



## COURSE SYLLABUS

# Production Development II - Virtual Tools and Modelling, 7.5 credits

*Produktionsutveckling II - virtuella verktyg och modellering, 7,5 högskolepoäng*

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| <b>Course Code:</b> TPVS22                            | <b>Education Cycle:</b> Second-cycle level     |
| <b>Confirmed by:</b> Dean Mar 1, 2021                 | <b>Disciplinary domain:</b> Technology         |
| <b>Revised by:</b> Director of Education Oct 22, 2021 | <b>Subject group:</b> MT1                      |
| <b>Valid From:</b> Jan 1, 2022                        | <b>Specialised in:</b> A1F                     |
| <b>Version:</b> 2                                     | <b>Main field of study:</b> Production Systems |

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### Intended Learning Outcomes (ILO)

After a successful course, the student shall

Knowledge and understanding

- display knowledge of the concept of productivity and its underlying factors
- demonstrate comprehension of how production systems are realized and deployed
- demonstrate comprehension of methods and tools for system modelling, design and analysis
- demonstrate comprehension of the role of maintenance management to enhance productivity

Skills and abilities

- demonstrate skills of applying different modelling tools for the design and improvement of production systems
- demonstrate skills of applying basic multi-objective optimization for production system development

Judgement and approach

- demonstrate the ability to evaluate various production system designs
- demonstrate the ability to evaluate the effect of different maintenance strategies to production performance.

### Contents

The course is a natural follow up to Production Development I - Strategy and System. It deals with methods and tools to support production system modelling, design and analysis using virtual tools. The concept of productivity and its various components are at the core of the course. The aim is to increase productivity through a better design of production systems during its operational phase. Much focus is on using discrete-event simulation to its support. The strategic development of maintenance to support productivity is also studied, using also systems thinking modelling. Some insights into optimization techniques for experimenting, analyzing and verifying simulation models is also gained. An important part of the course is an industrial project, where the students' newly gained skills and understanding are expected to become

manifested. In the seminars we reflect upon our learnings and share our new experiences with each other.

The course includes the following elements:

- Evaluation of production performance and productivity
- Analysis and implementation of production strategies
- Design of production systems, which can include sustainability and maintenance, production philosophies, layout and organizational solutions
- Flow simulation and other tools for system design
- Time studies, balancing and flow optimization
- The connection between maintenance operations and production operations
- Key performance indicators in maintenance, and their corresponding effect to drive behavior in maintenance and the relation to short- and long-term effects on productivity
- Reactive and proactive maintenance and production development

### Type of instruction

Lectures, seminars, exercises and project work.

The teaching is conducted in English.

### Prerequisites

Passed courses at least 90 credits within the major subject in Mechanical Engineering, Industrial Engineering and Management or Civil Engineering, and 15 credits Mathematics, and completed courses Production Development I - Strategy and System 7,5 credits and Integrated Product and Production Development 7,5 credits. Proof of English proficiency is required (or the equivalent).

### Examination and grades

The course is graded 5,4,3 or Fail.

Registration of examination:

| Name of the Test         | Value       | Grading |
|--------------------------|-------------|---------|
| Assignments <sup>I</sup> | 3.5 credits | 5/4/3/U |
| Project Work             | 3 credits   | U/G     |
| Seminars                 | 1 credit    | U/G     |

<sup>I</sup> Determines the final grade of the course, which is issued only when all course units have been passed.

### Course literature

The literature list for the course will be provided 8 weeks before the course starts.

Title: Discrete-Event simulation and System Dynamics for Management Decision Making

Author: Brailsford, S., Churilov, L., Dangerfield, B. eds.

Publisher: John Wiley & Sons.

ISBN: 9781118349021

*Reference literature*

Title: Beyond World-Class Productivity: Industrial Engineering Practice and Theory

Author: Shigeyasu Sakamoto

Publisher: Springer

ISBN: 978-1-84996-268-1

Title: Uptime: Strategies for Excellence in Maintenance Management

Author: John D. Campbell, James V. Reyes-Picknell, Hyung Sik Kim

Publisher: CRC Press Taylor & Francis Group

ISBN: 978-1-4822-5237-8

Title: Simulation the practice of model development and use

Author: Stewart Robinson

Publisher: Palgrave MacMillan

ISBN: 9781137328021

Title: Discrete-event system simulation

Author: Banks, J., Carson II, J. S., Nelson, B. L. & Nicol, D. M.

Publisher: Pearson Education Limited

ISBN: 9780136062127

Title: Business dynamics: systems thinking and modeling for a complex world Boston

Author: Sterman, John D

Publisher: Irwin/McGraw-Hill

ISBN: 0072311355