

MICRO-448

Manufacturing systems and supply chain dynamics

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Cursus	Sem.	Type
Advanced Manufacturing		Opt.
Microtechnics	MA2, MA4	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Oral
Workload	90h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

This course discusses quantitatively some important and generic performance and reliability issues that affect the behavior of manufacturing systems and supply chains.

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.

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.

Transversal skills

- Use a work methodology appropriate to the task.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Use both general and domain specific IT resources and tools
- Write a scientific or technical report.

Assessment methods

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

Supervision

Office hours	No
Assistants	No
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Ressources en bibliothèque

- [Manufacturing Systems Engineering / Gershwin](#)
- [Factory Physics / Hopp](#)
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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

Moodle Link

- <https://go.epfl.ch/MICRO-448>