

Course Outline for CIS 81B

DATABASE ESSENTIALS IN THE CLOUD

Effective: Spring 2020

I. CATALOG DESCRIPTION:

CIS 81B — DATABASE ESSENTIALS IN THE CLOUD — 3.00 units

This course addresses cloud database management which supports a number of different approaches for storing data. In the course, students define, operate and scale both SQL and noSQL data storage solutions. This course considers factors that should be balanced during the design of a storage solution. Principles are applied by performing exercises using Amazon RDS and SQL to create and fill tables, retrieve and manipulate data. Object-based APIs are used to serialize objects to Amazon DynamoDB for noSQL solutions. Topics include automated backups, transaction logs, restoration and retention.

3.00 Units Lecture

Strongly Recommended

CIS 81A - Introduction to Cloud Computing with a minimum grade of C

Grading Methods:

Letter or P/NP

Discipline:

- Computer Information Systems

	MIN
Lecture Hours:	54.00
Expected Outside of Class Hours:	108.00
Total Hours:	162.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering this course, it is strongly recommended that the student should be able to:

A. CIS81A

1. Describe the cloud computing model, history, vendor perspectives and industry offerings.
2. Describe the process to obtain an Amazon Web Services (AWS) and/or Microsoft AZURE account and establish an account via AWS or AZURE.
3. Describe examples of infrastructure as a service, platform as a service, and software as a service.
4. Use current cloud services from a leading service provider.

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

- A. Apply for an Amazon (AWS) account and Amazon Educate account
- B. Describe the basics of database technology including their need, transactions, indexing, keys and components
- C. Demonstrate how to create and interface to an Amazon cloud based relational Database System (RDS)
- D. Demonstrate how to store and access relational data from the cloud RDS through application and programmatic methods
- E. Demonstrate how to store and access non-relational data using the DynamoDB through application and programmatic methods

V. CONTENT:

- A. AWS access
 1. AWS account acquisition
 2. AWS educate account acquisition
- B. Database technology
 1. Commercial database examples
 2. Requirements for database technology versus flat file storage
 3. Transaction processing including atomicity, consistency, isolation and durability
 4. Indexing principles
 5. Modern Relational Database Systems (RDBMS) components

- C. AWS Database Services
 - 1. Amazon RDS instance creation
- D. Storage and access of RDS through remote applications
 - 1. Remote management of RDS via the HeidiSQL tool
 - 2. Remote access to RDS through MySQL Workbench tool
 - 3. RDBMS tables, data, metadata and data types
 - 4. Basic SQL commands
 - a. CREATE TABLE
 - b. INSERT INTO
 - c. DROP TABLE
 - d. TRUNCATED TABLE
 - e. Primary key
 - 5. Creating tables using HeidiSQL and MySQL Workbench
 - 6. Adding data to tables using HeidiSQL and MySQL Workbench
 - 7. Querying data in tables using HeidiSQL and MySQL Workbench
 - 8. Foreign key basics
 - 9. Using HeidiSQL and MySQL Workbench to establish foreign keys
 - 10. Programmatic access to RDS via JavaScript
- E. Unstructured databases
 - 1. Introduction and need
 - a. Concepts of volume, velocity, variety and veracity
 - b. Introduction to Big Data and example of Amazon Rekognition image analysis service
 - c. Introduction to Amazon DynamoDB NoSQL database service
 - 1. Tables and table creation
 - 2. Items
 - 3. Primary Key
 - 4. Secondary Index
- F. Amazon DynamoDB usage
 - 1. Creating and launching an Amazon DynamoDB table
 - 2. Managing and securing the Amazon DynamoDB instance
 - 3. Basics of JavaScript Object Notation (JSON)
 - 4. Connecting to Amazon DynamoDB via JavaScript
- G. Database Migration Concepts
 - 1. Understanding and using the Amazon Database Migration Service (AWS DMS)
 - 2. Migrating data from source DB to target DB
 - a. Pricing Model
 - b. Source DB DBMS types
- H. Monitoring and managing RDS instances
 - 1. Monitoring fundamentals
 - a. Performance metrics including CPU, memory, disk space and Input/Output operations (IOPS), throughput and connections
 - b. Monitoring via RDS console
 - c. Monitoring via Trusted Advisor dashboard
 - d. Monitoring via Amazon CloudWatch
 - 2. Backup and restore concept
 - a. Strategies
 - b. RDS backup
 - c. Snapshot creating and restore
- I. Managing Amazon DynamoDB instances
 - 1. Backup and restore options
 - 2. Creation and restore
 - 3. Encryption

VI. METHODS OF INSTRUCTION:

- A. **Lecture** - Lecture on database technologies, implementation databases in the cloud
- B. **Lab** - Hands-on computer lab tasks

VII. TYPICAL ASSIGNMENTS:

- A. Using Amazon Web Services Console and the Database tools, create a relational database to store student information that supports a primary key concept and reduces data duplication
- B. Based on the sample data provided, answer the problems
 - 1. How many records does the table store
 - 2. How many fields are in each record
 - 3. What problems would you encounter if you wanted to list the records in order of the street address, city, state, or zip or area code

VIII. EVALUATION:

Methods/Frequency

- A. Exams/Tests
 - final exam
- B. Quizzes
 - frequent 4-10
- C. Lab Activities
 - 60% hands-on lab activities

IX. TYPICAL TEXTS:

- 1. Sarkar, Aurobindo. *Learning AWS: Design, Build, and Deploy Responsive Applications using AWS Cloud Components*. 2 ed., Packt Publishing, 2018.
- 2. Lucifredi, Ryan. *AWS System Administration*. 1 ed., O'Reilly Publishers, 2018.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Web browser: any HTML 5 compliant web browser
- B. AWS and/or AZURE account: free for students