

## COURSE SYLLABUS

**Applied Simulations in Production, 7.5 credits***Applied Simulations in Production, 7.5 högskolepoäng*


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|--------------|--------------|----------------------|-------------------------------------------------------------------|
| Course Code: | TSTS25       | Education Cycle:     | Second-cycle level                                                |
| Confirmed:   | Feb 01, 2025 | Disciplinary domain: | Technology                                                        |
| Valid From:  | Sep 01, 2025 | Subject group:       | Mechanical Engineering                                            |
|              |              | Specialised in:      | A1F Second cycle, has second-cycle course/s as entry requirements |
|              |              | Main field of study: | Production Systems                                                |

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**Intended Learning Outcomes (ILO)**

On completion of the course the student shall:

**Knowledge and understanding**

- display knowledge of the principles, models, and applications of simulation in industrial production
- demonstrate comprehension of how randomness, probability distributions, and statistical methods are utilized in simulation modeling for industrial production
- display knowledge of the process of conducting a simulation study for industrial production, including model building, validation, and analysis
- demonstrate comprehension of advanced simulation techniques and optimization methods relevant to industrial production

**Skills and abilities**

- demonstrate the ability to implement and analyze simulation models of varying complexity for industrial production
- demonstrate skills in applying statistical methods and validation techniques to ensure the accuracy and credibility of simulation models for industrial production
- demonstrate the ability to analyze, interpret, and visualize simulation results to support decision-making in industrial production

**Judgment and approach**

- demonstrate the ability to critically evaluate and select appropriate simulation methods and tools for various industrial production scenarios
- demonstrate the ability to evaluate simulation results, recognizing potential limitations and pitfalls, and drawing valid conclusions for industrial production.

**Content**

This course provides a comprehensive introduction to the theory and practice of simulation modeling, with a focus on its applications in industrial production. Students will learn how to build, validate, and analyze simulation models to support decision-making in production planning and performance improvement. The course covers a range of topics from basic simulation concepts to advanced techniques like experimental design and optimization.

The course includes the following elements:

- Fundamentals of simulation and its applications
- Different types of simulation models and their characteristics
- Random number generation and probability distributions in simulation

- Model building, validation, and analysis techniques
- Input and output data analysis methods
- Experimental design and optimization for simulation
- Advanced simulation methodologies and best practices
- Integration of simulation with relevant industrial concepts and techniques

## Type of instruction

The course will employ a blended learning approach with a combination of lectures, laboratory-based assignments, and seminars. Lectures will cover the theoretical foundations of simulation modeling. Laboratories will be used to provide students with hands-on experience with simulation tools and allow them to apply the learned concepts and work on the assignments. Seminars will be used as a platform for students to present and discuss their performed jobs on the assignments. The number of assignments and seminars will be decided by the course coordinator according to the number of students.

Language of instruction is in English.

## Entry requirements

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 taken course Sustainable Production Development 7,5 credits (or the equivalent). Proof of English proficiency is required.

## Examination and grades

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

Registration of examination:

| Name of the Test         | Value       | Grading |
|--------------------------|-------------|---------|
| Examination <sup>1</sup> | 3.5 credits | 5/4/3/U |
| Assignment               | 2 credits   | G/U     |
| Seminar                  | 2 credits   | G/U     |

<sup>1</sup>Determines the final grade of the course, which is issued only when all course units have been passed.

## Other information

The course will utilize a combination of individual and group assignments to reinforce learning and encourage collaboration. The final project will provide students with an opportunity to apply their simulation skills to a real-world production scenario.

## Course literature

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

Textbook: Simulation Modeling and Analysis by Averill M. Law, 6th edition.

Software: Open-source tools mostly based on Python.

Online resources: Course website with lecture notes, lab guides, and sample code.