上海交通大学研究生专业课程信息收集表

Information Form for SJTU Graduate Profession Courses

<table>
<tr><th colspan="6">课程基本信息 Basic Information</th></tr>
<tr><td>*课程名称
Course Name</td><td colspan="5">（中文 Chinese）塑性成形过程的仿真理论及系统分析
（英文 English）Simulation Theory and System Analysis of Metal Forming Process</td></tr>
<tr><td>*学分
Credits</td><td>3</td><td>*学时
Teaching Hours</td><td colspan="3">48（1 学分=16 课时）</td></tr>
<tr><td>*开课学期
Semester</td><td>春季学期 Spring</td><td>*是否跨学期
Cross-semester?</td><td>否 No</td><td colspan="2">跨 Spanning over 个学期
Semesters（含夏季学期）。</td></tr>
<tr><td>*课程类型
Course Type</td><td>专业选修课 Program Elective Course</td><td>*课程分类
Course Type</td><td colspan="3">全日制课程 For full-time students</td></tr>
<tr><td>*课程性质
Course Category</td><td>专业课 Specialized Course</td><td>课程层次
Targeting Students</td><td colspan="3">博士课程 Doctoral Level</td></tr>
<tr><td>*授课语言
Instruction Language</td><td>中文 Chinese</td><td>主要授课方式
Teaching Method</td><td colspan="3">课堂教学 In class teaching</td></tr>
<tr><td>*成绩类型
Grade</td><td>等第制 Letter grading</td><td>主要考核方式
Exam Method</td><td colspan="3">论文 Essay</td></tr>
<tr><td>*开课院系
School</td><td colspan="5">050 材料科学与工程学院（School of Material Science and Engineering）</td></tr>
<tr><td>所属学科
Subject</td><td colspan="5">材料科学与工程（Material Science and Engineering）</td></tr>
<tr><td rowspan="2">负责教师
Person in charge</td><td>姓名 Name</td><td>工号 ID</td><td colspan="2">单位 School</td><td>联系方式 E-mail</td></tr>
<tr><td>陈军（CHEN Jun）</td><td></td><td colspan="2">材料科学与工程学院（School of Material Science and Engineering）</td><td>jun_chen@sjtu.edu.cn</td></tr>
<tr><th colspan="6">课程扩展信息 Extended Information</th></tr>
<tr><td>*课程简介
(中文)
Course Description</td><td colspan="5">课程介绍：本课程主要介绍金属塑性成形数值仿真涉及的塑性力学模型、基于形变理论和流动理论的变分原理、小变形弹塑性有限元法、大变形弹塑性有限元法、刚(粘)塑性有限元法的基本理论、基本方程、塑性成形有限元数值仿真软件系统实现的关键技术问题与处理方法、弹塑性有限元和刚塑性有限元工业应用。是从事金属塑性成形数值仿真研究的重要基础课程。
教学目标：（1）了解塑性成形过程数值仿真的不同方法和数学力学基础；（2）掌握弹塑性有限元法和刚塑性有限元法的基本理论；（3）了解各种力学模型参数确定的实验方法；（4）了解该领域目前的技术现状和发展趋势；（5）具备运用典型数值仿真软件模拟塑性成形过程的能力。</td></tr>
<tr><td>*课程简介
（English）
Course Description</td><td colspan="5">Course introduction: In this course, we will introduce plasticity models, deformation theory based variational principle, flow theory based variational principle, small deformation based elasto-plastic FEM, large deformation based elasto-plastic FEM, rigid plastic FEM, the key technologies for the implementation of numerical simulation, engineering applications of numerical simulations by elasto-plastic FEM and rigid-plastic FEM. This course is an important fundamental course for numerical simulation of metal forming processes.

