

## SYLLABUS

# CS726 Relational Database Design

## Instructor

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## Course Description

If you are in the data engineering and database development sector, as a provider, payer, or administrator, this course is well suited for you. If you are pursuing a career change to the data engineering and database development sector, you may also be interested in this course.

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

This course provides you with the opportunity to learn about relational database design. You will be provided an in-depth understanding of the design principles and methodologies involved in creating well-structured, normalized, and efficient relational databases to manage data for small, medium, and large-scale enterprises.

Possessing database design skills will enable you to excel in careers such as Database Administrators, Data Analysts, Software Developers, Data Engineers, and Business Intelligence Developers; capitalizing on the ability to create robust and efficient data solutions for any organization. These are one of the most sought-after careers across many industries today.

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:

- Describe the process and the design aspects involved in relational database design.
- Interpret the main components of an Entity-Relationship diagram (ERD) using unified modeling language (UML) notation.
- Develop entity-relationship diagrams using basic and extended Entity-relationship features in relational design.
- Translate an Entity-Relationships diagrams into logical schemas (relation schemas)
- Explore the theory and practical application of functional dependencies in relational database design.
- Use the theory to recognize candidate keys and primary keys: Identify candidate keys and choose appropriate primary keys for each table to uniquely identify records and maintain relational integrity.
- Deriving minimal and canonical covers of functional dependencies: Describe the process of deriving minimal sets of functional dependencies and organizing them into canonical form to represent relationships accurately.
- Describe the principles of database normalization: Explain the fundamental concepts of normalization, including the rationale behind breaking down data into multiple tables to minimize redundancy and maintain data integrity.

- Identify and apply normalization techniques: Gain the skills to identify data anomalies and apply normalization techniques, such as first normal form (1NF), second normal form (2NF), third normal form (3NF), Boyce-Codd normal form (BCNF), and beyond, to structure data effectively.

## **Course Materials**

The link to reading materials and resources to learn 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.

## **Course Outline**

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

### **Module 1: Design Overview**

#### **Key concepts**

- Entity-Relationship Modeling (E-R Model)
- Developing E-R Diagrams
- Extended E-R Features and Relation Schemas

#### **Readings**

- Entity and Relationship
- Modeling Constraints – Participation and Cardinality
- Steps to Develop E-R Diagrams
- Interpreting E-R Diagrams and Cardinality Constraints
- Reduction to Relation Schemas
- Extended E-R Features

### **Module 2: Functional Dependency (FD)**

#### **Key concepts**

- Functional Dependency Theory
- Finding Candidate Keys and Attribute Closure
- Derive Minimal Cover of FDs

#### **Readings**

- Functional Dependency
- Key Aspects of Functional Dependency
- Armstrong's Axioms Closure Algorithm
- Attribute Closure
- Finding Candidate Keys

### **Module 3: Database Normalization**

#### **Key concepts**

- Normal Forms (NFs)

## Readings

- Normal Forms
- Conversion to 1NF
- Conversion to 2NF
- Conversion to 3NF

## Course Structure and Learning Activities

There are 3 content modules in this course and each module may take about 5-8 hours to complete. 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 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.
- **Peer Reviewed Assignments:** You have 3 Peer Review Assignments in this course. After submitting your work, you will then swap assignments and engage in peer reviews to provide feedback to course colleagues on their assignments.
- **Summative Course Assessment:** This course contains one final summative course 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 the Master of Data Science program 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	4-7 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%)
Peer Reviewed Assignments	Yes	1 per module	1-2 hours	N/A	N/A
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.
- Do 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.

## Illinois Institute of Technology Copyright Statement

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