# Directions & Deliverable – Tim Capehart

Complete the following exercises in a single document. Label each question and/or letter clearly. Submit your work electronically to Blackboard by the due date specified.

#### Exercises

1. Create an ER diagram for each of the following descriptions:

(a) Each company operates four departments, and each department belongs to one company. (Note when the exact cardinality is known (in this example, 4) a value can replace the multiplicity range.



(b) Each department in part (a) employs one or more employees, and each employee works for one department.



(c) Each of the employees in part (b) may or may not have one or more dependants, and each dependant belongs to one employee.



(d) Each employee in part (c) may or may not have an employment history.



(e) Represent all the ER diagrams described in (a), (b), (c), and (d) as a single ER diagram.



1. You are required to create a conceptual data model of the data requirements for a company that specializes in IT training. The Company has 30 instructors and can handle up to 100 trainees per training session. The Company offers five advanced technology courses, each of which is taught by a teaching team of two or more instructors. Each instructor is assigned to a maximum of two teaching teams or may be assigned to do research. Each trainee undertakes one advanced technology course per training session.
2. Identify the main entity types for the company.

Session, Instructor, Team, Trainee, TechCourse

1. Identify the main relationship types and specify the multiplicity for each relationship. State any assumptions you make about the data.

1 Session 🡪 Has 🡪 30 Instructors

1Team 🡪 Has 🡪2 or more Instructors

1 Instructor 🡪 Has 🡪 0 or up to 2 Teams

5 Coarses 🡪 Have 🡪 1 Team

100 Trainees 🡪 Have 🡪 1 Coarse

1. Using your answers for (a) and (b), draw a single ER diagram to represent the data requirements for the company.



1. Read the following case study, which describes the data requirements for a DVD rental company. The DVD rental company has several branches throughout the USA. The data held on each branch is the branch address made up of street, city, state, and zip code, and the telephone number. Each branch is given a branch number, which is unique throughout the company. Each branch is allocated staff, which includes a Manager. The Manager is responsible for the day-to-day running of a given branch. The data held on a member of staff is his or her name, position, and salary. Each member of staff is given a staff number, which is unique throughout the company. Each branch has a stock of DVDs. The data held on a DVD is the catalog number, DVD number, title, category, daily rental, cost, status, and the names of the main actors, and the director. The catalog number uniquely identifies each DVD. However, in most cases, there are several copies of each DVD at a branch, and the individual copies are identified using the DVD number. A DVD is given a category such as Action, Adult, Children, Drama, Horror, or Sci-Fi. The status indicates whether a specific copy of a DVD is available for rent. Before hiring a DVD from the company, a customer must first register as a member of a local branch. The data held on a member is the first and last name, address, and the date that the member registered at a branch. Each member is given a member number, which is unique throughout all branches of the company. Once registered, a member is free to rent DVDs, up to maximum of ten at any one time. The data held on each DVD rented is the rental number, the full name and number of the member, the DVD number, title, and daily rental, and the dates the DVD is rented out and date returned. The rental number is unique throughout the company.
2. Identify the main entity types of the DVD rental company.

Company, Branch, Members, Rental, Staff, Stock

1. Identify the main relationship types between the entity types described in (a) and represent each relationship as an ER diagram.









1. Determine the multiplicity constraints for each relationship described in (b). Represent the multiplicity for each relationship in the ER diagrams created in (b).









1. Identify attributes and associate them with entity or relationship types. Represent each attribute in the ER diagrams created in (c).









1. Determine candidate and primary key attributes for each (strong) entity type.

See above.

1. Using your answers (a) to (e) attempt to represent the data requirements of the DVD rental company as a single ER diagram. State any assumptions necessary to support your design.

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1. Create an ER model for each of the following descriptions:

(a) A large organization has several parking lots, which are used by staff.

(b) Each parking lot has a unique name, location, capacity, and number of floors (where appropriate).

(c) Each parking lot has parking spaces, which are uniquely identified using a space number.

(d) Members of staff can request the sole use of a single parking space. Each member of staff has a unique number, name,telephone extension number, and vehicle license number.

(e) Represent all the ER models described in parts (a), (b), (c), and (d) as a single ER model. Provide any assumptions necessary to support your model.



1. Create an ER model to represent the data use by the library.

The library provides books to borrowers. Each book is described by title, edition and year of publication and is uniquely identified using the ISBN. Each borrower is described by his or her name and address and is uniquely identified using a borrower number. The library provides one or more copies of each book and each copy is uniquely identified using a copy number, status indicating if the book is available for loan and the allowable loan period for a given copy. A borrower may loan one or many books and the date each book is loaned out and is returned is recorded. Loan number uniquely identifies each book loan.

