# http://www.ric.edu/webcommunications/images/SealWithText_Small_Black.pngUNDERGRADUATE CURRICULUM COMMITTEE (UCC)PROPOSAL FORM

## Cover page scroll over blue text to see further important [instructions](#instructions): please read.

**N.B. DO NOT USE HIGHLIGHT, please DELETE THE WORDS THAT DO NOT APPLY TO YOUR PROPOSAL**

**ALL numbers in section (A) need to be completed, including the impact ones.**

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| --- | --- | --- |
| A.1. Course or program | **CSCI 422 Introduction to computation theory** |  |
| [Replacing](#Ifapplicable)  |  |
| A.2. Proposal type | **Course: revision**  |
| A.3. Originator | **Stephanie Costa****Namita Sarawagi** | [Home department](#home_dept) | **Mathematics & Computer Science** |
| A.4. Context and Rationale  | **We would like to change the prerequisites of CSCI 422, increase the credits from three to four, and change the offering from Spring odd years to Spring as needed.** **The current prerequisite for CSCI 422 is CSCI 325 and MATH 436. Both MATH 436 and CSCI 325 introduce Finite State Machines, which is the first topic in any Computation Theory course. It is not essential for students to have both courses before they take CSCI 422. Since CSCI 422 is a theoretical computer science course, having a Math prerequisite like Discrete Mathematics (MATH 436) is more essential. Not having CSCI 325 does not affect the learning of this content. Also, dropping a CSCI prerequisite allows math majors to take this course without special permission. The proposed prerequisite now matches URI's equivalent course, CSC 445.****The credit change from 3 to 4 also matches URI's Computation Theory course (CSC 445). We have added an additional topic--Undecidability--a topic related to Turing machines, as a major topic. This is also included in the proposed course description. We would also like to emphasize applications of Computation Theory in computer science, in this course more than we have in the past, so the increase in meeting time will allow for that, and the description will also be updated to reflect these changes.****As this course is an elective course in the BA and BS Majors – in the “choose 3 courses from” category – it will be offered in rotation with other courses in this category – so we would like to change its offering from Spring odd years to Spring as needed. The extra credit will not affect any program totals.** |
| A.5. Student impact | **The revised course will offer more applications and deeper understanding of the content of theoretical models of computation.**  |
| A.6. Impact on other programs  | **Math majors can take this course as one of their elective courses. We used to waive the CSCI 325 pre-requisite in the past for Math majors. With the proposed change they will be able to register directly for this course. This is also an elective for CIS.** |
| A.7. Resource impact | [*Faculty PT & FT*:](#faculty)  | **Existing Faculty** |
| [*Library*:](#library) | **None** |
| [*Technology*](#technology) | **None** |
| [*Facilities*:](#facilities) | **None** |
| A.8. Semester effective | **Fall 2018** | A.9. Rationale if sooner than next Fall |  |
| A.10. INSTRUCTIONS FOR CATALOG COPY: This single file copy must include ALL relevant pages from the college catalog, and show how the catalog will be revised. (1) Go to the “Forms and Information” page on the UCC website. Scroll down until you see the Word files for the current catalog. (2) Download ALL catalog sections relevant for this proposal, including course descriptions and/or other affected programs. (3) Place ALL relevant catalog copy into a single file. Put page breaks between sections and delete any catalog pages not relevant for this proposal. (4) Using the track changes function, revise the catalog pages to demonstrate what the information should look like in next year’s catalog. (5) Check the revised catalog pages against the proposal form, especially making sure that program totals are correct if adding/deleting course credits. If new copy, indicate where it should go in the catalog. If making related proposals a single catalog copy that includes all is acceptable. Send as a separate file along with this form. |

B. [NEW OR REVISED COURSES](#delete_if)  **DO NOT use highlight. Delete this whole page if the proposal does not include a new or revised course.**

|  | Old (for revisions only)Only include information that is being revised, otherwise leave blank (delete provided examples that do not apply) | NewExamples are provided for guidance, delete the ones that do not apply |
| --- | --- | --- |
| B.1. Course prefix and number  | **CSCI 422** | **CSCI 422** |
| B.2. Cross listing number if any |  |  |
| B.3. Course title  | **Introduction to Computation Theory** |  |
| B.4. Course description  | Computation theory concepts are introduced, including finite state automata, pushdown automata, and Turing machines. Also covered are the applications of these concepts to lexical analysis, parsing, and algorithms. | Computation theory concepts are introduced with applications to lexical analysis, parsing, and algorithms. Topics include formal languages, finite-state automata, pushdown automata, Turing machines, and undecidability. |
| B.5. Prerequisite(s) | **CSCI 325 and MATH 436** | **MATH 436** |
| B.6. Offered | **Spring Odd years**  | **Spring As needed.** |
| B.7. Contact hours  | **3** | **4** |
| B.8. Credit hours | **3** | **4** |
| B.9. Justify differences if any |  |
| B.10. Grading system  | **Letter Grade** | **Letter Grade** |
| B.11. Instructional methods | **Lecture** | **Lecture** |
| B.12.Categories | **Elective in CSCI, CIS and Math Majors** | **Elective in CSCI, CIS and Math Majors** |
| B.13. Is this an Honors course? | **No** | **No** |
| B.14. General EducationN.B. Connections must include at least 50% Standard Classroom instruction. |  |  |
| B.15. How will student performance be evaluated? | **Exams, Quizzes, and Homework Assignments** | **Exams, Quizzes, and Homework Assignments** |
| B.16. Redundancy statement |  |  |
| B. 17. Other changes, if any |  |

