

CS 5/7392 - Web Application Development
Fall 2023
Assignment 5
Due date: Nov 15, 2023 (Wednesday)

This assignment assumes that you have successfully completed Assignment 4. In this assignment, you will develop a complete web application.

Problem Description

A hospital book keeping information system maintains the health records of the patients which are accessible only by authorized persons such as physicians, nurses and receptionists. The health records maintain two sets of information about patients - visitation records and lab tests. For the purpose of this project, we can assume the following models of health records:

Lab tests model

Patient name	Patient ID	Lab test	Date	Value
Jacob Brinstone	10032	Hemoglobin	01-12-2023	11.6
			02-10-2023	12.8
			04-01-2023	12.4
		Calcium	01-12-2023	138
			02-10-2023	149
			04-01-2023	176
		Ferritin	01-12-2023	8
			02-10-2023	54
			04-01-2023	62
Laura Wickerson	72546	Hemoglobin	01-18-2023	6.6
			02-21-2023	10.4
			04-15-2023	12.4
		Calcium	01-18-2023	169
			02-21-2023	219
			04-15-2023	176
		Ferritin	01-18-2023	78
			02-21-2023	154
			04-15-2023	202
Mylan Grand	49267	Hemoglobin	01-06-2023	21.6
			02-14-2023	17.8
			04-03-2023	19.4
		Calcium	01-06-2023	158
			02-14-2023	189
			04-03-2023	176
		Ferritin	01-06-2023	78
			02-14-2023	92
			04-03-2023	81

Visitation record model

Patient name: Laura Wickerson

Patient ID: 72546

Healthcare provider's name: Dr. Mariam Hossain

Visitation date: June 21, 2023

Visitation time: 3:00 P.M.

Visitation location: Heinstock Building, Room no. 327

Notes:

- Laura was having abdominal pain for the past three days. She has problems in digestion as well.
- Dr. Hossain advised Laura not to take pain killers. Instead, she was asked to take complete rest.
- Laura was asked to come back and see the doctor again after three days, if the pain does not go away.

There will be three types of users in this problem - *physicians*, *receptionists* and *nurses*. A physician P can access both visitation records and lab tests for those patients associated with P . Receptionists can only access the relationship between physicians and patients, and physicians and nurses. They will not be able to see the healthcare record of any patient. A nurse N can access both visitation records and lab tests of those patients who are associated with the physician P , provided N works for P . For example, Dr. Hossain may have three patients - Laura Wickerson, Emily Golden and Ransi Menon. Kate Springer is a nurse working for Dr. Hossain. So, both Dr. Hossain and Kate will be able to access the healthcare records of all the three patients. It is to be noted that a nurse can work with more than one physician; in that case, the nurse will be able to access the healthcare records of all the patients who are associated with the physicians P_1, P_2, \dots, P_n provided she works for this set of physicians.

The above description suggests that you need to maintain the relationships between physicians and patients and physicians and nurses in the database.

Programming Requirements

Database

You must use a database for this problem. You can choose any database. The design and implementation of the database should be discussed with the instructor. The database can be pre-populated. The instructor will provide a sample dataset for this project. For simplicity, we can assume that the visitation records will only be read by the users and will not be updated. No new visitation records will be added. However, the lab test values can be added or updated. As per federal laws on healthcare, no medical records can be deleted. These assumptions suggest that you focus more on reading the database, and some addition and updates.

Application

The application must be developed in Java. Use Java servlets for server side code.

Front end

The front end should use HTML, CSS and JavaScript. The design and implementation of web pages should be discussed with the instructor. The front end should have a professional style appearance, possibly with a nice logo.

Authentication

Each user must be authenticated when using the system. As a norm for healthcare applications, you should use 2-factor authentication for this project. For simplicity, we can use an ID number of the user as the second factor. Each account should include a unique username, password and an ID number of the user. The login accounts for the users can be pre-populated in the database. Operations to create, to modify and to delete login accounts need not be implemented.

After successful login, the user must be taken to a separate page. Maintain a different style for each type of user so that it would be visually easier to identify what type of user has logged in. For example,

you can choose a different background color for each type of user. The login user's username must be displayed on the right top corner of the home page so that it not only confirms successful login, but it also enables verification of permitted operations.

Typical operations

The operations will depend on the type of user who logged in. The following table summarizes a minimal set of operations that can be performed by the three types of users:

User type	Operation	Expected output
Physician	Get patient's all lab tests	All lab tests for the patient
	Get patient's particular lab tests	The particular lab tests of the patient; e.g., Hemoglobin lab tests of patient X
	Get one particular record of a lab test for a patient	One lab test on a specific date
	Get visitation record of a patient on a specified date/time	One visitation record
Nurse	Get patient's all lab tests	All lab tests for the patient
	Get patient's particular lab tests	The particular lab tests of the patient; e.g., Hemoglobin lab tests of patient X
	Get one particular record of a lab test for a patient	One lab test on a specific date
	Get visitation record of a patient on a specified date/time	One visitation record
Receptionist	Physician(s) of a patient	At least one physician
	Patient(s) of a physician	Zero or more patients

Design and Implementation

We will use incremental prototyping approach for this project. So, you can start with any of the three components - Database, Application or Front end. Discuss the design with the instructor first. Implement and demonstrate the component and then move on to the other component(s).

Project Report

As part of this project, you are expected to write a project report. This report should focus on the development approach you followed, and not on the product itself. The following list will help prepare the report:

- Include a separate title page.
- Explain how you designed and implemented this project. For example, where you started first (front end, database or application). You can also describe the type of interactions/queries you designed and how you implemented them.
- Briefly explain the tools, languages and technology you used for this project. This will help students who take this course in the future. It is strongly recommended that you include references to these at the end of the report (see the last item in this list).
- Challenges you faced and how you overcame those challenges.
- Any significant observations or test results from the implementation.
- References - include the websites, books or other resources that you used. This will help students who take this course in the future.