Project

Purpose
To analyze the requirements, design, implement, document and test a database application for Pluto College. The User Requirements of the database application are given in Appendix A below.

Materials to submit
You will be asked to submit reports at various milestones as major phases of the project are completed. Further, you will also need to demonstrate the database application you designed and developed. Details about the milestones of the project, the phases they include and their due dates will be posted on the class webpage.

Project Report/Phases
The project consists of the following phases. In addition, you will develop and maintain a Project Report. Your Project report should consist of a section for each phase, as well as an executive summary, introduction, and conclusion.

A. Analysis of the requirements of the project and a high-level description of the tasks involved.

B. Conceptual Design.
This stage involves the following
- Develop an Entity-Relationship model detailing the relations involved.
- Identify the attributes of the entities and the relations along with the primary key for each entity.
- List the constraints for each relation and entity.
- You should be able to explain the reasons for the particular design approach you have chosen.

C. Logical Design
This stage involves the mapping of your conceptual design above onto the relational data model. In this stage, you will design the tables for all your entities and relations. You should apply all normalizations you find useful and/or necessary. Ensure that your design still satisfies the user requirements. Justify your design choices.

D. Physical Design
This stage involves the following:
- Design an Oracle database based on the design developed in section B.
- Implement SQL tables for the relations and the constraints. Maintain scripts for the creation and deletion of tables.
- Maintain scripts for loading data into your tables.
- Design the user interfaces for your application.
- Ensure that your design still satisfies the user requirements.
- Justify your design choices.
E. Prototype, Development, and Testing.
   This consists of the following:
   • Write Java code to access, update and administer the SQL tables made.
   • Develop user interfaces, using Java, which satisfy all functional user requirements.
   • Create indices for the database application. Justify the reasons.

F. Make a user's guide for the database application.

Project Demonstration
Populate the tables with data for
• At least five courses offerings, three courses, and two degree programs
• At least five faculty, three departments, and ten students
• At least fifteen enrollments, and eight course grades
The demonstration should include all the functional user requirements.

Miscellaneous
The final project report should document all the activities with appropriate E-R diagrams, relation schema, etc. It should also give a list of the limitations of the application and give possibilities for improvement.
Features and functions other than specified in the document can also be added but should be documented clearly and demonstrated as well.
Appendix A

Pluto College
User Requirements

Pluto College (aka Pluto) is interested in developing a database application to help it in managing its faculty, students, and courses.

System Scope

The users of the application are the employees of Pluto. It is assumed that all users have network computers capable of running IE or Netscape Web browsers and Java applications.

Data Requirements

Students
For each student the following information is maintained: unique student id, name, gender, date of birth, High School (name, state, and zipcode), HS graduation year and GPA, matriculation date.

Faculty
Faculty of Pluto College are responsible of offering courses. Each faculty member has a unique id, name (first and last), department, email address, telephone number, title, status and type, highest degree and discipline of highest degree. The title of a faculty is one of: Instructor, Lecturer, Senior Lecturer, Assistant Professor, Associate Professor, and Professor. The status is full-time or part-time, while the type is tenure-track, non-tenure-track, visiting, and adjunct.

Departments
Pluto College organizes its faculty into departments. Each department has a unique name, an address (building code and room number), telephone number, and a Chair which is full-time tenure-track faculty member. Each full-time faculty member belongs to one department only. All other faculty may belong to more than one department. Each department offers one or more degree programs.

Degree Programs
Each degree program has a unique name, an acronym (a 4 letter code), a director which is full-time faculty member, department offering the program, and a set of coursework requirements. Each coursework requirement is comprised of the minimum required number of credits, minimum number of courses, minimum grade in each such course, whether these courses may be reused to satisfy additional program requirements, and a list of courses that can be used to satisfy the requirement. The acronym of a degree program is also known as a major.

Courses and course offerings
Each course has an acronym and number, title, description, and degree program responsible for the course. The acronym and number together uniquely identify a course.

A course may have one or more prerequisites. Each prerequisite is a set of one or more other courses together with a minimum grade required on each such course to satisfy the prerequisite. A student should satisfy at least one of the prerequisites prior to enrolling in a course offering.

Time at Pluto College is partitioned into semesters: Fall, Winter, Spring, and Summer. A semester together with a year make an academic date. Courses are offered during semesters.
Each course offering has a section number, academic date of offering, faculty teaching the course, and one or more meeting periods. Each meeting period has a weekday, start and finish times, building code, and room number.

Course enrollments, grades, and degrees
Students enroll at Pluto College to pursue one or more degree programs, by declaring one or more majors.

Students enroll in course offerings and receive grades (A, B,C,D,F,I,W,AU,NG). A student may repeat a course at most three times, and the highest grade received is used when considering whether degree program requirements or prerequisites have been satisfied.

Students may add/drop any course offering from their semester enrollments, as well as change (add/drop) their declared major(s). Pluto College maintains the complete history of all such add/drop actions.

Upon completing all the requirements of a degree program, a student is awarded a corresponding degree. Pluto College maintains for each student the degree(s) awarded together with their academic date.

Functional Requirements

Enter, update, and delete the details of
- Faculty
- Departments
- Degree programs
- Degree program requirements
- Courses
- Course offerings
- Students
- Student course enrollment actions (add/drop)
- Student declared majors
- Student grades

Queries and Reports
1. List the details of all faculty by department.
2. Find the total number of faculty and courses for a given department.
3. Find the number of course offerings for a given department by academic date.
4. List the names of students enrolled in a particular course offering in a given academic date.
5. Find the total sum of students X credits for course offerings in a given academic date by declared major.
6. Find the total sum of students X credits for course offerings in a given academic date by department.
7. Find the GPA of each student in a given academic date for a given degree program.
8. Find those students that register for a course offering and satisfy all its prerequisites in a given academic date for a given course offering.
9. Find the number of students pursuing a degree program, for each degree program by academic date.
10. Find the minimum, maximum, average, and standard deviation of each course, for all its offerings, for a given degree program and given time period (in years).