturing process in a digital manner, including the creation of three-dimensional graphics of parts, generation of numerical control codes, simulation of cutting processes. Exercise students' ability to define problems, simplify problems, and analyze problems.

16. 预达学习成果 **Learning Outcomes**

完成本课程的学习后，学生应该掌握制造过程仿真的方法；具备仿真实际加工过程的能力；具备采用切削仿真的手段优化切削参数、刀具参数从而为实际加工提供指导的能力。

After completing this course, the students should master method of manufacturing process simulation. Students can simulate actual processing and can use cutting simulation method to optimize cutting parameters and tool parameters to provide guidance for actual machining.

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.)



SUSTech
Southern University
of Science and
Technology

理论课教学内容、学时分配及教学要求:			
课次	课程内容	教学要求 Objectives	学时(h)
1	实验设计与数据分析 Experimental design and data analysis	<ul style="list-style-type: none"> • 熟悉实验设计与数据分析的方法; • 能够将实验设计与数据分析的方法应用到制造过程仿真模型中。 ➢ Familiar with experimental design and data analysis methods; ➢ Ability to apply experimental design and data analysis methods to manufacturing process simulation models. 	2
2	制造过程仿真概述 Simulation of manufacturing process	<ul style="list-style-type: none"> • 理解制造过程仿真的意义及其应用范围; • 熟悉制造过程几何仿真的软件及仿真方法。 ➢ Understand the meaning of manufacturing process simulation and its application range; ➢ Familiar with software and simulation methods for geometric simulation of manufacturing processes. 	2
3	切削过程仿真 Simulation of cutting process	<ul style="list-style-type: none"> • 熟悉切削过程仿真的概念及方法; • 熟悉切削过程仿真软件及其建模方法。 ➢ Familiar with the concept and method of cutting process simulation; ➢ Familiar with cutting process simulation software and its modeling method. 	2
4	材料本构模型建立 Establish material constitutive model	<ul style="list-style-type: none"> • 熟悉材料本构模型的概念及建立方法; • 熟悉切削过程的材料本构模型建立实验方法。 ➢ Familiar with the concept and construction method of material constitutive model; ➢ Familiar with the experimental method of material constitutive model of the cutting process. 	2
5	切削过程材料模型用户子程序建立 Establish user subroutine of material model for cutting process	<ul style="list-style-type: none"> • 熟悉材料用户子程序的概念及其建立方法; • 熟悉不同材料对应的用户子程序的模型。 ➢ Familiar with the concept of material user subroutine and its establishment method; ➢ Familiar with the model of the user subroutine corresponding to different materials. 	2
6	刀具磨损仿真 Simulation of cutting tool wear	<ul style="list-style-type: none"> • 熟悉刀具磨损仿真模型及其建立方法; • 能够采用用户子程序的方式建立刀具磨损模型。 ➢ Familiar with tool wear simulation model and its establishment method; ➢ Build tool wear models using user subroutines. 	2
7	由局部切削仿真到全局仿真 From local simulation to global simulation	<ul style="list-style-type: none"> • 熟悉由局部仿真到全局仿真的建模方法; • 能够建立局部切削仿真到全局仿真的模型。 ➢ Familiar with modeling methods from local simulation to global simulation; ➢ Ability to model localized simulation to global simulation for cutting process. 	2
8	铸造过程仿真 Simulation of casting process	<ul style="list-style-type: none"> • 熟悉铸造过程仿真的建模方法; • 能够建立铸造过程仿真模型。 ➢ Familiar with the modeling method of casting process simulation; ➢ Ability to build simulation models for casting processes. 	2

实验课教学内容、学时分配及教学要求:

课次	课程内容	教学要求 Objectives	学时
1	制造过程几何仿真 Geometry simulation of manufacturing process	<ul style="list-style-type: none"> • 采用 EdgeCam 生成刀具路径; • 仿真并优化刀具路径。 ➢ Generate toolpath by using EdgeCam; ➢ Simulate and optimize toolpaths. 	4
2	切削过程仿真模型建立 Establishment of	<ul style="list-style-type: none"> • 建立切削过程(车削、铣削及钻削)仿真模型; • 预测切削过程中的切削力、切削温度及切削应力 	10

	simulation model for cutting process	等。 ➤ Establish simulation models for cutting processes (turning, milling and drilling); ➤ Predict cutting force, cutting temperature and cutting stress during cutting process.	
3	用户子程序建立 Establish user subroutine	<ul style="list-style-type: none"> • 建立材料本构模型用户子程序; • 建立切削力用户子程序; • 建立刀具磨损用户子程序。 ➤ Establish user subroutine of material constitutive model; ➤ Establish user subroutine of cutting force model; ➤ Establish user subroutine of cutting tool wear model.	8
4	由局部切削仿真到全局仿真 From local cutting simulation to global simulation	<ul style="list-style-type: none"> • 将布局仿真获得的切削力、切削热施加到全局仿真模型; • 预测全局仿真中工件的变形及应力分布。 ➤ Apply the cutting force and cutting heat obtained from the local simulation to the global simulation model; ➤ Predict the deformation and stress distribution of the workpiece in the global simulation.	4
5	铸造过程仿真 Simulation of casting process	<ul style="list-style-type: none"> • 建立铸造过程仿真模型; • 预测铸造过程中的温度及应力分布。 ➤ Establish simulation models for casting processes; ➤ Predict temperature and stress distribution during casting process.	4
6	实验设计与数据分析 Experimental design and data analysis	<ul style="list-style-type: none"> • 采用实验设计与数据分析方法分析切削仿真及铸造过程仿真等仿真结果。 • 采用田口实验方法优化切削仿真及铸造仿真参数。 ➤ Analysis of simulation results such as cutting simulation and casting process simulation using experimental design and data analysis methods; ➤ Optimize cutting simulation and casting simulation parameters using Taguchi experimental method.	2

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

参考资料:

1. 《先进制造与工程仿真技术》，李彬主编，北京大学出版社，2013年5月版。
2. 《数字化设计制造仿真与模拟》（上、下册），王华侨主编，机械工业出版社，2011年10月。
3. 《制造系统建模与仿真》，苏春主编，机械工业出版社，2014年9月。

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		10		
课堂表现 Class Performance		10		
小测验 Quiz				
课程项目 Projects		50		
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		30		
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