Study Guide for ISQA 8050 Test Out Exam

The test out exam is designed to assess your knowledge in the following areas: database, file structures, and computer networks. Percentages are assigned in accordance to the weight each topic has in ISQA 8050. The test out will contain different question types such as True/False, Matching, Multiple Choice, Short Answer, and Modeling (ERD).

You need to reach at least 50% in each of the three section, and at least 75% overall in order to pass the exam.

Database (approx. 60%)

- Understand the terms 'database', 'database management system', 'relational database'
- Understand problems associated with traditional file processing systems and how the database approach solves problems of traditional file processing systems
- Understand the database development process, and how it fits into the broader context of systems analysis, design, and implementation
  - Understand the ANSI/SPARC model
  - Understand the difference between a conceptual and logical model
- Understand and apply normalization to relations in a relational DBMS
  - Functional dependency, partial and transitive dependencies, UNF, 1NF, 2NF, 3NF
- Understand the data integrity issues associated with database systems and how these are addressed in contemporary database management systems
  - Entity integrity, domain integrity (domain constraints), referential integrity
- Use (a subset of) the SQL data manipulation and definition language
  - Be able to identify the results of a query (INSERT, UPDATE, DELETE, SELECT (FROM, WHERE, AND, OR, JOIN, DISTINCT, BETWEEN, IN))
  - Be able to write simply SQL SELECT queries
- Understand and use techniques and tools for developing data models, as part of a database analysis and design effort
  - Be able to write an Entity-Relationship-Diagram based on a problem statement and business rules
  - Identify entities, attributes, and relationships
    - Identify primary keys if any
    - Identify minimum and maximum cardinality for relationships and identify an appropriate verb phrase for the relationships
    - Use appropriate entity and attribute names with pre-fixes
  - Use Crow’s Foot Notation
  - Example for a conceptual model: See below
- Transform a conceptual model into a logical model (= transform ERDs to tables)
  - Identify primary keys and foreign keys, resolve m:n relationships

File Structures (approx. 20%)

- Understand how a computer works
  - CPU, main memory, secondary storage
- Understand various forms of data storage devices
  - Tapes, disk storage, optical storage, solid state drives
- Understand how files of records are physically stored and their advantages and disadvantages
  - How to store fields within records: Fixed-length, Length Indicator, Delimiter, Keyword=Value, Tags
  - How to store records within a file: Fixed-length records, Fixed Number of Fields per record, Length Indicator, Delimiter between records, tags, index file
- Understand different ways to access files and their performance implications
  - Direct Access (Advantages, Disadvantages, Performance for search and direct access)
    - No index:
      - An ordered (sorted), sequential file of fixed-length records without any type of index structure requiring a relative record number
    - Simple index:
      - An entry-sequenced file with a simple (array-type) index structure.
    - Multi-level indexes:
      - An entry-sequenced file with a B-Tree index structure
      - A file organized as a B+Tree.
    - Hashing: A fixed-length hashed file.

Computer Networks (approx. 20%)

- Understand basic network components: applications, host, routers, link
- Understand network types (PAN, LAN, etc.)
- Understand C/S versus P2P architecture
- Understand multi-tiered Computer Architecture (n-tier CS architectures)
- Understand Circuit versus Packet Switching
- Understand OSI Reference Model
  - Know the different layers, the names, the sequence of layers, and the responsibilities of each layer (you don’t need to know an explanation for the presentation and session layer, but you should know that they are part of the OSI Reference Model)
  - How layers add to the original message
  - TCP/IP Reference Model and example protocols
- Course Information -

University: University of Nebraska at Omaha
College: Graduate College
Curriculum: Info Systems & Quant Analysis
Number: 8050
Type: Lecture
Title: Data Organization and Storage
Short title: Data Organization and Storage
Effective term: Summer 2014
Graduate non-degree students: Allowed
Can course be taken for credit multiple times? No

- Credit Hours Information -

Type: Fixed
Hours: 3

- Cross-listing and/or Dual-listing (UG/G) Information -

Courses: Not applicable

- Duplication Information (not to be used for cross/dual-listings) -

Curriculum: Not applicable

- 1.0 Course Description Information -

1.1 Catalog description:
The course will provide concepts of data organization, data storage, and data transfer through computer networks. The performance implications of various design decisions will be explored. The purpose of this course is to prepare the student for further graduate-level study of information systems. This course may not be used in a plan of study for any graduate program at UNO.

1.2 Prerequisites of the course:

1.3 Overview of content and purpose of the course:
The course will provide basic concepts of data organization, data storage, and data transfer through computer networks. The course is divided into three major topics. First, students learn how data can be organized which includes topics such as data models, relational databases, database design, and implementation with SQL. Second, for the data storage topic students will get an overview of basic computer and file processing, secondary data storage, and organizing data into files of records. Third, students will learn how data is transferred through computer networks which includes knowledge about layered model of network architecture, OSI reference model, Internet architecture and TCP/IP, and wireless technologies.

1.4 Unusual circumstances of the course:

- 2.0 Course Justification Information -

2.1 Anticipated audience / demand:

ISQA 8050 is a foundation course and intended for students who come into the program without an adequate background in computers. The course prepares the students for subsequent graduate courses.

2.2 Indicate how often this course will be offered and the anticipated enrollment:
The course is offered once or twice every year. Current demand is approximately 20-40 students.

2.3 If it is a significant change to an existing course please explain why it is needed:

The management of data requires knowledge about data organization, data storage, as well as data transfer. These are fundamental areas of knowledge for students in an MIS program. The course change will add the area of data transfer, i.e., how data is transferred via a computer network and how computer networks work. This makes the foundation more comprehensive.

