Syllabus

Descrizione corso

Titolo insegnamento	Impianti Industriali
Codice insegnamento	42180
Titolo aggiuntivo	
Settore Scientifico-Disciplinare	IIND-05/A
Lingua	Tedesco
Corso di Studio	Corso di laurea in Ingegneria Industriale Meccanica
Altri Corsi di Studio (mutuati)	
Docenti	prof. Patrick Dallasega, Patrick.Dallasega@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/33073
Assistente	
Semestre	Secondo semestre
Anno/i di corso	3
CFU	8
Ore didattica frontale	50
Ore di laboratorio	24
Ore di studio individuale	126
Ore di ricevimento previste	24
Sintesi contenuti	- Site planning; - Layout and space planning; - Investment decisions; - Plant and equipment maintenance
Argomenti dell'insegnamento	1. Introduction a) Structure and content of the lecture b) Introduction to factory planning c) Definitions and fundamentals

	2. Site planning a) Structure of logistics systems (supply networks) b) Choice of production sites c) Valuation methods for location decisions (cost-benefit analysis, break-even analysis) 3. Layout and space planning a) Planning steps in structural planning b) The process and phases of layout planning c) Overview of layout types d) Innovative algorithms for computer-aided layout planning (CRAFT, CORELAP, ALDEP) e) The "Hollier" methods 1 and 2 f) Space requirements of machines and workforces g) Short introduction to the planning of service layouts h) Case studies and exercises 4. Investment decisions a) Depreciation of machines/plants b) Calculation of the contribution margin c) Payback method d) Return On Investment (ROI) e) Net Present Value method (NPV) f) Internal Rate of Return method (IRR) g) Case studies and exercises 5. Plant and equipment maintenance a) Introduction to reliability concepts b) Analytical formulation of failure rate and reliability c) Explanation of the availability of machines/plants d) Reliability Centered Maintenance e) The KPIs for reliability and maintenance (MTBF and MTTR) f) The Fault Tree Analysis g) Reliability Block Diagrams (Systems in series, systems in parallel, k-out-of-n parallel components) h) The Bayes theorem for the calculation of complex systems i) The Fault-Tolerance approach j) The Total Productive Maintenance (TPM) approach k) The analysis of losses and the OEE in the maintenance context

	l) Notes on the EU Machinery Directive m) Case studies and exercises.
Parole chiave	Location planning, layout planning, investment calculations, industrial maintenance
Prerequisiti	Students attending this course should have already passed the exam of Production Systems and Industrial Logistics.
Insegnamenti propedeutici	
Modalità di insegnamento	Lectures, exercises (teamwork which is carried out with the innovative software solution visTABLE®), expert lectures, excursions to local industrial companies (or online seminars).
Obbligo di frequenza	No.
Obiettivi formativi specifici e risultati di apprendimento attesi	Specific educational objectives The lecture Factory and plant planning is part of the so-called "characterizing" learning subjects of the L-9 Bachelor's programme in Industrial and Mechanical Engineering. The course follows the process for building a factory including the required production facilities. At the beginning the students are introduced to the methods of factory planning. Next, common methods of factory location planning are explained. In the third part, commonly used methods for layout and area planning of a factory are explained. The fourth part of the lecture deals with the basics of investment decisions in an industrial environment. The fifth part of the course covers essential methods for the maintenance of industrial plants. During the exercise hours, the theoretical basics are applied in a practical teamwork. Here, the innovative software visTABLE® is used for digital factory planning. The teamwork is elaborated in groups of 2-3 students and presented to the participants at the end of the course. Knowledge and understanding 1. The student knows the basics of modern layout planning, investment decisions for plants as well as industrial maintenance. 2. The student knows the common methods and models for layout planning, plant investment decisions as well as for industrial maintenance. Applying knowledge and understanding 3. The student can apply and understand theoretical content through exercises, case studies and project work. Theory contents

