The first exam covers the topics discussed in class since the beginning of the semester. It will be closed book and closed notes and will focus on the lecture notes, class discussions, and homework assignments – you should use the textbook for clarification of concepts and their significance, but material from the text that was not covered in class will not be on the exam.

The exam will be worth 100 points, and will be a combination of multiple choice and True/False questions.

**History / Introduction:**
- Data vs. information
- Issues with computerized file-based systems
- Advantages of database systems
- Components of a database system
  - Characteristics of a DBMS
- Types of databases
- Types of database models
  - hierarchical
  - network
  - relational
  - issues with redundancy
- Types of anomalies

**Concepts:**
- Database
- Database management system (DBMS)
- Relation
  - properties of a relation
- Tuple
- Entity
- Attribute
- Relationship

**Data modeling:**
- ER models
  - Entity types / entity instances
  - Strong and weak entity types
  - Simple and composite attributes
  - Single and multi-valued attributes
  - Derived attributes
  - Relationships
    - Degree of a relationship
    - Cardinality
    - Associative entity type
- EER models
  - Supertypes and subtypes
  - Generalization vs. specialization
  - Subtype discriminator
  - Participation constraints and disjoint constraints
Converting data models to relations:
Mapping entities to relations
  simple attributes
  composite attributes
  multi-valued attributes
  weak entities
Mapping relationships
  1:M
  1:1
  M:N
  supertype -> subtype

Concepts:
  Relational schema
  Null values
  Superkey
  Candidate key
  Primary key
  Foreign key
  Secondary key
  Entity integrity
  Referential integrity

Normalization:
  Data redundancy and types of anomalies

You should know not just the definition of each of the following, but also the process by which it is achieved:
  First normal form (1NF)
  Second normal form (2NF)
  Third normal form (3NF)
  [Boyce-Codd normal form (BCNF)]

Concepts:
  Normalization (def.)
  "Well-structured" relations
  Functional dependency
    Full dependencies
    Partial dependencies
    Transitive dependencies
  Determinants