聆听 MEMS专家的独家分享！

面对新机遇和新挑战 您准备好了吗？

MEMS Technology: A Key Technology for the 21st Century

-Emerging Trends and Economic Opportunities

(MEMS 技术:面向 21 世纪的关键技术--新兴趋势和经济机会)

NOVEMBER 18 - 20, 2015 | SHANGHAI, CHINA

Why Participate：

MEMS (Micro-electro-mechanical systems) are undoubtedly an enabling key technology for the 21st century, as they can contribute to solutions for practically all grand societal challenges humanity is facing, such as sustainable growth, mobility, environmental problems, health and renewable energy. This fascinating and multidisciplinary research field will certainly strongly grow over the next years, and already represents an important economic factor. MEMS based technology currently has an estimated worldwide revenue of 15-20 billion USD and a forecast of 15-20% annual growth for the foreseeable future.

The short course will cover the main fabrication and design principles of a wide range of MEMS devices, using plenty of practical examples from industry for illustration. A detailed economic breakdown of various MEMS devices and their applications will be given. For fabrication, the main foundry processes will be explained, and for the design the industry standard CAD tools for MEMS devices will be described. The devices covered in the course include pressure sensors, accelerometers, gyroscopes, resonant sensors, energy harvesters, biosensors, actuators and microphones. There will be a special emphasis on emerging application driven MEMS markets such as biomedical sensors, Internet of Things and Industry 4.0. After attending the short course, the participants will have a sound knowledge in MEMS design and fabrication, well prepared to enter the commercial opportunities this field currently is offering.

Who Should Attend：

Engineers from companies planning to enter or recently have entered the MEMS field. Postgraduate university students planning to work on MEMS for their PhD or Master project.

Why Lynne Consulting：

Lynne Consulting is offering advanced engineering courses in the field of analog, RF and mixed-signal IC design targeting the audience of electrical engineers, company managers and marketing engineers working in the semiconductor industry. The lecturers are leading practitioners and top experts in the area from high-technology companies and universities, who teach the most up-to-date information available at the time of the course.

LYNNE

咨询电话：021-5109 6090

Course Details：

- **Duration:** 3 days（18th-20th Nov. 2015）
- **Venue**：Building 21, No 1388, Zhangdong Road, Pudong New District, Shanghai, China
- **Registration Fee:**￥*3600*/person (Included in the fee are lecturing fee, lecture notes, daily lunches and two coffee breaks a day.)
- A discount applies for groups before **4th November 2015** （3 persons（Total:￥*10500*）; 4 persons（Total:￥*13600*）; 5 persons or more（negotiation））
- ￥*3000*/person for students
- The above discount can not apply simultaneously
- Deadline for registration: **10th Nov. 2015**

★Registration Method★:

Please fill out the registration form (in the attachment) and send the completed form to：

Email：service@lynneconsulting.com

Fax: 021-3327-5892

Course Program:

Day 1--18th Nov. 2015（第一天 2015 年 11 月 18 号）

Lecture 1: What is MEMS?

第一课：什么是 MEMS？

- Where did MEMS come from?/MEMS

-从而何来？

- Definitions of MEMS, Microsystemtechnology and Nanotechnology

-MEMS、微系统技术和纳米技术的定义

- Scaling laws

- 比例定律

- Some real world examples

- 一些真实世界的例子

Lecture 2: Economic Status and Predictions

第二课：MEMS 经济地位和预测

- Current Market and their economic status
- 当前 MEMS 市场和经济地位
- Market data for various MEMS devices and their applications
- 多种 MEMS 器件应用及市场数据
- Emerging applications in consumer electronics, Internet of Things, Industry 4.0 and high value markets
- MEMS 新兴应用：消费电子、物联网、工业 4.0 和高端市场
- Main MEMS players and product roadmap
- 主要 MEMS 厂商和产品路线图
- Discussion Session
- 讨论环节

Lecture 3: Fabrication Principles for MEMS

第三课：MEMS 制造原理

- Surface and bulk micromachining
- 表面硅和体硅加工技术
- Standard MEMS fabrication processes
- 标准 MEMS 制造工艺
- Economics of fully integrated vs hybrid MEMS
- 经济性：完全集成 vs. 混合 MEMS
- MEMS CMOS integration、
- MEMS CMOS 集成
- Description of main MEMS foundry services and processes
- 主要 MEMS 代工服务和工艺说明
- Discussion Session
- 讨论环节

Day 2--19th Nov. 2015（第二天 2015 年 11 月 19 号）

Lecture 1: Design Principles for MEMS Physical Sensors

第一课：MEMS 物理传感器设计原理

- Main transduction principles used in MEMS
- 主要 MEMS 传感器原理

- *Main actuation principles used in MEMS*
- 主要 MEMS 执行器原理
- *CAD and simulation tools for MEMS*
- MEMS CAD 和仿真工具
- *Practical examples*
- 实践案例

