《数据库原理及应用（双语）》本科课程教学大纲

《Principle and Application of Database (Bilingual)》Syllabus

一、课程基本信息 Basic Information

课程名称 Course Name	数据库原理及应用（双语）				
	Principle and Application of Database (Bilingual)				
课程代码 **Course Code**	2140020	课程学分 **Course Credit**		3	
课程学时 **Course Hour**	48	理论学时 **Theoretical Hour**	16	实践学时 **Experiment Hour**	32
开课学院 **Department**	国际教育学院 College of International Education	适用专业与年级 **Major**		数字媒体技术（双语）三年级 Third year in Digital Media Technology(Bilingual)	
课程类别与性质 **Characteristic of the Course**	专业基础必修课 Professional basic required courses	考核方式 **Assessment Method**		考查 course with the requirement to submit a term paper	
选用教材 **Teaching Materials**	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				
先修课程 **prerequisites**	程序设计基础（python 语言）Computer programming 2050624（4），数据结构（Python 语言）Data structure 2050248（3）				
课程简介 **Course Description**	本课程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。 The main task of this course 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.				
选课建议与学习要求 **Suggestion for Selection of Course**	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。 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.				
大纲编写人 Tutor Signature	余莉	制/修定日期 Date		2022 年 9 月	

专业负责人 Program Leader Signature		审定日期 Date	2022 年 9 月
学院负责人 College Leader Signature	刘潇莹	批准日期 Date	2022 年 9 月

二、毕业要求与课程目标 Graduation Requirements and Course Objectives

（一）课程目标 Course Objectives

类型 Type	序号 No.	内容 Content
知识目标 Knowledge objectives	1	掌握数据库技术的基本概念、原理、方法和技术。 Master the basic concepts, principles, methods, and techniques of database technology.
技能目标 Skill objectives	2	掌握SQL语言查询和编程的基本技术，具备SQL语言编程能力。 Master the basic techniques of SQL language queries language and the ability to program in SQL language.
	3	掌握设计数据库的基本方法，具备数据库设计能力。 Master the basic methods of databases design and the ability to design databases.
素养目标 (含课程思政目标) Literacy goals	4	能够利用课内外时间主动学习，关注行业动态新技术，通过自主学习发展自身能力，树立终身学习理念。 Being able to actively learn during and outside of class, paying attention to industry trends and new technologies, developing one's own abilities through self-directed learning, and establishing a lifelong learning philosophy.

（二）课程支撑的毕业要求 Graduation requirements supported by the Course

LO2问题分析：能够应用数学、自然科学和工程科学的基本原理，对数字媒体领域复杂的工程问题进行抽象分析与识别、建模表达，并通过文献研究分析数字媒体领域复杂工程问题，以获得有效结论。
③能够运用专业知识、借助文献研究、分析数字媒体领域复杂工程问题的解决方案，验证解决方案的合理性。
LO2 Problem Analysis: be able to apply the basic principles of mathematics, natural sciences, and engineering sciences to analyze, identify, model, and express complex engineering problems in the field of digital media. Through literature research, analyze complex engineering problems in digital media and draw conclusions.
③ Be able to apply professional knowledge, conduct literature research, analyze solutions to

complex engineering problems in the field of digital media, and verify the rationality of the solutions.
LO5使用现代工具：能够针对数字技术领域复杂工程问题，选择与使用恰当的技术，使用媒体创作、虚拟现实、资源管理等软件工具，进行设计与开发，并能够针对工程应用需求，在通用工具基础上二次开发或定制。 ②能够选择与使用计算机专业涉及的现代仪器、软硬件平台、开发测试工具、配置管理工具、信息检索工具对数字媒体领域复杂工程问题进行分析、计算与设计。 LO5 uses modern tools: be able to select and use appropriate technologies for complex engineering problems in the digital technology field, using software tools in media creation, virtual reality, and resource management to design and development, and be able to develop or customize system based on general tools according to engineering application requirements. ② Be able to select and use modern instruments, software and hardware platforms, development and testing tools, configuration management tools, and information retrieval tools related to computer science to analyze, calculate, and design complex engineering problems in the field of digital media.
LO12终身学习：具有自主学习和终身学习的意识，有不断学习和适应发展的能力。 ②具备终身学习的知识基础，掌握自主学习的方法，了解拓展知识和能力的途径。 LO12 Lifelong Learning: Possess awareness of self-directed and lifelong learning, and have the ability to continuously learn and adapt to development. ② Having a sense of lifelong learning, mastering the methods of self-directed learning, and knowing the ways to expand knowledge and abilities.

