



SCME

scme-support.org

Support Center for Microsystems Education

Learning Modules Available

MEMS Introductory Topics

- MEMS History
- Introduction to Sensors
- Introduction to Transducers
- Introduction to Actuators
- Units of Weights and Measures
- A Comparison of Scale
- Introduction to Statistical Process Control
- Problem Solving for Microsystems
- Intro to Nanotechnology

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- Chemical Lab Safety Rules
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- Micropressure Sensors & the Wheatstone Bridge
- Micropumps

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- MEMS: Making Micro Machines

BioMEMS

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- Clinical Laboratory Techniques and Microtechnology
- BioMEMS Diagnostics Overview
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- MEMS for Environmental and Bioterrorism Applications
- Regulations of BioMEMS
- DNA Microarrays

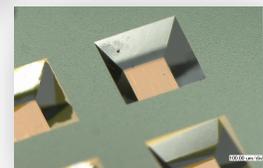
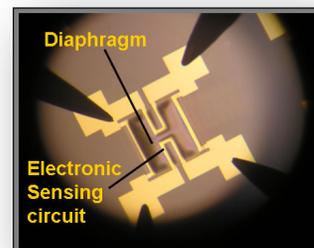
Hands-on Kits Available

- Pressure Sensor Model Activity and Kit
- MEMS: Making Micro Machines DVD Kit
- Microcantilever Activity and Kit
- Crystallography Activities and Kit
- Micropressure Sensor Process Activity and Kit
- Bulk Micromachining Activity and Kit
- Surface Micromachining Activity and Kit
- Science of Thin Films Activity and Kit
- DNA Microarray Model Kit
- Learning Microsystems through Problem Solving LIGA

Online Courses Available

- Career Pathways in Microtechnology
- Crystallography
- Microcantilevers
- BioMEMS Applications
- Micropressure Sensors
- Science of Thin Films

A new online course will be made available every month, visit our website to see what's new!





SCME

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MEMS Introductory Topics

MEMS History

This learning module provides a timeline of the progression of microtechnology through a series of innovations that starts with the first Point Contact Transistor built in 1947 and ends with the optical network switch in 1999. Activities provide the opportunity to build on this timeline and to identify innovations of the 21st century that have contributed to current advancements in both micro and nanotechnology.

<http://scme-support.org/index.php/introductory-topics/mems-history>

Introduction to Sensors

This learning module covers the types of components found in microelectromechanical systems (MEMS). This module discusses "sensors" – what they are, how they work, and how they are used in both macro and micro-sized systems. An activity provides further exploration into specific sensors and how they are used in everyday devices. Two related learning modules cover macro and micro-sized transducers and actuators.

<http://scme-support.org/index.php/introductory-topics/intro-to-sensors>

Introduction to Transducers

This learning module is one of three SCME modules that discuss the types of components found in microelectromechanical systems (MEMS). This module covers "transducers" – what they are, how they work, and how they are used in both macro and micro-sized systems. An activity provides further exploration into specific transducers and how they are used in everyday devices. Two related learning modules cover macro and micro-sized sensors and actuators.

<http://scme-support.org/index.php/introductory-topics/intro-to-transducers>

Introduction to Actuators

This learning module is one of three SCME modules that discuss the types of components found in microelectromechanical systems (MEMS). This module covers "actuators" – what they are, how they work, and how they are used in both macro and micro-sized systems. An activity provides further exploration into specific actuators and how they are used in everyday devices. Two related learning modules cover macro and micro-sized sensors and transducers.

<http://scme-support.org/index.php/introductory-topics/intro-to-actuators>

Units of Weights and Measures

This learning module provides information on the evolution of the current systems of weights and measures, and an overview of the International Standards of Units and metric system. Activities provide the opportunity to research the current state of weights and measures around the world and its importance to society and industry, specifically its importance to microtechnology fabrication and design. Instruction and practice for converting from any unit of measure to another is also provided.

<http://scme-support.org/index.php/introductory-topics/units-of-weights-measures>

A Comparison of Scale

In order to grasp many of the concepts associated with micro and nano-size devices, one needs to understand scale and the size of objects associated with different scales. This learning module introduces various concepts associated with scale, and a comparison of the macro, micro, and nano-scales. Activities provide the opportunity to further explore the macro, micro and nano scales and their associations with micro and nanotechnology.

<http://scme-support.org/index.php/introductory-topics/a-comparison-of-scale>

Introduction to Statistical Process Control

Statistical Process Control or SPC is a set of tools used for continuous improvement and the assurance of quality in an active manufacturing process. This learning module introduces some of the SPC tools used by technicians and engineers, including one of the most common tools – control charts. Activities provide the opportunity to demonstrate an understanding of control charts using select sets of data.

<http://scme-support.org/index.php/introductory-topics/intro-to-statistical-process-control>

Problem Solving for Microsystems

This learning module introduces a systematic approach to solving problems by using a six-step process. This approach is used throughout industry to solve simple to complex problems. Activities provide the opportunities to this six-step process in a real life situation as well as MEMS process problem.

