The University of Texas at El Paso
Computer Science Department
CQI Report: Languages, Fall 2023

1 Subcommittee Information

The following courses are part of this subcommittee. A course may have several sections and instructors.

Subcommittee CS Courses	CRN number	Instructor name
CS 3350 – Automata	13902	Luc Longpre
CS 3350 – Automata	12491	Vladik Kreinovich
CS 3360- Programming Language Concepts	16171	Yoonsik Cheon
CS 3360- Programming Language Concepts	10898	Saeid Tizpaz Niari
CS 3360- Programming Language Concepts	13809	Saeid Tizpaz Niari
CS 4342 – Database Systems	13575	Natalia Villanueva Rosales

Report date: 09/04/24

Faculty meeting presentation date: 09/06/24

2 Summary

During the Fall 2023 semester, the course CS 3350 had two sections, the course CS 3360 had THREE sections, and the CS 4342 had one large section. The evidence collection took place in the Fall of 2023, and the individual reports were completed in the Summer of 2024. The committee met on August 23rd, 2024, to discuss recommendations. This report was approved by the committee on September 4, 2024.

3 Recommendations and follow up

3.1 Reflection on previous report recommendations and actions taken

CS 3350 - Automata

1. **CS 3350.** Pay more attention to topics for which the outcomes were below satisfactory in Fall 2021. **Action taken**: As a result, with two exceptions, all topics are now at the satisfactory level. (Of course, more time spent on the previously problematic topic meant a little bit less time spent on other topics, so the average grades on several topics slightly decreased in comparison with Fall 2021 -- while remaining on the satisfactory level).

The following were the two exceptions:

* In VK's section, the average grade for outcome 2f "construct a context-free grammar for a given context-free language" went from good in Fall 2021 to below satisfactory 62 in Fall 2023. Legally speaking, this may be counted as satisfactory, since for this class, D (which corresponds to etween 60

and 70) is a passing grade, however, for all other outcomes, the average grade is 70 or above. VK needs to spend more time on this topic. This was already done in Spring 2024, where the average grade was above 70.

* In LL's section, the average grade on Level 1 outcomes is below 60. This does not necessarily indicate that the students lack this knowledge, since these grades did not come from directly asking the corresponding questions, these grades come from asking much more complex (and not level 1) questions that go much deeper into the material.

CS 3360 – Programming Language Concepts

2. CS 3360. Monitoring and addressing specific outcomes, as several outcomes were either not assessed, not met, or only marginally met, including 1e (semantics), 2b (BNF), 2e (functional programming), 2f (scripting), 3a (critical evaluation of programming languages), and 3b (selecting suitable languages).

Action taken: To address these, the instructors placed special emphasis on the identified outcomes by incorporating additional in-class exercises to ensure comprehension. As a result, in one section (CRN: 16171), all outcomes were successfully met with an average of 80% or higher, except for Outcome 2b (BNF), which was marginally met with an average between 70% and 79%. In the second section (CRN 13809), all outcomes were successfully met with an average of 68%, except for 2e (write purely functional programs) with an average below 55%. In this section, there were three borderline problematic outcomes: 1e (formal dynamic semantics) and 2d (subprograms), and 3b (choose suitable PL). In the third section (CRN 10898), all outcomes were successfully met with an average of 65%, but there were two borderline problematic outcomes: 2d (sub-programs) and 2e (write purely functional programs). *We recommend that the instructor continue monitoring and focusing on outcomes that were previously unmet or marginally met to ensure consistent improvement across sections.*

3. CS 3360. Preventing plagiarism, as a concern arose from one section where multiple students were reported to the OSCCR for plagiarism.

Action taken: Proactive steps were also taken to mitigate plagiarism concerns. The "Academic Dishonesty" section of the syllabus was thoroughly reviewed during the first class, and a quiz question on this topic was added. Consistent reminders were provided throughout the semester, resulting in no reported incidents of academic dishonesty across all sections.

4. CS 3360. Improving student success rate, after observing a disparity in the previous assessment cycle: one section of 46 students has a failure rate of 17%, while another section of 42 students has a failure rate of 7%.

Action taken: This semester, the instructors closely monitored failure rates by tracking attendance and estimated final grades, reaching out to students who fell below certain thresholds. As a result, the overall failure rate dropped significantly to an average of 3%. In one section, all students passed.

CS 4342 – Database Systems

5. **CS 4342.** Embed outcomes that are Level 1 in the project or change 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.

Action taken: Some Level 1 outcomes were changed from describe to identify, contributing to more of these outcomes and not changing students' ability to meet Level 2 and Level 3 outcomes. More emphasis was made on revisiting these concepts when possible and within the project's context. Still, outcome 1b was not met.

