

**University of Texas at El Paso, Department of Computer Science**  
**Languages CQI Report- Fall 2021**  
**Analysis and Recommendations**

The Languages group for the Fall 2021 semester was composed of instructors of CS 3350 Automata (Kreinovich and Longpre), CS 3360 Programming Languages (Tizpaz Niari and Cheon), CS 4342 (Villanueva Rosales and Gandara), and previous instructor of CS 3360 Ward.

This group met on January 24<sup>th</sup> and 31<sup>st</sup>, 2022, to discuss the outcomes of the courses and review reports. Instructors for each course held additional meetings to review assessments instruments, criteria, and consistency across the sections.

Most of the outcomes were evaluated across the three Languages courses, but some of them were not evaluated, not met, or marginally met in some sections. A report including an analysis of areas of improvement and recommendations was created for each section. In addition, joint reports for each course were generated and are included below.

### **CS 3350 Automata**

**Results:**

In both sections, most students succeeded: in Kreinovich's section, 6 students who were failing dropped the class. In Longpre's section, no one dropped, so he had 7 Fs (this non-dropping occurred in Kreinovich's section in the past). In the future, we plan to more clearly inform the students of the possibility to withdraw from the class.

**Analysis:**

In both sections, most outcomes were successfully checked. For some questions, average grades of the outcomes on some assignments were way below 70%, for two reasons:

- Kreinovich added too many questions into the final exam, as a result of which students did not have time to do the corresponding problems. If we only consider those students who did try to solve these problems, or if you consider answers on previous exams, then the average grade becomes close to the desired 70% minimum. Next time, Kreinovich will try not to cram all the outcomes into the final exam and rely more on intermediate exams.
- Longpre's final exam included questions related to Level 1, but these questions were asked on a higher level than Level 1 understanding. So while many of the resulting average grades are much lower than the desired 70% minimum, the fact that students have desired average grades on related Level 2 questions seems to indicate that they have Level 1 understanding of these topics. Next time, it is desirable to explicitly ask Level 1 questions, to adequately check students' understanding of these topics.

**Recommended Changes:**

The current description of outcomes 2a and 2b, when mentioning non-deterministic finite automata, also mentions the term "transition graphs", which is an older synonym for non-deterministic finite automata, which is no longer used in the textbooks. We recommend deleting this synonym from the outcomes.

*Current outcomes:*

- 2a. Convert a non-deterministic FA (respectively transition graph) into an equivalent deterministic FA.
- 2b. Convert a transition graph or NFA into an equivalent regular expression.

*Proposed outcomes:*

- 2a. Convert a non-deterministic finite automaton into an equivalent deterministic finite automaton.
- 2b. Convert a non-deterministic finite automaton into an equivalent regular expression.

## **CS 3360 Programming Languages**

### **Results and Analysis:**

1. There are several outcomes that were not assessed, not met, or met marginally: 1e (semantics), 2b (BNF), 2e (functional programming), 2f (scripting), 3a (critical evaluation of PLs), and 3b (chose a suitable language). Monitor or pay attention to these outcomes.
2. In one section, the instructor has to report nine students to OSCCR for plagiarism. Think about ways to prevent plagiarism.
3. The failure rate in one section with 46 students is 17%; it is 7% in the other section with 42 students. Keep monitoring the failure rate and try to find the root causes, especially if it repeats in the subsequent offerings.
4. Continue introducing interesting programming languages such as Dart, Ruby, Scala, and PyMC3 that the instructor sees fit the course needs and contents.

### **Recommended Changes of Course Title, Description, and Outcomes**

1. Change the course title to better match the actual course contents offered.  
*Design and Implementation of Programming Languages*  
=>  
*Programming Language Concepts*
2. Change the course description better match the actual course contents offered.  
*Design features of modern programming languages, including flow control mechanisms and data structures; techniques for implementation of these features*  
=>  
*Design features of modern programming languages, including flow control mechanisms and data structures; techniques for implementation of these features; [practice programming in several representative languages](#)*
3. Add a new level 1 outcome:  
*[1f. Understand code snippets written in a paradigm beyond imperative, object-oriented, and functional, e.g., algebraic, aspect-oriented, logic, or probabilistic languages.](#)*
4. Make minor changes to level 2 outcomes; remove EBNF.  
*2a. Define syntax of a small context-free grammar in BNF ~~and EBNF~~.*  
*2b. Define the syntax of a small subset of a programming language using BNF ~~or EBNF~~.*
5. Rephrase a level 3 outcome:

