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 indentification. 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: Tutorial

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

SYS 7999 Thèse de maîtrise / Master's
Volet / Course Component: Recherche / Research
Préalable : SYS 7990. / Prerequisite: SYS 7990.