RELIABLE AND ROBUST TURN-KEY WORKSTATIONS

Professor Shirley Dyke is the driving force behind University Consortium on Instructional Shake Tables (UCIST), she helped start the Consortium in 1999. The main goal of UCIST is to bring earthquake simulators to classrooms and foster collaborative teaching and learning at the university level. Students early in their undergraduate courses get a chance to develop an understanding of structural dynamics and controls principles through hands-on experiments in addition to theory. “Hands-on experiments seem to be particularly effective for teaching basic concepts in dynamics and controls,” said Prof. Dyke. UCIST selected the Shake Table II as their bench-scale seismic simulator. “Quanser simply offered us a complete package,” commented Prof. Dyke. “The system consists not only of a shake table, but includes accelerometers, test structures, data acquisition and computer to record data and control the shake table. It gave us desired flexibility in performing experiments. No other company was able to give us all that.” Since joining forces with Quanser, UCIST has grown from 23 member universities to over 100 worldwide, and UCIST now recommends the Shake Table II as a turnkey solution for teaching civil engineers.

HOW LEADING EDUCATORS ARE ENHANCING CIVIL ENGINEERING EDUCATION

Dr. Anthony Ingraffea, Professor at the Cornell School of Civil and Environmental Engineering is a long time user of Quanser’s Shake Tables to bridge the gap between theory and practice. “It has been very useful for five generations of freshman,” commented Prof. Ingraffea. Recognizing that preparing students for the real world requires real-world experiments, he uses the Shake Table II when introducing structural dynamics and assigns projects that offer hands-on and teamwork experiences. His undergraduate students experience what an earthquake looks like and the actual response of a structure. Prof. Ingraffea is confident that using a Shake Table in his classes has dramatically increased engagement and retention of undergraduates pursuing an engineering degree at Cornell. Inspired by their effectiveness, Prof. Ingraffea also uses the Shake Table in outreach activities. His goal is to stimulate underprivileged students from the High Jump program to pursue an engineering degree and career. More information is available at www.highjumpchicago.org.

For more information please visit quanser.com/earthquake

About Quanser:
Quanser is the world leader in education and research for realtime control design and implementation. We specialize in outfitting engineering control laboratories to help universities capitalize on the brightest minds, motivating them to succeed and produce graduates with industry-relevant skills. Universal worldwide implementation of Quanser’s open-architecture control solutions, industry-relevant curriculum and cutting-edge workstations to teach introductory, intermediate or advanced controls to students in Electrical, Mechanical, Mechatronics, Robotics, Aerospace, Civil, and various other engineering disciplines. To request a product brochure, please email info@quanser.com.

Quanser educational solutions are fully compatible with:

UniVIEW
LaVIEW
Maple
LaTEX

About UCIST:
UCIST is a University Consortium on Instructional Shake Tables. UCIST is comprised of over 100 universities from North America and worldwide. UCIST helps universities to over 100 worldwide, and UCIST now recommends the Shake Table II as a turnkey solution for teaching civil engineers. UCIST selected the Shake Table II as their bench-scale seismic simulator. “Quanser simply offered us a complete package,” commented Prof. Dyke. UCIST has grown from 23 member universities to over 100 worldwide, and UCIST now recommends the Shake Table II as a turnkey solution for teaching civil engineers.

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UNIVERSAL Power Amplifier User-friendly Programming Environment
There are seven key earthquake engineering experiments. Their key attributes and technical specifications are presented here.

**PRODUCTS**

**SHAKE TABLE I-40 Linear shaker**

- The Shake Table I-40 is a single-axis linear device that can be used to study the response of buildings and structures to earthquake engineering and other related topics to Civil and Structural Engineering. A computer interface allows the shake table to be remotely controlled.

**SHAKE TABLE II Heavy-load linear shaker**

- Developed in cooperation with the University Consortium on Instructional Shake Tables (UCIST) and recommended by the Consortium to more than 100 institutional members, the Shake Table II offers a wide range of capabilities which can accommodate several structures to increase the complexity of the experiments performed. Shake Table II has been used in several programs involving community services as well as K-12 education. This portable, bench-scale table moves along a single axis, however, two tables can be coupled for dual-axis, x-y operation.

