

Day 1 (8 Sept 2026) – Mechanical and Kinematic Measurements



Session 1: Force, Torque, and Strain Measurement Techniques

This session provides a comprehensive introduction to the measurement of mechanical loads and deformation in engineering systems. Participants will explore the principles of force and torque sensing using strain-based load cells, multi-axis force platforms, and torque sensors commonly applied in structural testing, and machinery analysis. The session also introduces non-contact strain measurement using Digital Image Correlation (DIC), allowing participants to visualise full-field strain distribution and understand deformation behaviour beyond traditional point-based sensors. Emphasis is placed on sensor calibration, measurement accuracy, signal interpretation, and common sources of error in experimental force and strain measurements.



Session 2: Kinematic and Motion Measurements

This session focuses on measuring motion-related quantities such as acceleration, displacement, and vibration in dynamic systems. Participants will be introduced to accelerometer-based vibration measurements, particle velocity sensing, and non-contact laser displacement measurement techniques.

Through live demonstrations, the session highlights sensor mounting strategies, frequency response considerations, and time- and frequency-domain signal interpretation. Practical examples will illustrate how kinematic and vibration data are used to assess structural behaviour, machine condition, and dynamic performance in engineering applications.



Workshop on Practical Measurement and Testing for Mechanical, Acoustic, and Material Systems

8 – 9 Sept 2026

**School of Mechanical Engineering,
Tuanku Syed Sirajuddin
Engineering Campus,
Universiti Sains Malaysia.**



Introduction

Advanced engineering research and industrial applications increasingly rely on accurate measurement and analysis of physical phenomena such as force, torque, motion, vibration, sound, temperature, pressure, and material microstructure. Understanding how to properly select, calibrate, and apply measurement devices is essential for producing reliable experimental data and meaningful interpretations.

This workshop is designed to provide hands-on exposure and practical understanding of a wide range of experimental measurement techniques commonly used in mechanical engineering, vibration and sound analysis, materials characterization, and structural evaluation. Participants will engage directly with laboratory instruments, sensors, and data acquisition systems under the guidance of experienced instructors and technical experts.

Target Participants



- Postgraduate students
- Academic researchers and lecturers
- Engineers and laboratory technical staff
- Industry practitioners involved in testing, diagnostics, and product development

Workshop Objectives

The objectives of this workshop are to:

1. Introduce fundamental principles of force, torque, vibration, sound, thermal, and microstructural measurements.
2. Provide hands-on training on industrial-grade sensors and laboratory instrumentation.
3. Enhance participants' understanding of sensor calibration, signal interpretation, and measurement limitations.
4. Demonstrate integrated measurement approaches for structural, dynamic, acoustic and material analysis.
5. Support postgraduate students, researchers, and engineers in conducting high-quality experimental work relevant to academia and industry.



Fees:

- RM 480 (special discount) to postgraduate students and lecturers
- RM 980 for industries

Expected Learning Outcomes

By the end of the workshop, participants will be able to:

- Select appropriate sensors and instruments for specific experimental needs
- Understand calibration procedures and data reliability
- Perform basic force, vibration, sound, thermal, and microstructural measurements
- Interpret experimental data with awareness of measurement uncertainty
- Apply integrated measurement techniques in research and industrial testing



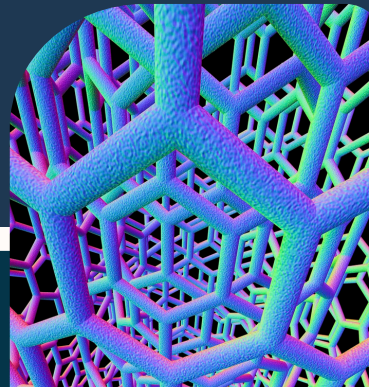
Day 2 (9 Sept 2026) – Acoustic, Thermal, and Microstructural Measurements

Session 3: Acoustic, Pressure, and Thermal Measurement Techniques

This session introduces measurement techniques for sound, pressure, and temperature that are essential in noise evaluation, fluid–structure interaction studies, and thermal analysis. Participants will learn the fundamentals of microphone calibration, sound pressure and sound power level measurements, and acoustic material characterisation using an impedance tube. The session also covers dynamic pressure measurement using high-speed pressure sensors, contact temperature measurement using thermocouples, and non-contact thermal imaging using infrared cameras. Attention is given to measurement standards, data reliability, and practical considerations when conducting acoustic and thermal experiments.

Session 4: Microstructure, Surface, and Mechanical Property Characterisation

This session focuses on techniques used to examine material surfaces and microstructural features that influence mechanical performance. Participants will be introduced to optical microscopy for surface morphology and roughness evaluation, followed by indentation-based testing methods such as nano-indentation and pico-indentation. These techniques enable the measurement of hardness, elastic modulus, and local mechanical properties at micro- and nano-scales. The session emphasises sample preparation, data interpretation, and the relationship between microstructural characteristics and macroscopic material behaviour in engineering applications.



