

STIMESI MEMS Training Course Program

MEMSCAP: MUMPs® (Multi-User MEMS) processes

Fondazione Bruno Kessler - FBK

Trento, Italy

May, 15 - 17, 2012

Abstract

MEMSCAP provides access to three MEMS processes, described below, via the MUMPs® MPW service.

The PolyMUMPs™ process is based upon the deposition of the following layers onto a Si substrate: a nitride isolation layer, a polysilicon ground layer, two structural polysilicon layers, two sacrificial oxide release layers, and one metal layer for electrical connection and enhanced reflectivity.

SOIMUMPs™ utilizes a three mask, silicon-on-insulator (SOI) process based upon a starting wafer consisting of layer thicknesses 10 µm or 25µm, 1 µm, and 400 µm, for the silicon, oxide, and substrate, respectively. The silicon layer may be patterned and etched down to the oxide to form mechanical structures, resistors and electrical routing. In addition, the substrate can be back-etched to the oxide, enabling the construction of through-hole structures.

MetalMUMPs™ employs electroplated nickel as the primary structural and interconnect material. In addition to this, doped polysilicon layers may be used to form resistors or further mechanical structures. Electrical isolation is achieved through the deposition of silicon nitride and oxide is employed as a sacrificial layer. Trench layers may be etched into the substrate so as to achieve additional thermal and electrical isolation. Gold plating of the nickel sidewalls may be employed if low contact resistance is desired.

Topics

This training course will provide an overview to the three MUMPs® processes, highlighting their different strengths with reference to potential applications. An overview of the design kits will be presented, and design methodologies will be illustrated using hands-on tutorial exercises. A strong emphasis of the course will be on familiarizing the participants with the process design rules. In this way, tips and tricks for pushing the process will be discussed.

Format

The first day of the course will provide attendees with an overview of each of the processes, as well as an introduction to the design kits and design rules. The second half of the course will consist of hands-on design exercises using CoventorWare™ for design entry, system level simulation and finite element modeling.

Besides a deeper understanding of the MUMPs processes, participants will learn how to use Coventor's [MEMS+](#)™ product design platform to construct a model of a MUMPs device using a library of behavioral model building blocks. Attendees will learn how to simulate the performance of the device together with system electronics. The course will also teach on how to use Coventor's [DESIGNER](#)™ to build and mesh a solid model from 2D layout and MUMPS process information and simulate this model in CoventorWare [ANALYZER](#)™ using one of our Finite Element Analysis tools.

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. Researchers from industry and other organizations can also attend.

No prior knowledge of MEMS design and processing is required.

Objectives

- Introduce MEMSCAP three technologies, PolyMUMPs™, SOIMUMPs™ and MetalMUMPs™, and the key concepts of micromachining of silicon, like bulk-, surface- and high aspect ratio micromachining;
- Provide awareness of common sensor transduction methods;
- Explain methods to help participants design and analyze devices manufactured in the MEMSCAP's MUMPs MPW processes; (Note: MEMSCAP MUMPs technologies are available through the EUROPRACTICE MPW Service)
- Explain MEMSCAP's MUMPs process flows and design rules to enable students to design with confidence;
- Provide familiarity with CoventorWare MEMS Design and Simulation tools, [MEMS+](#)™, [DESIGNER](#)™ and [ANALYZER](#)™
- Reinforce learning through practical case studies and worked examples based on simple devices during and after the course;
- Support participants to develop their own design ideas

What is STIMESI?

The goal of the STIMESI Stimulation Action is to stimulate European universities and research institutes to adopt MEMS 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 components. Additionally other universities not currently active in this area will be given guidance to help them bootstrap their MEMS 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 technologies. Also companies having interest in using MEMS in future products are invited to attend.

Note:

STIMESI courses run four times in the period from 2011 to Q3/2012, this is, approximately every 6 months and moves to different locations within Europe. This course is limited to **25** participants to ensure a high quality of training. Please reserve your place early.

Start /end date: May, 15 - 17, 2012

Location

The STIMESI Course will take place at the **Fondazione Bruno Kessler** institute, which is located in the city of **Trento**, Italy.

Trento is a major educational, scientific, financial and political centre in Trentino-Alto Adige/Südtirol and Northern Italy in general. The University of Trento ranks highly out of Italy's top 30 colleges, and amongst the 500 best in the world according to the Times Higher Education. The city contains a picturesque Medieval and Renaissance historic centre, with ancient buildings such as Trento Cathedral and the Castello del Buonconsiglio.

Modern-day Trento is a cosmopolitan city, with highly-developed and organized modern social services.



