This project involves the CSE230 Project/Exam handout that is posted on the course web page. For this project, you are to explore different specification techniques including DFD, ER, FSM, and various UML diagrams (Use Case, Activity, and State Chart). Each question is listed below.

1. **(20 points total) Finite State Machine**

   In X-CHG, Cooperative Design and Remote Office Hours both utilize the Chat Tool, to support an interactive ‘talk’ mode where two or more users can converse electronically via window-based interfaces. A ‘record’ option will track the discussion in an electronic form for later use. To support this tool, a number of behaviors would need to be included:

   - A user makes a request to start a new chat session with one user.
   - A user makes a request to start a new chat session with two or more other users.
   - A user makes a request to join an existing chat session.
   - A user makes a request to turn on the recording option during a chat session.
   - A user makes a request to turn off the recording option during a chat session.
   - A user in a chat session with one or more other users sends a dedicated message to one specific user in the session.
   - A user in a chat session with one or more other users broadcasts a message to all other users in the session.

   Design a finite state machine (FSM) to represent the necessary state behavior for the Chat Tool of X-CHG. Clearly identify each state, your start state, and any final states. Don’t forget to also label the transition arrows between states, as well as the states themselves, with meaningful words/phrases. Use either Microsoft Word or PowerPoint to draw your FSM.

2. **(20 points total) Use Case Diagram**

   Using Problem 1 as a guide, design a UML use-case diagram that contains at least 5 distinct use cases and at least 4 actors that are relevant for the different functionalities and behaviors of X-CHG that will utilize the Chat Tool. For example, in support of Remote Office Hours, the corresponding tool would employ chat to allow faculty to broadcast messages and chat individually after office hours are announced. Likewise, the Cooperative Design capability would employ chat. Make sure that you consider various capabilities of X-CHG that would utilize the Chat Tool. Utilize names and notation similar to the FSM when developing your use-case diagram solution so that I can easily see the correspondences! Use Together Architect (UML Tool available in the Engineering Learning Center) to draw your diagram. When relevant, use terminology that is consistent with the FSM.

3. **(20 points total) Activity Diagram**

   Use the description in Problem 1 above to design a UML Activity Diagram in for the Chat Tool. Utilize names and notation similar to the FSM and Use Case Diagram when developing your use-case diagram solution so that I can easily see the correspondences! Use Together Architect (UML Tool available in the Engineering Learning Center) to draw your diagram.
4. (20 points total) Data Flow Diagram

One major capability of X-CHG involves direct access to transcript information on students by faculty, as described below:

Registrar/Student Record Access: In this situation, faculty are given the ability to interact directly with Registrar computing systems. This will allow faculty to electronically manipulate the most up-to-date information on students, and will reduce paper for reports that are issued each semester. One report that is for all undergraduate/graduate students is a full transcript. The second report, maintained for just undergraduates, is a listing of how their course record compares against their individual catalog/plan of study requirements. To summarize, this capability of X-CHG will allow faculty to have online access to:

• review up-to-date transcripts of his/her graduate and undergraduate advisees, which replaces the hardcopy reports normally sent by the Registrar to faculty;
• review the catalog/plan of study requirements for an individual undergraduate advisee to check his/her status in helping to advise the student on what courses to take in an upcoming semester;
• check the transcripts of the students that are enrolled in a class currently being taught by the faculty member; and
• electronically submit midterm and final grades, which supports the direct modification of Registrar databases by faculty.

Of course, to utilize this capability of X-CHG, the faculty member must be validated to insure that an unauthorized user isn’t attempting to access confidential data.

Using this description, design a data-flow diagram that identifies the data stores, input actions, output results, functions, and the flows between them for the Registrar/Student Record Access mode as described. Remember, your data stores are at a database level, e.g., Transcripts, Faculty, Students, etc., would all be databases. Define your data stores as needed for your solution, and make sure that you label your lines to/from the data stores by indicating the information that is being stored/retrieved. Your final solution should have between four (4) and six (6) functions. Use either Microsoft Word or PowerPoint to draw your FSM.

5. (20 points total) Entity Relationship Diagram

In the project description for X-CHG, there are a number of databases listed. Of particular note is the Faculty and Student Profile Database. For this problem, use the Faculty and Student Profile Database to design an ER diagram that contains multiple entities and relationships. Note that the description as given for this database in the project handout is somewhat limited. Part of your role as a software engineer will be to analyze this description and think about other information that will need to be in this database. For example, you may want to keep track of the information on a transcript for each student, or the requirements that are yet to be met by each student towards their degree, etc. I would suggest you use peoplesoft to try to discern additional features for your ER design for this database. I expect a solution with between 8-10 entities and 5-6 relationships. Make sure you also specify attributes for entities and use inheritance among entities when appropriate. Use Together Architect (UML Tool available in the Engineering Learning Center) to draw your diagram.