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| **Process optimization and analysis II** |

**Code: MFFOP32G03-EN**

**ECTS Credit Points: 3**

**Evaluation: exam**

Year, Semester: 3rd year/2nd semester

Number of teaching hours/week:

Lecture: **1**

Practice: **2**

**Prerequisites:** MFFOP31G03-EN

**Topics**:

Students can acquire knowledge of resource calculation (MRP/SZTR), timing questions, supply and supply chain management. The curriculum includes the Toyota production system, the main properties of Just In Time (JIT) and the Japanese approach to production management with Lean methods and tools. (VSM, VSD, 5S, PFMEA, etc.). Students can also gain insights into new methods in LEAN office, Jidoka and production ergonomics. The target of this subject is to describe company values and culture and to develop process thinking in engineering students. This thinking has to adapt to the production environment. By the end of the semester the students will acquire and will be able to use these kinds of methods.

**Literature:**

1. William J. Stevenson: Operations management 10th ed. Bostob: McGraw-Hill/Irwin 2009.

2. Olhager, Jan – Person, Fredrik: Advances in Production Management System Springer-Verlager GmbH, 2007.

3. James P. Womack – Daniel T. Jones: Lean Thinking, Banish Waste and Create Wealth in Your Corporation. Revised and Updated, Touchstone, an Imrint of Simon & Schuster, Inc., 2003.

4. Jeffrey K. Liker: The Toyota Way: 14 Management Principles from the World’s Greatest Manufacturer, McGraw-Hill, 2004.

5. Womack, James P. – Daniel T. Jones – Daniel Roos: The Machine That Change The World: The Story of Lean Production, New York, HarperPerennial, 1991.

**Schedule**

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| **1st week:****Lecture:** General information, Lean basics**Practice:** Lean examples in industry. Elimination of waste within a manufacturing system. | **2nd week:** **Lecture:** TQM, Continuous improvement, Six sigma.**Practice:** TQM and Six Sigma in manufacturing, case studies. |
| **3rd week:****Lecture:** 5S principles, 7 wastes**Practice:** 5S as Lean principle for Kaizen in practice. | **4th week:****Lecture:** Kaizen and continuous improvement**Practice:** Operation levels of Kaizen in automobile industry. |
| **5th week:** **Lecture:** TPM, Traditional TPM model, The light pillars of TPM, OEE**Practice:** Maintenance strategies examples and Total Productive Maintenance I. | **6th week:****Lecture:** TPM roadmap, Additional TPM activities**Practice:** Maintenance strategies examples and Total Productive Maintenance I. |
| **7th week:****Lecture:** Key performance indicators**Practice:** A global case study for revealing manufacturing and operational problems with Lean methods. | **8th week:****Mid-term test****Lecture:**-**Practice:**- |
| **9th week:****Lecture:** SMED, Implementing SMED**Practice:** Single-Minute Exchange of Die (SMED) and QCO principle to make production faster. | **10th week:****Lecture:** SMED roadmap, “Focus on people”**Practice:** Analysing and simplifying movements of production, time-analysis. |
| **11th week:****Lecture:** VSM-VSD, Definition of value, floes, symbols**Practice:** How to make value stream maps for real problems I. Examples.Process FMEA overview in practice. | **12th week:****Lecture:** VSM-VSD, Definition of value, flows, symbols, definition of takt time.**Practice:** How to make value stream maps for real problems II. Examples. |
| **13th week:****Lecture:** Just in time and Kanban systems, Different types of Kanban systems, Jidoka and Heijunka**Practice:** JIT (TPS) in the automobile industry.  Reducing flow times within production as well as response times from suppliers and to customers. | **14th week:****Lecture:** MRP (Material Requirements Planning), MRP II., Benefits and drawbacks of MRP.**Practice:** [Production planning](https://en.wikipedia.org/wiki/Production_planning), [scheduling](https://en.wikipedia.org/wiki/Scheduling), and an [inventory](https://en.wikipedia.org/wiki/Inventory) control system by MRP.  The lowest possible material principle. Plan manufacturing activities. Examples. |
| **15th week:****End-term test** |  |

**Requirements**

During the semester there are two tests: the 1st test in the 8th week and the 2nd test in the 15th week – and there are three design tasks. Attendance at lectures is strongly recommended, but not compulsory. Participation at practice classes is compulsory. A student must attend practice classes and may not miss more than three times during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. A student can’t make up a practice with another group. Attendance at lectures and at practice classes will be recorded by the staff of the department. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, being discussed with the tutor. Students are required to bring calculators and the printed materials of the lectures to each occasion (both lectures and practice classes). Active participation is evaluated by the teacher in every class. Students’ activity and participation is required. Students have to submit all the two tests and the design tasks as scheduled minimum on a sufficient level. The minimum point of the tests and a design task have to be taken. The minimum (required to have a mid-semester grade) and maximum points can be obtained are the follows: Two tests: Test 1: Maximum: 30 points Minimum: 18 points, Test 2: Maximum: 30 points Minimum: 18 points Summa: 60 points and minimum of 36 points for tests. A design task: Maximum: 40 points Minimum: 25 points Summa points: Maximum: 100 points Minimum: 61 points

The course ends in an exam grade (ESE). The grade for the test is given according to the following table: Score Grade 0-59 fail (1) 60-69 pass (2) 70-79 satisfactory (3) 80-89 good (4) 90-100 excellent (5).

If the score of any test is below 60, a student once can take a retake test of the whole semester material.