Theory of Computer Science - Course Syllabus

Course Number: CS 161

Course Title: Theory of Computer Science

Academic Semester:	Spring	**Academic Year:**	2015/ 2016
Semester Start Date:	Jan 24, 2016	**Semester End Date:**	May 19, 2016

Class Schedule: Sun-Thu, 2:30 - 4:00 pm

Classroom Number:

Instructor(s) Name(s): Malek Smaoui
Email: malek.smaoui@kaust.edu.sa

Teaching Assistant name:
Email:

Office Location: Bldg. 1, flr. 4, rm 4124
Office Hours: Sun-Thu, 10:00 am - 12:00 pm

COURSE DESCRIPTION FROM PROGRAM GUIDE

The course will progress through finite automata, circuits and decision trees, Turing machines and computability, efficient algorithms, reducibility, the P versus NP problem, NP-completeness, the power of randomness, and computational learning theory. It examines the classes of problems that can and cannot be solved by various kinds of machines. It tries to explain the key differences between computational models that affect their power.

COMPREHENSIVE COURSE DESCRIPTION

Part one: computational models, including Finite State Automata and regular expressions, Push down-automata and context-free grammars, and Turing machines.

Part two: decidability, Church-Turing thesis, Universal Turing Machine and the Halting problem, unrecognizable languages.

Part three: reductions, computable functions, complexity, P and NP, NP completeness.

GOALS AND OBJECTIVES

At the end of this course, students should:

1. Use different computational models to recognize or generate languages.

2. Understand language classification according to computational modelization.

3. Prove a language is decidable/undecidable.

4. Prove a language is recognizable/unrecognizable.

5. Prove a language is P, NP or NP-complete

REQUIRED KNOWLEDGE

Basic Calculus and discrete math.

REFERENCE TEXTS

Required Textbook:

- Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning, 2012.

Reference Books:

- Concise Guide to Computation Theory. Akira Maruoka, Springer London, 2011.

- Elements of Computation Theory. Arindama Singh, Springer London, 2009.

- Computational complexity: a modern approach. Sanjeev Arora, Boaz Barak, Cambridge University Press, 2009

- Computability and Complexity Theory. Steven Homer, Alan L. Selman, Springer US, 2011.

METHOD OF EVALUATION

Percentages %	Graded content
• 30 % **• 40 %** **• 30 %**	**Homeworks** **4 Quizes** **Comprehensive Final Exam**

COURSE REQUIREMENTS

Assignments

Homeworks: 1-3 exercises from the textbook assigned at the end of each session due by the beginning of the next session.
Quizes: 30-45 min and cover the material of the last 2-3 weeks

Course Policies

Reflecting on the homework with one or a group of colleagues is acceptable but submitted solution should be written individually.Solutions copied from the internet will be detected and sanctioned. Verification of solution authenticity can be verified via related short pop quizes. Late assignments will not be accepted and will get a null mark.

Additional Information

NOTE
The instructor reserves the right to make changes to this syllabus as necessary.