*3a. Evaluate modern, representative programming languages critically with respect to design concepts, design alternatives and trade-offs, and implementation considerations for scope, binding, data types, expressions, control structures, subprograms, abstract data types, objects, concurrency structures, and exception handling.*

=>

*3a. Evaluate modern, representative programming languages critically considering design concepts, design alternatives, or implementation concerns for **variables, types, expressions, control structures, and program modules.***

## **CS 4342 Database Management**

### **Results and Analysis:**

Results for outcomes that are only related to reviewing materials in lecture and the book (i.e., mostly on level 1) were lower. This result can be attributed to either the way questions were asked given the limitations of Blackboard or that these concepts were never applied in their project. We recommend either embedding those concepts as part of the project or changing the expectations (e.g., "identify" instead of "describe") and the way they are evaluated (e.g., change questions in class for homework, do quizzes right after the concept is reviewed).

The course project was instrumental for students to get a good understanding of the concepts taught in the class and develop their skills related to the design and implementation of a database system as well as professional skills including communication, writing reports, and working in a group.

### **Recommended Changes to Title and Outcomes:**

The course covers database fundamentals, design, management, and implementation of database applications. The majority of the committee voted to change the name for Database Systems.

### **Recommended Changes to Course Catalog Description:**

#### **Current description:**

Introduction to database fundamentals, modeling, the use of database management systems for applications, and current trends for data management including: relational algebra, entity-relationship models, relational data models, semi-structured data models, schema design, query processing, data integrity, privacy, security, and data analytics.

#### **Proposed description:**

Introduction to database fundamentals (e.g., relational algebra), data models (e.g., entity-relationship model, relational model), the use of database management systems with a course project (e.g., database design and implementation, query processing), new paradigms for data management (e.g., non-relational data models), data integrity, privacy, and security.

We recommend removing the semi-structured model from 1a and including it on 1h as this model is not covered at the same depth as the ones included in 1a. There is an overlap on 1h and 2e, and we found there is not enough time to cover this outcome at the level 2, given the other demands for this course. We recommend removing 2e and explicitly stating that 1h covers new trends. There is an overlap

between 1c and 1j. We recommend removing 1j. We recommend removing 1f as it is subsumed by 2c. Recommendations on 1b and 1d are done for readability and clarity purposes.

*Current outcomes:*

- 1a. Describe and compare data models (e.g., Entity-Relationship model, relational model, semistructured model), how they have been used in the past, and how they are currently used for data management.
- 1b. Describe the components of a database system, the most common designs for core database system components including the query optimizer query executor, storage manager, access methods, and transaction processor their most common design, and give examples of their use.
- 1c. Cite the basic goals, functions, and models of database systems.
- 1d. Identify database languages and interfaces for data management.
- 1f. Explain the uses of declarative queries.
- 1h. Identify current trends of data management paradigms.
- 1j. Identify major database management systems functions and describe their role in a database system.
- 2c. Use a relational query language (e.g., SQL) to elicit information from a database.
- 2e. Justify the use of relational or non-relational data management systems based on the requirements of an application.

*Proposed outcomes:*

- 1a. Identify key characteristics of data models based on their level of abstraction (e.g., Entity-Relationship model, relational model) and explain how these models are used for data management.
  - 1b. Describe the components of a database management systems (e.g., query optimizer, query executor, storage manager) and how they are used.
  - 1c. Describe the main goals and functions of database management systems.
  - 1d. Identify database languages and tools for data management.
  - 1f. Describe the use of declarative queries.
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- 1h. Identify new trends in data management paradigms (e.g., semi-structured model, non-relational databases) and describe for which scenarios they are best suited.
- Remove 1j.  
Remove 1f.  
Remove 2e.

**Notes about course resources for this course**

1. Appropriate lecture venues are needed for this course, which, in place of a lab, embeds a lot of practice in the lecture, requiring students to bring their laptops to class. A classroom with enough outlets, adequate internet access for all students to connect to servers, and an individual desk space (or similar) for them to work individually and/or in teams is crucial for the success of the class.
2. Blackboard has become the default tool for evaluating outcomes in this course as per the institutional support. However, further support for disaggregating information about outcomes would streamline the CQI process.