

ME-498

Continuous improvement of manufacturing systems

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Cursus	Sem.	Type
Managmt, tech et entr.	MA2, MA4	Opt.
Mechanical engineering minor	E	Opt.
Mechanical engineering	MA2, MA4	Opt.
Robotics	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Withdrawal	Unauthorized
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	4 weekly
Courses	2 weekly
Project	2 weekly
Number of positions	50

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

Summary

Continuous improvement deals with improvement of products and services in order to deliver value to customers. This course will arm students with practical skills and hands-on tools for evaluating and improving products and services' performance and leading systematic change in companies.

Content

This course is based on the following four modules:

Module 1) Introduction to Continuous Improvement

- Value chain and value adding networks
- Driving change and transformation in service/manufacturing companies
- Continuous improvement; three main pillars of the course (people, process, technology)

Module 2) People: Leadership for Engineers

- **Leading oneself** (Self-Awareness, values and strenghts, brain functions, amygdala, biases, brain's neuroplasticity, rewiring the brain, habits, mind and mindset, attention, focus, perception five receptors, illusion, reality, emotional intelligence, emotional agility, empathy and compassion)
- **Leading others** (Social-Awareness, listening, listening vs hearing, listening blockers, communication, monologue/dialogue, verbal/non-verbal, communication blockers, managing conflict and difficult conversations, conflict management, delivering effective feedback)

Module 3) Process: Leading Change

- **Operations Improvement** (problem solving, appreciative inquiry, design thinking, innovation and disruption, work study, methods analysis, work measurement)
- **Lean Operations** (Toyota Production System (TPS), Just-in-Time (JIT), principle of lean system, goals and building blocks, lean tools (value stream mapping, ...), digital lean, agile, scrum)
- **Capacity & Constraint Management** (capacity planning, bottleneck analysis, Theory of Constraints (TOC))
- **Facility Location and Layout** (product and process layouts, line balancing)
- **Quality Management** (product and service quality, quality costs, quality tools, Total Quality Management (TQM), quality tools, quality control, six sigma)
- **Quality Control** (inspection, acceptance sampling, control process (Variables: mean charts, R charts, Attributes:

P-chart, C-chart), process capability, six sigma)

- **Leading Change** (why change projects fail, nature, causes, and factors of change, organizational change, emotions of change, change management, change models, communicating a change plan, effectiveness in leading change)

Module 4) Technology: Leading Digital Transformation

- Industry 4.0
- Digitization, digitalization, Digital transformation
- Digital transformation frameworks
- Digital technologies
- Big data and data-driven industries
- Digital supply chain (value chain, operations, omnichannel)
- Digital masters
- Digital Trust and Cybersecurity

Keywords

Continuous improvement, Value Chain, Engineering Leadership, Emotional Intelligence, Leading Change, Lean, Leading Digital Transformation.

Learning Prerequisites

Required courses

- **Probability and Statistics**

Recommended courses

- **Production Management (Fall semester)**

Important concepts to start the course

- Data analysis with Excel
- Active engagement
- Advanced level of probability and statistics
- Openness and willingness to make change and transformation

Learning Outcomes

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

- Understand the fundamentals of change initiatives (from continuous improvement to transformation)
- Learning how to communicate change and manage emotions of change
- Evaluate and analyze a system performance
- Design and execute a change plan for a system with people and not for them

Transversal skills

- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Assess progress against the plan, and adapt the plan as appropriate.
- Use a work methodology appropriate to the task.
- Communicate effectively, being understood, including across different languages and cultures.
- Keep appropriate documentation for group meetings.
- Manage priorities.

Teaching methods

- Case studies
- Assignments and project-based learning
- Videos
- Articles and research papers
- Guest speakers

The course is based on the implementation of theoretical concepts and models to practical cases. Students work in a group on multiple cases during the whole semester.

Expected student activities

- **Individual:** Self-study, active engagement and class discussions, case evaluations, Q&A
- **In-group:** Teamwork (respect, brainstorming, engagement and giving effective feedback)

Assessment methods

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

- **25%** presence, 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
Forum	Yes
Others	<ul style="list-style-type: none"> • Meetings by appointment. • All information sharing and communications regarding the course must be through Moodle.

Resources

Bibliography

Series of book chapters, hand-outs, and notes will be shared in the class. The following books are recommended:

1. Daniel Kahneman, Thinking Fast and Slow, Farrar, Straus and Giroux, 2013
2. Daniel Goleman, Emotional Intelligence, Random House, 2007
3. Chade-Meng Tan, Search inside Yourself, 2014
4. George Kohlrieser, Hostage at the Table, John Wiley & Sons Inc, 2006

5. Douglas Stone, Bruce Patton, Sheila Heen, *Difficult Conversations*, Penguin, 2011
6. Peter Senge, *The Fifth Discipline*, Doubleday, 2006
7. John Sterman, *Business Dynamics: Systems thinking and modeling for a complex world*, McGraw Hill, 2000
8. John Kotter, *Leading Change*, Harvard Business Review Press, 2012
9. Nigel Slack, Alistair Brandon-Jones, *Operations Management*, 2018
10. Sunil Gupta, *Driving Digital Strategy*, Harvard Business Review Press, 2018
11. David Rogers, *The Digital Transformation Playbook*, Columbia Business School Publishing, 2016

Ressources en bibliothèque

- [Hostage at the table / Kohlrieser](#)
- [The Toyota Way to Continuous Improvement / Liker](#)
- [The Fifth Discipline / Senge](#)
- [Leading Change / Kotter](#)
- [The Digital Transformation Playbook / Rodgers](#)
- [Operations Management / Slack](#)
- [Emotional Intelligence / Goleman](#)
- [Business Dynamics: Systems thinking and modeling for a complex world / Sterman](#)
- [Difficult Conversations / Stone](#)
- [Driving Digital strategy / Gupta](#)

Notes/Handbook

- Course slides (main material)
- Videos
- Hand-outs