**CSC 540 - DATABASE MANAGEMENT CONCEPTS & SYSTEMS**

**FALL 2017 PROJECT 1 ‐ DATABASE APPLICATION DESIGN &**

**IMPLEMENTATION**

**PRELIMINARY PROJECT DESCRIPTION**

**COURSE ASSESSMENT SYSTEM**

**Introduction**

The goal of the project is to design a relational database application for supporting course assessment at a university such as ours. The project should be carried **out in teams of four (4) or 5 a**nd team peer assessments will be part of the overall grade for each student. The project is expected to be executed in stages with interim deliverables submitted. The description has several details that you should pay attention to.

First, it describes the data and application requirements. It then gives information about deliverables and tentative deadlines (deadlines may change slightly) and “getting started” guidelines.

**Note: You should necessarily assume that this is an imperfect description and will be subject to updates**. Therefore, it is important that you read through the description in the coming days and ask questions to clarify any missing or ambiguous statements.

**Project Specification**

1. **Background & Overview**

**The Assignment Management System Case Study**:

Now that you have all used Gradiance you are ready to start thinking about your project. This case study describes an online automated system for managing homeworks/exercises similar to the Gradiance System. Listed in these sections following is a description of the data recorded, maintained, and accessed by the system to support the administration of its functions.

**Courses**

Every course has a course id or “token”, a course name, start and end dates, a professor, one or more teaching assistants (TAs), the students enrolled in the course (by TA or instructor), and a list of topics (e.g. The Relational Model, Disk and Storage, Security and Authorization, etc). Each topic will have a name and id. Each course is associated with a question bank that contain a list of possible questions relevant to the topics of the course.

**Homework Exercises**

A course may have several homework exercises. Exercises can be created by instructors or TAs and are made up of questions drawn from a question bank. An exercise has a name, a deadline in terms of a time and date, Other attributes of an exercise include the total number of questions in the homework, the number of retries allowed (e.g. 1, 2, 3, unlimited), start date/time, end date/time, number of points per correct answer and penalty points per incorrect answer, and the scoring policy(explained in the section ‘Scoring policy’ below). Note that an exercise should not available to students before or after the start and end dates respectively (Although, they can be available to TAs and instructors). Only students who are enrolled in the course by TA or instructor can view homeworks for that course.

Each question in the question bank has an id, the actual question text, a topic, a difficulty level (ranging from 1,2,3,4,5,6) and optionally a hint. A question may have either a completely fixed or a parameterized structure: i.e. there is an overall “root” question whose structure contains both fixed and variable portions. Concrete questions can be created from parameterized questions by taking the root question and assigning values to the variables in the variable portions of its question structure. For e.g. for a root question such as “*if c1+c2=ans, where c1=x, and c2=y, find ans*”, one possible concrete question can be obtained by assigning values to the variables *x* and *y* to produce “*if c1+c2=ans, where c1=2, and c2=3, find ans*.”

Each question is also associated with a difficulty level, a set of correct answers, a set of incorrect answers and a single detailed solution/explanation. The detailed solution/explanation is only available to students after the deadline has passed. When creating a parameterized question, different concrete parameter value options must be provided for each variable. In this case, the set of correct and incorrect answers is separate for each parameter value combination that can be used to generate a concrete question e.g. for each *c1*, *c2* concrete combination.

**Homework Exercise Creation and Generation**

There are two major ways that an exercise can be created by an instructor or TA. They can search the question bank either by question id or by selecting from the list of topics for that course which generates questions relevant to that topic. Alternatively, they could find an existing homework on the same topic and reset the parameters, e.g. start date, end date, points, etc and save it under a new name. They also can add and remove questions from the old homework. Homework exercises are automatically generated for each student for each of their attempts. There are two possible exercise generation modes and the mode must be selected at the time of exercise creation: Random and Adaptive. Some special kinds of exercises called ‘adaptive exercises’ can also be created the instructor. They are different from the aforementioned regular exercises in that the questions are dynamically selected by the system based on the performance of the student.

This feature can which can be indicated by the instructor while creating the exercise. If an exercise is adaptive, then the instructor does not need to add questions manually to the exercise. The system will automatically and dynamically select the next question (for the student taking the test) based on the student’s performance in the current question answered. The first question of the exercise will be of difficulty level 3. If the student answers current question correctly, the next question will be of a higher difficulty level (the difficulty level increases by one, till 6), else a question with a lower difficulty level (the difficulty level decreases by one, till 1) is presented.

For example: A student starting an exercise is given question one (difficulty level 3), if he fails the question, then questions 2 should be one with difficulty level 2, else if he answers correctly, question 2 should should have difficulty level 4.

**Exercise Submission**

After a student submits an exercise, a report is displayed showing the total score of assessment, and for question whether it was answered correctly or incorrectly. For the questions answered incorrectly, it displays the hint corresponding to the question. If the assessment allows for multiple retries and the student has not exhausted number of tries, and the due date/time for exercise has not passed, the student may re-attempt the assessment exercise. The details of all submissions are stored for each student. The final score for each student is selected based on the scoring policy selected for the exercise. If a student logs in after the end of the submission period, they may additionally see the more detailed explanation of solution that is associated with each question.

For exercises with multiple retries allowed, we want to keep all information about each attempt for each student – time of submission, answer id selected for each question and total number of points for that attempt.

**Scoring policy**

If multiple retries are allowed for an exercise, the final score for each student is selected based on the scoring policy selected for the exercise. A scoring policy can be one of “latest attempt, maximum score or average score” of all attempts. This means that total score could be the latest, average or maximum of all attempts.

**Roles and Access Control Requirements**

Students and professors have unique ids.Students also have levels associated with them (undergraduate or graduate) and only graduate students may be TAs.

There will be different access control restriction based on the roles:

1. Professor – A professor can see all questions and answers related to any topic in any course (even if he/she is not the professor for that course) at all times.

2. Teaching Assistant (TA) – A TA can only see exercises created by the instructor, and their corresponding questions. The TA does not have access to the entire question bank otherwise. TAs can see the exercise as soon as it is created (even before the start date of the exercise). However, TAs cannot make changes to exercises at any time.

3. Both instructors and TAs can see the class roll and homework attempts and grades of all students.

4. Student - The access restrictions for students is as described in throughout the document.

**The following shows examples of query classes and queries that should be supported by your application:**

**Retrieval SQL queries -** used to find specific information

Find students who did not take exercise 1.

Find students who scored the maximum score on the first attempt for exercise 1.

Find students who scored the maximum score on the first attempt for any exercise.

Retrieve all attempts for exercise 1 for Student 5.

**Reporting Queries**. – used to find more general information

For each student, show total score for each exercise and average score across all exercises.

For each exercise and question, show the maximum and minimum score.

For all exercises to date, show the average number of attempts.

**Deliverables:**

**Sept. 17.** Post any questions for clarification of description on forum.

**Sept. 30.** Submit initial E-R Model and implementation plan.

**Due Date:**  Oct 30th.

**Demo Date:** Early to Mid Nov. TBA