Research Master Project

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- **<u>Project 2:</u> Memristor-based Oscillator : Modeling and Design**

  <u>Candidate:</u> Mariem Bouraoui

Memristors exhibit very promising features such as nonvolatility and small area. Several types of memristors have been developed in the last decade using different materials along with physical models explaining their behaviors. Due to their unique behavior and characteristics, memristors are expected to play a key role in many applications. The idea of memristor-based sinusoidal oscillators has been introduced in many recent publications which depends on the replacement of some or all resistors with memristors in the most common oscillator circuits and investigating the response.

In this work, the student is asked to cover a proper amount of information about history, modeling implementation and memristor oscillator. However, the main focus of this master research work is on wide tunning range memristor-based oscillator design for RF transceiver.

<u>Tasks</u>

- Study of the memristor device (clear definitions and discussing of its properties)
- Literature review about the more popular memristor models used for oscillator design and make a comparison among them to identify the most suitable model.
- Modeling and simulation of the chosen memristor model (for the simulation the student will use Cadence, Hspice, MATLAB, VerilogA)

- Design of memristor-based oscillator. (for the design, the student will use Cadence)

Reference:

[1]. L. Chua, “Memristor-The missing circuit element,” IEEE Transactions on Circuit Theory, vol. 18, no. 5, pp. 507– 519, 1971.

[2]. M. Affan Zidan, H. Omran, A.G. Radwan and K.N. Salama, “Memristor-based reactance-less oscillator”, Electronics Letters 27th October 2011 Vol. 47 No. 22

[3]. Dongsheng Yu, Herbert Ho-Ching Iu, Senior Member, IEEE, Andrew L. Fitch, and Yan Liang” A Floating Memristor Emulator Base Relaxation Oscillator”, IEEE Transactions on Circuits and Systems- I : Vol. 61, No. 10, October 2014.

[4]. Ahmed . Radwan, Mohammed E. Fouda, ““Memristor: Models, Types, and Applications”, Book: On the Mathematical Modeling of Memristor, Memcapacitor, and Meminductor, pp 13-49, 2015