

From human motion to humanoid control			
Credits: 4 Semester 3 (ECN) Compulsory: No			
Format	Lectures 20 h	Examples 12 h	Private study 68 h
Lecturers: S. Sakka			
<p>Objectives: This course makes a review of the necessary steps allowing a software simulation of a captured human motion to control a humanoid robot. It presents the fundamental knowledge on the mechanics of the human body considered as open kinematic chains of rigid bodies.</p>			
<p>Contents: The following subjects will be discussed:</p> <ul style="list-style-type: none"> - Human kinematics and dynamics modelling from non-invasive measures <ul style="list-style-type: none"> - Non invasive measurement of human movement, experimental process - Experimental, hardware and software artefacts - Musculo-skeletal system - Human models for robotics applications, approximations - Simulation of human dynamics from optical motion capture - Imitation of human motion using a humanoid robot <ul style="list-style-type: none"> - Kinematics – application to manipulation, upper and whole body movements - Dynamics – application to whole-body humanoid motion generation - Autonomous behaviors 			
<p>Abilities: After completing this course, the students will be able to:</p> <ul style="list-style-type: none"> • Measure human motion using optical motion capture system. • Model and simulate human dynamics • Imitate hand, arm and whole body human motion (kinematics) using a humanoid robotic system • Understand the security and ethics issues of interacting with human beings 			
Assessment: 30% continuous assessment, 70% from end of semester examination.			
<p>Recommended texts:</p> <ul style="list-style-type: none"> - W. Khalil, E. Dombre: <i>Modeling, identification and control of robots</i>, Hermes Penton, London, 2002. - S. Kajita, H. Hirukawa, K. Harada, K. Yokoi: <i>Introduction à la commande des robots humanoïdes</i>, Springer, 2009. 			
<p>Further readings: will be provided by lecturers</p>			