3.2 Recommendations for this cycle – involving only the faculty who teach these classes.

Note: Recommendations are in italics.

CS 3350 - Automata

1. **CS 3350.** In several topics, while the final average grade is satisfactory, average grades on the midterms and on some of the related questions on the final exam are below satisfactory. This means that *more attention should be paid to these topics from the very beginning.* One way to increase the average student's knowledge -- as reflected in their grades -- is to get them more excited about this class, to provide more examples of how these topics are useful for many other areas. For example, since now many students are excited about AI and deep learning, it may be a good idea to explicitly mention neural networks as another computational paradigm, in addition to paradigms studied in the class.
2. **CS 3350.** *The committee recommends to continue paying special attention to outcome 2f.*
3. **CS 3350.** *The committee's recommendation is to include explicit questions about Level 1 outcomes topics in exams or quizzes, so that we will get a more adequate picture of the students' knowledge.*

CS 3360 – Programming Language Concepts

4. **CS 3360.** The introduction of Outcome 1f (familiarity with a language beyond conventional paradigms) has proven successful. In one section, it was met even when assessed as a Level 3 outcome (writing Prolog clauses). Given the increasing importance of programming paradigms and languages for AI, such as logic and probabilistic languages. *The committee recommends considering elevating this outcome to a higher level to reflect its significance.*

3.3 Recommendations for this cycle that require departmental approval (e.g., changes in outcomes)

CS 3360 – Programming Language Concepts

1. **CS 3360.** Remove Outcome 2a: This outcome is redundant and subsumed by Outcome 2b, as both involve defining syntax using BNF. Furthermore, original Outcome 2a is extensively covered in CS 3350. Rename all the Level 2 remaining outcomes accordingly. (old) 2a: Define the syntax of a small context-free grammar in BNF.

(old) 2b: Define the syntax of a small subset of a programming language using BNF.

(new) 2a: Define the syntax of a small subset of a programming language using BNF.

2. **CS 3360.** Add Outcome 1g. It is an important topic that is not explicitly covered by current outcomes.

(new) 1g. Explain language constructs that promote information hiding and ensure representation independence.

3. **CS 3360.** Replace Outcome 3a with 3a, 3b, 3c, and 3d. Rename the original outcome 3b to 3e. Outcome 3a contained too many topics and it was hard to measure appropriately.

(old) 3a: Evaluate modern, representative programming languages critically, considering design concepts and design alternatives, and implementation issues for variables, types, expressions, control structures, and program modules.

(new) 3a. Critically evaluate type system options such as static, dynamic, gradual, and optional and features including type inference, polymorphism, and subtyping of programming languages.

(new) 3b. Analyze class inheritance and related code reuse mechanisms in object-oriented programming languages, considering choices such as single vs. multiple inheritance, interface vs. implementation inheritance, and static vs. dynamic dispatch, and mixins.

(new) 3c. Assess the utility of advanced expression syntax, including lambda expressions and higher-order functions, in modern programming languages.

(new) 3d. Analyze advanced language constructs such as pattern matching, closures, continuations, and concurrency constructs, and critically evaluate their design trade-offs in comparison to traditional programming constructs.

CS 4342 – Database Systems

2. **CS 4342.** Change 1b from “Describe” to “Identify”.

(old) 1b. Describe the components of a database system (e.g., query optimizer, query executor, storage manager) and how they are used.

(new) 1b. Identify the components of a database system (e.g., query optimizer, query executor, storage manager) and how they are used.

3. **CS 4342.** Change 1c from “Describe” to “Identify”. For consistency with change in 1b and how these outcomes are evaluated, although this outcome was met.

(old) 1c. Describe the main goals and functions of database management systems.

(new) 1c. Identify the main goals and functions of database management systems.

4. **CS 4342.** Change 1h from “Describe” to “Identify”. For consistency with change in 1b, although this outcome was met.

(old) 1h. Describe technical solutions to the challenges in information privacy, integrity, security, and preservation.

(new) 1h. Identify technical solutions to the challenges in information privacy, integrity, security, and preservation.

4 Individual CS Course Outcomes Reports

CS 3350 course (section 1) outcomes report: CRN13902 - REPORT

CS 3350 course (section 2) outcomes report: CRN12491 - REPORT

CS 3360 course (section 1) outcomes report: CRN16171 - REPORT

CS 3360 course (section 2) outcomes report: CRN10898 - REPORT

CS 3360 course (section 3) outcomes report: CRB13809 - REPORT

CS 4342 course (section 1) outcomes report: CRN13575 - REPORT