（三）毕业要求与课程目标的关系 The Correlation between Graduation Requirements and Course Objectives

毕业要求 Graduation Requirements	指标点 Index point	支撑度 supporting degree	课程目标 Course Objectives	对指标点的贡献度 Contribution to index points
LO2	③	M	1. 掌握数据库技术的基本概念、原理、方法和技术。 Master the basic concepts, principles, methods, and techniques of database technology.	60
			3. 掌握设计数据库的基本方法，具备数据库设计能力。 Master the basic methods of databases design and the ability to design databases.	40
LO5	①	H	2. 掌握SQL语言查询和编程的基本技术，具备SQL语言编程能力。 Master the basic techniques of SQL language queries language and the ability to program in SQL language.	50

			3. 掌握设计数据库的基本方法，具备数据库设计能力。 Master the basic methods of databases design and the ability to design databases.	50
LO12	③	L	4. 能够利用课内外时间主动学习，关注行业动态新技术，通过自主学习发展自身能力，树立终身学习理念。 Being able to actively learn during and outside of class, paying attention to industry trends and new technologies, developing one's own abilities through self-directed learning, and establishing a lifelong learning philosophy.	100

三、课程内容与教学设计 Course Contents and Teaching Design

（一）各教学单元预期学习成果与教学内容 Course Expected Learning Outcomes and Teaching Contents

Part 1 Introduction 第 1 部分 概论

教学内容 Teaching Content:

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。

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.

教学难点 Difficulties in Teaching：

1 数据模型 Data Models

2 数据库设计 Database Design

Part 2 Relational Language 第 2 部分 关系语言

教学内容 Teaching Content:

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。

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.

教学难点 Difficulties in Teaching：

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

2 SQL 查询结构 SQL Query Structure

3 连接操作 join operation

4 聚合函数 Aggregation functions

5 嵌套子查询 Nested Sub-queries

6 视图定义 View definition

Part 3 Database Design 第 3 部分 数据库设计

教学内容 Teaching Content:

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。

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.

教学难点 Difficulties in Teaching：

1 实体和实体集 Entity and entity sets

2 关系和关系集 Relationship and Relationship Sets

3 E-R 图 E-R Diagram

4 映射基数 Mapping Cardinality

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

教学内容 Teaching Content:

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。

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.

教学难点 Difficulties in Teaching：

1 事务和 ACID 性质 Transaction and ACID properties

2 不一致状态 Inconsistent state

（二）各教学单元对课程目标的支撑关系 The supporting relationship between each teaching part and the course objectives

课程目标 course objectives / 教学单元 teaching part	1	2	3	4
Part 1 Introduction 第 1 部分 概论	√	√	√	
Part 2 Relational Language 第 2 部分 关系语言		√		√

Part 3 Database Design 第 3 部分 数据库设计		√	√	
Part 4 Transactions 第 4 部分 数据管理实现技术之事务管理	√			√

（三）教学方法与学时分配 Teaching methods and teaching hour

教学单元 teaching part	教与学方式 Teaching and Learning Methods	评价方式 Assessment Methods	学时分配 teaching hour		
			理论 Theoretical	实践 Experiment	小计 total
Part 1 Introduction 第 1 部分 概论	授课 Lecture	问题，章节测验 Multiple Questions, Quiz	2	0	2
Part 2 Relational Language 第 2 部分 关系语言	授课、讨论、案例分析 Lecture, Discussion, Case Study	各类问题，章节测验，案例学习 Multiple Questions, Quiz, Case Study	6	24	30
Part 3 Database Design 第 3 部分 数据库设计	授课、讨论、案例分析 Lecture, Discussion, Case Study	各类问题，章节测验，案例学习 Multiple Questions, Quiz, Case Study	6	8	14
Part 4 Transactions 第 4 部分 数据管理实现技术之事务管理	授课 Lecture	问题，章节测验 Multiple Questions, Quiz	2	0	2
合计 total			16	32	48

（四）课内实验项目与基本要求 In-Class Experiment and Basic Requirements

序号 No.	实验项目名称 Name of Experiment	目标要求与主要内容 Main Content of the Experiment	实验时数 Experiment Hours	实验类型 Experiment Type
1	数据库设计 Database Design	使用 ER 模型对现实信息进行数据库设计；将 ER 模型转换为对应的关系模式；综合应用关系数据库设计理论进行数据库和表的规范化设计 Design a database for real-world using the ER model; Convert the ER model into relational patterns; Integrating the Theory of Relational Database Design to normalize database design	8	③设计型 Design
2	关系语言 Relational Language	创建数据库、表；使用 SQL 语句对数据库进行单表和多表查询、分组及排序；设计视图、触发器及存储过程实现对数据库的管理 Create databases and tables; Use SQL statements to perform database queries, grouping, and sorting on single table or multi table; Design	24	③设计型 Design

		views, triggers, and stored procedures to manage databases		

实验类型：①演示型 ②验证型 ③设计型 ④综合型

四、课程思政教学设计 Course Ideological and Political Education Design

1．通过数据库基础知识学习，形成严谨的逻辑思维，培养科学态度。

By learning the basic knowledge of database principles, form rigorous logical thinking and cultivate a scientific attitude.

2．能够利用课内外时间主动学习，关注行业动态新技术，树立终身学习理念。

Able to actively learn within and outside of class, pay attention to industry trends and new technologies, and establish a lifelong learning philosophy.

五、课程考核 Course Assessment

总评构成 **Grading Computation**	占比 **Weightage**	考核方式 **Assessment Index**	课程目标 **Course Objectives**				合计 **Total**
			1	2	3	4	
X1	50%	个人项目报告 Final Personal Report（2000 words）		60	40		100
X2	20%	过程考核：个人作业 Personal Work（800 words）	40	60			100
X3	20%	过程考核：小组团队作业 Team Work（1200 words）			60	40	100
X4	10%	过程考核：课堂表现、出勤等 Class Performance	20	60		20	100