Course Location

Address:

STIMESI Course is on:
Fondazione Bruno Kessler - FBK
Via Sommarive, 18
38123 Povo, Trento, Italy
Lecture room: FBK North building rooms

Useful links:

Fondazione Bruno Kessler - FBK: www.fbk.eu
How to come to FBK: www.fbk.eu/getting/scientific_hub
How to come to Trento: www.fbk.eu/getting/trento
Google Maps: [click this link](http://maps.google.be/maps/ms?msid=214772448369649897276.0004b2bc8fdcf6045c7be&msa=0&ll=46.066799,11.138248&spn=0.047581,0.077162) or
<http://maps.google.be/maps/ms?msid=214772448369649897276.0004b2bc8fdcf6045c7be&msa=0&ll=46.066799,11.138248&spn=0.047581,0.077162>
Trento Tourist board: www.ap.trento.it/en/Home.htm
More about Trento: <http://en.wikipedia.org/wiki/Trento>



Planned Social Event

Guided Tour to Trento City Historical Center

Capital of Trentino, not far from the Dolomites and the numerous lakes that can be found near by, Trento is a city of art that has a strong Renaissance mark, which characterises it for its colours, its buildings and make it unique in the entire Alpine arc. Trento is able to surprise as it always presents itself in a new form, maintaining at the same time close links to tradition. Visitors throughout the various seasons can admire its many folded facets: its tasty products in the autumn period, kept alive by its historical re-enactments during the San Vigilio festival at the end of June or illuminated by the "warm" Christmas market lights during Advent.

Visit to the Buonconsiglio Castle (Optional)

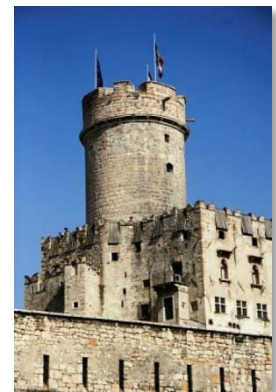
The Buonconsiglio Castle is a museum as well as the largest monumental complex in Trentino-Alto Adige. The Castle built up against the 13th century city walls, served as the residence of the Bishops of Trento from the second half of the 13th century until the secularization of the principality in 1803, and is composed of a series of buildings of different eras, enclosed by walls and positioned slightly higher than the city.

Today it is the seat of the Museo Provinciale d'Arte (Provincial Art Museum), monuments and provincial art collections. It holds numerous collections of art, paintings, sculptures, graphic works, miniate codes, majolica ovens, as well as archaeological and numismatic collections. Among its many Baroque and Gothic frescoes, an outstanding work is the Ciclo dei Mesi (Cycle of the Months) considered one of the most significant examples of international Gothic style in the world.

The Castle is located in the very center of Trento: Castello del Buonconsiglio - Via Bernardo Clesio, 5 – Trento, Italia www.buonconsiglio.it

Social dinner

The social dinner will be held at a typical brewery in downtown Trento, an historical place, founded at the beginning of the last century, and brewing since august 2000 with a 10 hl equipment of beer (called Lag's Beer): Chiara (Helles style), Weizen and Rossa (Vienna).



Fees

Attendance is kept low in order to lower the barrier for members of universities and research institutes. However, a fee will be required to cover the cost of the local infrastructure, catering,

- Attendance fee: 150 €
- Fees exclude VAT which will be invoiced subject to national regulations.
- STIMESI staff will send you information on how you can make the payment.
- Places on courses will not be confirmed until payment is completed.
DO NOT make any travel plans until your place is confirmed.
- Fee includes all lectures, course materials, lunches and refreshment breaks. Accommodation, transport and other meals are not included in the course fee.

- **Cancellation charges:**

- Cancellation 14 or more days prior to the start of the course 100% of your fee will be refunded or credited.
 - Cancellation between 7 and 14 days before the start of the course 50% of your fee will be refunded or credited.
 - Cancellation within 7 days of the start of the course (or for those who do not attend) no fees will be refunded or credited.
- If you need to cancel your booking, please email stimesi@stfc.ac.uk quoting your full name and Booking Reference.

- In case the course is oversubscribed, access may be limited to one participant per institute and will be on a first-come basis.

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Accommodation

Participants need to make their own accommodation and travel arrangements.

Web site information about accommodation will be provided. The correct and updated link will be provided on the general stimesi site and on the STIMESI Course Booking System.

For further hotels or touristic info about Trento, please visit the site: <http://www.ap.trento.it/en/Accommodation/Hotel/Hotel.htm>

Transportation

Bus: the town has an efficient urban travel system (yellow buses) run by Trentino Trasporti Spa (www.ttesercizio.it). Extra urban buses are run by the same company. If you visit the Trentino Trasporti office at the main railway station, you can pick up a free timetable "Guida ai trasporti del Trentino".

Taxi: taxis can be caught anywhere in town or booked on the phone number (+39) 0461 930002

Registration

Registration can be done using the STIMESI Course Booking System, which is managed and maintained by STFC Rutherford Appleton Laboratory, UK.

The following link brings you there: <http://www.stimesi.stfc.ac.uk>

Browse to the [STIMESI Course Booking System](#), select the course of your choice and use the "Book This Course" link

Notes:

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A joining pack will be sent to registrants containing details of the course location, schedule and suggested local accommodation.

All necessary course material will be provided. To get complementary course materials, such as the Design Handbooks, the institutes or companies sending attendants to this course are requested to sign the required Design Kit License Agreement (DKLA) from the EUROPRACTICE-IC service. Instructions on how to get the access to the Design Handbooks and the DKLA will be sent to the registered attendee prior to the course.

The STIMESI Course Booking System is managed and maintained by STFC Rutherford Appleton Laboratory.

All enquires should be emailed to: stimesi@stfc.ac.uk

More information

For more information, please visit the following links:

www.stimesi.org

www.stimesi.stfc.ac.uk

www.europactice.com

www.memscap.com