COURSE DESCRIPTION

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Type</th>
<th>Course Title</th>
<th>Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 550</td>
<td>Sel. Elect.</td>
<td>Combinatorics on Words</td>
<td>Francine Blanchet-Sadri</td>
</tr>
</tbody>
</table>

Sem. Hours: 3

Current Catalog Description:

Introduction to the problems and methods in algorithmic combinatorics on words. Problem areas include periodicity, primitivity, and borderedness.

Textbook:


References:

None

Course Outcomes:

Upon successful completion of this course, a student should be able to:

1. Understand the basic theoretical concepts of combinatorics on words: codes, periods, and avoidable sets, and recognize the special partial words related to combinatorial results on partial words. (CO1)
2. Analyze algorithms on words and test combinatorial properties of partial words such as avoidability of a two-element set. (CO2)
3. Design applets that provide implementation of an algorithm on words. (CO3)
4. Identify and discuss the main results of the current research on partial words and classify the proof cases according to their number of undefined positions. (CO4)
5. Draw the domino graph of a given set of partial words. (CO5)
6. Comprehend and apply a number of algorithms such as: the domino technique on words to determine if a finite set of words is a code; the algorithm to transform a partial word into a binary one with the same periodic structure; the Patterson algorithm to find out whether a set is a code; and an algorithm to decide if a given finite set of words is avoidable. (CO6)
7. Prove that some problems, such as deciding whether a finite set of partial words is avoidable, are NP-hard by using techniques such as reduction from the 3SAT problem. (CO7)
Prerequisites by Topic:

Students must have
- permission of instructor

Major Topics Covered in the Course:

- Preliminaries on Partial Words
- Primitive Partial Words
- Unbordered Partial Words
- Deciding the Pcode Property
- Correlations of Partial words
- Unavoidable sets of partial words

Estimated Curriculum Category Content (Semester hours):

<table>
<thead>
<tr>
<th>Area</th>
<th>Core</th>
<th>Advanced</th>
<th>Area</th>
<th>Core</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algorithms</td>
<td>1</td>
<td>2</td>
<td>Software design</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Data structures</td>
<td>0</td>
<td>0</td>
<td>Prog. Languages</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Comp Org &amp; Arch</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>