Course syllabus

Smart Manufacturing
Smart tillverkning

TFRP90, 5.0 credits, A (Second Cycle)

Valid for: 2025/26
Faculty: Faculty of Engineering LTH
Decided by: PLED M
Date of Decision: 2025-04-24
Effective: 2025-09-15

General Information

Depth of study relative to the degree requirements: Second cycle, has only first-cycle course/s as entry requirements
Language of instruction: The course will be given in English

Aim

The course covers the main aspects of AI implementation in manufacturing processes, beginning from machining operations and ending with production quality control and production costs analysis. The course includes a brief introduction to machining operations, a more detailed look into machining dynamics and its influence on the process and production quality, monitoring the process parameters, sensors and data acquisition systems. A particular attention is given to Big Data, data processing and data organization, development of Machine Learning (ML) algorithms and their implementation in manufacturing processes.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- discuss fundamental principles of machining and dynamic behavior at machining operations
- discuss fundamental principles of product quality assessment and control
- estimate performance of AI-based models and define ways for model’s improvement

Competences and skills
For a passing grade the student must

- practically estimate tool condition and parameters of production quality
- handle and analyze collected data from different sensors with general methods of signal and image processing
- build AI model, based on collected and processes data obtained from machining operation

Contents

From Manufacturing to Smart Manufacturing

- Manufacturing processes and tools
- Machining Dynamics and vibrations
- Process monitoring, data collection, and Big Data
- Production quality monitoring, assessment, and control

AI ML and ANN

- Machine learning and ANN
- Equipment for monitoring and measurements: sensors, tools, type of data
- Data acquisition, cleaning, and analytics for AI solutions

AI in manufacturing

- Tool condition monitoring
- Surface quality and integrity monitoring
- Production quality monitoring
- Production costs monitoring
- From Smart manufacturing to Autonomous systems

Examination details

Grading scale: TH - (U, 3, 4, 5) - (Fail, Three, Four, Five)
Assessment: Assignments and project.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Modules
Code: 0124. **Name:** Assignments and Project.
Credits: 5.0. **Grading scale:** TH - (U, 3, 4, 5). **Assessment:** Mandatory assignments and a mandatory project **The module includes:** Digital lectures that alternate with seminars

Admission

Admission requirements:

- 90 hp in technical courses with at least 6hp in programming. English 6.

The number of participants is limited to: No
Kursen överlappar följande kurser: MMTN50

Reading list

Contact

Course coordinator: Oleksandr Gutnichenko, oleksandr.gutnichenko@iprod.lth.se
Teacher: Andrii Hrechuk, andrii.hrechuk@iprod.lth.se
Examinator: Oleksandr Gutnichenko, oleksandr.gutnichenko@iprod.lth.se

Further information

Can be cancelled with less than 12 students