COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electronics and Communications Engineering, Cairo

Graduation Project Description Form

Project Title:

Design of a Plasma System for Educational VLSI IC Fabrication

Project Supervisor(s):

Prof. Dr. Khaled Shehata (EC. Dept., College of Eng., AAST, Cairo)

Dr. Amr Bayoumi (EC. Dept., College of Eng., AAST, Cairo)

Duration from mo/year: 2/2103 till mo/year: 2/2014

Product Category

Algorithm____ Hardware X Software_____

Standards:

Safety: UL, CE_____ IEEE _____FCC _____Other X

Practical Realization Form

PCB X Firmware__ Embedded CPU Kit (ARM, ..etc):_____

PC Software _____ Ready-made Package_____ DSP Kit____ FPGA Kit__

VLSI Schematics ____ VLSI Layout _____ VLSI Silicon (ASIC)_____

Electronics Assembly: X Control & Automation: X Mechanical Assembly: X

Language

VHDL/Verilog_____ Matlab _____ C/C++/Java _____

Productization:

Finished Product Form: X Possible Commercialization X

Amount of funds needed for buying components: _____

IEEE GOLD Made-In-Egypt/Engineering Day: X

ITAC (ITIDA) or NTRA Funding Application: X

Testing:

Functional X Simulation X Parameters___ Final Hardware X Other:

Lab Test Setup

EMC _____ Environmental Microwave _____ Analog Lab_ Other:

CAD Tools *(No unauthentic software is allowed):*Numerical Modeling of Electric & Magnetic Field

Elective Classes Recommended: VLSI Fabrication (EC536)

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Abstract

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Prof. Dr. Khaled Shehata / Dr. Amr Bayoumi

Plasma processing is a major operation in integrated circuits (IC) fabrication. It is used in defining transistor gate, interconnects and contacts using and etching process. It is also used in Chemical Vapor Deposition (CVD) of gates and dielectrics, and Physical Vapor Deposition (PVD) of metals.

Plasma is a weakly ionized gas, generated under high electric field, and often focused using magnetic field. The plasma itself needs a high voltage power supply and an RF generator, plus a matching circuit. Much of the plasma science resembles a simple neon flourescent lamp. The system is made of two capacitor-like parallel plates, with optional magnet and AC frequency generator. A block diagram is shown at:

http://www.oxfordplasma.de/technols/dp_fm.htm

http://www.oxfordplasma.de/technols/rie_icp.htm

In this project we will understand the basics of plasma reactor design, and calculate the needed circuit elements to design the system.

A simple general purpose system for education of VLSI fabrication is to be designed, and simulated using numerical simulator. A very simple system may be built, and tested, depending on progress. The students will learn about steps used in VLSI fabrication, and will get to work with basic circuits and electric and magnetics of ionized gases. Students will use mechanical system design software. A stress will be on the measurement and control of the system, and on DC and RF power supply design.

An example system can be found at:

http://www.beamservices.com/products/85-products/plasmatics/115-table-top-plasma-rie-and-pecvd-systems

References and Links

http://en.wikipedia.org/wiki/Reactive-ion_etching