**XY SHAKE TABLE III Heavyload planar shaker**

- The multi-axis shake table III is a high-performance tool that can deliver high accelerations and reductions with velocities up to 500 cm/s, presents more advanced analysis with the introduction of multi-dynamics of particle motion. It is also useful for structural dynamics research relating to earthquake loss reduction. It is powered using linear motor technology, eliminating the need for hydraulic, it has three linear motors, two of them operate in parallel to actuate the x-axis, while a single motor is used to actuate the y-axis.

**HEXAPOD Multi-axial shaker**

- This multi-axis shake table III is a parallel robotic device capable of moving heavy loads at high accelerations, within a small workspace. Featuring six Degrees of Freedom (DOF), this industrial grade platform is suitable for research in materials testing, structural vibration, bio-medical dynamics, rehabilitation and more. Unlike commercially available shake table platforms, the Hexapod is a robotic motion system controlled by electrical motors which make this an ideal platform for precise, responsive and low-maintenance operation.

**SMART STRUCTURE Flexible beam and pendulum**

- This stand-alone structure consists of a flexible beam and a servomotor driving an eccentric load. A longer pendulum with an internal load is used to activate computer-controlled simulations of the structure. This experimental platform teaches undergraduate students how to dampen vibrations in tall structures using various control concepts. The Smart Structure works with any load or structure and is any shape shake table.

**AMD 01 Active Mass Damper**

- The advanced active mass damping experiment is useful to study the effects of employing AMDs on a two floor structure. A table-topable structure consisting of beams and dampers is instrumented with an accelerometer on each floor to measure their acceleration. The structure is flexible along its facade. A cart driven by an eccentric load in the same direction as the structure is actuated to control the building deflection. The cart is controlled to minimize the building deflection. AMD 02 is particularly valuable for teaching and research in structural dynamics as it includes two dynamic modes.

**AMD 02 2 Floor Active Mass Damper**

- This advanced active mass damping experiment is useful to study the effects of employing AMDs on a two floor structure. A table-topable structure consisting of beams and dampers is instrumented with an accelerometer on each floor to measure their acceleration. The structure is flexible along its facade. A cart driven by an eccentric load in the same direction as the structure is actuated to control the building deflection. The cart is controlled to minimize the building deflection. AMD 02 is particularly valuable for teaching and research in structural dynamics as it includes two dynamic modes.

**SHAKE TABLES AND SMART STRUCTURE FOR TEACHING AND RESEARCH**

There are seven turn-key earthquake engineering experiments. Their key attributes and technical specifications are presented here. This section provides a detailed overview of the cutting-edge laboratory systems available for teaching or research.

**FOR MORE INFO VISIT www.QUANSER.com/earthquake**

*Quanser Shake Tables can be expanded by adding Smart Structures – test building-like bench-scale structures with active mass damper. This makes the Shake Table workstations adaptable for real-life earthquake studies. These structures are ideal for*
**RELIABLE AND ROBUST TURN-KEY WORKSTATIONS**

Quanser’s Shake Tables come complete with all of the components you need; the experiment, amplifier, data acquisition card and control software are supplied with purchase. You receive a versatile, robust, optimized and scalable solution that gives you peace of mind. The value of this turnkey solution is extended further by its open-architecture and scalable design.

**BENCH-SCALE SHAKE TABLES MOVE EARTHQUAKE ENGINEERING EDUCATION TO NEW HEIGHTS**

Cutting-Edge Lab Systems for Structural Dynamics Education and Research

Heightened earthquake awareness throughout specific regions and stringent design codes has led to increasingly more undergraduate-level programs focusing on the dynamic behavior of structures. In successfully designing buildings, bridges, dams and tunnels, the engineers of tomorrow are challenged to develop and implement effective techniques to diminish damage and losses caused by earthquakes. While the dynamic behavior of buildings and bridges is of fundamental importance in modern structural design, undergraduate engineering students must also understand how these structures respond when acted upon by time-varying loads.

To help undergraduate engineering students comprehend structural dynamics and control principles, Quanser developed a number of bench-scale instructional shake tables on which students can perform hands-on experiments. These experiments allow students to see how structures respond to an earthquake loading, plus they can modify the dynamic characteristics of test cases, select different earthquake inputs, measure and analyze structural responses.

“It has been a lot of fun working with Quanser’s equipment and teaching students things they wouldn’t otherwise have a chance to see.”

Dr. Shirley Dyke, Professor of Mechanical and Civil Engineering, Purdue University, USA

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Quanser educational solutions are fully compatible with: