Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Industrial Installations and Operational Safety
Course code	42142
Scientific sector	ING-IND/17
Degree	Bachelor in Industrial and Mechanical Engineering
Semester	1
Year	3
Academic year	2017 - 2018
Credits	10
Modular	*No*

Total lecturing hours	64
Total lab hours	
Total exercise hours	30
Attendance	Required
Prerequisites	Students attending this course should have already passed the exam of Production Systems and Industrial Logistics.
Course page	

Specific educational objectives	The course belongs to one of the basics in the **class: L-9** Industrial Engineering. It aims to teach both scientific foundations and practical methods. The course follows the structure of a common plant life cycle in industrial production. At the beginning, students are introduced to different production types and requisites. Different methodologies for analyzing and optimizing industrial processes are explained. Next, students are introduced to well-known methodologies for layout and space planning of a factory. The fourth part of the lecture covers fundamentals in investment decisions in an industrial environment. The course concludes with common methodologies used in plant and equipment maintenance.

Lecturer	Patrick Dallasega, patrick.dallasega@unibz.it Ivan Ferretti, Ivan.Ferretti@unibz.it
Scientific sector of the lecturer	ING-IND/17
Teaching language	English
Office hours	30
Teaching assistant *(if any)*	
Office hours	
List of topics covered	1. Introduction a) Craftsmanship production

b) Mass production (Smith, Taylor)
c) Developments up to the 4th Industrial Revolution

2. The operation system „Factory“ in ETO/MTO
   a) Definitions and fundamentals
   b) Productivity, efficiency and efficacy
   c) Classification of production systems (Wortmann)
   d) Production types and requisites
   e) The Little’s law
   f) Pull control mechanisms (Kanban vs. CONWIP)
   g) Process flow analysis (VSD, VSE, ASME, BPMN)
   h) Case study

3. Layout and space planning
   a) The layout process and the phases
   b) The material flow (ideal planning)
   c) Process/Assembly sheets
   d) Hollier method
   e) Space, machines and workforce requirements
   f) Design methods (Standard Spaces, Sankey Diagram, Closeness-Relationship Diagram)
   g) Innovative software modules for layout planning
   h) Case studies

4. Investment decisions
   a) Depreciation
   b) Discounted cash flow
   c) Net present value method
   d) Internal rate of return method
   e) Payback method

5. Plant and equipment maintenance
   a) Introduction to reliability concepts
   b) Failure rate and reliability analytical formulation
   c) Reliability Block Diagrams
   d) Reliability Centred Maintenance
   e) The KPI for Reliability and Maintenance (MTBF, MTTR, Availability)
   f) Methodologies and tools: FMECA, Fault Tree Analysis, Root Cause Analysis
   g) Modern Maintenance: the TPM approach
   h) The analysis of losses and the OEE
   i) Introduction to the Computer Managed Maintenance Systems (CMMS)
   j) Sustainable and green factory (regenerative Energien, urban production)
   k) Case studies

6. Industrial simulation
   a) Introduction simulation processes
   b) Notes on random number generation

	c) The Monte Carlo method d) Discrete event and agent based modeling 7. Exercises a) Case study Layout Planning writing desk IKEA b) Excursion to a local company
Teaching format	Power Point presentations will be given to the students in pdf format before each single lecture. During the exercise part, a case study will be developed in class. Furthermore, an excursion to a local company takes place where practical applications will be explained.

Learning outcomes	Basic knowledge The Engineering students are able to analyze different production types and requisites. Based on this understanding, the student is able to plan and design the factory layout. To choose the appropriate plant, the student is familiar in most common investment decisions methodologies. To operate appropriately the machine pool of a factory, the student knows the most advanced methodologies for plant and equipment maintenance. Practical application By explaining exercises during the lecture hours and by working out the case study, the student will be able to use theoretical concepts in practice. Soft skills During the exercise part the case study is performed in collaboration. As a result, students learn to interact in a project team. At the end of the case study students will present the achieved results improving so their communicative skills.

Assessment	Final assessment is done with a written examination.
Assessment language	English
Evaluation criteria and criteria for awarding marks	The final grade is calculated from the results of the written exam. The theoretical part counts 65% and the exercise part counts 35% of the final grade.

Required readings	Lecture notes and documents for exercise are available on the reserve collections.
Supplementary readings	1. Hopp, W.J., Spearman, M.L. and Sarker B.R.: *Factory physics: foundations of manufacturing management*. Irwin/McGraw-Hill Burr Ridge, IL, 2001. 2. Wiendahl, H.P., Reichardt, J. and Nyhuis, P.: *Handbook Factory Planning and Design.* Springer 2015. 3. De Carlo, F.: *Impianti industriali: conoscere e*

	progettare i sistemi produttivi. Sixth edition, Lulu.com 2016. (available at the library Free University of Bolzano) 4. Schweizer, W.: Wertstrom Engineering – Typen- und variantenreiche Produktion. Berlin: epubli GmbH, 2013.