

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	数据库原理(H) Principles of Database Systems(H)
2.	授课院系 Originating Department	计算机科学与工程系 Department of Computer Science and Engineering
3.	课程编号 Course Code	CS213
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	夏季 Summer
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)	于仕琪, 副教授, 计算机科学与工程系, yusq@sustech.edu.cn Shiqi Yu, Associate Professor, Department of Computer Science and Engineering, yusq@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	王维语, 教学实验员, 计算机科学与工程系, wangwy@mail.sustech.edu.cn Weiyu Wang, Assistant Teaching Technician, Department of Computer Science and Technology, wangwy@mail.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	32		32		64
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	CS102A 计算机程序设计基础 A Introduction to Computer Programming A				
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

本课程的教学目标为：通过讲授数据库系统的基本概念和原理，让学生了解数据库系统的目的、基本工作原理、系统结构、使用维护、应用领域等，并熟练掌握数据库设计和 SQL 语言用法；此外，学生应该对关系数据库系统底层设计具有较深入的理解。

The teaching objectives of the course are: to teach students the basic concepts and principles of database systems, so that they can understand the purpose, basic working principles, system architecture, database maintenance and application fields. The students should master database design and SQL language, and understand the design principles of database systems.

16. 预达学习成果 Learning Outcomes

课程的预达学习成果为：让学生掌握从一个数据库应用系统的立项、系统需求分析和定义、数据需求分析和定义、数据模型设计、数据库概念（逻辑）模式设计、数据库视图（外部）模式设计、数据库物理（内部）模式设计、数据库开发、数据库应用系统开发和维护。学生还应该掌握数据库系统的整体架构，深入理解数据库系统设计的基本原理。

The learning outcomes of the course are: Students can master the project establishment for a database application system, system requirement analysis and definition, data requirement analysis and definition, data model design, database conceptual (logic) schema design, database view (external) schema design, database physical (internal) schema design, database development, database application development, and actual operation and maintenance of the developed database application system. Students can also master the architecture of database systems, and fully understand the principles in database systems.

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.)

1. Database system: What is it, why study it. three normal forms in database design
2. Database System Architecture, relational databases and the relational model
3. Relational algebra, relational calculus
4. Introduction to SQL: The history of SQL and database systems, data types, DDL, insert
5. The Entity–Relationship model
6. Retrieving Data from One Table: select, date, functions
7. Data processing: distinct, aggregate functions
8. Retrieving data from multiple tables: inner join, outer join, set operations, subqueries
9. Ordering: order by, window function, rank functions
10. Fuzzy search, transaction, import data from a file
11. Data modification in databases: update, insert, delete, more functions
12. Procedure, trigger, auditing
13. Performance: index, execution plan
14. View and security, change data through views, data dictionary
15. NoSQL and big data, Query optimization, Scaling
16. Review

1. 什么是数据库系统？为什么要学习研究数据库系统？数据库设计中的三个范式
2. 数据库系统结构，关系数据库与关系模型
3. 关系代数，关系演算
4. SQL 介绍，SQL 和数据库系统的历史，数据类型，DDL，数据插入
5. 实体关系模型
6. 单表数据检索：select 命令，日期格式，函数
7. 数据处理：distinct，聚合函数
8. 多表检索：内连接，外连接，集合操作，子查询
9. 数据排序：order by，窗口函数，排名函数
10. 模糊查询，交易，从文件中导入数据
11. 数据库中的数据修改：update, insert, delete 以及更多函数介绍
12. 过程、触发器、审计
13. 数据库性能：索引和执行计划
14. 视图，数据安全，通过视图修改数据，数据字典
15. NoSQL 和大数据，查询优化，数据库规模扩展
16. 总复习

实验教学大纲

实验 1. 软件安装 (server: PostgreSQL, client: datagrip)

- 实验 2. 数据库与文件, JDBC
- 实验 3. 数据库设计 (Database design)
- 实验 4. 基础 SQL 语句, 单表查询
- 实验 5. 复杂 SQL 语句, 多表查询一
- 实验 6. 复杂 SQL 语句, 多表查询二
- 实验 7. 开窗方法
- 实验 8. 数据库函数设计
- 实验 9. 项目中期指导
- 实验 10. 数据库触发器
- 实验 11. 事务处理与隔离级别
- 实验 12. 连接池
- 实验 13. 索引
- 实验 14. 数据库目录文件
- 实验 15. 扩展介绍
- 实验 16. 项目指导与展示

Syllabus of Lab

- Lab 1. Software Installing (server: PostgreSQL, client: datagrip)
- Lab 2. Database and File (JDBC)
- Lab 3. Database Design
- Lab 4. Simple Queries in single table
- Lab 5. Complex Queries from multiple tables 1
- Lab 6. Complex Queries from multiple tables 2
- Lab 7. Window Function
- Lab 8. Procedure and function in database
- Lab 9. Guidance of Project in Mid-term
- Lab 10. Trigger in database
- Lab 11. Transaction and Isolation Levels
- Lab 12. Connection Pool
- Lab 13. Index
- Lab 14. Information schema and PG catalog
- Lab 15. Extension Introduced
- Lab 16. Guidance of Project and Presentation

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

A. Silberschatz, H. F. Korth, and S. Sudarshan, "Database System Concepts," McGraw-Hill, 2010 (6th Edition).
 J. D. Ullman & J. Widom, "A First Course in Database Systems," Pearson, 2008 (3rd Edition).
 T. M. Connolly & C. E. Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management," Pearson, 2015 (6th Edition).
 R. Elmasri and S. B. Navathe, "Fundamentals of Database Systems," Pearson, 2016 (7th Edition).
 D. M. Kroenke & D. J. Auer, "Database Processing: Fundamentals Design, and Implementation," Pearson, 2012 (12th Edition).
 C. J. Date, "An Introduction to Database Systems," Pearson, 2000 (7th Edition), 2004 (8th Edition).

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		10%		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects		30%		
平时作业 Assignments		20%		
期中考试 Mid-Term Test				
期末考试 Final Exam		40%		
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

