**Program/Track Name: \_\_\_\_\_\_\_\_\_AAS-Database Development\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| Program-Level Learning Outcomes |
| Program Learning Outcome 1: | Design, develop, and implement a relational database based on the requirements of the stakeholders. |
| Program Learning Outcome 2: | Prepare design specifications and functional documents for database projects based on the requirements of the stakeholders. |
| Program Learning Outcome 3: | Optimize database systems for performance efficiency based on the requirements of the stakeholders. |
| Program Learning Outcome 4: | Test and identify challenges and issues involving database performance and devise solutions to correct the issues. |
| Program Learning Outcome 5: | Devise and implement security plans with procedures to protect databases. |

**Program Map ▼**I=Introduced P=Practiced E=Emphasized A=Assessed

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Program Courses | Program Learning Outcome 1 | Program Learning Outcome 2 | Program Learning Outcome 3 | Program Learning Outcome 4 | Program Learning Outcome 5 |
| ITSE 1307 | I, P |  |  |  | I |
| ITSE 1330 |  | I |  |  |  |
| ITSE 1346 | I, P | I, P, E, A |  |  | I, P, E, A |
| ITSE 2309 | I, P, E, A | I | I | I |  |
| ITSE 2347 | P, E | P, E | I, P | I, P | I, P, E |
| ITSE 2354 | P, E | P, E | E, A | E, A | I, P, E |
| ITSE 2370 |  |  | I |  |  |
| ITSW 2334 |  |  | I |  |  |
| ITSW 2370 |  |  | I |  |  |
| INEW 2330 | P,E |  |  |  |  |
| ITSC 2380 | P,E |  |  |  |  |
| ITSE 1359 |  | I |  |  |  |
| ITSW 1304 | I |  |  |  |  |
| ITSC 1305 | I |  |  |  |  |
| ITNW 1358 |  | I |  |  | I |
| ITSE 1311 |  | I |  |  |  |
| ITSC 1315 | I | I |  |  | I,P |

 \* The courses ITSE 1330, ITNW 1358, ITSE 1311, and ITSY 1300 provide a foundation for programming, networking,
 web development, and basic security skills to apply to the database development environment.

|  |  |  |
| --- | --- | --- |
| Program-Level Learning Outcome (e.g. Students will describe the impact of various cultures on American cuisine.) | Assessment Measure(s) and Where Implemented in Curriculum – Description of Instrument(s)/ process(es) used to measure results and indication of where the assessment will be collected in curriculum. (e.g. Essay on Cultural influences on American cuisine in CUIS 1300.) | Targets- Level of Success Expected(e.g. 80% of students score 2.5 or better on rubric for essay on cultures and cuisine.) |
| PLO #1The students will be able todesign, develop, and implement a relational database based on the requirements of thestakeholders. | Course Project in ITSE 2309-Database Programming-SQL. This assessment evaluates a student’s ability to design a multiple table database that is normalized to at least third normal form, contains primary and foreign keys (if applicable) and is populated with relevant datasets. | 80% of students score 2.5 or better on project rubric |
| PLO #2The students will be able toprepare design specificationsand functional documents fordatabase projects based on therequirements of thestakeholders. | Final Project in ITSE 1346-Database Theory and Design. This assessment requires students to take stakeholder requirements for a database project into consideration in order to prepare design specifications, employ data modelling, and create a database functional design document that resolves a business need in the project scenario. | 80% of students score 2.5 or better on project rubric |
| PLO #3The students will be able to describe optimization methods database systems for performance efficiency based on the requirements of the stakeholders.  | Case project A in ITSE 2354-Advanced Oracle PL/SQL. This assessment evaluates the student’s ability to effectively describe optimization methods of database systems for performance efficiency and pose conclusions that demonstrate their critical thinking skills given stakeholder requirements | 73% of students score 2.5 or better on Case Project A rubric |
| PLO #4The students will be able to test and identify challenges and issues involving database performance and devise solutions to correct the issues. | Case project B in ITSE 2354-Advanced Oracle PL/SQL. This assessment evaluates the student’s ability to apply skills to identify performance issues in an existing database and to devise solutions that correct the issues and optimize database performance. | 73% of students score 2.5 or better on Case Project B rubric |
| PLO #5The students will be able to devise and implement security plans with procedures to protect databases. | Unit Project on database security in ITSE 1346-Database Theory and Design. This assessment evaluates the student’s ability to evaluate the environment of a physical database (i.e. hardware and software) for security vulnerabilities then devise plans and procedures to protect databases using SQL and functional design/requirements documents. | 80% of students score 2.5 or better on project rubric |

**Assessment Plan for Program Learning Outcomes**

**Appendix**

**PLO #1**

Design a relational database that maintains data for customers, employees, products, and departments. The database should consist of at least four tables and each table should have at least three fields. Each table should have a primary key and one or more foreign keys depending on the table relationships. Carefully design the tables so they are normalized up to third normal form. Each table should have at least 7 records.