	are illustrated by means of practical examples using arithmetic exercises. 4. The students independently work out a factory plan based on a practical case study. 5. Presentation techniques will be trained by MS-Power-Point, blackboard, and flipchart. 6. During excursions to local companies and through expert lectures, the students have the opportunity to gain insight into practice. Making judgements 7. According to a specific situation in practice, the student is able to judge on the use of suitable methods and models for layout planning, investment decisions and maintenance planning. 8. The student is also able to interpret specific Key Performance Indicators (KPIs) for make to order production, layout planning, investment calculation and maintenance planning. Communication skills 9. The student can hold technical discussions about factory planning and is able to prepare, present and argue technical contents on analogue (flipchart) and digital (power point) media in a structured way. Ability to learn 10. The student learns the material by frontal teaching (theory part) as well as by exercises in the lecture hall and in the laboratory (practical exercises). 11. The student is also able to expand the acquired knowledge through self-study and consultation of scientific and technical texts.
Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)	
Modalità di esame	Formative assessment Form: Exercises in the lecture hall; Duration: Following each unit; ILOs assessed: 2,3,5,10 Form: Repetitions before each unit; Duration: 5-10 min. before each unit; ILOs assessed: 1,2,8,9,10 Form: Group work; Duration: During the lecture (exercise hours); ILOs assessed: 1,2,3,4,5,8,9,10 Summative assessment

	Form: Written examination (questions on theory and seminars, exercises); 50%; Duration 2,5 hours; ILOs assessed: 1,2,3,6,7,8,11 Form: Elaboration and presentation of the group work: 50%; Duration: 15 min. for each group (10 min. pres. 5 min. Q&A); ILOs assessed: 2,3,4,5,7,8,9,10,11
Criteri di valutazione	Final evaluation by a single final grade. 50% of the final grade is determined from the results of the written final examination (theory and exercises) and 50% from the results of the project work. Criteria for the assessment of the written examination: completeness and correctness of the answers. Criteria for the evaluation of the project work/case study: Accuracy and completeness of content as well as quality, correctness of presentation and answers to subject-specific questions.
Bibliografia obbligatoria	Lecture notes and documents for the exercise part will be provided on the Reserve Collections and MS-Teams.
Bibliografia facoltativa	1. Pawellek, G. *Ganzheitliche Fabrikplanung: Grundlagen, Vorgehensweise, EDV-Unterstützung*. Springer-Verlag, 2014. (Verfügbar in der Bibliothek der Freien Universität Bozen) 2. Grundig, C. G. *Fabrikplanung: Planungssystematik-Methoden-Anwendungen*. Carl Hanser Verlag GmbH Co KG. 2012. (Verfügbar in der Bibliothek der Freien Universität Bozen) 3. Helbing, K. W. *Handbuch Fabrikprojektierung*. Springer-Verlag 2010. 4. Günther, H.-O., Tempelmeier, H.: *Produktion und Logistik. 9. Aufl.*, Springer Verlag, Berlin 2012 (Verfügbar in der Bibliothek der Freien Universität Bozen) 5. Aggteleky, B. *Fabrikplanung: Werksentwicklung und Betriebsrationalisierung. 3. Ausführungsplanung und Projektmanagement. Planungstechnik in der Realisationsphase*. Hanser. 1990. (Verfügbar in der Bibliothek der Freien Universität Bozen) 6. De Carlo, F.: *Impianti industriali: conoscere e progettare i sistemi produttivi*. Sixth edition, Lulu.com 2016. (Verfügbar in der Bibliothek der Freien Universität Bozen)

	7. Hopp, W.J., Spearman, M.L. and Sarker B.R.: *Factory physics: foundations of manufacturing management*. Irwin/McGraw-Hill Burr Ridge, IL, 2001. 8. Wiendahl, H.P., Reichardt, J. and Nyhuis, P.: *Handbook Factory Planning and Design*. Springer 2015.
Altre informazioni	Software used: The innovative software solution visTABLE® is used to develop the project work (Unibz licence available).
Obiettivi di Sviluppo Sostenibile (SDGs)	Buona salute, Innovazione e infrastrutture, Buona occupazione e crescita economica