<http://scme-support.org/index.php/introductory-topics/problem-solving>

Intro to Nanotechnology

This learning module is to be used in conjunction with the NanoTechnology film of the same name, by Silicon Run Productions, A kit is available that contains the DVD, an Instructor Guide and a Participant Guide.

This Learning Module is not yet on the SCME-support.org Website

MEMS Safety

Hazardous Materials

This learning module provides information on hazardous materials and how these materials could affect one's health and the safety of the working environment. This information should provide students and employees with the knowledge and confidence needed to work in environments in which hazardous materials are used and stored.

<http://scme-support.org/index.php/safety-for-microsystems-fabrications/hazardous-materials>

Chemical Lab Safety Rules

The fabrication of micro and nano devices requires the use of several types of chemicals, both inert and hazardous. This learning module provides the general safety rules for working in facilities and laboratories that use chemicals. Through its activities, the learning module gives students the opportunity to demonstrate their understanding of these rules and their ability to apply them in a chemical use environment.

<http://scme-support.org/index.php/safety-for-microsystems-fabrications/chemical-lab-safety-rules>

Safety Data Sheets

A Safety Data Sheet (SDS) contains valuable information and OSHA required information on a chemical – its physical and chemical properties, potential hazards, proper methods for storing and transporting, and much more. This learning module provides information on the requirements and content of Safety Data Sheets, how to locate a specific SDS, and how to interpret it. Activities allow students to demonstrate their ability to locate a specific SDS and to extract and interpret important safety information. (Note: The SDS used to be called a Material Safety Data Sheet or MSDS.)

<http://scme-support.org/index.php/safety-for-microsystems-fabrications/safety-data-sheets>

Chemical Labels – NFPA

The fabrication of micro and nano devices requires the use of several types of chemicals, both inert and hazardous. OSHA requires specific information about a chemical to be on its label. This learning module provides information needed to interpret chemical labels and symbols used. One such symbol is the NFPA diamond developed by the National Fire Protection Association. Upon completion of this learning module one should be able to describe the information found on a NFPA diamond and a chemical label.

<http://scme-support.org/index.php/safety-for-microsystems-fabrications/chemical-labels-nfpa>

Personal Protective Equipment

This learning modules introduces students to the types of personal protective equipment (PPE) required when working in a manufacturing or laboratory environment. The purpose of PPE is discussed as well as the type of PPE required for different tasks.

<http://scme-support.org/index.php/safety-for-microsystems-fabrications/personal-protective-equipment>

MEMS Applications

MEMS Applications Overview

Microelectromechanical Systems (MEMS) rotate the screens on your smartphones, trigger airbags in a car crash, and beat the hearts of patients with serious heart problems. In this learning module you are introduced to some of the many applications of MEMS and then allowed to explore MEMS in areas of your personal interest.

<http://scme-support.org/index.php/category-01/mems-applications-overview>

Microcantilevers

This learning module introduces you to the microcantilever, its applications in micro and nanotechnologies, its use in sensor arrays, and how it works in both static and dynamic modes of operation. There is a pre and post-test, four (4) informational units (PKs), and two (2) activities. Presentations for three of the informational units are also provided.

<http://scme-support.org/index.php/category-01/microcantilevers>

Micropressure Sensors & the Wheatstone Bridge

This learning module allows you to explore micro and nano-sized pressure sensors – their applications, design and fabrication, and operation. Because the Wheatstone bridge (a specialized electronic circuit) is used as the sensing circuit of such pressure sensors, the module also goes into detail as to how this circuit works and how it is used to sense minute changes in pressure.

<http://scme-support.org/index.php/category-01/micropressure-sensors-the-wheatstone-bridge>

Micropumps

This learning module introduces the micropump, how it works and where it is used in microtechnology. Activities allow for further discovery into the operation of micropumps.

<http://scme-support.org/index.php/category-01/micropumps>

MEMS Fabrication

Crystallography for Microsystems

This learning module introduces the science of crystallography and its importance to microtechnology and the fabrication of microelectromechanical systems (MEMS). Four activities are provided that allow you to further explore several concepts of this science and "see" the formation of crystals and crystal planes.

<http://scme-support.org/index.php/category-02/crystallography-for-microsystems>

Deposition Overview for Microsystems

This learning module is an introduction to the common processes used to deposit thin films for the fabrication of micro-size devices. Thermal oxidation and several types of deposition are discussed. Activities provide further exploration into these processes as well as the properties and applications of the thin films deposited.

<http://scme-support.org/index.php/category-02/deposition-overview-for-microsystems>

Photolithography Overview for Microsystems

This learning module provides an overview of the most common photolithography process used for the fabrication of microelectromechanical systems (MEMS), its terminology and basic concepts. Activities allow you to further explore some of these concepts.