Lecture 2: MEMS Pressure Sensors and Their Applications

第二课：MEMS 压力传感器及其应用

- *Principles of operation*
- 工作原理
- *Pressure sensors for automotive applications*
- 汽车级压力传感器
- *Pressure Sensors for consumer applications*
- 消费类压力传感器
- *Pressure sensors for medical applications (active implants)*
- 医疗级压力传感器（活性植入物）
- *Discussion Session*
- 讨论环节

Lecture 3: MEMS Inertial Sensors

第三课：MEMS 惯性传感器

- *Principles of operation*
- 工作原理
- *Accelerometers and gyroscopes*
- 加速度计和陀螺仪
- *Inertial sensors for consumer applications*
- 消费类惯性传感器
- *Inertial sensors for high performance applications*
- 高性能惯性传感器
- *Q&A Session*
- 问答环节
- *Discussion Session*
- 讨论环节

Day 3--20th Nov. 2015（第三天2015 年11 月20 号）

Lecture 1: MEMS Devices for Biochemical and medical applications

第一课：生物和医疗领域的 MEMS 器件

- MEMS resonator sensors for bio-analyte concentration measurement
- 应用于生物分析物浓度测定的 MEMS 谐振传感器
- Enzymatic sensors
- 酶传感器
- Artificial retinal prosthesis
- 人工视网膜假体
- Lab on a chip
- 芯片实验室

Lecture 2: MEMS for Internet of Things and Industry 4.0

第二课：物联网和工业 4.0 领域中的 MEMS 技术

- Energy harvesters
- 能量收集器
- MEMS for wearable technology
- 可穿戴设备中的 MEMS
- MEMS for smart production
- 智能制造领域中的 MEMS
- The trillion sensor vision
- 万亿级传感器前景
- Q&A Session
- 问答环节

Lecture 3: Emerging MEMS and Applications

第三课：新兴 MEMS 和应用

- MEMS microphones and ultrasonic sensors
- MEMS 麦克风和超声波传感器
- MEMS actuators (autofocus, inkjet, microspeaker)
- MEMS 执行器（自动对焦、喷墨打印头、微扬声器）
- MEMS bolometer
- MEMS 辐射热测量计

- *RF MEMS and oscillator*
- **RF MEMS 和 MEMS 振荡器**
- *Gas and humidity sensors*
- **气体和湿度传感器**
- *UV Sensors*
- **紫外线传感器**
- *MEMS display*
- **MEMS 显示器**
- *Academic MEMS research topics*
- **学术领域的 MEMS 研究课题**
- *Round-up and Feedback Session*
- **总结和反馈环节**

Lecturer's Biography:

Michael Kraft is a Professor of Micro- and Nanosystems at the University of Liege, Department of Electrical Engineering and Computer Science (Montefiore Institute). From 2012-2014, he was at the Fraunhofer Institute for Microelectronic Circuits and Systems in Duisburg, Germany, where he headed the Department of Micro- and Nanosystems focussing on fully integrated microsensors and biohybrid systems. He concurrently held the W3 Professorial Chair of Integrated Micro- and Nanosystems at the University of Duisburg-Essen.

From 1999 to 2012 he was a faculty member and Professor of Micro-System-Technology at the University of Southampton, UK. Concurrently, he also was the director of the Southampton Nanofabrication Centre. He graduated with a Dipl.-Ing. (Univ.) in electrical and electronics engineering at the Friedrich Alexander Universität Erlangen-Nürnberg in 1993. In 1997 he was awarded a PhD from Coventry University on the development of a MEMS accelerometer. He then spent two years at the Berkeley Sensors and Actuator Centre at the University of California working on integrated MEMS gyroscopes. He has 20 years of experience in micro- and nano-fabrication techniques, microsensors and actuators and their interface circuits, in particular for capacitive sensors. He has a broad interest in MEMS and nanotechnology ranging from process development to system integration of MEMS and nano-devices. In 2005 his research group developed the world's first fifth order sigma-delta-modulator (SDM) interface for a MEMS accelerometer, and in 2007 a band-pass SDM for a MEMS gyroscope. He has done ground-breaking work on electrostatically levitated micro-objects for sensing and actuation applications, and developed several novel, micro-fabricated atom and ion chips. He has published over 200 peer reviewed journal and conference publications as an author or co-author. He also contributed to three text books on MEMS, and edited a book on MEMS for aerospace and automotive applications. He currently serves on several steering and technical committees of international conferences such as IEEE Sensors, Eurosensors and MME, as well as being an associate editor for the journals Mechanical Sciences and Sensors and Sensors Systems. He

also has done industrial consultancy for many companies active in the MEMS field.

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