

## STIMESI MEMS Training Course Program

### **MEMS Design and INTEGRAMplus Silicon MEMS Prototyping Services**

**Institute of Electron Technology (ITE), Warsaw, Poland - 16-19 April 2007**

#### **Abstract:**

QinetiQ provides microsystems solutions based on 3 core silicon MEMS process technology families: Polysilicon surface micromachining, Metal-nitride surface micromachining, SOI micromachining using deep dry etching. A broad range of applications has been demonstrated in these processes. Low-cost access services continue to be supported as part of the INTEGRAMplus EUROPRACTICE service, both as multi-project wafers (MPW) for prototyping and single-project wafers (SPW) for intermediate volumes with added flexibility. Each process is supported by a design handbook containing information to enable design and simulation of devices, which has also been encoded into CAD support files for L-Edit™ and CoventorWare™.

This 4-day course will be given by a combination of academic experts, industrial designers and software developers. It provides an overview of MEMS processing technologies and how to approach the design of MEMS devices. Underpinning concepts of micro-mechanics (with worked examples of accelerometer and gyroscope) and microfluidics, electronic transduction techniques, and the principles of Finite Element Analysis will be reviewed. This will be followed by tutorials on the INTEGRAMplus silicon MEMS processes, design rules and introduce various design tools for analytical design, layout and simulation (circuit-level and finite element). This course will also introduce for the first time concepts and drivers for multi-domain integration and INTEGRAMplus microfluidic services. The emphasis throughout is to provide participants with hands-on experience to reinforce learning through a combination of group exercises and the use of CAD tools over the final 2 days. Practical design tutorials with case studies in CoventorWare will be included and there is also dedicated time for participants to develop their own design ideas. Participants will have the opportunity to continue to develop their skills through post-course homework and support.

#### **Target Groups:**

The course is primarily aimed at postgraduate students and researchers from European universities and research institutes with interest in developing MEMS design skills and accessing low-cost fabrication services who may participate free of charge. In addition, engineers and researchers from industry and other organisations are invited to participate for a minimal fee.

No prior knowledge of MEMS design and processing is required, although some prior reading and familiarisation with the INTEGRAMplus design handbooks before the course would be advantageous.

#### **Objectives:**

- Introduce MEMS and the key concepts of micro-mechanics, including the use of standard equations to analyse a range of simple mechanical devices and their properties
- Provide awareness of common sensor transduction methods and how to extract signals from MEMS sensors
- Explain methods to help students design and analyse MEMS devices, culminating in a basic grasp of multi-physics design tools and when and how to use them.
- Explain INTEGRAMplus silicon MEMS process flows and design rules to enable students to design with confidence
- Introduce multi-domain and multi-technology integration
- Provide familiarity with major CAD tools for MEMS in the EUROPRACTICE Software Service (L-Edit for layout and CoventorWare for MEMS design) and associated INTEGRAMplus support modules
- Reinforce learning through practical case studies and worked examples based on simple devices
- Support participants to develop their own design ideas and practical implementations in INTEGRAMplus processes

## Topics:

### Day 1: Introduction to MEMS

- MEMS Fabrication Basics
- Micromechanics and Transduction Basics
- Analytical Design and P-Spice Examples

### Day 2: Introduction to Design and INTEGRAMplus Services

- Introduction to Design
  - Design methodology
  - Finite element analysis
  - Circuit and system modelling
- INTEGRAMplus Silicon MEMS Fabrication Services and Design Kits
- Fundamentals of Microfluidics
- INTEGRAMplus Microfluidic Services

- Multi-domain and Multi-technology Integration

### Days 3-4: CAD tools for MEMS

- Introduction to Layout using L-Edit
  - practical layout and design rule exercises
- CoventorWare Training and Tutorials
  - Accelerometer-based tutorial covering:
    - Circuit-level simulation with parameterised libraries
    - Solid model generation
    - Finite element analysis
    - Statistical yield prediction
- Freeform design session with trainer support

Each course is limited to 18 participants to ensure a high quality of training. Please reserve your place early to avoid disappointment. STIMESI INTEGRAMplus design courses run approximately every 6 months and move to different locations within Europe.

## What is STIMESI ?

The goal of the STIMESI Stimulation Action is to stimulate European universities and research institutes to adopt MEMS and SiP technologies. The more experienced universities already active in MEMS design/technology will be assisted to increase their MEMS research activities and to design and fabricate more MEMS circuits and SiP components. Additionally other universities not currently active in this area will be given guidance to help them bootstrap their MEMS / SiP teaching and research activities.

## Who should attend?

All EUROPRACTICE member universities and research institutes that want to begin or strengthen their teaching and/or research activities in MEMS / SiP technologies. Also companies having interest in using MEMS in future products are invited to attend.

## For more information please visit the following links:

[www.STIMESI.org](http://www.STIMESI.org) [www.EUROPRACTICE.com](http://www.EUROPRACTICE.com) [www.INTEGRAMplus.com](http://www.INTEGRAMplus.com) [www.QinetiQ.com/MEMS](http://www.QinetiQ.com/MEMS)

This course is organised by QinetiQ in conjunction with the Institute for Electron Technology (ITE), Warsaw, Poland – [www.ite.waw.pl](http://www.ite.waw.pl)

**STIMESI MEMS Training Course Program****MEMS Design and INTEGRAMplus Silicon MEMS Prototyping Services****Institute of Electron Technology (ITE), Warsaw, Poland - 16-19 April 2007****REGISTRATION FORM**Return this form to IMEC by fax to: +32 16 281 584 or by e-mail (e-copy) to [Wendy.Fannes@imec.be](mailto:Wendy.Fannes@imec.be)

Name: .....

Affiliation: .....

Nationality: .....

Address: .....

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Telephone: .....

Fax: .....

E-mail: .....

Date: .....

Signature: .....

**Location:**Institute of Biocybernetics and Biomedical Engineering (IBIB), Warsaw, Poland, <http://www.ibib.waw.pl/gi.html>

Participants need to make their own accommodation and travel arrangements. A joining pack will be sent to registrants containing details of the course location, schedule and suggested local accommodation.

**Fees:**

- Attendance is free for members of universities and research centers from all 27 EU countries and Norway, Iceland, Lichtenstein, Israel, Croatia, Switzerland and Turkey. In case the course is oversubscribed, access may be limited to one participant per institute and will be on a first-come basis.
- Companies and other organisations: 300 € (excl. 21% VAT)
- Fee includes all lectures, course materials, lunches and refreshment breaks. Accommodation, transport and other meals are not included in the course fee.
- Cancellation by a participant between 2 and 28 days before the start of the course is subject to a 200 € administration fee. A 300 € fee will be charged for cancellation within 48 hours of the start of the course or for those who do not attend.