SYLLABUS

CS725 Introduction to Relational Databases

Instructor

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Course Description

If you are currently with any company or organization that uses data, this course is well suited for you. Here, you'll gain skills to have more effective access to and control of the data. If you're pursuing a career change to data focused roles such as data science, business intelligence, marketing analytics, database administration, healthcare informatics, or e-commerce would also find it useful.

This course is part of the Performance Based Admission courses for the Data Science program.

Database management systems are a crucial part of most large-scale industry and open-source systems. This course will introduce you to important concepts of database systems and design. We will learn what relational databases are, what they are used for, the theory underlying their design, and how to query and modify a database using the declarative SQL language.

Additionally, if you would like to complete your master's degree in data science or If you are interested in academic credit for this course, you can transfer your learning and take a final exam for credit. This course is part of a Performance Based Admission pathway for the Master of Data Science program. More information about academic credit and degree pathways can be found here.

Course Outcomes

Upon successful completion of this course, you will be able to:

- **Know what relational databases are, and how they are used:** Have a clear understanding of what databases are, why they are essential in various industries and fields, their historical development, and various real-world applications.
- **Master the Relational Database Model:** Develop a thorough understanding of the relational database model, including the concepts of relation schema, database schema, instances, keys, and foreign keys.
- **Develop Proficiency in Formal Relational Database Theory:** Demonstrate a deep understanding of relational algebra, including set operations, joins, division, projection, and aggregation. They should be able to construct relational algebra formulas to solve database-related problems and figure out the results of such formulas on given relations.
- **Acquire Comprehensive SQL Skills:** Students will learn the key operations of SQL and know how to apply them. By the end of this course, students should understand the operators for data definition, basic query structure, set operations, handling null values, aggregate functions, nested subqueries, and database modification. They should also learn about defining keys and integrity constraints in SQL.
- **Apply Database Knowledge to Practical Problems:** Throughout the course, students should

develop the ability to apply their theoretical knowledge to practical problems, such as designing, implementing, and querying a relational database.

Course Materials

The link to reading materials and resources to learn on the topics can be found in each week's learning module. All materials are available online for free, no required resources need to be purchased. There is no required textbook to supplement the course materials. Note: Be aware that some resources may open in a new tab.

Software Requirements: Jupyter Notebooks, SQL

Course Outline

The course consists of 3 modules that focus on the following key areas:

Module 1: Database overview

Key concepts

- Relational databases
- Relational models
- Database schemas

Readings

- Watt, A., & Eng, N. (2014). *Database design* (2nd ed.). Pressbooks. Chapters 2-5 and 7.

Module 2: Relational algebra

Key concepts

- Basic and set operations
- Algebra joins
- Complex operations

Readings

- Watt, A., & Eng, N. (2014). *Database design* (2nd ed.). Pressbooks. Chapter 16
- Maier, D. (1983). *The theory of relational databases*. Computer Science Press, Inc. Chapters 2-3

Module 3: Structured Query Language (SQL)

Key concepts

- SELECT
- JOINs and complex queries
- Data definition language

Readings

- Watt, A., & Eng, N. (2014). *Database design* (2nd ed.). Pressbooks. Chapters 15 & 16

Course Structure and Learning Activities

There are 3 content modules in this course and each module may take about 6 hours to complete. Each module represents 1 week of learning with corresponding assignments per module. You can advance at your own pace; a consistent pace will help you complete the module and move on to the next course in the sequence. The final module consists of your final assessment for the course. You have to pass module tests and final assessment with 80% of achievement. At the end of the course, you will receive a Certificate of Completion branded by Coursera and IIT

This course is comprised of the following elements:

- **Readings**: Each module may include several required and/or supplemental readings.
- **Video Lessons**: In each module, the concepts you need to know will be presented through a collection of short videos. You may stream these videos for playback within the browser by clicking on their titles.
- **Discussion Forum**: This course has a place for you to interact with other learners about class-related topics. Unless specified, discussion forums do not carry a score.
- **Practice Quizzes**: Each module will include some practice quizzes, intended for you to assess your understanding of the topics. You will be allowed unlimited attempts at each practice quiz. There is no time limit on how long you take to complete each attempt at the quiz. These quizzes do not contribute toward your final score in the class.
- **Summative Module Assessments:** Each module will include at least one summative module assessment. You will be allowed three attempts per every eight hours for each assessment. There is no time limit on how long you take to complete each attempt at the assessment. Your highest grade will be recorded.
- **Summative Course Assessment:** This course will contain one final formative assessment. You will be allowed one attempt for this assessment.

