

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	流域水文模型-应用与实践 Watershed hydrologic models: Applications and Practices
2.	授课院系 Originating Department	环境科学与工程学院 School of Environmental Science and Engineering
3.	课程编号 Course Code	ESE 415
4.	课程学分 Credit Value	3
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 Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	姜丽光, 环境科学与工程学院 JIANG Liguang, School of Environmental Science and Engineering
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
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	38	4	6		48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	先修课/Pre-requisites: 水文学原理与应用 Hydrology: Principles and Applications				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	后续课/Advanced course: 遥感水文学 Remote sensing in hydrology				
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

A student who has met the objectives of the course will be able to:

- Understand the conceptual/physical and lumped/distributed hydrologic models
- Understand the procedure of develop a hydrological model
- Prepare forcing data sets of a lumped rainfall-runoff model
- Operate computer-based modelling tools
- Set up, calibrate, and validate a rainfall-runoff model for a watershed
- Analyze and interpret the modelling results
- Expand the knowledge of hydrological modelling

完成可能目标的学生能够:

- 理解概念性/物理模型和集总式/分布式水文模型
- 理解如何研发一个水文模型
- 正确设置集总式水文模型驱动数据
- 熟练模型操作、优化和可视化工具
- 配置、校正和验证一个实际流域降雨径流模型
- 分析和解译模型结果
- 了解当前的水文模拟前沿

16. 预达学习成果 Learning Outcomes

A student who participates the course will:

- Finish all tutorials and hand in mid-term assignment
- Present the overall procedure and results of a case study
- Describe and document in report form the applied methods and obtained results

参加本课程学习的学生:

- 合格完成基本练习和作用
- 完成和表达一个实际案例
- 以演讲和文档的形式阐述和记录实际案例极其结果

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.)

Introduction (2 hours) 课程介绍和基本水文模型的背景知识介绍

Part I: Process-based and physics-Based Modelling 过程模型和物理模型模拟

- Review of modelling theories (2 hours) 模拟基本理论介绍
- Modelling purpose, model conceptualization and parameterization (4 hours) 模拟目的、模型概化和参数化
- The HBV lumped conceptual rainfall-runoff model (6 hours including 2 hours computer operation) HBV 集总式水文模型
- Model calibration and optimization (4 hours including 2 hours computer operation) 模型校正和参数优化
- Parameter sensitivity and uncertainty analysis (2 hours) 参数敏感性和不确定分析
- Parameter regionalization for prediction in ungauged basin (4 hours) 无测站流域参数区域化
- Introduction to the Mesoscale Hydrological Model (mHM) (2 hours) 中尺度水文模型 mHM 介绍
- Analysis and interpretation of model results, visualization (2 hours) 模拟结果分析、解译和可视化

Part II: Machine Learning based modelling 基于机器学习的水文模拟

- Introduction to artificial neural networks (2 hours) 人工神经网络介绍
- Supervised ML - decision tree (2 hours) 监督机器学习-决策树
- Long short-term memory rainfall-runoff model (4 hours including 2 hours computer operation) 长短期记忆降雨-径流模型

Part III: Advanced hydrological modelling 高级水文模拟

- Multi-objective and multi-variate parameter estimation (4 hours) 多目标和多变量参数估计
- Probabilistic multi-model ensemble (2 hours) 概率性多模型集合
- Large sample hydrological modelling (2 hours) 大样本流域水文模拟

The remaining 4 class hours are used for mid-term discussion and final presentation. The total number of class hours is 48.

剩余 4 个学时用于中期讨论和期末讲演, 总课时为 48 学时。

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

1. Textbooks
 Rainfall-runoff modelling The Primer, 2nd Edition by Keith Beven.
 Physical Hydrology, 3rd Edition by S. Lawrence Dingman.

2. Reading materials
 100 Years of Progress in Hydrology
 Textbook OF hydrologic models, Chong-yu Xu

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	In each lecture	10%		
课堂表现 Class Performance	In each lecture	10%		
小测验 Quiz				
课程项目 Projects	After the final presentation	35%		Report
平时作业 Assignments	One week after the assignment	25%		
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation	During the exam week	20%		Oral 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