SUBJECT PROGRAM

I. IDENTIFICATION OF THE SUBJECT

<table>
<tr><td colspan="2">Subject: Theoretical Computing</td><td>Acronym: INF-155</td><td colspan="3">Approval date
10/11/2016
(CC.DD. Agreement 13/2016)</td></tr>
<tr><td>UTFSM Credits : 3</td><td rowspan="2">Prerequisites:
INF-134 +
INF-152</td><td rowspan="2">Exam:
Does not have</td><td colspan="3">Faculty</td></tr>
<tr><td>SCT Credits : 5</td><td colspan="3">Computer Science Department</td></tr>
<tr><td rowspan="2">Lecture Hours
Weekly : 3</td><td rowspan="2">Weekly
Assistantship
Hours: 1.5</td><td rowspan="2">Hours
Weekly Lab: 0</td><td colspan="3">Semester in which it is taught</td></tr>
<tr><td>Odd</td><td>Pair
X</td><td>Both</td></tr>
<tr><td colspan="6">Formative axis : Engineering Sciences - Computer Science for complex problems in Industry</td></tr>
<tr><td colspan="6">Total time dedicated to the subject : 150 chronological hours</td></tr>
</table>

Subject Description

The student identifies the theoretical foundations of computer science, becoming familiar with abstract notions such as: machine, computation, language, and algorithm. The student distinguishes the different levels of complexity that a computing problem can have, including the extreme case of formally insoluble problems. In the case of solvable problems, design a finite state automaton, a context-free grammar, or a Turing machine, as appropriate.

Entry requirements

- Apply demonstration techniques.
- Apply logic, set theory and relationships.
- Understand basic algorithms related to graphs.

Contribution to the graduation profile

Specific Competence

- Apply theoretical and algorithmic foundations to develop efficient ways to solve computational problems.

Transversal Competencies

- Develop their work with solid criteria that allow ensure quality from a systemic perspective.

Learning outcomes expected to be achieved in this subject

- **Design** a finite state machine that accepts a specified language, **using** schematics, diagrams, and language types.
- **Represents** a specified language, **designing** a regular expression
- **Generates** a specified language, **designing** a context-free grammar.
- **Identify** the class of a language in Chomsky's hierarchy.
- **Converts** equivalent descriptions for a language, **including** automata, regular expressions, and context-free grammars, as appropriate.
- **Prove** that a problem is algorithmically insoluble, **applying** the strategy of reducing a known insoluble problem to it.
- **It identifies** that a problem is intractable (NP hard and NP complete), **reducing** a known intractable problem to it.

Thematic contents

- Alphabets and languages.
- Regular expressions.
- Regular sets.
- Finite state machines.
- Free context grammars.
- Stack automata.
- Turing machines.
- Church Turing thesis.
- Chomsky's hierarchy.
- Non-computable problems.
- Rice's computability theorem.
- Problems in P and in NP, NP-complete problems.

Teaching and learning methodology.

- Expository classes with audiovisual support.
- Individual and group work in solving computational problems of different levels of complexity.

Evaluation and grading of the subject. (Adjusted to Institutional Regulations-Regulation No. 1)

Approval requirements and qualification	This subject is evaluated with: 2 exams (65%) and work (or tasks) in problem solving (35%). Final Note (NF): • Contest(C1) = 30% • Contest(C2) = 35% • Tasks(T) (about 5 to 7) = 35% **NF: $(C_1) * 0.3 + (C_2) * 0.35 + (T) * 0.35$**

Resources for learning.

Virtual platform

Bibliography:

Guide Texts	• J. Hopcroft, R. Motwani, J. Ullman. (2008). Automata Theory, Languages and Computing, Prentice Hall, 3rd Ed.
Complementary or Optional	• M. Sipser. (2012).Introduction to the Theory of Computation, Cengage Learning; 3rd.Ed. • J. Hromkovic (2011).Theoretical Computer Science, Springer.

CALCULATION OF NUMBER OF HOURS OF DEDICATION - (SCT-Chile) - SUBJECT SUMMARY TABLE

ACTIVITY	Number of hours of dedication		
	Number of hours per week	**Number of weeks**	**Total number of hours**
PRESENCE			
Lecture or theoretical classes	3	17	51
Assistantship/Exercises	1.5	fifteen	23
Industrial visits (from Field)			
Laboratories / Workshop			
Evaluations (exams, others)	2	2	4
Others (specify)			
NO PRESENCE			
Assistantship			
Mandatory tasks	7	4	28
Individual and Group Work	3	4	12
Others: Personal Study	2	16	32
TOTAL (HOURS)			**150**
Total number of TRANSFERABLE CREDITS			**5**