

Autonomous Vehicles			
Credits: 4 Semester 3			
Format	Lectures 20 h	Examples, Laboratory 12 h	Private study 60 h
Lecturers: Ph. Martinet, E. Lecarpentier (ECN), C. Laugier (INRIA)			
Objectives: This course presents the fundamentals of the perception for intelligent and autonomous vehicles. Topics will include Mapping, Decision making process, autonomous navigation and platooning.			
Contents: The following subjects will be treated:			
<ul style="list-style-type: none"> - Introduction to IV and ITS application - Probability theory, stochastic processes - Estimation theory, decision process (classical and Bayesian frameworks) - Markov process, Bayes filtering (Kalman and particle filters) - Autonomous navigation - Platooning 			
Practical Work will use Matlab			
<ul style="list-style-type: none"> - Random variable simulation, histogram, autocorrelation, Kalman filtering (4 h) - Comparison of Extended Kalman Filter, Unscented Kalman Filter, Bootstrap filter for a mobile robot localization (4 h) - Platooning modelling and control (4 h) 			
Abilities: After completing this course the students will be able to:			
<ul style="list-style-type: none"> • Have an overview of an intelligent vehicles capabilities • Estimate the risk and the situation • Put in place a decision making process • Understand the global architecture of an autonomous vehicle and platoon 			
Assessment: 30% continuous assessment, 70% from end of semester examination.			
Recommended texts:			
<ul style="list-style-type: none"> - Eskandarian Azim, Handbook of Intelligent Vehicles, Springer London Ltd Edition, 2012, 1630 pages, ISBN-10: 0857290843, ISBN-13: 978-0857290847 - Cheng Hong, Autonomous Intelligent Vehicles, Theory, Algorithms, and Implementation, Series: Advances in Computer Vision and Pattern Recognition, Springer, 2011, 147 pages, ISBN:978-1-4471-2279-1 - Yaobin Chen, Lingxi Li, Advances in Intelligent Vehicles, 1st Edition, Academic Press, Dec 2013, 336 Pages, ISBN : 9780123971999 - Robert M. Gray, Lee D. Davisson, An Introduction to Statistical Signal Processing, Cambridge University Press, 2005 - A. Doucet, N. de Freitas, N. Gordon, Sequential Monte Carlo in Practice, Springer, 2001 - Thrun, Burgard, Fox: Probabilistic Robotics, MIT Press, 2005 			