

## INTRODUCTION TO **MEMS** TECHNOLOGIES AND THEIR APPLICATIONS

**EUROPRACTICE**  
*webinar series*

Today's world is all about development of miniaturized systems. Be it a consumer product that goes into medical, automotive or for that matter any market segment, low power, low cost, high reliability and high integrability are key differentiators for competitiveness. Micro Electro Mechanical Systems (MEMS) are typically used for sensors and actuators consuming very low power, while most people know MEMS from their application in mobile devices. MEMS technology has evolved over the years to fit the needs of the customers. Nowadays they can be found in many applications where miniaturization is required. Whether it is a miniaturized pressure sensor, an ink jet print head or micropumps and valves in biomedical devices, MEMS enable innovations in all application domains.

Ready-to-use MEMS foundry technologies allow both the manufacturing of high volumes and small series prototyping. EUROPRACTICE has been providing MEMS device fabrication services for many years thanks to the support of foundries such as MEMSCAP and X-FAB. Recently, the service is being extended with system integration which enables the combination of a MEMS device with other devices and technologies, such as ASICs, Photonics, or Microfluidics. While MEMS foundries have come up with fabrication processes compatible with CMOS fabrication, there still lies a lot of issues to be dealt with from design phase to fabrication and packaging.

This webinar series will start with an introduction into the different technologies, then give an overview of MEMS fabrication services within EUROPRACTICE. The series will also announce a new piezoMEMS technology soon to be offered through EUROPRACTICE.

This course is suited for PhD Students, Engineers, Physicists and Technology and Innovation Managers who are interested in broadening their horizon and want to develop a heterogeneous system incorporating MEMS devices.

### Program includes four webinars on MEMS



- ▶ **Introduction to MEMS and their applications**  
Dr. Veda Sandeep Nagaraja, Tyndall National Institute  
[YouTube](#)
- ▶ **MUMPs technology platforms from MEMSCAP enabling low-cost prototyping**  
Dr. Sambuddha Khan, Tyndall National Institute  
[YouTube](#)
- ▶ **XMB10: the Open Platform MEMS technology from X-FAB for 3-Axis Inertial Sensor applications**  
Dr. Romano Hoofman, imec  
[YouTube](#)
- ▶ **Tyndall's new PiezoMEMS process for SAW applications**  
Dr. Veda Sandeep Nagaraja, Tyndall National Institute  
[YouTube](#)

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- ▶ Advanced Photonic Packaging
- ▶ Introduction to Microfluidics
- ▶ Silicon Photonics
- ▶ Introduction to MEMS Technologies

There are new webinar series coming up in autumn 2021.



Dr. Veda Sandeep  
Nagaraja

24 March at 11:00 CET

### Introduction to MEMS and their applications

Dr. Veda Sandeep Nagaraja, Tyndall National Institute

The opening webinar will give introduction to MEMS devices and outline the scope of the next webinars in the series. Participants will have an opportunity to discover MEMS technologies and their applications, together with possibilities and challenges of cooperation between researchers from the MEMS domain and other fields. Becoming acquainted with different MEMS platforms can help researchers and innovators to use resources more efficiently and explore new opportunities.

This talk will deal with applications, case studies and challenges in the MEMS field. It will also provide insights on how these challenges can be overcome by using the state-of-the-art technology service provided by EURORACTICE. This is a good time to learn more about the EURORACTICE service portfolio, which is now enlarging to include more MEMS technologies and associated system integration solutions.



Dr. Sambuddha  
Khan

7 April at 11:00 CET

### MUMPs technology platforms from MEMSCAP enabling low-cost prototyping

Dr. Sambuddha Khan, Tyndall National Institute

The second webinar will focus on Microfabrication technology platforms from MEMSCAP that are available in Multi-Project-Wafer (MPW) mode through EURORACTICE. The MEMSCAP foundry offers three Multi-User MEMS Processes (MUMPs), namely SOIMUMPs, PiezoMUMPs and PolyMUMPs.

The PolyMUMPs platform is suitable for users who need a surface micromachining process by means of three thin-film polysilicon layers, whereas SOIMUMPs and PiezoMUMPs are suitable for researchers working in the area of bulk micromachining. In SOIMUMPs, the devices are realized by etching the device layer of a Silicon-On-Insulator (SOI) wafer. The devices are later released by selective etching of thick handle layer of the SOI wafer from the back while protecting the front side of the wafer. The PiezoMUMPs is an extended process of SOIMUMPs where a thin layer of a piezoelectric material is deposited and patterned to obtain devices that use piezoelectricity for transduction.

The webinar will touch upon all these three MUMPs platforms with their design rules and critical realizable dimensions. It will end with application examples of devices that are realized using these processes.



Dr. Romano  
Hoofman

21 April at 11:00 CET

### XMB10: the Open Platform MEMS technology from X-FAB for 3-Axis Inertial Sensor applications

Dr. Romano Hoofman, imec

In this third webinar on MEMS, we will focus on the XMB10 MEMS technology from X-FAB. This webinar will start with zooming on the technology process itself. The technology is based on surface-micromachining of an SOI wafer. For realisation of the inertial sensor structures (seismic mass, comb drives, read-out capacitors), trenches and holes are etched anisotropically in the device layer of the SOI wafer, down to the buried oxide. By using isotropic etching, the structures are under-etched and their ends released. Finally, those structures are electrically contacted and hermetically sealed by a silicon cap wafer.

In the second part of the webinar, it will turn more to an application focus. The XMB10 MEMS technology is especially suited for 3-Axis Inertial Sensor applications, enabling acceleration sensors and other inertial sensors, such as high-performance gyroscopes or inclination sensors with a particular focus in the automotive industry. In this webinar, customer testimonials will demonstrate that there are many more applications which can be served with this technology, ranging from energy harvesting to micro-spectrometers.

5 May at 11:00 CET

## Tyndall's new PiezoMEMS process for SAW applications

Dr.Veda Sandeep Nagaraja, Tyndall National Institute



Dr.Veda Sandeep  
Nagaraja

In this final webinar, we will be introducing new piezoMEMS process capabilities that are being developed at Tyndall National Institute. We will explain the working principle of Surface Acoustic Wave (SAW) devices and their applications that range from biosensor to RF filters. The SAW device has found profound use in RF filters for high frequency applications. It can also be used as a sensor for detection of bio-enzymes or gas in a given environment. The diverse use of this device has led many researchers to develop novel materials and designs to enhance the performance of the overall system.

This talk will give details on the device stack and challenges faced during development of these devices. In addition, it will zoom in on the three modules of piezoMEMS from Tyndall National Institute, which will be available through EUROPRACTICE services in the near future.

This episode on piezoMEMS will be useful for participants with different background. On the one hand, it will help users who are familiar with the field to find a platform to develop and fabricate their devices. On the other hand, it will give a basic understanding of piezoMEMS and their applications to less experienced participants.