

Mechanical Engineering Research Labs

The University of Kansas

Biomaterials Research Lab – 2101 Learned

Dr. Lisa Friis

The Biomaterials Research Laboratory is outfitted with modern mechanical test equipment suitable for mechanical analysis of a variety of biomaterials and medical devices. Research focuses on the experimental development and testing of new materials and devices used in orthopaedic applications.

Biodynamics Research Lab – 2110 Learned

Dr. Carl Luchies

This lab is primarily focused on musculoskeletal biomechanics. Research into the effects of age, age related disease, and exercise on balance and motor control are conducted in collaboration with associated faculty in physical therapy, geriatrics, exercise science, cognitive physiology, and engineering. Projects are based upon the integration of mechanical engineering with the biological and medical sciences. Experimental studies, mathematical modeling, and computer simulations are conducted to produce insights into biomechanical research questions.

Composite Materials Lab – 1101A Learned

Dr. Robb Sorem

A composite is a combination of materials to create a stronger material. Fabrication equipment in this lab includes a hot press, an autoclave, and an oven, which can cure 5 x 6 x 10 ft. composite sections.

Computational Mechanics Laboratory – 3124 Learned

Dr. Karan Surana

The Computational Mechanics Laboratory (CML) is the focal point of computational mechanics research and development in linear and non-linear solid mechanics, structural mechanics and composite mechanics, fluid dynamics (Newtonian, generalized Newtonian and viscoelastic fluids), error estimation, h-, p-adaptive methods for smooth and singular problems, special element formulations (1 elements) for singular problems, numerical simulation of moving fronts such as: elastic and inelastic wave propagation in isotropic, orthotropic and composite materials, acoustic waves, low speed and high speed compressible flows, reacting flows and fluid-structure interaction.

Experimental Joint Biomechanical Lab – 2101A Learned

Dr. Lorin Maletsky

The objective of this lab is to experimentally investigate the joints of the human body to determine the function of natural structures as well as to evaluate the artificial replacements for these structures. A hydraulic system and multi-axis controller allow researchers to develop and build machines to simulate the loads and motions of the joints. Research ties with investigators at the Kansas University Medical Center provide collaborative possibilities and clinical motivation for the research. Current work is concentrated on the knee joint. A five-axis dynamic knee simulator built at The

University of Kansas is used to apply realistic loading to the knee to simulate activities such as walking or stair ascent and descent. Research opportunities are available for all levels of students.

Heat Transfer Laser Lab – 2104 Learned

Dr. Ron Dougherty

This laboratory is dedicated to the study of employing lasers to determine the size, shape and concentration of very small particles suspended in fluids. A 5-watt Argon-Ion laser and a Helium-Neon laser are used as the power sources. Measurements are compared with Radiative Heat Transfer and Dynamic Light Scattering computer models. Examples of applications include the characterization of small particles in pharmaceuticals, particles in air for automotive and building filtration systems, and particles as contaminants in fuel and hydraulic systems.

Human Motion Control Lab – 2101 Learned

Dr. Sara Wilson

Human motion is controlled through a complex set of feedback and control mechanisms much like many other engineering systems. Work in this lab examines these mechanisms and their relation to normal spine motion. The goals of this work are better understanding and prevention of low back disorders including low back injuries, scoliosis and age-related vertebral fractures. The laboratory has ongoing collaborations with physical therapists, neuroscientists, orthopedic surgeons, and physicians specializing in geriatrics. Projects include experimental assessment of low back dynamics and computational modeling to the spine and torso.

Intelligent Systems and Automation Lab – 1100 Learned

Dr. Terry Faddis

The ISA Lab encompasses programs and projects involved with the application of microprocessors and sensors to advanced electromechanical systems. Major programs in computer integrated manufacturing, industrial innovation and augmented telerobotics are in progress. All involve technology transfer to regional industry through cooperative efforts involving personnel, financial resources and expertise from the laboratory, industry and government.

Computational Orthopedic Biomechanics Lab – 3102 Learned

Dr. Ken Fischer

The research includes various orthopedic tissues and approaches. Tissues studied include bone (both structural and tissue properties), ligaments, joint capsules, and tendons. The approaches include experimental investigation, imaging studies, analytical and computational modeling. Studies include analyses of the properties of normal and diseased tissues and their affect on functional activities. The tissue research is also integrated with joint biomechanics research on the upper extremity (forearm and wrist) that includes experimental mechanics and computational models. The joint biomechanics research explores how joint degeneration or abnormality and surgical repairs affect joint contact pressure and stability. The tissue biomechanics research is performed in collaboration with researchers on the Lawrence campus and with researchers and clinicians at the University of Kansas Medical Center (KUMC).