【数据库原理及应用（双语）】

【Principle and Application of Database (Bilingual)】

一、基本信息 Basic Information

课程代码 Course Code：【2140020】
课程学分 Course Credits：【3】
面向专业 Major：【数字媒体技术（双语）Digital Media Technology(Bilingual)】
课程性质 Characteristic of the Course：【系级必修课 Department-level required courses】
开课院系 Department：【国际教育学院 International Education College】
使用教材 Teaching and Reference Materials：

教材 Textbook：

【数据库系统概念（本科教学版），（美）Abraham Silberschatz 等，机械工业出版社，原书第 7 版】

【Database System Concepts, (US) Abraham Silberschatz et., Higher Education Press, Version 7 Edition】

参考书目 Bibliography：

【Database Illuminated, Catherine M. Ricardo and Susan D. Urban, Jones & Bartlett Learning, 3rd Edition】

课程网站网址 Online Learning Website URL：http://gench.fanya.chaoxing.com/
先修课程 Preface Course: 程序设计基础（python 语言）Computer programming 2050624（4），数据结构（Python 语言）Data structure 2050248（3）

二、课程简介 Course Description

The main task of this module is to systematically introduce the basic concepts of database system, the basic methods of database design, database program design and database implementation. Through the study of this course, students can master the basic concepts of database system and its design and implementation technology, and have the basic ability to design and implement databases.

该模块的主要任务是系统地介绍数据库系统基本概念，数据库设计基本方法，数据库程序设计和数据库实现。通过本课程的学习，使学生掌握数据库系统基本概念及其设计、实现技术，具有设计、实现数据库的基本能力。

三、选课建议 Suggestion for Selection of Course（必填项）

This course as the professional elective courses fits for the advanced level students for more knowledge of computer database and preparation for the advanced courses.

本课程为专业基础课程，适合高年级学生选择，以获得计算机数据库知识为高级课程做预备。

四、课程与专业毕业要求的关联性 The Correlation between Curriculum and Graduation Requirements

专业毕业要求 Graduation Requirements	关联 Relation
LO11 表达沟通 Expressing communication 理解他人的观点，尊重他人的价值观，能在不同场合用书面或口头形式进行有效沟通。 Understand the views of others, respect their values, and communicate effectively in writing or orally on different occasions	
LO21 自主学习 Self-learning 能根据需要确定学习目标，并通过搜集信息，分析信息，讨论，实践，质疑，创造等方法来实现学习目标。 Be able tOidentify learning goals as needed and achieve them by gathering information, analyzing information, discussing, practicing, questioning,	●
LO3 专业能力 Professional ability	
LO31：工程素养：掌握数学、自然科学知识，具有工程意识，能结合计算机、数字媒体技术相关专业知识解决复杂工程问题。 LO31：Engineering literacy: master mathematics and natural science knowledge, have engineering awareness, and be able to combine computer Professional knowledge of digital media technology to solve complex engineering problems.	
LO32：软件开发：掌握主流设计技术、程序设计思维以及相关数据库技术，具备建设可运行于多种终端网站的能力。 LO32：Software development: master the mainstream design technology, programming thinking and related database technology, and have the ability to build a variety of terminal websites.	●
LO33：系统运维：系统地掌握计算机硬件、软件的基本理论、基本知识，具备保障系统运行与维护基本技能。 LO33：System maintenance: systematically master the basic theory and knowledge of computer hardware and software, and have the basic skills to ensure system operation and maintenance.	
LO34：素材采集与处理：掌握数字媒体的基本理论、主流数字媒体应用软件使用技术，具备素材的采集、存储、处理以及传输的能力。	

