

## **Project information**

Your project consists of three phases of DBMS development that are broken down into 10 assignments. Here is a list and completion dates for each assignment. As a group, you need to submit a single report after completing each assignment. Your report must be submitted to the assigned T.A. during the lab hours.

Project Report format and marking scheme:

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### **Database application:**

Select an application from the list provided below and try to create minimum 5-10 entities and 5-10 interesting relationships among the entities from the description that you will provide in A1. You should be familiar with the data requirements of the selected application. Designing more entities and relationship among them will show more benefits of DBMS.

The guideline that is used as a sample of DBMS design and will be discussed in class and is explained in lecture notes is a university database system.

**Assignment marks and submission schedule:** You have to submit each assignment part in the week shown below during your lab hours to the T.A. to receive marks for that part.

**Group formation:** Week of Sep. 2 (Inform the lab TA your group members and interested application name from the list) –there is no lab in this week

**Assignment 1: Application Description:** Week of Sep. 9. Finalize the application in consultation with the lab TA. Submit a report on description of the application, its functions and the information that you expect from it, in high level to the TA (2 marks)

**Assignment 2: ER model:** Week of Sep. 16 (4 marks)

**Assignment 3: Schema design:** Week of Sept 23. Use Oracle to create the tables derived from ER/EER diagram as discussed in the class and hand in the print of source code (2 marks) **End of logical database design Phase/**

### **Start of Implementation Phase/ Second Phase**

Database construction: Populate the tables of database and create simple queries: (use SQL-Oracle as discussed in the class and follow the examples of lecture notes)

**Assignment 4: Demo of Designing Views/ Simple Queries:** Week of Sept 31 (4 marks in total). Assignment 4 has two parts for the first part of Assignment 4 (due on Week of Sept31), design at least 7-8 simple queries (at least one for each of your table) and in the second part (due Week of Oct7) create at least two VIEWS and more queries and hand in the snapshots of their results to the TA during each week lab hours. In general, use the necessary keywords such as DISTINCT, and grouping/sorting commands to produce professional report results for queries. The query results should show records in tables with meaningful titles and proper format similar to queries 1-8 for the part one and two assignment4. For each part submit the print out of your source code during that week's lab.

**Week of Oct 7:** Complete assignment4 with adding VIEWS and Join queries (Q9) and advanced queries as much as you can. Demo and hand in these additional parts of A4 to your TA. In Assignment 5, your completed queries will be executed by Unix Shell menu commands.

**Reading week:** Week of Oct 14 – no lab

### **Oct 23 midterm test during the class hours.**

**Assignment 5: Demonstration of adv. queries by Unix shell Implementation:** Week of Oct21 (2 marks). For Assignment 5, hand in the snapshots of advanced query results. Prepare at least 5 interesting advanced queries similar to the queries 9 to 23 of the lecture notes including join, set operations, statistical and aggregation functions and grouping queries. All queries should have clear and nice formatted results. For assignment 5 you do Application development by shell script: Design menus to perform the functions of application by executing

related Oracle SQL commands. For UI in that stage Unix shell programming and command line is expected. In the next stages you will develop a nice GUI interface in the frontend by using Java or other Web/Windows-based tools to communicate with db engine in backend (Oracle running on Linux). For assignment 5 you only need to demo Unix Shell scripts and text-based menus for creating and populating database and showing queries results of your application as shown in class.

**Assignment 6: Normalization of the database/ Functional Dependencies:** Week of Oct 28. During assignment 6, 7 and 8 you should normalize all the tables to be in 3NF or BCNF.

Then you should create dummy data and test and validate the application and try to optimize it. For assignment 6 you should only show Functional dependencies in a report. (1.5 mark)

**Assignment 7: Normalization / 3<sup>rd</sup> NF:** Week of Nov 4. For assignment 7 verify all tables being in 3NF. You can use diagram (shown in the class) or explain why your tables are 3NF. If there is any table which is not in 3NF (or not in BCNF), decompose it to 3NF tables by diagram. For 3NF you need to breakdown at least one table by Bernstein's Algorithm and show the details for making that table 3NF which you can submit during A8. (1.5)

**Assignment 8: Normalization 3NF/ BCNF by Algorithm:** Week Nov. 11 (2 marks). For assignment 8 verify for all tables whether or not they are BCNF as shown in class. You can explain why each table is BCNF by showing FDs. You need to use BCNF algorithm by showing the details at least for making one table BCNF. Note that during assignments 7 and 8 if you change any table to make it 3NF or BCNF, again you should add data in the modified tables. In this lab you should show both Bernstein's Algorithm for 3NF and BCNF algorithms each of them at least for one table. It is recommended to start creating Java/web based UI application and menus during assignments 7 and 8.

**Assignment 9/10: Demonstration of application by Java/web based UI and Submission of document:** Week of Nov 18. The DB application should be in 3NF/BCNF and contain dummy records and brief comments on the code about any special cases and advanced reports. For assignment 9 you create a UI similar to Unix Shell menus which worth 3 marks. However a professional DBMS application contains Graphical UIs at front end to do operation for on tables. There will be 3 extra bonus marks for creating either complete JAVA GUI or a web application implementation. You can make web application by Oracle Express or any other method but it should be connected to Oracle DB on your laptop or school DB. There is a separate section for showing the bonus mark of assignment 9 which can be shown and submitted during the lab for assignment 10 as well. In this stage you will submit the soft copy of the runnable application including code through the D2L according to the instructions provided in the class (3 marks for assignment 9 and 3 bonus mark for web application or graphical UIs). Please demo your assignment as early as possible.

