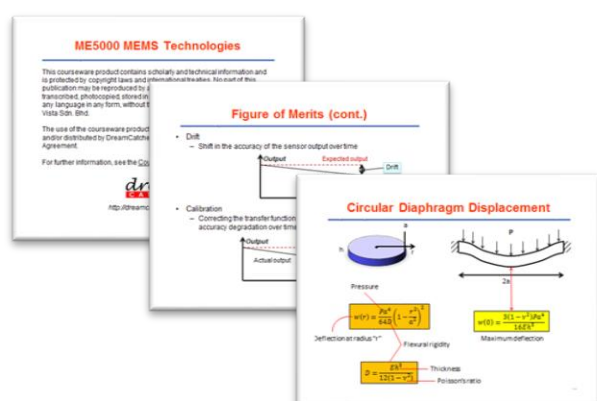


ME5010

MEMS Sensor and IoT Courseware

Teaching slides

- Editable Microsoft® PowerPoint® slides
- Covers 45 hours of teaching



Training kit

- MEMS sensors board and IoT controller board.
- Lab sheets and model answers
- Problem-based assignments
- Covers 24 hours of labs



Target university subject	Target year of study	Prerequisite(s)
MEMS Technologies and IoT Applications, IoT Smart Sensors	Second or third-year undergraduate	Basic Electronics, C Programming

The ME5010 is a ready-to-teach package in Micro-Electro-Mechanical Systems (MEMS) sensor technologies, its applications in the Internet of Things (IoT), and designing IoT smart sensors. It is a resource for lecturers consisting of teaching slides, training kits, lab sheets, and problem-based assignments.

Learning Outcomes

Upon completion of this course, students would be able to:

- Describe various MEMS technologies and micro-fabrication processes
- Evaluate specifications of MEMS sensors
- Perform static and dynamic analysis of MEMS devices
- Perform precision parametric measurements
- Perform data processing and analysis on MEMS sensors
- Design and develop an IoT smart sensor
- Implement IoT application for Industrial
- Gain practical exposure to IoT building blocks and enabling technologies

Benefits of the ME5010 courseware

- A practical, hands-on approach to learning MEMS principles and measurements
- Hands-on experiments on motion sensing using MEMS accelerometers and gyros
- Build an IoT smart sensor by integrating an IoT controller with MEMS sensors



- Exposure to design challenges of IoT devices in Power and Security management



Teaching Slides

More than 400 editable Microsoft PowerPoint teaching slides are provided. The teaching slides cover more than 45 hours for one full semester. The teaching slides cover the following topics:

- Introduction to Internet-of-Thing System
- Overview of MEMS Sensor Technology
- Micro Sensing and Systems
- Micro Actuators and Actuating Systems
- MEMS Measurement Techniques
- Interfacing/Integration between controller and sensors
- IoT Communications
- Important Security Features for IoT Devices
- Essentials of Power Management for IoT
- MEMS Sensors Applications - Physical, optical, RF, Microfluidics
- Industrial IoT Case Studies