| B.18**. Course learning outcomes: List each one in a separate row** | [**Professional Org.Standard(s), if relevant**](#standards) | [**How will each outcome be measured?**](#measured) |
| --- | --- | --- |
| Define the major terms in automata theory, such as finite automaton, pushdown automaton, Turing machine and the related concepts of determinism and non-determinism. |  | Exams, Quizzes |
| Construct finite automata to recognize simple languages. Describe regular languages using regular expressions. Convert regular expressions to equivalent finite automata. |  | Exams, Quizzes, , Assignments |
| Construct pushdown automata to recognize simple languages. Convert context-free grammars to equivalent pushdown automata. |  | Exams, Quizzes, Assignments |
| Apply automata to lexical analysis and parsing. |  | Exams, Quizzes, Assignments |
| Describe the undecidability of the halting problem using a suitable formalization of algorithm. |  | Exams, Quizzes, Assignments |

| B.19. **Topical outline: Do NOT insert whole syllabus, we just need a two-tier outline** |
| --- |
| 1. Basic Concepts of Formal Languages 1 week1. Define and give examples of formal languages
2. Define the complement, union, intersection, and concatenation and Kleene star operations.

2. Deterministic Finite Automata 2 weeks1. Define and give examples of deterministic finite automata.
2. Construct DFAs to recognize finite languages and unions, intersections and complements of languages accepted by DFAs.
3. Prove that some languages are not accepted by any DFA.

3. Nondeterministic Finite Automata 2 weeks1. Define and give examples of nondeterministic finite automata.
2. Construct NFAs to recognize the union, concatenation and Kleene star of languages accepted by NFAs.
3. Construct a DFA equivalent to any given NFA.

4. Regular Expressions 2 weeks1. Define and give examples of regular expressions.
2. Construct an NFA equivalent to any regular expression.
3. Construct a regular expression equivalent to any DFA.
4. Conclude that DFAs, NFAs and regular expressions all describe the same class of languages.

5. Context-Free Languages 3 weeks1. Define and give examples of context-free grammars and parse trees.
2. Define and give examples of pushdown automata.
3. Prove that context-free grammars and pushdown automata describe the same class of languages.
4. Discuss additional topics such as parsing and/or ambiguity.

6. Turing Machines and Undecidability 3 weeks1. Define Turing machines and justify, without formal proof, that they are equivalent to algorithms.
2. Define a decidable formal language as one that can be recognized by an algorithm.
3. Prove that there is no algorithm that determines whether or not a program terminates.

 Testing and Review 1 week -------- Total 14 weeks |

## D. Signatures

* Changes that affect General Education in any way MUST be approved by ALL Deans and COGE Chair.
* Changes that directly impact more than one department/program MUST have the signatures of all relevant department chairs, program directors, and relevant dean (e.g. when creating/revising a program using courses from other departments/programs). Check UCC manual 4.2 for further guidelines on whether the signatures need to be approval or acknowledgement.
* Proposals that do not have appropriate approval signatures will not be considered.
* Type in name of person signing and their position/affiliation.
* Send electronic files of this proposal and accompanying catalog copy to curriculum@ric.edu and a printed or electronic signature copy of this form to the current Chair of UCC. Check UCC website for due dates.

##### D.1. Approvals: required from programs/departments/deans who originate the proposal. may include multiple departments, e.g., for joint/interdisciplinary prposals.

| Name | Position/affiliation | [Signature](#_Signature" \o "Insert electronic signature, if available, in this column) | Date |
| --- | --- | --- | --- |
| Stephanie Costa | Chair of Mathematics & Computer Science |  |  |
| Earl Simson | Dean of Faculty of Arts and Sciences |  |  |

##### D.2. Acknowledgements: REQUIRED from OTHER PROGRAMS/DEPARTMENTS IMPACTED BY THE PROPOSAL. SIGNATURE DOES NOT INDICATE APPROVAL, ONLY AWARENESS THAT THE PROPOSAL IS BEING SUBMITTED. CONCERNS SHOULD BE BROUGHT TO THE UCC COMMITTEE MEETING FOR DISCUSSION

| Name | Position/affiliation | [Signature](#Signature_2) | Date |
| --- | --- | --- | --- |
| Jeffrey Mello | Dean of School of Business |  |  |
| Lisa Bain | Chair CIS and Accounting |  |  |