Course objectives: (1) Understand different methods for metal forming process numerical simulation and relevant fundamentals of mathematics and mechanics; (2) Grasp the fundamental theories of elasto-plastic FEM and rigid-plastic FEM; (3) Understand the plasticity models and the methods to determine their parameters; (4) Get to know the state-of-the-art about metal forming process numerical simulation and the future trends; (5) Build the capability to use commercial software tools for metal forming process numerical simulation.</td></tr>
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*教学大纲 (中文) Syllabus	第 1 章、材料加工和数值仿真基础、背景：3 个课时；课堂授课+讨论； 第 2 章、塑性形变理论与流动理论的变分原理：3 个课时；课堂授课+讨论 第 3 章、小变形弹塑性有限元法：3 个课时；课堂授课+讨论 第 4 章、大变形弹塑性有限元法：6 个课时；课堂授课+讨论 第 5 章、刚（粘）塑性有限元法：3 个课时；课堂授课+讨论 第 6 章、塑性变形的力学模型与参数确定：6 个课时；课堂授课+讨论 第 7 章、仿真系统结构的分析与二次开发:：3 个课时；课堂授课+讨论 第 8 章、刚塑性有限元数值仿真实现的关键技术:：6 个课时；课堂授课+讨论 第 9 章、大变形弹塑性有限元数值仿真实现的关键技术：6 个课时；课堂授课+讨论 第 10 章、金属体积成形过程的数值仿真应用：3 个课时；课堂授课+讨论 第 11 章、金属板料成形过程的数值仿真应用：3 个课时；课堂授课+讨论 第 12 章、塑性加工仿真的方法与技术前沿问题：3 个课时；课堂授课+讨论
*教学大纲 （English） Syllabus	Chapter 1： Background of metal forming technologies and fundamentals of numerical simulation; 3 teaching hours (TH); In-class teaching and discussion Chapter 2： Calculus of variations about plastic deformation and flow law; 3 THs; In-class teaching and discussion Chapter 3： Small deformation theory-based elasto-plastic finite element method; 3 THs; In-class teaching and discussion Chapter 4： Finite deformation theory-based elasto-plastic finite element method; 6 THs; In-class teaching and discussion Chapter 5：Rigid visco-plastic finite element method; 3 THs; In-class teaching and discussion Chapter 6：Flow stress model, yield function, hardening model, forming limit curve and ductile fracture criterion and parameter calibrations; 6 THs; In-class teaching and discussion Chapter 7：Framework of numerical simulation system and advanced development; 3 THs; In-class teaching and discussion Chapter 8：Key technologies for rigid visco-plastic FEM implementation; 6 THs; In-class teaching and discussion Chapter 9： Key technologies for elasto-plastic FEM implementations; 6 THs; In-class teaching and discussion Chapter 10： Numerical simulation applications of rigid visco-plastic FEM; 3 THs; In-class teaching and discussion Chapter 11： Numerical simulation applications of elasto-plastic FEM; 3 THs; In-class teaching and discussion Chapter 12：Cutting edge questions on metal forming technologies and numerical simulation; 3 THs; In-class teaching and discussion
*课程要求 （中文） Requirements	考核：授课最后一周，每人做一个 10-15 分钟的学术报告，报告应与所授课程的内容有关。授课结束后，要求完成一篇与本门课程内容有关的综述报告或针对具体成形工艺数值仿真的学术报告。
*课程要求 （English） Requirements	Grading: In the last week, each student shall make a 10-15 minute presentation related with the course. After the course is finished, each student shall submit an review report or an academic report/article related with the course within 2 months.
*课程资源 （中文） Resources	[1] 彭颖红，1999，金属塑性成形仿真技术，上海交通大学出版社 [2] 乔端、钱仁根，1990，非线性有限元法及其在塑性加工中的应用，冶金工业出版社 [3] 吕丽萍，1989，有限元法及其在锻压工程中的应用，西北工业大学出版社 [4] 陈如欣、胡忠民，1989，塑性有限元法及其在金属成形中的应用，重庆大学出版社 [5] 钟志华、李光耀，1997，薄板冲压成型过程的计算机仿真与应用，北京理工大学出版社 [6] 林忠钦，2005，车身覆盖件冲压成形仿真，机械工业出版社 [7] 蒋友谅，1988，非线性有限元法，北京工业学院出版社 [8] S. Kobayashi, S.I. Oh, T. Altan. 1989, Metal Forming and the Finite Element Method, Oxford University Press [9] J. Hallquist, 2006, LS-Dyna Theory Manual, www.lstc.com
*课程资源 （English） Resources	[1] PENG Yinghong, 1999, Numerical Simulation Technologies for Metal Forming Processes, Shanghai Jiao Tong University Press [2] QIAO Duan and QIAN Rengen, 1990, Nonlinear Finite Element Method and Its Applications in Plastic Forming, Metallurgical Industry Press [3] LV Liping, 1989, Finite Element Method and Its Applications in Forging Process,

	Northwestern Polytechnical University Press [4] CHEN Ruxin, HU Zhongmin, 1989, Plastic Finite Element Method and Its Applications in Metal Forming Processes, Chongqing University Press [5] ZHONG Zhihua, LI Guangyao, 1997, Computer Simulation and Application of Sheet Metal Forming Process, Beijing University of Technology Press [6] LIN Zhongqin, 2005， Numerical Simulation of Auto Panel Stamping Processes, Mechanical Engineering Press [7] JIANG Youliang, 1988, Nonlinear Finite Element Method, Beijing Institute of Technology Press [8] S. Kobayashi, S.I. Oh, T. Altan. Metal Forming and the Finite Element Method, Oxford University Press, 1989 [9] J. Hallquist, LS-Dyna Theory Manual, www.lstc.com, 2006
备注 Note	