课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	**大涡模拟在水力学中的应用 Large Eddy Simulations in Hydraulics**
2.	**课程性质** **Compulsory/Elective**	专业选修课 Major Elective Courses
3.	**课程学分/学时** **Course Credit/Hours**	3/48
4.	**授课语言** **Teaching Language**	中英文 Chinese/English
5.	**授课教师** **Instructor(s)**	刘延 Yan Liu
6.	**是否面向本科生开放** **Open to undergraduates or not**	否
7.	**先修要求** **Pre-requisites**	水力学

8. 教学目标
Course Objectives

本课程的教学目标是使学生：

1） 掌握大涡模拟计算方法的基本原理；

2） 学习计算流体力学商业软件；

3） 了解大涡模拟计算方法在环境水力学中的应用，如大坝异重流、桥墩绕流、植被绕流、河流交换、污染物扩散等。

The teaching objective of this course is to enable students to:

1) Master the basic principle of the large eddy simulation method;
2) Learn commercial computational fluid dynamics software;
3) Understand the application of the large eddy simulation method in environmental hydraulics, such as gravity currents, flow over piers, flow through vegetation, river confluences, pollutant transport, etc..

9. 教学方法
Teaching Methods

课堂教学和科研探讨相结合的形式。

10. 教学内容
Course Contents
（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

Section 1	绪论（2 学时）/ Introduction (2 class hours)
Section 2	大涡模拟基本方法（2 学时）/Basic methodology of LES (2 class hours)
Section 3	亚格子应力模型（4 学时）/Subgrid-scale (SGS) models (4 class hours)
Section 4	数值方法（4 学时）/Numerical methods (4 hours)
Section 5	边界条件与初始条件（4 学时）/Boundary and initial conditions (4 hours)
Section 6	隐式大涡模拟方法（2 学时）/Implicit large eddy simulation (2 hours)

	Section 7	雷诺-大涡模拟混合方法（2 学时）/Hybrid RANS-LES methods (2 hours)
	Section 8	紊动结构统计方法（6 学时）/Eduction of turbulence structures (4 hours)
	Section 9	计算流体力学商业软件学习（6 学时）/ Commercial CFD tools (6 hours)
	Section 10	大涡模拟在水力学中的应用实例（16 学时）/Application examples of LES in hydraulics （16 学时） ➢ Flow over rough and permeable beds ➢ Flow over bedforms ➢ Flow through vegetation ➢ Flow in compound channels ➢ Flow in curved open channels ➢ Shallow merging flows ➢ Flow pass in-stream hydraulic structures ➢ Gravity currents

11. 课程考核
Course Assessment

（①考核形式 Form of examination；②.分数构成 grading policy；③如面向本科生开放，请注明区分内容。If the course is open to undergraduates, please indicate the difference.）

出勤 Attendance: 20%
软件学习及作业 Assignments: 30%
期末报告 Final Presentation: 50%

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

1、 Large-eddy simulation in hydraulics, 1st Edition, Wolfgang Rodi, George Constantinescu and Thorsten Stoesser, 2013, CRC Press, ISBN: 9780429212765