Control of linear multivariable systems

Credits: 5 Semester 1 Compulsory: No			
Format	Lectures 25 h	Examples 15	Private study 85 h

Lecturer: G. Lebret (ECN)

Objectives: The aim of the course is to give a methodology for the design of a control law for multivariable linear time invariant systems (MIMO LTI systems). This methodology is developed in the state space approach and is based on the concept of the "Standard Problem".

Contents:

The following subjects will be addressed:

State space equations and solutions.
Controllability, observability.
Static state feedback control law.
Observer synthesis, and observer based controller.
Specification of a control problem in terms of a standard problem.
Regulator problem with internal stability,
Internal model principle,
Linear quadratic method of regulator synthesis,
The concept of robustness by loop transfer recovery,
Optimization H2 (or LQG),
Methodology of control of multi-variable systems.

Practical Work: Control of different laboratory systems using Matlab and dspace.

Abilities: After completing this course the students will be able to:

- analyze the properties (controllability, …) of a linear multivariable systems,
- design an observer based controller,
- define the standard problem (multivariable servo-regulation problem) for a linear (or linearzed) multivariable system,
- give a solution to the standard problem which insure robust stability and robust asymptotic performances to the closed loop system.

Assessment: 30% continuous assessment, 70% from end of semester examination.

Recommended texts: The notes of the course will be given by lecturer..

Further readings:

- T. Kailath, *Linear Systems*. Prentice-Hall, New Jersey, 1980.
- G.F. Franklin, J.D. Powell and A. Emami-Naeini, *Feedback Control of Dynamic Systems* (Second Edition). Addison-Wesley, 1991.
- K.J. Aström, B. Wittenmark, *Computer-Controlled Systems, Theory and Design*. Prentice Hall, New Jersey, 1990.
- W.M.Wonham, *Linear Multivariable Control : A Geometric Approach* (Third Edition). Springer Verlag, New York, 1985.
- K. Zhou, with J. Doyle Essentials of Robust Control (Third Edition). Prentice Hall, New Jersey,1998.