



## **DENSO International Dynamic Systems Design Studio**

The primary focus of the *DENSO International Dynamic Systems Design Studio* is to allow students to combine their efforts in the development and use of computational tools, in the design and analysis of multidisciplinary dynamic engineering systems.

To design and analyze dynamic engineering systems it is necessary to understand interactions between various system components. The DENSO Studio includes a number of experimental stations mimicking real life applications of dynamic systems including their 'dynamics' and 'control'. Student will perform a number of exploratory experiments leading to an insight into system behaviors. This information will be used to design and develop new applications through understanding of system characteristics and simulation software. Simulations will predict a system performance over a wide operating range, evaluate concepts prior to hardware construction, determine trade-offs, and are very useful for design optimization studies.



Simulation software such as MATLAB, MATRIXx, ACSL, AMESim, SABRE, and dSpace are widely used in industry to design and analyze dynamic systems. The DENSO Studio includes the software MATLAB and its associated tool box Simulink and LabVIEW, with future software including SABRE, and dSpace. MATLAB and Simulink will be used for design and analysis, while LabVIEW will be used for data logging. Since MATLAB and LabVIEW share a common database, very robust and exhaustive design simulation will be a feature of the DENSO Systems Design Studio. The software dSpace will allow students to program microprocessors after testing the control algorithm within a virtual simulation environment.

The experimental setups include an electromechanical apparatus, a pneumatic servo, a loaded beam apparatus, and a multi-mass electrically driven dynamic apparatus. These experimental stations are at different stages of development and will be configured to mimic a number of real-life applications.

This DENSO '*studio*' arrangement will allow Kettering University to educate students in the use of new tools and techniques for the design and analysis of dynamic engineering systems. Undergraduate students will have the opportunity to gain first hand experience in using computational tools in solving complicated real-life problems. Graduate students will be able to develop new designs and evaluate system performance under new and different conditions. Simulations will also facilitate explaining new and difficult concepts and help demonstrate use of theories in solving complicated engineering problems.

The DENSO studio will help prepare a new breed of engineers prepared to use computational technologies for the design, analysis, and optimization of dynamic engineering systems.