

# Basic Biomechanics and Biomechanical Methods for Experimental Research of the Musculoskeletal System

at the University of Ulm, Germany  
organised by the  
Institute of Orthopaedic Research and Biomechanics

The aim of this workshop is to train the inexperienced researcher in basic principles of biomechanics. It will allow the participants to gain knowledge in planning and conducting biomechanical experiments by a balanced mixture of 7 lectures and 12 practical courses.

**Date:** November, 4 – 7, 2013  
**Venue:** Institute of Orthopaedic Research and Biomechanics  
Helmholtzstraße 14, 89081 Ulm, Germany  
+49(0)731-500-55301

## Agenda:

<b>Monday</b> <b>November, 4</b> 14:00	<b>Arrival day</b> Welcome and introduction by Prof. Dr. Lutz Claes
14:30 -16:00	<b>Lecture I (90 minutes) (Dr. U. Simon)</b> Basic mechanics 1 Statics: forces, moments, free-body diagram, static equilibrium
16:00-16:30	<b>Coffee</b>
16:30-18:00	<b>Lecture II (90 minutes) (Prof. Dr. H.-J. Wilke)</b> Measuring techniques in biomechanics How to measure force, displacement, pressure, strain and calibration methods
18:00	<b>Welcome party</b>
<b>Tuesday</b> <b>November, 5</b> 8:30-10:00	<b>Lecture III (90 minutes) (Prof. Dr. H.-J. Wilke)</b> Biomechanics of the locomotion apparatus Functional anatomy, significance of muscle forces, adaptation of bone
10:00-10:30	<b>Coffee</b>
10:30-12:00	<b>Lecture IV (90 minutes) (Dr. U. Simon)</b> Basic mechanics 2 Elastostatics: stress and strain, material properties Dynamics: inertia, dynamic equilibrium
12:00-13:00	<b>Lunch</b>

13:00-14:30	<b>Laboratory I</b> <ol style="list-style-type: none"> <li>1. Tensile test – hard tissue (Dipl.-Ing. M. Steiner)</li> <li>2. Pressure distribution (D. Volkheimer, M.Eng.)</li> <li>3. Fatigue test (Wöhler diagram) (Dipl.-Ing. R. Jonas)</li> <li>4. In vitro measurement of soft tissue permeability (Dr. F. Galbusera)</li> </ol>
14:30-15:00	<b>Coffee</b>
15:00-16:30	<b>Laboratory I</b>
Evening	<b>Sight seeing walk in Ulm (18:00) and dinner (20:00)</b>
<b>Wednesday November, 6</b> 8:30-10:00	<b>Lecture V (90 minutes) (Dipl.-Ing. M. Steiner)</b> Basic kinematics of joints
10:00-10:30	<b>Coffee</b>
10:30-12:00	<b>Lecture VI (90 minutes) (Prof. Dr. L. Dürselen)</b> Special biomechanics 3-point bending, 4-point bending, shear loads, motion of fracture gap, cell biomechanics
12:00-13:00	<b>Lunch</b>
13:00-14:30	<b>Laboratory II</b> <ol style="list-style-type: none"> <li>1. Tensile test – soft tissue (M. Freutel, M.Sc.)</li> <li>2. Strain gauges (Dipl.-Ing. M. Steiner)</li> <li>3. Spine motion and loading simulator (Prof. Dr. H.-J. Wilke)</li> <li>4. Photoelastic experiment: femur, stress protection, stress concentration (Dr. U. Simon)</li> </ol>
14:30-15:00	<b>Coffee</b>
15:00-16:30	<b>Laboratory II</b>
Evening	<b>No program</b>
<b>Thursday November, 7</b> 8:30-10:00	<b>Lecture VII (90 minutes) (M. Freutel, M.Sc.)</b> Mechanical properties of biological tissues Elasticity, viscoelasticity, poroelasticity, homogenous and anisotropic properties of bone, cartilage, ligaments, and muscles
10:00-10:30	<b>Coffee</b>
10:30-12:00	<b>Laboratory III</b> <ol style="list-style-type: none"> <li>1. Subsidence of cages (Dipl.-Ing. N. Berger-Roscher)</li> <li>2. Interface movement between bone and total hip replacement (Prof. Dr. L. Claes / D. Volkheimer, M.Eng.)</li> <li>3. Bending and torsion test (Dipl.-Ing. M. Steiner)</li> <li>4. Motion analysis (Dipl.-Ing. (FH) N. Graf)</li> </ol>
12:00-12:30	<b>Lunch</b>
12:30-14:00	<b>Laboratory III</b>
14:00	<b>Discussion</b>
	<b>Departure around 3 pm</b>