南方科技大学 SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

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	**工程流体力学 Engineering Fluid Mechanics**
2.	授课院系 Originating Department	力学与航空航天工程系 Department of Mechanics and Aerospace Engineering
3.	课程编号 Course Code	MAE207
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业基础课 Major Foundational Courses
6.	授课学期 Semester	秋/春 Fall/Spring
7.	授课语言 Teaching Language	中英双语 Bilingual
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）	邓巍巍 教授 力学与航空航天工程系 dengww@sustech.edu.cn Weiwei Deng, Professor Department of Mechanics and Aerospace Engineering dengww@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	无 NA
10.	选课人数限额(可不填) Maximum Enrolment （Optional）	25

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	48				48

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	MA102B 高等数学（下） 或者 MA102A 数学分析 II MA102B Calculus II A / MA102A Mathematical Analysis II
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	无 NA
14.	其它要求修读本课程的学系 **Cross-listing Dept.**	无 NA

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程介绍流体力学的基本概念和方法。知识点包括：压强，应力，静力学，浮力；开放系统和控制体积分析；流动液体的质量和动量守恒；粘性流体，管流；量纲分析；边界层；升力和阻力。学生将应用学习到的概念针对不同问题建立模型来研究、分析、设计流体系统。本课程将训练在实际工程应用背景下简化和解决问题的能力。

This class provides students with an introduction to principal concepts and methods of fluid mechanics. Topics covered in the course include pressure, stress, hydrostatics, and buoyancy; open systems and control volume analysis; mass conservation and momentum conservation for moving fluids; viscous fluid flows, flow through pipes; dimensional analysis; boundary layers, and lift and drag on objects. Students will work to formulate the models necessary to study, analyse, and design fluid systems through the application of these concepts, and to develop the problem-solving skills essential to good engineering practice of fluid mechanics in practical applications.

16. 预达学习成果 Learning Outcomes

按预期修完本课后，学生会获得以下能力：

1.理解流体力学的基本概念，包括质量和动量守恒。

2.使用伯努利方程求解相关流体力学问题。

3.使用控制体方法求解相关流体力学问题。

4.使用势流理论求解相关流体力学问题。

5.使用量纲分析方法求解相关流体力学问题。

6.层流和湍流边界层的基础知识。

7.对流体力学最新发展的了解，尤其是航空领域。

8.应用流体力学知识分析流动系统并设计某些基本的流体系统。

After successful completion of this course, the student will obtain:

1.An understanding of fluid mechanics fundamentals, including concepts of mass and momentum conservation.

2.An ability to apply the Bernoulli equation to solve problems in fluid mechanics.

3.An ability to apply control volume analysis to problems in fluid mechanics.

4.An ability to use potential flow theory to solve problems in fluid mechanics.

5.An ability to perform dimensional analysis for problems in fluid mechanics.

6.A basic knowledge of laminar and turbulent boundary layer fundamentals.

7.An exposure to recent developments in fluid mechanics, with application to aerospace systems.

8.An ability to apply the concepts developed for fluid flow analysis to issues in certain basic fluid system design.

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.)

Section 1: Introduction and fluid properties (2 credit hours)

绪论和流体基本性质 （2 学时）

Section 2: Fluid properties(4 credit hours)

流体基本性质（4 学时）

Section 3: Fluid Statics(2 credit hours)

流体静力学（2 学时）

Section 4: Fluids Undergoing Constant Acceleration, Surface Tension(4 credit hours)

常加速度下的流体，表面张力（4 学时）

Section 5: Conservation laws: Integral Form(2 credit hours)

积分形式的守恒率（6 学时）

Section 6: Kinematics and Bernoulli’s equation(2 credit hours)

伯努利方程（2 学时）

Section 7: Differential analysis of the conservational laws(4 credit hours)

微分形式的守恒率（10 学时）

Section 8: Dimensional analysis(2 credit hours)

量纲分析（2 学时）

Section 9: Irrotational, incompressible flows(4 credit hours)

无旋不可压流场（4 学时）

Section 10: Internal flows: Flow in Pipes(2 credit hours)

管流（6 学时）

Section 11: External flows: boundary layer(2 credit hours)

边界层（2 学时）

Section 12: Selected topics of engineering fluid mechanics(4 credit hours)

工程流体问题选讲（4 学时）

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

教材（Textbook）：

Alexander J. Smits, A Physical Introduction to Fluid Mechanics (PDF copy provided)

参考书（Reference）：

Frank M. White, Fluid Mechanics, McGraw-Hill

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		25	抄袭项目报告记0分 Cheating: 0	
平时作业 Assignments		20	抄袭平时作业记0分 Cheating: 0	
期中考试 Mid-Term Test		25	考试作弊本门课程记0分 Cheating: 0	
期末考试 Final Exam		30	考试作弊本门课程记0分 Cheating: 0	
期末报告 Final Presentation				
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

力学与航空航天工程系教学指导委员会
The commission of teaching instruction in department of mechanics and aerospace engineering