**Documentation Phase/ 3<sup>rd</sup> Phase**

**Assignment 10: Final Documentations of the Project:** Note that the final submission of project is on week of Nov 25 and it has 3 marks. In the documentation the Relational Algebra (RA) notation should be added to describe your SQL queries. Report writing should be done concurrently rather than waiting for the completion of the project. When you get a feedback from each part of project try to modify the related reports and keep them in the project documentation that is submitted at the end. In writing prove your database is 3NF or BCNF and add concluding remarks on your design experience. Finally collect all the documents in a binder with a table of content and hand in to your T.A. in your last lab and submit the Word file as well as pdf file of the whole document and also all SQL,Java and other programs in a zipped file through the submission folder.

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Total: 25% marks

## **Application List:**

Select your application from following Database Applications List. Make sure you communicate with the TA about interested application and have a clear idea about the requirements and scope of the work during first and second week of the class.

Hotel Management Database Management Systems  
University online student registration system  
E-commerce System  
Online Job bank system  
Retail Banking system  
Patient Information and Record Management System  
Point of Sale System for Shopper Drug Marts  
Document Management system  
Data Center  
E-ticket Reservation System  
E-learning system  
Online movie store  
Employee performance management system  
Help desk system  
Library Database system  
University Enrollment Application  
Movie and Music Store DBMS  
Equipment test center  
Clothing Retail Store DBMS  
Auction DBMS  
Medical clinic information system  
Consulting database management information system  
Store sale DBMS  
Customer relation system  
Car Rental DBMS  
Payroll Management DBMS  
Hospital-pharmacy DBMS  
Art gallery/convention center DBMS  
Telecommunication (VoIP/VOD/IPTV) DBMS  
Ice Cream Manufacturer DBMS  
Photo/Video equipment rental DBMS  
Soccer League DBMS  
Dental clinic DBMS  
Intensive Care Unit (ICU) DBMS

If you are interested to do any other application which is not listed here please confirm with me before the due date of assignment 1.

The above applications are common database application. However, with introduction of social networks and online marketing many database applications have been created to manage web data. Below are the two example descriptions of such database systems which are not complete. You are welcome to select them but you have to enhance the writing and add more to their descriptions to make them larger systems with more functions.

**Example 1: DBMS of Fulfillment Service of Amazon (FBA):** These days, Amazon provides a resource that helps people handle their business and by helping the sellers to find new customer at their site. This service is called fulfillment by Amazon (FBA). FBA makes the products visible to millions of loyal happy Amazon customers while providing fulfillment, fast shipping and good customer service that will get the business to a whole different level.

The business owners (we call them sellers) can purchase products online from anywhere in the world and can make payment using different methods. The online store then ships the ordered products to the Amazon facilities that are located all over the world. The products are stored securely. Sellers pay Amazon for keeping the inventory. These inventory details are accessible to the sellers from any device, any location.

A seller has various attributes like its user name, password, email, seller ID and its response time. Out of all the said attributes seller ID is the primary key attribute because it's unique. A seller sends the online store all the information of the products that s/he needs to get shipped to the Amazon facility. While placing the order, it is required that the seller makes a payment of that order too. The payment ID of any payments will be a primary key attribute of all the attributes. Payments can be made through credit/debit cards or gift cards and will comprise of billing address, date and any discount codes used. The online store from where the products are picked from has an store ID as a primary key attribute, store address and phone number. Also the store can have a rating of the products that they ship. Store rating is a weak entity. The products that the store is shipping has product id as the primary key attribute. The other attributes of the products can be its name, price, description and whether or not the item is in stock. Once the product is in Amazon facility, it has its product ID and the location address... see following link for more details:

<https://services.amazon.com/fulfillment-by-amazon/benefits.html>

**Example 2: DBMS for YouTube Channels:** YouTube was first introduced in 2005 and was taken over by google in 2006. It is a video sharing website that has grown drastically in the past years. Reports show that over 1.5 billion people log in to YouTube every month and 1 billion hours of video are watched daily. This website is not limited to streaming videos. Users are able to upload videos, like, dislike or leave a comment for a video. For these actions you need to use a google account. In the recent years channels have become very popular. A YouTuber creates a channel and uploads their videos there. Other users can subscribe to the channel and be notified when a new video is uploaded.

As of May 2017, over 1500 channels have more than 1 million subscribers with the highest belonging to Pewdiepie with over 50 million subscribers. Also some media corporations such as BBC, CNN and NBC etc. have channels on YouTube.

This part focuses on a channel and its subscribers. A channel creator needs a google account and to build this account following information is needed: first name, last name, date of birth, gender and phone number. Subscribers also need to have same information to have a google account. A channel can be for personal or business purposes. Creator usually adds links of their website or their social media accounts. In the about section an email can be provided to contact the YouTuber. There are many other parts that can be added to this system such as information of videos , related videos and etc.