SYSTEMS SCIENCE (SYS)

SYS 5010 Foundations of Simulation (2 crédits / 2 units)
Volet / Course Component: Cours magistral / Lecture

SYS 5100 Systems Engineering (3 units)
Controllability and observability, Euler-Lagrange equations, Pontryagin
maximum principle, dynamic programming, linear quadratic regulator
problem, matrix Ricatti differential equations and properties of their
solution, design of optimal regulator based on steady state solution of
the Ricatti differential equation, time optimal control, LaSalle bang-bang
principle, applications to motor speed control, satellite attitude control,
etc.
Course Component: Lecture
Prerequisites: CSI 1100 and MAT 2341 and (MAT 2324 or MAT 2331) and
MAT 2371 and MAT 2375.

SYS 5110 Foundation of Modelling and Simulation (3 units)
Fundamental aspects of systems modelling and the simulation process.
Elements of continuous system simulation. Issues relating to the
numerical solution of ordinary differential equations. Elements of discrete
event simulation Generation of random numbers and variates. Simulation
validation and quality assurance. Introduction to simulation languages.
Course Component: Lecture
Prerequisites: CSI 1100 and MAT 2341 and (MAT 2324 or MAT 2331) and
MAT 2371 and MAT 2375.

SYS 5120 Applied Probability (3 units)
An introduction to stochastic processes, with emphasis on regenerative
phenomena. Review of limit theorems and conditioning. The Poisson
process. Renewal theory and limit theorems for regenerative processes;
Discrete-time and continuous-time Markov processes with countable
state space. Applications to queueing.
Course Component: Lecture
Prerequisites: MAT 2341 and MAT 2371 and MAT 2375.

SYS 5130 Systems Optimization and Management (3 units)
Analysis of user requirements and model design. Data mining. Use of
optimization software. Systems thinking and its application to economic
systems and hierarchical systems. Applications to economic systems
simulation, modeling, optimization and management.
Course Component: Lecture
Prerequisites: CSI 1100 and MAT 2341 and (MAT 2324 or MAT 2331).

SYS 5140 Economic System Design (3 units)
Introduction to the epistemology of systems thinking and its application
to economic systems. Basic concepts of complex systems thinking
including hierarchical systems and economic systems simulation
and behaviour. Soft systems thinking. Examples from other fields of
application will be reviewed from an interdisciplinary perspective.
Course Component: Lecture
Prerequisites: CSI 1100 and MAT 2341 and (MAT 2324 or MAT 2331) and
MAT 2371 and MAT 2375.

SYS 5160 Systems Integration (3 units)
Planning, design of complex systems from continuous to discrete time.
Synthesis of systems methodology. State estimation. Parameters
identification. Discretization and stochastic effects. Dynamic, logic
control. Modelling, discrete event, simulation examples.
Course Component: Lecture
Prerequisites: Two of the following: SYS 5100, SY S5110, SYS 5120,
SYS 5130, SYS 5140.

SYS 5180 Topics in Systems Science (3 units)
Course Component: Research

SYS 5190 Directed Readings in Systems Science (3 units)
Course Component: Lecture

SYS 5580 Thèmes en science des systèmes (3 crédits)
Volet : Cours magistral
Prerequisite: SYS 5180

SYS 5590 Lectures dirigées en science des systèmes (3 crédits)
Volet : Cours magistral

SYS 5901 Séminaire de recherche sur les systèmes environnementaux /
Research Seminar on Environmental Systems
Volet / Course Component: Cours magistral / Lecture

SYS 5975 Projet en science des systèmes / Project in Systems Science
(3 crédits / 3 units)
Volet / Course Component: Recherche / Research

SYS 5980 Thèmes en science des systèmes / Topics in Systems Science
(3 crédits / 3 units)
Volet / Course Component: Recherche / Research

SYS 7990 Proposition de thèse de maîtrise / Master Thesis Proposal
Volet / Course Component: Recherche / Research