ME-419

Production management

Kaboli Amin

Cursus	Sem.	Type
Energy Management and Sustainability	MA1, MA3	Opt.
Managmt, tech et entr.	MA1, MA3	Opt.
Mechanical engineering minor	H	Opt.
Mechanical engineering	MA1, MA3	Opt.
Robotics	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Withdrawal	Unauthorized
Session	Winter
Semester	Fall
Exam	During the semester
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Project	2 weekly
Number of positions	

It is not allowed to withdraw from this subject after the registration deadline.

Summary

Production management deals with the production of goods/services at the right time, quantity, and quality with the minimum cost. This course will arm students with hands-on tools for demand management, supply management, and digital transformation in manufacturing companies.

Content

This course is based on the following four modules:

Module 1) Introduction to Production Management

- How a production company works and what challenges it faces
- What is green production and how production management can be sustainable
- How to connect operations strategy to tactical and operational plan
- How to lead the production of a given product/service from A to Z
- What are the latest trends in Production Management

Module 2) Demand Management

- **Demand management** (Data, Demand Disruptions, Bullwhip Effect)
- **Forecasting methods** (Model selection roadmap, Assumptions, Context, Forecasting Steps)
- **Qualitative methods** (Brain and Forecasting Biases, Executive Opinion, Salesforce Opinion, Consumer Survey, Delphi Method)
- **Quantitative methods** (Casual models, Time Series, Machine Learning models)
- Casual models (Correleation & causation, Linear trend, Regression models)
- Time Series - Stationary (Naïve, average, Moving Average, Weighted Moving Average, Exponential Smoothing)
- Time Series - Trend (Linear Trend Model, Holt Model)
- Time Series - Trend and Seasonality (Autocorrelation, Hotel-Winter Model)
- Machine Learning (ML models used for demand forecasting)
- **Demand plan/Sales forecast**

Module 3) Supply Management

- **Supply management** (Data, Supply Disruptions, Reverse Bullwhip Effect)

- **Production Planning** (AP, MPS, CCRP, MRP)
- Aggerate production planning strategies (Level plan, Chase plan, Hybrid plan)
- Master Production Schedule (MPS)
- Capacity Planning (Rough-Cut Capacity Planning (RCCP), Capacity Planning using Overall)
- Material Requirement Planning (MRP)
- **Inventory management** (Inventory costs, Classification, Decision variables)
- **Inventory models** (Economic Order Quantity (EOQ), Economic Production Quantity (EPQ), Quantity discount model & Procurement and negotiation with suppliers, Safety stock, Periodic review model, Promotion model/christmas tree/single period inventory model)
- **Supply plan/Shipment plan**

Module 4) Digital Production Management

- How digital transformation is changing the face of manufacturing and production
- What is smart manufacturing and how does factory of future looks like
- What are the key digital technologies changing the future of manufacturing and production
- How to move from manufacturing products to platforms
- How companies build digital trust, maitain cyber resilience, and ensure reliable cybersecure systems

Keywords

Demand Management, Supply Management, Forecasting, Production Planning, Capacity Planning, Inventory management, Smart Manufacturing, Factory of Future, Machine Learning & AI, Products vs Platforms.

Learning Prerequisites

Required courses

- Probability and Statistics

Recommended courses

- Continuous Improvement of Manufacturing Systems
- Machine Learning & Deep Learning
- Data Science for Business
- Supply Chain Management

Important concepts to start the course

- Data analysis using Excel
- Active engagement
- Advanced level of probability and statistics

Objective of this course

- Understanding how a production company works.
- Recognizing the critical challenges that a production company faces with.
- Analyzing production of a given product/service.
- Knowing how to lead and manage a given product/service from A to Z.

Learning Outcomes

By the end of the course, the student must be able to:

- Choose production tools and methods based on performance and cost requirements and needs, taking into consideration applicability limits and associated hypotheses, CP8
- Model , analyse and optimize the internal logistics of a production and distribution system and the dynamic behaviour of a network of companies, CP9
- Design a system based on engineering specifications utilizing suitable numerical and analytical tools for optimizing the design parameters, CP10

Transversal skills

- Assess progress against the plan, and adapt the plan as appropriate.
- Communicate effectively, being understood, including across different languages and cultures.
- Keep appropriate documentation for group meetings.
- Manage priorities.
- Negotiate effectively within the group.
- Evaluate one's own performance in the team, receive and respond appropriately to feedback.
- Demonstrate the capacity for critical thinking
- Continue to work through difficulties or initial failure to find optimal solutions.
- Write a scientific or technical report.
- Take feedback (critique) and respond in an appropriate manner.
- Demonstrate a capacity for creativity.
- Take account of the social and human dimensions of the engineering profession.
- Take responsibility for environmental impacts of her/ his actions and decisions.
- Resolve conflicts in ways that are productive for the task and the people concerned.
- Identify the different roles that are involved in well-functioning teams and assume different roles, including leadership roles.

Teaching methods

- Formal lectures
- Case studies
- Project-based learning
- Games and simulations
- Videos
- Articles and research papers
- Guest speakers

Expected student activities

- **Individual:** Self-study, Active class discussions, case evaluations, Q&A
- **In-group:** Teamwork (respect, brainstorming, involvement and constructive feedback)

Assessment methods

Continuous evaluation of case reports, projects, individual and group presentations, class discussions, during the semester. More precisely:

- **25%** participation, and class engagement,
- **45%** class assignments, presentations, projects, and case reports,
- **30%** final exam (final report and presentation and understanding of the case)

Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes
Others	• Meetings by appointment. • All information sharing and communication regarding the course must be through Moodle.

Resources

Virtual desktop infrastructure (VDI)

Yes

Bibliography

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Ressources en bibliothèque

- Demand-Driven Forecasting: A Structured Approach to Forecasting / Chase
- The Digital Transformation Playbook / Rodgers
- Operations Management / Slack
- Manufacturing operations management / Yoo
- Manufacturing Planning and Control for Supply Chain Management / Vollman
- Thinking Fast and Slow / Kahneman
- Data science for business / Provost
- Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World / Karim
- Driving Digital Strategy / Gupta
- Operations Management / Stevenson
- Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World / Lakhani

Notes/Handbook

- Course slides (main material)
- Videos
- Hand-outs during the semester

Moodle Link

- http://moodle.epfl.ch/course/view.php?id=48