Databases project
Academic year 2024/25

The aim of this project is for each group of students to build a complete database (i.e. database and interface) to manage the data of a specific domain.

The database will be built with the Oracle® 18c system, using Oracle® Application Express to create the interface.

Although part of one lab in the semester is reserved for developing the project, this time will certainly not be enough to complete it. Therefore, it is explicitly assumed that the work will have to be done essentially outside of class time (corresponding to the 9 ECTS of the course).

About the project:
- It is usually done in groups of exactly 3 students. Teachers will have absolute freedom to form groups with students who do not belong to groups of 3 (see section Phases).
- The students in a group must **all** be enrolled in **the same** practical class.
- It is delivered in two phases, with their own deadlines, and also has several intermediate dates, as described in section Phases.
- Both phases must be accompanied by a report.
- It is subject to an oral presentation, at which all members of the group must be present (absent students will receive 0 points in the assessment of the practical component).

Although the project is done in groups, the grade for this component will always be individual. The project itself, the performance in the oral presentation and the report all contribute to the (individual) assessment.

Important: Late submissions will be penalized as indicated in the section Delays.

Project evaluation
The project will be given a mark out of 20, taking into account:
- The qualitative evaluation (communicated in Moodle) of the report delivered in the 1st phase in Moodle
- The delivery of the 2nd phase
- Performance in the oral presentation

If it becomes clear during the oral presentation that a student of the group did not participate, or only very marginally, in the preparation of the project, her/his final mark for the project will be 0.

Databases project statement

As this is an area where there is no shortage of application examples, instead of presenting a concrete domain as a target, each group of students is left to choose which domain they will build their database on. If necessary, they can choose a topic such as:

- Personal management of movies/series/music
- Management of grades, assignments, discussions of assignments, of a course
- Online sales store management
- Running a clinic
- Managing a community
- ...

Important: Work will not be accepted on a database on higher education applications, as this is the focus of the database used in the practical classes, nor on a university or bank management, as these are the most developed examples in the recommended textbook and on the slides respectively.

On the size and difficulty of the project:
- On the one hand, the project shouldn't be too small/simple (such as managing a list of friends' phone numbers), otherwise, even if the work is very well done, it won't be enough to get a positive grade.
- But it shouldn't be too big/complex either (like, for example, the complete management of data relating to student registrations, grades, classes, timetables, etc. for a college). It goes without saying that this is a course unit project and not an end-of-course project.
- Perhaps a good indication of the size of the project is to say that the database is expected to have 10-15 tables. In addition, in the database's entity-relationship diagram there should be at least one many-to-many relationship.
- In addition to queries on the database, the project should include the possibility of adding and modifying data, and guaranteeing integrity, using triggers if necessary.
- The teachers will help to assess the appropriate size of the topics chosen by the students. That's why it's necessary to register the topic of the project in time (see the section Phases).

In addition to the database design, to be delivered in the 1st phase, in the 2nd phase, an APEX application must be developed to implement part of the interface with the database.

We do not expect a complete interface, just a set of pages (forms/reports) that demonstrate/contemplate at least the following:

1. Existence of a home page with links to subsequent pages;

2. Database data listings where foreign key codes are replaced by the value of other easy-to-understand attributes (e.g. list of students where the name of their course is shown instead of their course code);

3. Listing of data from the Database where derived values are shown (e.g. the average of each student);

4. Possibility of inserting, removing and updating database tuples;

5. Possibility of filling in attribute values corresponding to relations (foreign keys) without having knowledge of codes (e.g. by selecting a value from a LOV based on a query) and/or restricting the domain of the selected values (e.g. by selecting the value in a select list whose options are obtained dynamically by a LOV based on a query);

6. Breadcrumbs on the various pages;

7. Existence of two interconnected reports, where one shows details of the other (e.g. a page with a list of all the courses where, by selecting one of them, we are guided to a page with details about that course, for example a list of its students).

8. Existence of a conditional detail (e.g. when listing only students from the selected course in a select list, show the total number of seats on that course when there is one selected);

9. Existence of a master-detail form, where it is possible to insert, remove and change data (at least) from the detail (e.g. form with information about a student and a list of course registrations, where it is possible to add registrations, remove registrations, and change the data of existing registrations);

10. A report for each interesting query implemented.

Submissions implementing additional functionalities will be valued.
Below is a (non-exhaustive) list of aspects that will be evaluated:
In the 1st phase:

- ER diagram (quality and rigor)
- relational model of the database (definition and correction incl. keys)

In the 2nd phase:

- ER diagram and relational model (updated)
- integrity constraints, e.g. keys, domain (definition and correction)
- implementation (presentation, functionality, complexity)

In both phases:

- proposed statement (clarity, detail and degree of complexity)
- report (content, detail and presentation)

Oral presentation performance

Phases

The evaluation and development of the Database project is carried out according to the following phases, each of which has its own deadline:

1.   Setting up the groups
2.   Submitting the topic
3.   Delivery of the 1st phase of the project
4.   Delivery of the 2nd phase of the project
5.   Scheduling the oral presentation
6.   Project oral presentation

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1. Setting up the groups

When?
Until 11:59 p.m. on March 17th

How?
In Google form. Groups must consist of exactly 3 students, **all registered for the same practical class.** Teachers will have absolute freedom to form groups with students who do not belong to groups of 3 on the deadline for registering the formation of groups, including separating students registered in groups of 2 to complete other groups. In case of doubt, contact the teacher(s) of your practical class. Students will be notified of their group constitution by March 18th.

