JÖNKÖPING UNIVERSITY
School of Engineering

COURSE SYLLABUS

Machine Learning and AI in Manufacturing Analytics, 2.5 credits

Maskininlärning och AI för tillverkningsanalys, 2.5 högskolepoäng

Course Code:	T2MOAF	Education Cycle:	Second-cycle level
Confirmed:	Sep 01, 2025	Disciplinary domain:	Technology
Valid From:	Aug 31, 2026	Subject group:	Materials Technology
		Specialised in:	A1N Second cycle, has only first-cycle course/s as entry requirements
		Main field of study:	Product Development

Intended Learning Outcomes (ILO)

On completion of the course the student shall:

Knowledge and understanding

- show familiarity with modern machine learning and AI concepts and their application in manufacturing analytics, including process prediction, quality monitoring, defect detection, and decision support.
- demonstrate comprehension of data management, governance, security, and ethical considerations in industrial AI applications.

Skills and abilities

- demonstrate skills in applying machine learning methods to real manufacturing datasets for process improvement and quality analysis.
- demonstrate the ability to validate and interpret model results using appropriate metrics and explainability tools (e.g., SHAP, LIME) and utilize modern large language models (LLMs) for analytics support.

Judgement and approach

- demonstrate the ability to reflect upon responsible and ethical AI use, including transparency, fairness, bias, and risk in manufacturing applications.

Content

This course introduces machine learning and artificial intelligence methods for manufacturing analytics, focusing on how data-driven models can support process optimization, quality monitoring, defect detection, and operational decision-making. Emphasis is placed on practical industrial applications, responsible AI, and sustainability-oriented manufacturing improvements.

The course addresses how AI can contribute to energy efficiency, reduced material waste, and more robust production systems through early detection of process deviations and interpretable predictive models. Participants gain hands-on experience with industrial datasets and learn how to evaluate, deploy, and critically assess AI solutions in manufacturing environments.

The course includes the following elements:

- Overview of machine learning and AI for manufacturing applications
- Industrial data pipelines: data collection, preprocessing, management, and governance
- Supervised and unsupervised learning for process modeling and quality analytics
- Introduction to deep learning, explainable AI methods and interoperability for manufacturing data
- Model validation, performance metrics, and uncertainty assessment

- Use of modern large language models (LLM:s), ethics, transparency, bias and risk management
- Case studies from manufacturing, process optimization, and quality engineering for sustainability

Type of instruction

Lectures, assignments, and discussion forums and an in-person workshop.

Language of instruction is English.

Entry requirements

Academic degree of at least 180 ECTS credits within Engineering and/or Technology or passed courses of at least 40 credits in the main field of study within Engineering and/or Technology and at least 1 year of work experience in the manufacturing industry or at least 4 years of work experience in the manufacturing industry. Proof of English proficiency is required.

Examination and grades

The course is graded Pass (G) or Fail (U).

Registration of examination:

Name of the Test	Value	Grading
Assignment	2.5 credits	G/U

Other information

All required tools used in the course are open-source or accessible free of charge.

Course literature

Please note that changes may be made to the reading list up until eight weeks before the start of the course.

The main course literature will be provided on Canvas.