LO34:Material collection and processing: master the basic theory of digital media and the use technology of mainstream digital media application software, and have the ability of material collection, storage, processing and transmission.	
LO35：虚拟现实设计与制作：熟悉虚拟现实基本原理，掌握虚拟现实产品设计与制作流程及主流的设计、集成平台，具备结合相关硬件实现虚拟现实产品的内容制作和应用开发的能力。 LO35:Virtual reality design and production: be familiar with the basic principles of virtual reality, master the design and production process of virtual reality products and the mainstream design and integration platform, and have the ability to realize the content production and application development of virtual reality products combined with relevant hardware.	
LO41 尽责抗压 Due diligence and pressure resistance 遵守纪律，守信守则，具有耐挫折，抗压力的能力。 Discipline, abide by the rules, with resistance to setbacks, the ability to resist pressure.	
LO51 协同创新 Collaborative innovation 同团队保持良好的合作关系，做集团中的积极成员；勇于从不同的角度思考问题，勇于提出新设想。 Keep good cooperation with the team, be an active member of the group, be brave to t hink from different perspectives and put forward new ideas.	●
LO61 信息应用 Information application 能在学习，工作中应用信息技术解决问题，具有运用计算机处理工作领域中的信息和技术交流的能力。 Can apply information technology tOsolve problems in study and work, and have the ability tOuse computers tOprocess information and technology exchanges in the field of work.	
LO71 服务关爱 Service care 愿意服务他人，服务企业，服务社会；为人热忱，富于爱心，痛得感恩（感恩， 回报， 爱心为我校校训内容之一） Willing to serve others, enterprises and society; being enthusiastic, loving and grateful (gratitude, return, love is one of the contents of our school motto)	
LO81 国际视野 International Perspective 具有基本的外语表达沟通能力与跨文化理解能力，能够阅读专业外文资料，有国际竞争与合作意识。 With basic foreign language communication skills and cross- cultural understanding ability, able to read professional foreign language materials, wit h international competition and cooperation awareness.	

备注：LO=learning outcomes（学习成果）

五、课程目标/课程预期学习成果 Course Objectives / Course Expected Learning Outcomes

序号 No.	课程预期学习成果 Course Expected Learning Outcomes	课程目标（细化的预期学习成果） Course Objectives（Detailed Expected Learning Outcomes）	教与学方式 Teaching and Learning Methods	评价方式 Assessment Methods
1	LO211	Be able to explain key principles of database and information security 能够解释数据库的关键原理信息和信息安全	Lecture and Discussion and Individual Presentation 授课与讨论及个人演示	Multiple Questions, Quiz, Case Study, and Team Work 各类问题，章节测验，案例学习，和团队项目
2	LO32	Be able to explain and provide a rationale for relational, semi-structured and alternative data model concepts 能够解释并提供以下方面的基本原理： 关系型、半结构化和可选数据模型概念	Lecture and Discussion 授课与讨论	Multiple Questions, Quiz, Case Study, and Team Work 各类问题，章节测验，案例学习，和团队项目
3	LO511	Be able to design and implement a database justifying design decisions 能够设计和实现数据库证明设计决策的合理性	Lecture, Discussion, Case Study and Team Work 授课、讨论、案例分析和团队项目	Multiple Questions, Quiz, Case Study, and Team Work 各类问题，章节测验，案例学习，和团队项目

六、课程内容 Course Contents

Part 1 Introduction 第 1 部分 概论

理论课时 Theoretical Hours 2/实践课时 Practical Hours 0

教学内容 Teaching Content:

Part 1 provides a general overview of the nature and purpose of database systems. We explain how the concept of a database system has developed, what the common features of database systems are, what a database system does for the user, and how a database system interfaces with operating systems. We also introduce an example database application: a university organization consisting of

multiple departments, instructors, students, and courses. This application is used as a running example throughout the book.

第 1 部分概述了数据库系统的性质和目标。我们解释了数据库系统的概念是如何发展的，数据库系统的共同特征是什么，数据库系统能为用户做什么，以及数据库系统如何与操作系统交互。我们还引入了一个数据库应用的例子：一个包括多个系、教师、学生和课程的大学。这个应用作为贯穿本课程的运行示例。

教学难点 Difficulties in Teaching：

1 Data Models 数据模型

2 Database Design 数据库设计

Part 2 Relational Language 第 2 部分 关系语言

理论课时 Theoretical Hours 20/实践课时 Practical Hours 10

教学内容 Teaching Content:

Part 2 introduces the relational model of data, covering basic concepts such as the structure of relational databases, database schemas, keys, schema diagrams, relational query languages, relational operations, and the relational algebra.