<http://scme-support.org/index.php/category-02/photolithography-overview-for-microsystems>

Etch Overview for Microsystems

This learning module introduces the most common etch processes used for the fabrication of microsystems. Activities allow you to demonstrate your understanding of the terminology and basic concepts of these processes.

<http://scme-support.org/index.php/category-02/etch-overview-for-microsystems>

MEMS Micromachining Overview

This learning module provides an overview of three micromachining processes (bulk, surface, LIGA) used for the fabrication of microsystems or MEMS (MicroElectroMechanical Systems). Activities are provided that contribute to a better understanding of these processes and that encourage further exploration.

<http://scme-support.org/index.php/category-02/mems-micromachining-overview>

MTTC Pressure Sensor Process

This unit outlines the individual sub-processes necessary to create the micro pressure sensor manufactured at the Manufacturing Training & Technology Center (MTTC) at the University of New Mexico. This process is used during a 3-day workshop at the MTTC. However, it can be used in the classroom to illustrate a complete process for a MEMS device.

<http://scme-support.org/index.php/category-02/mttc-pressure-sensor-process>

MEMS: Making Micro Machines

This learning module is based on the film MEMS: Making Micro Machine which covers MEMS applications, fabrication, packaging and design.

<http://scme-support.org/index.php/category-02/mems-making-micromachines>

BioMEMS

BioMEMS Overview

This unit distinguishes between MEMS and BioMEMS and identifies the major characteristics that define BioMEMS. This unit provides an overview and introductory information on the emergence of BioMEMS into MEMS technologies.

<http://scme-support.org/index.php/category-03/biomems-overview>

BioMEMS Applications

This unit provides an overview of Microelectromechanical Systems (MEMS) applications in the biomedical field. Such devices are referred to as BioMEMS.

<http://scme-support.org/index.php/category-03/biomems-applications>

DNA Overview

This unit provides an overview of DNA (Deoxyribonucleic acid), its role as genetic material, its molecular components and structure, and DNA replication. This information is necessary to better understand the role of microelectromechanical systems (MEMS) in DNA analysis, disease diagnostics, and gene therapy.

<http://scme-support.org/index.php/category-03/dna-overview>

DNA to Protein

This unit provides content information needed to understand how the digitally encoded information in DNA is translated into a functional protein that can be used for diagnostics, analysis and measurements in medical applications.

<http://scme-support.org/index.php/category-03/dna-to-protein>

Cells – The Building Block of Life

This unit introduces the different types of cells, aspects of their growth, and the types of organelles found within cells. This knowledge leads to an understanding of the importance of cells in BioMEMS applications.

<http://scme-support.org/index.php/category-03/cells>

Biomolecular Applications for BioMEMS

This unit discusses the characteristics and phenomena of biomolecules that make them attractive components for BioMEMS devices. It provides information that will allow one to understand how biological molecules can be used as working devices within BioMEMS.

<http://scme-support.org/index.php/category-03/biomolecular-applications>

BioMEMS Diagnostics Overview

This unit discusses the advantages and disadvantages of adapting existing diagnostic laboratory tests and materials to MEMS, what areas in medicine will be impacted and how, and examples that are already being tested.

<http://scme-support.org/index.php/category-03/biomems-diagnostics-overview>

BioMEMS Therapeutics Overview

Therapeutics is the process of serving and caring for the patient in a comprehensive manner. This unit covers a few of the MEMS and BioMEMS therapeutic devices that are currently on the market or close to becoming a commercial product.

<http://scme-support.org/index.php/category-03/biomems-therapeutics-overview>

MEMS for Environmental and Bioterrorism Applications

This unit discusses MEMS applications for environmental and bioterrorism sensing, the reasons such sensing devices are needed, and the MEMS that are currently used or being tested for such applications.

<http://scme-support.org/index.php/category-03/mems-for-environmental-and-bioterrorism-applications>

Regulations of BioMEMS

This unit provides introductory material that is needed to better understand the various processes and organizations involved in ensuring the proper regulation of BioMEMS devices.

<http://scme-support.org/index.php/category-03/regulations-of-biomems>

DNA Microarrays

This unit provides an overview of the different types of DNA microarrays, their applications, operation, fabrication, and interpretation.

<http://scme-support.org/index.php/category-03/dna-microarrays>

Clinical Laboratory Techniques and Microtechnology

This unit reviews testing that takes place in a clinical lab, the requirements of the technicians and equipment used to produce accurate and consistent results, and the possibilities of replacing some of these tests with micro-sized devices.

<http://scme-support.org/index.php/category-03/clinical-laboratory-techniques-and-microtechnology>



SCME

Support Center for Microsystems Education

...formally known as Southwest Center for
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Want to learn how to process a micropressure sensor in a cleanroom?
Attend our 3 day micropressure sensor workshop in Albuquerque, New Mexico

SCME Micropressure Sensor Workshop Albuquerque, New Mexico January 9-11, 2017



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