

Harbin Institute of Technology
School of Computer Science and Technology
Database System Concepts
Spring 2018

Disclaimer: The information here may include errors, typos, or missing items. Notify to your instructor.

Lab Objective

- ✓ *Students are expected to complete the implementation exercises of various relational database topics. Topics are listed below. These lab activities are designed and intended to increase the depth of knowledge on the foundation of lecturing, research activities, and project activities.*

Labs

- ✓ *All lab assignments must be submitted as instructed for each assignment and are due **indicated in a class scheduler**.*
- ✓ *A specific site where the lab assignments should be posted shall be provided.*
- ✓ *Late submissions are accepted with the following penalties:*
 - *50% off of the assignment points graded for the first day of late submission.*
 - *No assignment points granted for two days late or no submission.*
- ✓ *No show for the Lab session shall be granted 0% for the affected lab.*
- ✓ *Early leave from the Lab session shall be granted 50% off of the assignment points for the affected lab.*

Evaluation Criteria for Labs

- *Points will be granted based on the quality and completeness of work.*

Tentative Lab Practice Topics

I reserve the rights to change a topic and/or schedule as deemed necessary with/without notice.

Lab No.	Category	Total
Lab Exercise		
Lab 1	Relational Languages & Data Modeling	400
Lab 2	Query Processing & Optimization	400
Lab 3	DB Objects, DW, and NoSQL Data Stores	400
Lab 4	Transaction, Concurrency, and Recovery	400
		1600*

**This will account for 25% of the overall grade.*

Tentative Lab Assignment Topics:

Lab assignment topics may be subject to change as deemed necessary. A notification shall be sent to students.

Lab 1 - Relational Languages & Data Modeling

Lab 1.1: Keys, Relational Languages

Goals:

- Master Keys (Superkeys, Candidate Keys, Primary Keys, Foreign Keys)
- Master Relational Languages (Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus)

Instructions:

Lab: Will provide the specific exercise problems

- Practice 1: Keys
- Practice 2: Relational Algebra
- Practice 3: Relational Calculus

Submission:

- (Pair) Solve the problems: Practices 1, 2, and 3, and submit it to a designated class website:
 - Lab1_FN1 and FN2.doc
- *FN = First Name

Lab 1.2: Implement Keys, Relational Language in MySQL

Goals:

- Master the concepts of relational language
- Master the implementation of the concepts in MySQL, DDL
- Master the conversion of TRC, DRC to SQL
- Master the queries in MySQL, DML

Instructions:

Lab: Will provide the specific exercise problems

- Practice 1: Tuple relational calculus (TRC) and domain relational calculus (DRC)
- Practice 2: Build a database using MySQL, DDL
- Practice 3: From TRC, DRC to SQL in MySQL, DML
- Practice 4: Your own practice relevant to keys and relational languages in MySQL

Submission:

- (Pair) Solve the problems: Practices 1, 2, 3, and 4, and submit it to a designated class website:
 - Lab2_FN1 and FN2.doc

- Lab2_FN1 and FN2.wbm
- *FN = First Name

Lab 1.3: Implement E-R Modeling in Dia

Goals:

- Master the Implementation of E-R Modeling in Dia

Instructions:

Lab: Will provide the specific practice problems

Submission:

- Dia E-R Modeling: submit it to a designated class website:
 - Lab2.1_<yourname>.zip
- *zip includes documents and <filename>.

Lab 1.4: UML Notations

Goals:

- Master the concepts of use cases
- Master the UML notations
- Master the project scheduler

Instructions:

Lab: Will provide the specific exercise problems

Submission:

- UML Practice: submit it to a designated class website:
 - Lab1.2_<yourname>.zip
- *zip includes documents and <filename>.uml

Lab 2 - Query Processing & Optimization

Lab 2.1: Functional Dependency

Goals:

- Master the concepts of functional dependency, finding keys
- Master the normalization (1-4NF, BCNF)

Instructions:

Lab: Will provide the specific practice problems

- Practice 1: Normal Forms
- Practice 2: Functional Dependency
- Practice 3: Identify Key(s) with Functional Dependency

- Practice 4: Your own practice relevant to functional dependency and normalization

Submission:

- (Pair) Solve the problems: Practices 1, 2, 3, and 4, and submit it to a designated class website:
 - Lab4_FN1 and FN2.doc
- *FN = First Name

Lab 2.2: Implement Normalization in MySQL

Goals:

- Master the concepts of FD inferred rules including Armstrong's Axioms
- Master the concepts of closure and the identification of keys
- Master the implementation of normalization in 5 Normal Forms in MySQL

Instructions:

Lab: Will provide the specific practice problems

- Practice 1: Identification of the closure of FD using Armstrong's Axioms and others
- Practice 2: Identification of keys using techniques taught in class
- Practice 3: Implementation of 1NF, 2NF, 3NF, BCNF, and 4NF in MySQL
- Practice 4: Your own practice relevant to normalization

Submission:

- (Pair) Solve the problems: Practices 1, 2, 3, and 4, and submit it to a designated class website:
 - Lab5_FN1 and FN2.doc
 - Lab5_FN1 and FN2.mwb
- *FN = First Name

Lab 3.3: Query Processing in MySQL

Goals:

- Master the concepts of SQL

Instructions:

Lab: Will provide the specific practice problems

Submission:

- SQL Practice: submit it to a designated class website:
 - Lab3.1_<yourname>.zip
- *zip includes documents and <filename>.mwb

Lab 3.4: Query Optimization

Goals:

- Understand Nested Loop Join
- Master Query Optimization Heuristic Approach
- Master Query Optimization Cost-based Approach

Instructions:

Lab: Will provide the practice problems

Submission:

- Practices: submit it to a designated class website:
 - Lab4.1_<yourname>.doc

Lab 3 - DB Objects, DW, and NoSQL Data Stores**Lab 3.1: DB Objects I****Goals:**

- Master the concepts of Indexing, Hashing, Join

Instructions:

Lab: Will provide the specific practice problems

Submission:

- SQL Practice: submit it to a designated class website:
 - Lab3.1_<yourname>.zip
- *zip includes documents and <filename>.mwb

Lab 3.2: DB Objects II**Goals:**

- Master the concepts of Triggers, Stored Procedures

Instructions:

Lab: Will provide the specific practice problems

Submission:

- SQL Practice: submit it to a designated class website:
 - Lab3.2_<yourname>.zip
- *zip includes documents and <filename>.mwb

Lab 3.3: Data Warehouse**Goals:**

- Master the concepts of Data Warehouse

Instructions:

Lab: Will provide the specific practice problems

Submission:

- DW Practice: submit it to a designated class website:
 - Lab3.3_<yourname>.zip
- *zip includes documents and <filename>.mwb

Lab 3.4: NoSQL Data Stores

Goals:

- Master the concepts of NoSQL Data Stores
- Master the skills of Mongo DB

Instructions:

Lab: Will provide the specific practice problems

Submission:

- MongoDB Practice: submit it to a designated class website:
 - Lab3.3_<yourname>.zip
- *zip includes documents and <filename>

Lab 4 - Transaction, Concurrency, and Recovery

Lab 4.1: Transaction, Concurrency, and Recovery

Goals:

- Understand the concepts of transaction, concurrency, and recovery
- Master skills on the implementation of transaction, concurrency, and recovery

Instructions:

Lab: Will provide the practice problems

Submission:

- Practices: submit it to a designated class website:
- - Lab4.1_<yourname>.doc