Workshop Itinerary

Day 1 (8 Sept 2026)

Mechanical and Kinematic Measurements

0830 – 0900	Registration and welcome coffee
0900 – 0915	Opening
0915 – 1100	Session 1: Force, Torque and Strain Measurements
1100 – 1115	Coffee break
1115 – 1300	Continuation of Session 1 (Hands-on Demonstration & Discussion)
1300 – 1400	Lunch break
1400 – 1630	Session 2: Kinematic, Motion, and Vibration Measurements
1630 – 1700	Afternoon tea

Day 2 (9 Sept 2026)

Acoustic, Thermal, and Microstructural Measurements

0900 – 1045	Session 3: Acoustic, Pressure, and Thermal Measurements
1045 – 1100	Coffee break
1100 – 1300	Continuation of Session 3 (Hands-on Demonstration & Discussion)
1300 – 1400	Lunch break
1400 – 1630	Session 4: Microstructure and Surface Characterisation
1630 – 1700	Afternoon tea / closing ceremony



Associate Professor Dr. Ahmad Zhafran bin Ahmad Mazlan

Senior academic and researcher at the School of Mechanical Engineering, USM, specialising in sound and vibration engineering. He earned his Bachelor of Engineering in Mechanical Engineering from Waseda University, Japan, and both his M.Sc and Ph.D. in Sound and Vibration from USM. His research interests include noise and vibration control, active vibration and force control, piezoelectric sensors and actuators, structural dynamic modification, dynamic modelling and simulation, and human vibration. He has published in indexed journals and is actively engaged in research that bridges theory with practical applications in engineering and industry.



Dr Mohamad Ikhwan Zaini Ridzwan

Senior lecturer and Deputy Dean (Academic, Career & International) at the School of Mechanical Engineering, USM. He holds a PhD in Mechanical Engineering from Imperial College London and conducts applied research in agricultural and patient transfer systems, with a focus on ergonomic design, force measurement, and biomechanical analysis. His work aims to enhance safety, efficiency, and usability of mechanised agricultural tools and patient lifting and transfer devices through rigorous experimental evaluation and industry and community-linked collaboration.

Speakers



Professor Dr. Zaidi Mohd Ripin

Professor Dr. Zaidi Mohd Ripin is an Honorary Professor at the School of Mechanical Engineering, Universiti Sains Malaysia (USM), known for his expertise in sound and vibration, tribology, finite element analysis, and machine design. He holds a B.Eng in Mechanical-Marine Technology from Universiti Teknologi Malaysia and both M.Sc and Ph.D. degrees in Mechanical Engineering from the University of Leeds, UK, specialising in vibration analysis. His research focuses on solving high-vibration problems in machinery and industrial processes, and he has extensive experience in experimental measurement and validating analytical and finite element models. He has collaborated with electronics and manufacturing industries and published widely in reputable journals, contributing to areas such as vibration control, machine condition monitoring, and mechanical system diagnostics.



Dr. Norwahida binti Yusoff

Senior lecturer and researcher in the School of Mechanical Engineering at USM whose work bridges mechanical engineering, materials science, and biomechanics. She holds a PhD in Mechanical Engineering from USM and has an interdisciplinary background including biomedical engineering and tissue mechanics. Her research focuses on fracture mechanics, stress analysis, finite element analysis and modelling, and biomechanics, applying both computational and experimental methods to understand material behaviour and structural integrity in engineering and bio-related systems. She also contributes to laboratory quality and testing services at USM, including ISO/IEC 17025-accredited mechanical testing activities.



Dr. Ooi Lu Ean

Senior lecturer and researcher in the School of Mechanical Engineering at USM, specialising in mechanical acoustics, vibration isolation, and noise and vibration control technology. His expertise includes vibration analysis, damping measurement, rubber characterisation and testing, and optimisation of dynamic systems, which are highly relevant to experimental and applied mechanical engineering research. Dr. Ooi holds a PhD in Mechanical Engineering with a focus on sound and vibration from USM and has been involved in collaborative research projects, including industry-linked work on acoustic and vibration systems.



Dr. Ahmad Fikri bin Mustaff

Senior lecturer, researcher, and professional engineer at the School of Mechanical Engineering, USM, where he has been a faculty member since 2024. He holds a bachelor's and master's degree in Mechanical Engineering from Korea University, South Korea, and his expertise lies in turbomachinery, fluid dynamics, and computational fluid dynamics (CFD), with research that includes both numerical simulation and experimental validation in areas such as compressor and flow optimisation. As a professional member of the Board of Engineers Malaysia (BEM), Dr. Ahmad Fikri engages in teaching, research, and industry-linked projects that bridge theoretical fluid mechanics with practical engineering applications.