**Grading Rubric**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PLO #1 (16 pts) | Excellent | Good | Fair | Poor | None |
|  | 4 | 3 | 2 | 1 | 0 |
| The database should consist of at least four tables and each table should have at least three fields.  |  |  |  |  |  |
| Each table should have a primary key and one or more foreign keys depending on the table relationships.  |  |  |  |  |  |
| Carefully design the tables so they are normalized up to third normal form.  |  |  |  |  |  |
| Each table should have at least 7 records. |  |  |  |  |  |

**PLO #2**

1. Based on your business scenario complete the following tasks
	1. Make a list of issues with the current system.
	2. Make a list of the database requirements for each stakeholder involved in the database.
	3. Make a list of business rules.
	4. List some major security rules for the database.
	5. Take a look at each of the forms, and make a list of all the nouns in them. Do the same for the interview, the questionnaire, and the Job Shadow Report. Then set up some preliminary entities and attributes.
	6. Identify some candidate keys
	7. Define your entities and attributes and the relations that exist between them.
	8. Create a logical model using crow’s feet notation in Visio or hand draw it on graph paper, if you prefer.
	9. Add all the entities and their attributes. You don’t need to worry about data types for now.
	10. Identify the key fields for each entity and the foreign keys.
	11. Analyze the diagram. Identify which role (i.e., domain, linking, lookup, or weak) each entity plays in your database.

**Grading Rubric**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PLO #2 (44 pts) | Excellent | Good | Fair | Poor | None |
|  | 4 | 3 | 2 | 1 | 0 |
| a. Make a list of issues with the current system. |  |  |  |  |  |
| b. Make a list of the database requirements for each stakeholder involved in the database. |  |  |  |  |  |
| c. Make a list of business rules. |  |  |  |  |  |
| d. List some major security rules for the database. |  |  |  |  |  |
| e. Take a look at each of the forms, and make a list of all the nouns in them. Do the same for the interview, the questionnaire, and the Job Shadow Report. Then set up some preliminary entities and attributes. |  |  |  |  |  |
| f. Identify some candidate keys |  |  |  |  |  |
| g. Define your entities and attributes and the relations that exist between them. |  |  |  |  |  |
| h. Create a logical model using crow’s feet notation in Visio or hand draw it on graph paper, if you prefer. |  |  |  |  |  |
| i. Add all the entities and their attributes. You don’t need to worry about data types for now. |  |  |  |  |  |
| j. Identify the key fields for each entity and the foreign keys. |  |  |  |  |  |
| k. Analyze the diagram. Identify which role (i.e., domain, linking, lookup, or weak) each entity plays in your database |  |  |  |  |  |

**PLO #3**

 Given a database project, answer the following:

1. If indexes are so important, why not index every column in every table? (Include a brief discussion of the role played by data sparsity.)
2. What is the difference between a rule-based optimizer and a cost-based optimizer?
3. What are optimizer hints, and how are they used?
4. What are some general guidelines for creating and using indexes?
5. Most query optimization techniques are designed to make the optimizer’s work easier. What factors should you keep in mind if you intend to write conditional expressions in SQL code?

**Grading Rubric**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PLO #3 (20 pts) | Excellent | Good | Fair | Poor | None |
|  | 4 | 3 | 2 | 1 | 0 |
| a. If indexes are so important, why not index every column in every table? (Include a brief discussion of the role played by data sparsity.) |  |  |  |  |  |
| b. What is the difference between a rule-based optimizer and a cost-based optimizer? |  |  |  |  |  |
| c. What are optimizer hints, and how are they used? |  |  |  |  |  |
| d. What are some general guidelines for creating and using indexes? |  |  |  |  |  |
| e. Most query optimization techniques are designed to make the optimizer’s work easier. What factors should you keep in mind if you intend to write conditional expressions in SQL code? |  |  |  |  |  |

**PLO #4**

Assume that you have 50,000 different products stored in an INVENTORY database and that you are writing a web-based interface to list all products with a quantity on hand (P\_QOH) that is less than or equal to the minimum quantity, P\_MIN. To improve/optimize the database, do the following:

* List the columns that are likely to represent data sparsity in the tables.
* Identify the indices that must be created. Explain your reasoning.
* What optimizer hint would you use to ensure that your query returns the result set to the web interface in the least time possible?
* Write the SQL code.

**Grading Rubric**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PLO #4 (12 pts) | Excellent | Good | Fair | Poor | None |
|  | 4 | 3 | 2 | 1 | 0 |
| List the columns that are likely to represent data sparsity in the tables. |  |  |  |  |  |
| Identify the indices that must be created. Explain your reasoning. |  |  |  |  |  |
| What optimizer hint would you use to ensure that your query returns the result set to the web interface in the least time possible? |  |  |  |  |  |

**PLO #5**

Given a physical design of a database:

1. Create tables of the data access needs of your users.
2. Create views of the data that meets the needs of your users.
3. Create a security plan that includes authentication and authorization and general policies and procedures. Consider the use of roles, stored procedures, views, and other tools.
4. Create a preliminary threat analysis.
5. Make a preliminary disaster management plan.

**Grading Rubric**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PLO #5 (20 pts) | Excellent | Good | Fair | Poor | None |
|  | 4 | 3 | 2 | 1 | 0 |
| 1. Create tables of the data access needs of your users. |  |  |  |  |  |
| 2. Create views of the data that meets the needs of your users. |  |  |  |  |  |
| 3. Create a security plan that includes authentication and authorization and general policies and procedures. Consider the use of roles, stored procedures, views, and other tools. |  |  |  |  |  |
| 4. Create a preliminary threat analysis. |  |  |  |  |  |
| 5. Make a preliminary disaster management plan. |  |  |  |  |  |