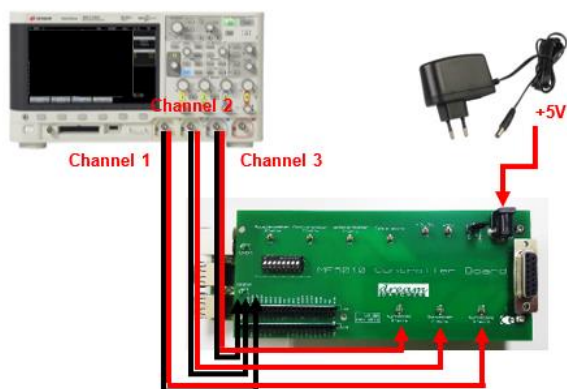


Training Kit

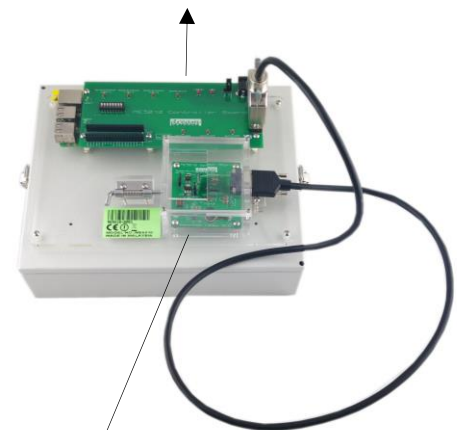
Hardware Kit

1. IoT Smart Sensor Building Blocks
 - a. IoT controller board
 - Raspberry Pi 3 B/B+ with WiFi and BLE
 - ADC circuit and sensor probing board
 - b. Sensor board:
 - i. Three DOF Accelerometer X, Y, Z
 1. Sensitivity: 300 mV/g
 - ii. Three DOF Gyro Roll, Pitch, Yaw
 1. Raw sensitivity: 0.67 mV/deg/s
 2. Full-scale range: 300 deg/s
 - iii. Adjustable vibration motor
- The board was designed to facilitate:
- iv. Parametric measurements
 - v. Static and dynamic measurements

3-axis measurement setup



IoT Controller Board



Sensor Board



Accessories

The following accessories are provided with the training kit.

Item	Quantity
Power adapter, 5 Vdc, 2 A	1
D-sub cable assembly	1
Digital temperature sensor	1

Lab Sheets

The training kit includes eight lab sheets in an editable Microsoft® Word format. Each lab requires three hours to complete. Model answers are provided with all lab sheets. The required instruments and software for the labs are listed below.

	Required Tools	
	Oscilloscope	DC Power Supply
1. Parametric Measurement of Sensors	√	
2. Sensor Static Measurements	√	
3. Sensor Dynamic Measurements	√	
4. Sensor Application	√	
5. Building Smart Sensor and Application: Real-time Signal Processing	√	
6. Serial Communications (SPI & I ² C) Interfacing	√	
7. Smart sensor power management		√
8. Smart sensor security		

Problem-Based Assignments

The problem-based assignments below allow students to enhance their problem-solving skills.

1. Smart sensor for fall sensing for old folk's home care
2. Applying data aggregation and power management techniques to sensor nodes



Instruments

Instrument

The recommended instruments and software, to be purchased separately, are listed below.

Instrument/Software ^[1]	Recommended Model
Digital Oscilloscope ^[2]	100MHz and above, 4-channel Oscilloscope.
DC Power Supply ^[2]	Voltage: minimum 5V, Current: minimum 1A.

[1] Refer to the Lab sheets section for the instrument/software selection.

[2] An oscilloscope with 3 channels is required to capture real-time data on the 3 DOF Accelerometer and Gyro Roll.

The courseware is designed to work with this instrument, which is to be purchased separately. Other models with equivalent performance may be used with alterations to the lab procedures.



Training Kit Hardware Specifications

Hardware kit		
DC Power source		+5 V
Accelerometer Sensitivity		300 mV/g
Gyro Raw Sensitivity		0.67 mV/deg/s
Gyro Full Scale Range		300 deg/s
Analog Temperature Sensor Accuracy		± 0.4 °C
Vibration Motor Speed		5000 rpm @ 5 V
Current Consumption		430 mA - 1 A

General		
Warranty		1 year

Ordering Information

Description	Package	Product Number
Teaching Slides	1 user license	ME5010-100
Training Kit	1 set	ME5010-200
Teaching Slides + Training Kit	1 user license + 1 set	ME5010-300
Instrument/Software	Where applicable	Purchase separately

Training courses related to subject matter are available on request. Visit dreamcatcher.asia for details.

For more information or enquiries: Website: dreamcatcher.asia/cw E-mail: cw.sales@dreamcatcher.asia Acehub Vista Sdn Bhd (785702-P) <i>(the legal entity of the University Courseware business)</i> 70-03-79, D'Piazza Mall, Jalan Mahsuri 11900 Bayan Lepas, Penang Malaysia	© 2010-2015 Acehub Vista Sdn Bhd We reserve the right to change or alter the information in this material without prior notice. The information provided in this material is accurate as of the print date. Microsoft, Windows, and Office Programs are trademarks of Microsoft Corporation in the United States and/or other countries. All other copyrights and trademarks belong to their respective owners. Updated on 17 August 2023 
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