We focus on the most influential of the user-oriented relational languages: SQL. We present a survey of basic DML and the DDL features of SQL. This part describe data manipulation: queries, updates, insertions, and deletions, assuming a schema design has been provided.

We provide a more detailed coverage of the SQL query language, including various join expressions, views, transactions, integrity constraints, index, and authorization.

We cover more advanced features of the SQL language, including mechanisms to allow accessing SQL from a programming language, SQL functions and procedures, triggers, and advanced aggregation features.

第 2 部分介绍了数据的关系模型，包括关系数据库的结构、数据库模式、键、模式图、关系查询语言、关系运算和关系代数等基本概念。介绍最有影响力的面向用户的关系语言：SQL。

我们给出对 SQL 的基本 DML 和 DDL 特性的概述。对于一个设计完成的模式，本部分描述了查询、修改、插入和删除等数据操作。我们将提供对 SQL 查询语言更详细的介绍，包括各种连接表达式、视图、事务、完整性约束、索引以及授权。

我们将介绍 SQL 语言更高级的特性，包括允许从编程语言中访问 SQL 的机制、SQL 函数和过程、触发器以及高级聚集特性。

教学难点 Difficulties in Teaching：

1 Keys, Foreign Key, Referential integrity constraints 主键、外键、引用完整性约束

2 SQL Query Structure SQL 查询结构

3 join operation 连接操作

4 Aggregation functions 聚合函数

5 Nested Sub-queries 嵌套子查询

6 View definition 视图定义

Part 3　Database Design 第 3 部分 数据库设计

理论课时 Theoretical Hours 8/实践课时 Practical Hours 6

教学内容 Teaching Content:

Part 3 provides an overview of the database-design process and a detailed description of the entity relationship data model. The entity-relationship data model provides a high-level view of the issues in database design and of the problems encountered in capturing the semantics of realistic applications within the constraints of a data model.

We introduce relational database design. The theory of functional dependencies and normalization is covered, with emphasis on the motivation and intuitive understanding of each normal form.

第 3 部分概要介绍数据库设计过程，并详细描述实体-联系数据模型。实体-联系模型为数据库计中问题，以及在数据模型约束下捕获现实应用的语义时所遇到的问题提供了一个高层视图。介绍关系数据库设计。涵盖了函数依赖和规范化的理论，重点强调了提出各种范式的动机。

教学难点 Difficulties in Teaching：

1 Entity and entity sets 实体和实体集

2 Relationship and Relationship Sets 关系和关系集

3 E-R Diagram E-R 图

4 Mapping Cardinality 映射基数

Part 4 Transactions 第 4 部分 数据管理实现技术之事务管理

理论课时 Theoretical Hours 2/实践课时 Practical Hours 0

教学内容 Teaching Content:

We focus on the fundamentals of a transaction-processing system: atomicity, consistency, isolation, and durability. It provides an overview of the methods used to ensure these properties.

我们着重介绍事务处理系统的基本概念：原子性、一致性、隔离性和持久性，并概述了用于保证这些特性的方法。

教学难点 Difficulties in Teaching：

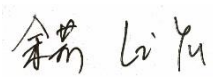
1 Transaction and ACID properties 事务和 ACID 性质

2 Inconsistent state 不一致状态

七、评价方式与成绩 Assessment Index & Weightage

总评构成（1+X） Grading Computation	评价方式 Assessment Index	占比（%) Weightage（%）
X1	过程考核：个人项目报告（2000 words） Final Personal Report（2000 words）	50%

X2	过程考核：个人作业（800 words） Personal Work（800 words）	20%
X3	过程考核：小组团队作业（1200 words） Team Work（1200 words）	20%
X4	过程考核：课堂表现 Class Performance	10%

撰写人：  　　系主任审核签名：矫桂娥

Tutor Signature　　Program Leader Signature

审核时间：2023.9.4

Date