

<b>Mobile robots</b>			
<b>Credits: 5 Semester 2 Compulsory: No</b>			
<b>Format</b>	Lectures 24 h	Tutorials 16	Private study 68 h
<b>Lecturers:</b> Ph. Martinet (ECN), G. Garcia (ECN), R. Zaccaria (UNIGE), W. Szyrkiewicz (WUT), J. Sales (UJI)			
<p><b>Objectives:</b> This course presents fundamentals of wheeled mobile robots modelling, control and localization.</p> <p><b>Contents:</b> The following subjects will be addressed:  Non holonomic constraint equations,  Classification of robots, using the degrees of mobility and steering,  Posture kinematic model,  Configuration kinematic model,  Motorisation of wheels.  Dynamic models including the contact model,  Trajectory generation,  Controllability and stabilisation, static and dynamic feedback linearization, nonlinear control based on Lyapunov.  Relative localisation: odometry, inertial systems.  Absolute localisation: GPS, sensor fusion,  3D range measurements and goniometry.  Analysis of the observability of robot location.  Path planning</p> <p><b>Practical Work:</b> The students will program mobile robots to follow some prescribed trajectories and to implement control laws taking into account the Cartesian localization.</p> <p><b>Abilities:</b> After completing this course, the students will be able to:  Generate the motion trajectories considering the robot constraints,  Simulate the robot motion,  Implement suitable control strategy,  Choose an appropriate localization system for a mobile robot,  Design and implement localization systems using various state observers</p> <p><b>Assessment:</b> 30% continuous assessment, 70% from end of semester examination.</p> <p><b>Recommended texts:</b></p> <ul style="list-style-type: none"> <li>- C.Canudas, B. Siciliano, G.Bastin (editors), <i>Theory of Robot Control</i>, Springer-Verlag, 1996. (chapters 7,8, and 9)</li> <li>- Ch. Ahikenchekh, A. Seireg, <i>Optimized-Motion Planning; Theory and Implementation</i>. John Wiley 1994.</li> <li>- R.Siegwart I.R. Nourbakhsh, <i>Introduction to Autonomous Mobile Robots</i>, MIT Press second edition 2010. B.Siciliano, O.Khatib,edt , <i>Robots Handbook</i>, Springer-Verlag 2008, Chapters 17, 34, 35.</li> </ul>			