**Week 1**

* Data Models: A collection of concepts for describing the data in a database
* Schema: A description of a particular collection of data, using a given data model
* Relational Model:
  + Structure: The definition of the database’s relations and their contents
  + Integrity: Ensure the database’s contents satisfy constraints
  + Manipulation: Programming interface for accessing and modifying a database’s contents
  + A relation is an unordered set that contain the relationship of attributes that represent entities
    - N-ary relation = Table with n columns
  + A tuple (row) is a set of attribute values (domains) in the relation
  + Relation, tuple, and attribute represented as table, row, and column respectively
* Elements of the Database Approach
  + Entities: A person, a place, an object, an event, or a concept in the user environment about which the organization wishes to maintain data
  + Relationships: Usually one-to-many or many-to-many
  + Relational Databases: A database that represents data as a collection of tables in which all data relationships are represented by common values in related tables
  + Data Models: Graphical system capturing nature and relationship of data
* Advantages of the Database Approach
  + Planned data redundancy
    - Not eliminate redundancy entirely
    - Control the type and amount of redundancy
  + Improved data consistency
    - By controlling data redundancy
  + Improved data sharing
    - A user view is a logical description of some portion of the database that is required by a user to perform some task
  + Enforcement of standards
    - Naming conventions
    - Data quality standards
    - Uniform procedure for accessing, updating, and protecting data
  + Improved data quality
    - Integrity constraints
  + Improved data accessibility and responsiveness
    - End users without programming experience can write queries
  + Reduced program maintenance
    - Data are more independent of the application programs that use them
    - We can change either the data or the application programs that use the data without necessitating a change in the other factor
  + Improved decision support
    - OLAP (Online analytical processing) and data warehousing
    - E.g. some databases are designed to support customer relationship management
* Costs and Risks of the Database Approach
  + New, specialized personnel
    - Design and implement databases
    - Provide database administration services
  + Installation and management cost and complexity
  + Conversion costs
  + Need for explicit backup and recovery