Summary
This course discusses quantitatively some important and generic performance and reliability issues that affect the behaviour of supply chains, and in particular manufacturing systems.

Content
Theoretical review: useful probability distributions and concepts of reliability theory, applied stochastic processes, relevant applied queuing systems, discrete-event simulation framework using AnyLogic.

Material flow analysis and reliability issues in manufacturing systems: machines prone to failure, random production flows in buffered transfer lines, decomposition of transfer lines, performance measures, associated discrete-event simulations.

Hedging point policies for manufacturing systems: dynamic programming principles for safety stock computation, optimality of hedging point policies, inventory management, associated discrete-event simulations.

Supply chain dynamics: stability, bullwhip effect, customer demand satisfaction.

Keywords
Stochastic manufacturing systems, production flows, hedging stock policies, inventory management, supply chain dynamics, discrete-event simulations.

Learning Prerequisites
Recommended courses
MATH 234 Probabilities and Statistics, or similar.

Learning Outcomes
By the end of the course, the student must be able to:
• Identify and characterize the relevant parameters that are influencing material flows in production lines.
• Synthesize the influence of buffers on the performance of transfer lines.
• Compute optimal hedging stock policies.
• Model the general dynamics of simple supply chains, and discuss linear stability issues.
• Examine the behaviour of manufacturing systems and supply chains using a discrete-event simulator.

Assessment methods
Final written exam (80% of the grade), project work during the semester (20% of the grade).

Resources

Ressources en bibliothèque

• Manufacturing Systems Engineering / Gershwin

• Factory Physics / Hopp

Notes/Handbook

Manuscript and slides available in English.

Books:

• Manufacturing Systems Engineering by Stanley B. Gershwin
• Factory Physics by W. J. Hopp and M. L. Spearman
• Stochastic Models of Manufacturing Systems by J. A. Buzacott and J. G. Shanthikumar