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2. Registering the topic of the project

When?
Until 11:59 p.m. on March 25th

How?
Online, on Moodle. The project topic consists of a title, a brief summary and a description (of one to two pages, in the style used in exercise sheet 1 of the practical classes) of the topic you intend to work on. The description should contain as much precise information as possible about the scope of what you are planning to develop. Feedback will be provided on Moodle by the teacher on the suitability of the topic and whether the scope of the proposed work corresponds to the expected size of the project. Any questions can be clarified during the practical class or by scheduling a Q&A session with the teacher of your practical class.. In view of this, students may, if they wish, reformulate the topic of the work, and may optionally register the final version for validation (notifying the teacher of the practical class).

The topic must be registered by submitting a document in PDF format on

Moodle, whose name must take the form BD??-TEMA.pdf (where ?? is the number of your group, obligatorily with two digits). Only the last submission counts.

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3. Delivery of the 1st phase of the database project

When?
Until 11:59 p.m. on April 13th

How?
At this phase, each group must submit a report on the ER and relational model of the database in PDF format (see Report section). A qualitative assessment will be sent on Moodle. Feedback on possible improvements can be given if requested by the group to the teacher of the respective practical class.

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4. Delivery of the 2nd phase of the database project

When?
Until 11:59 p.m. on May 27th

How?
Each group must submit a short report (see section Report) and the following scripts via Moodle:

- SQL script for creating the database. It should contain the code needed to create all the Database objects (e.g. tables, sequences, triggers, functions, procedures, etc. ...), and the code corresponding to inserting enough data to test the Database properly. The script must create the database regardless of the prior existence of other objects with the same name (which must be eliminated by the script before creation), and insert the data regardless of the local format for attributes of the DATE type. Scripts resulting from APEX auto-export will not be considered.
- SQL script with application. It should contain the code resulting from the export of the application developed in APEX. The application must be exported with the default parameters.

Note: Any settings reflected in the CSS, Themes, as well as images or additional files used will not be evaluated. Only the application exported in the SQL file will be delivered, installed and evaluated.

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5. Scheduling oral presentations

Until 7:00 p.m. on June 3rd

To be defined. The slots for oral presentations will be chosen on a "first come first served" basis. There will be specific slots for each of the practical classes.

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6. Project oral presentations

When?
To be defined

How?
The presentations will take place on days to be defined (scheduled for June 9, 11, 12, 16 and 17), according to the timetable that will be published on CLIP in due course.
All students in the group must show up at the venue 10 minutes before the scheduled time.

Important: If any of the students does not attend the presentation of the project without justification, even if other colleagues from the same group attend, this student will **receive 0** in the practical component.

If your justification is accepted, you will be scheduled for another oral presentation, this time one-on-one, at a later date to be agreed.

Each group has up to 5 minutes to present the final result of the project (the application), which they will manage as they see fit. This is followed by a period of (individualized) questions from the teachers, where the students may be asked to justify the choices made in the construction, explain how it was done, or even make small changes to the database and interface on the spot.

Report

Each group must submit two reports at two different times.

Both reports must include a cover with:

- Group identification number;
- Project topic;
- Number and name of all the students in the group;
- Practical class in which all the students of the group are enrolled.

Report on the 1st phase of the database project

This report should contain at least

- A section with a detailed description of the topic of the project and the objectives of the database;
- A section with the ER model, as described above, containing, where appropriate, a discussion of the options taken;
- A section with the relational model (indicating the tables as in the practical classes - **not** in diagram format), explicitly including the primary keys and foreign keys.
- A section with interesting queries that you want to visualize in the 2nd phase (between 3 and 5, written in plain english, as in the questions on exercise sheet 3).

Class diagrams, for example in UML, will **not** be evaluated in this 1s tphase.

Report on the 2nd phase of the database project
The final report must contain at least

- A section with a detailed description of the topic of the project and the objectives of the database;
- A section with the final ER model, as described above, containing, where appropriate, a discussion of the options taken;
- A section with the final relational model, explicitly including primary keys and foreign keys.
- A section containing the SQL code of any integrity triggers (and only these, thus excluding for example sequence triggers), functions or views used, including the rationale for their creation;
- A section containing a discussion of limitations/options taken for the implementation of the DB;
- A section describing the interesting queries you have implemented and the corresponding SQL code (at least one query with joins, one with aggregations, and one with set operations - queries that could be expressed in another clearly simpler way will not be considered);
- A section explaining where/how each of the ten interface features listed in the Project Statement section is implemented, as well as any other features you feel are relevant to the evaluation.
- A short user manual explaining how to use the database. This manual should include a precise sequence of steps/operations demonstrating the interface functionalities indicated in the Project Statement section, as well as other functionalities that you feel are relevant to the evaluation.

If you have made (minor) changes to the database schema submitted in the 1st phase, the report should also contain a section summarizing these changes and explaining why you have made them.

Reports that present an analysis of the database schema using the theory of functional dependencies, namely justifying its normal form, will be valued.

Class diagrams, for example in UML, will **not** be evaluated in this phase.

Delays

In **both phases of** the project, the following rules will apply to projects delivered after the deadline:

- Projects submitted within 48 hours of the deadline will have their **final grade** reduced by 25%.
- Projects submitted within the next 48 hours will have their **final grade** reduced by 50%.
- Projects submitted more than 96 hours late will not be assessed and will therefore be graded 0.

Using AI tools

Emerging AI tools may be used in **both phases** of the project. However, students must always clearly indicate in the report where and how they were used. Undeclared use might have a negative impact on the project's final grade.