Mr. Wan Mohd Amri Wan Mamat Ali

Research Officer in the School of Mechanical Engineering at USM, actively supporting experimental research and technical laboratory work, particularly within the Vibration Lab. He holds a B.Eng in Mechanical Engineering from USM and has contributed to a range of research projects involving mechanical testing, vibration analysis, and sound absorption studies, often assisting students and researchers with experimental setup, measurements, and data collection.

Speakers



**Associate Professor
Dr. Abdullah Aziz bin Saad**

senior academic and the Dean of the School of Mechanical Engineering, USM, with expertise in mechanics of materials, experimental and computational analysis, and industry-oriented engineering research. He obtained his PhD in Mechanical Engineering from the University of Nottingham, UK, and has extensive experience in finite element analysis, material behaviour (plasticity, creep, and fatigue), and experimental validation. In addition to his academic and research contributions, he is actively involved in collaborative projects with industry partners and currently serves in a leadership role at USM, contributing to the strengthening of research, education, and industry engagement.



Dr. Nurul Farhana binti Mohd Yusof

Senior lecturer and researcher in the School of Mechanical Engineering at USM, specialising in tribology, surface wear and friction, and contact mechanics. Her research focuses on understanding the behaviour of surfaces and interfaces under load, including wear mechanisms, lubricant performance, and vibration and condition monitoring of rolling element bearings, combining experimental methods with finite element analysis to solve practical mechanical engineering problems. She holds a PhD in Mechanical Engineering (Tribology) from USM and is professionally affiliated with bodies such as the Board of Engineers Malaysia (BEM) and the Institution of Engineers Malaysia (IEM).

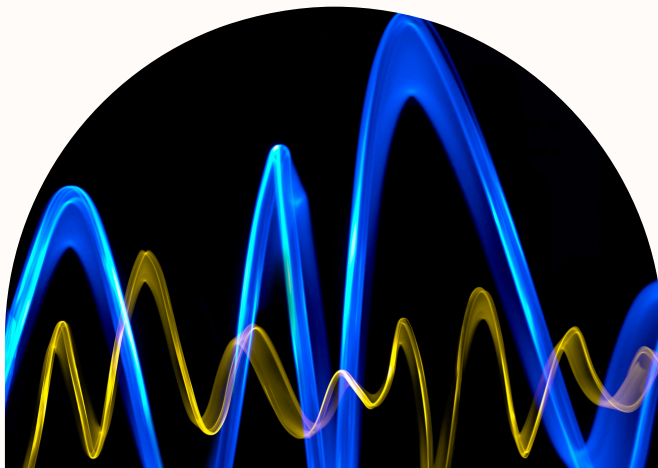


Mr. Huzairel Abdul Majid

Malaysian professional known for dealing in sensors and equipment related to dynamic testing of sound and vibration, associated with QiQo House, a company or brand involved in measurement and testing instruments. He has a background in engineering and business, with experience in supplying and supporting test equipment for acoustic and vibration applications.

Conclusion

This workshop provides a comprehensive and hands-on platform for participants to develop a practical understanding of experimental measurement techniques spanning force, motion, vibration, sound, thermal behaviour, and microstructural characterisation. By integrating theoretical principles with live demonstrations and real instrumentation, the workshop bridges the gap between classroom knowledge and real-world experimental practice. Participants are expected to gain improved confidence in selecting appropriate sensors, conducting reliable measurements, and interpreting experimental data with greater awareness of accuracy and limitations. Overall, the workshop supports the development of high-quality experimental skills essential for advanced research, engineering diagnostics, and industry-relevant problem solving.



Our Contact

Please contact our secretariat for more detail

Dr Mohamad Ikhwan Zaini Ridzwan

-  604 599 6302
-  mikhwanr@usm.my

Payment

- The following are the payment procedures for participants:
- 1. Company Cheque* / Bank Draft* / Local Order (LO)* / Purchase Order (PO)*
- * Must be made payable to **'USAINS HOLDING SDN. BHD.'**
- 2. Electronic Fund Transfer (EFT) / Telegraphic Transfer (TT) / Automated Teller Machine (ATM) & Cash Deposit / Over-the-Counter (OTC) payment:
- [Please email Proof of Payment (Kindly include your full name and program name)].
- Account Name : Usains Holding Sdn. Bhd.
- Bank Name : AmBank (M) Berhad.
- Bank Address : Ground Floor, Bangunan AmBank Group, No. 55 Jalan Raja Chulan, 50200 Kuala Lumpur.
- Account Number : 888 – 100 – 985 – 0380.
- Swift Code : ARBKMYYL.

 <https://thevibrationlab.eng.usm.my>