How to Pass This Course

Guidelines for completing and submitting each assigned course activity are posted along with the assignment. Assignments can be submitted at any time as you move through the module. Only those who complete and submit all assignments, including peer reviews, will receive a certificate of completion of this course. *No late assignments will be accepted.* In case of extenuating circumstances beyond your control that prevent the submission of an assignment or exam, you have to enter a request with the program advisor and the instructor.

To qualify for a Course Certificate of Completion, simply start verifying your coursework at the beginning of the course and pay the fee. Coursera Financial Aid is available to offset the registration cost for learners with demonstrated economic needs. If you have questions about Course Certificates, please see the help topics here.

Also, note that this course is part of Master of Data Science offered by Illinois Institute of Technology. By earning a Course Certificate in this course, you are on your way toward earning a Specialization Certificate in this topic. See more information about this program here.

If you choose not to pay the fee, you can still audit the course. You will still be able to view all videos, submit practice quizzes, and view required assessments. Auditing does not include the option to submit required assessments. As such, you will not be able to earn a grade or a Course Certificate.

The following table explains the breakdown for what is required in order to pass the class and qualify for a Course Certificate. You must pass each and every required activity in order to pass this course.

Activity	**Required?**	**Number per Course**	**Estimated Time per Module**	**% Required to Pass**	**% of Total Grade**
Lecture Videos	Yes	3-6 per module	.5-1 hour	N/A	N/A
Practice Quizzes	No	3-6 per module	.5 hour	N/A	N/A
Discussions	No	2 per course	1 hour	N/A	N/A
Summative Module Assessments	Yes	1 per module	.5 hour	80%	20% /each module (60%)
Summative Course Assessment	Yes	1 per course	1-3 hours	80%	40%

Getting and Giving Help

- Use the Learner Help Center to find information regarding specific technical problems. For example, technical problems would include error messages, difficulty submitting assignments, or problems with video playback. If you cannot find an answer in the documentation, you can also report your problem to the Coursera staff by clicking on the *Contact Us!* link available on each topic's page within the Learner Help Center.
- Use the flag icon under each item to report errors in lecture video content, assignment questions and answers, assignment grading, text and links on course pages, or the content of other course materials.
- Familiarize yourself with Coursera's policy on Accessibility.

Academic Integrity

Your attentiveness to academic integrity reflects the value you place on your own work and the work of others. In addition to Coursera's Honor Code, we also have high expectations for conduct during course participation.

Discussion Forums: Expectations

Sharing an online course with other avid learners like you gives you a unique opportunity to share, collaborate, and learn from others and their experiences, and helps you reinforce your understanding of the topics of the course. Interacting in the Discussion Forums is a great way to engage with your online community. We know that it is not possible to read every discussion forum post, so we recommend that you read those that interest you; and reply when you can contribute.

The forum is part of your class activities and everybody is expected to act professionally and be civil and respectful of others in your class. Failure to meet these expectations may be considered a break in the Academic Code of Conduct and may result in your removal from the course. Please, check tips and helpful tools to interact in discussion forums in this document.

Academic Code of Conduct

Above all else, learners are expected to ensure that their conduct helps to create an atmosphere conducive to learning and the interchange of knowledge. While it is understood that some of these items are subject to interpretation, learners should nonetheless endeavor to:

- Be respectful of fellow learners.
- Not discriminate against fellow learners in any manner.
- Conduct peer reviews in a timely manner and give useful feedback on what was done well, helpful suggestions for how to improve, and specific comments about why you gave the grade you chose to assist peers in their learning.
- Turn assignments in on time and follow instructions on all assignments including those affecting the use of technology.
- Be truthful in all communication, which includes, but is not limited to, avoiding academic dishonesty.

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