- 3.0 Objective Information -
Is this course part of or being proposed for the General Education curriculum?
No

3.1 List of performance objectives stated as student learning outcomes:
The course will provide basic concepts of data organization, data storage, and data networking. After taking this course, you will, among other things, be able to:
- define the terms ‘database’, ‘database management system’, ‘relational database’
- use current database management systems (e.g., Microsoft Access, Oracle)
- understand the database development process and how it fits into the broader context of systems analysis, design, and implementation
- understand and use techniques and tools for developing data models, as part of a database analysis and design effort
- understand and apply normalization to relations in a relational DBMS
- understand the data integrity issues associated with database systems and how these are addressed in contemporary database management systems
- design and implement a relational database system of modest size
- use (a subset of) the SQL data manipulation and definition language
- understand how a computer works: CPU, main memory, secondary storage
- understand various forms of data storage devices
- understand how files of records are physically stored and their advantages and disadvantages
- understand different ways to access files and their performance implications
- discuss issues around the physical database design
- get an overview of the main concepts of computer networks
- understand the OSI reference model and the purpose of layered model of network architecture
- understand the Internet Architecture and TCP/IP
- understand wireless technology and secure access points
- discuss the issues and techniques used with databases in a distributed environment, including the Internet
- be aware of current trends in data organization, storage, and networking

3.2 General Education Student Learning Outcomes

After completing the course, successful students shall be able to do the following:

- 4.0 Content and Organization Information -
4.1 List the major topics central to this course:
- Introduction to Files and Data Management
- Introduction to Data Models
- Data Modeling and ERD Modeling
- Database Design
- SQL
- How a computer works and secondary storage
- File processing and organization of records in files
- Physical database design
- Introduction to business data communications
- Layered model of network architecture
- OSI reference model
- Internet architecture and TCP/IP
- Databases and the Internet

- 5.0 Teaching Methodology Information -
5.1 Methods:
This class will use various teaching techniques: textbook readings, online lectures, exercises in- and outside the classroom, discussions, and lab sessions. Especially learning about designing and developing databases requires extensive practice. In order to incorporate exercises and practice into the classroom, students are required to acquire concepts on their own through reading the assigned chapters and listening to assigned online lectures. Some group work may be required in the classroom.

5.2 Student role:
Students are expected to contribute regularly in class. Class meetings will also be working sessions, devoted to discussion and practice of the concepts and techniques of data management, using the tools we have at our disposal. Instead of only passive absorption of wisdom handed down by the instructor, students should prepare for active involvement in the topic to be mastered at each class meeting. Students should expect to learn from their peers and provide learning to them, as well as from and to the instructor.

Class attendance is an essential part of a learning experience. Students are expected to come to class on time and stay until the end. Students are expected to come prepared to class. Students are expected to behave in a professional manner during all times, in and outside the class room. The instructor encourages the student to keep an open mind for the new things you are going to learn in this class. Students are expected to ask questions about and discuss the material, either in class or in the instructors office. Material that supplements the readings will be developed in class, so attendance is essential to full mastery of the course.

Obviously, students are expected to finish all quizzes, exams, and assignments.

- 6.0 Evaluation Information -
Students should be provided the actual list of projects, basis for determining the final grade, and grading scale at the beginning of each course.
6.1.1 Describe the typical types of student projects that will be the basis for evaluating student performance:

The following are typical assignments students complete:

- Developing a MS Access database. This assignment will give students practice in some of the basics of using the Microsoft Access DBMS. The student will gain some understanding of the basic functionality of MS Access such as creating tables, forms, and queries.
- Developing a Data Model. This assignment is the first of two assignments that will lead students through the database development process for a specific application. This assignment focuses on data modeling and transforming a conceptual schema into an internal schema. Tasks include creating a conceptual data model based on a problem description, transforming the conceptual model to an internal model (relational model), and normalization.
- Designing and Implementing a Data Model. This assignment is the second of two assignments that will lead students through the database development process for a specific application. In this part, students are implementing the internal schema developed in assignment 2. Students are implementing the database portion (table creation, inserting data, requests from the application to the database), not the user interface or application code. In this assignment students will create and populate database tables, and will formulate the queries that the application would need to execute to fulfill the functionality of the application.
- Current Trends in Data Organization, Storage, and Transfer. This assignment gives students the opportunity to investigate one current trend of their interest in the area of data organization, storage, or transfer. Tasks include formulating a research question or research topic, researching the question or topic, and preparing a short online presentation with the results of their research.

6.2 Describe the typical basis for determining the final grade (e.g., weighting of various student projects):

Exams (2) 50%
Assignments (4) 36%
Quizzes 10%
Participation 4%
TOTAL 100%

6.3 Grading type:
Letter grades

- 7.0 Resource Material Information -
7.1 Textbook(s) or other required readings used in course:

"Modern Database Management" by Hoffer, Ramesh, and Topi, 11th Edition.

7.2 Other student suggested reading materials:
7.3 Current bibliography and other resources:


- 8.0 Other Information -
8.1 Accommodations statement:
Accommodations are provided for students who are registered with UNO Disability Services and make their requests sufficiently in advance. For more information, contact Disability Services (MBSC 111, Phone: 402.554.2872, TTY: 402.554.3799) or visit the web at http://www.unomaha.edu/disability.

8.2 Other:

* 8.3 Author(s):
Dr. Martina Greiner (responsible); Dr. Peter Wolcott (entered information)