



Italian code: IND-ENG/17 (old) – IIND-05/a (new)
(Mechanical Industrial Systems)

Credits: 9

Course: Production Systems Management

Main language of instruction: Italian

Other language of instruction: English

Prerequisites: Industrial Plants

Teaching Staff

Head instructor

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Objectives

The teaching of the course of “Production Systems Management” aims to achieve the following educational objectives:

- Review the concepts of production system and supply chain;
- Illustrate strategic production planning, based on competitive advantage;
- Illustrate the classification of production systems and the product-process matrix;
- Illustrate the different techniques of materials management, both on stock and on demand, evaluating in detail the different models to be applied;
- Illustrate the MRP planning system and the criteria for the Operations Scheduling.

Course structure

The course is organized in four modules. The aim of the course is to provide a good knowledge of the production system and the supply chain, as well as of the different types of production systems and materials management techniques. The course aims to illustrate the key concepts for the strategic business decisions, in the context of a long-term production planning, both in financial and operational terms, in order to reach a competitive advantage with respect to the competition. Then the course focuses on the classification of production systems, analyzing in detail the Hayes-Wheelwright matrix and the Push & Pull production management. Among the educational targets of the course, there is the providing to the student a depth knowledge of materials management techniques, either in the area of management by stock (EOQ-ROP or fixed reorder interval model, safety stock, ABC analysis), or by requirement (MPS level or chase production plans, bill of materials, MRP system,



operations scheduling). To influence the rigor of learning, the course contains a practical part consisting of the resolution of two E-Tivities. They develop the skills necessary to correctly set up problems related to the materials management, correctly applying the concepts of stock or MRP systems.

Competencies

A. Knowledge and understanding

At the end of the course, the student will have demonstrated knowledge of the principles for the Production Planning, Scheduling and Control, of the different materials management techniques and of the possible classifications of the different production systems, acquiring an ability to analyze these topics. Furthermore, the student will acquire knowledge of the main stock management models, such as: the EOQ-ROP model, the fixed reorder interval model, the maximum-minimum stock model. At the same time, finally, the student will acquire the methods for a correct production planning (MPS plan), a correct material requirement planning (MRP system) and a correct order scheduling on one or more machines (Operations Scheduling). Moreover, the students will acquire the ability to correctly formulate material management problems in a production system, by means of the E-Tivities execution.

B. Applying knowledge and understanding

The student will be able to correctly analyze the production systems and choose the most correct model of material management, in stock or on-demand, based on the characteristics of the demand, the unit value of the materials and the characteristics of the supply system. He will also be able to apply the most correct models based on demand forecasting and production planning, programming and control. Finally, the E-Tivities will provide for the application of theoretical knowledge to practical problems, in materials managing, to be resolved in the production environment.

C. Making judgements.

The student will be able to identify the most appropriate production system for the production of a product, as well as the characteristic of a product on which to focus to obtain a competitive advantage over the competition. At the same time, he will be able to choose the most appropriate model to apply for stock or demand management of a material, based on the characteristics of the demand, the unit value of the materials and the characteristics of the supply system.

D. Communication skills

The student will be able to describe and support conversations on problems relating to production planning, management of materials, both in stock and on-demand, correctly identifying the data relevant to the problem and using a terminology appropriate to production systems.

E. Learning skills

At the end of the course, the student will have knowledge of the fundamental notions necessary for the analysis of a production system and the supply chain, within which it is placed. All this will allow him to clearly and wisely connect the notions already acquired in relation to the Industrial Plants, allowing him to continue his engineering studies with greater maturity and providing him with the basis for even more specialized courses, for example, in the area of contract manufacturing and quality management.

Syllabus



Subject 1 – Business strategy and competitiveness

The first Module addresses the following issues: production system, supply chain, operations management, operations strategy, competitive advantage, business strategy formulation, production capacity planning, production planning and control.

Subject 2 – Production Systems Classification

The second Module addresses the following issues: the classification of processes and production systems, internal lead times, production time (P-Time), delivery lead time (D-Time), Little's law, process analysis (WIP and Throughput), Wortmann classification, by parts or by process production, the Hayes-Wheelwright matrix, the Push & Pull management.

Subject 3 – Stock Management Techniques

The third Module addresses the following issues: the functions of stocks, stock classification, maintenance stock costs, order issuance and stock-out costs, materials management criteria, the EOQ-ROP model, the fixed re-order point model, the minimum-maximum stock model, security stocks, stock-out probability and service level, ABC analysis, stock efficiency measurement.

Subject 4 – Demand Management Systems

The fourth Module addresses the following issues: demand forecasting (costs and techniques), aggregate sales and production resources planning (S&OP), the master production schedule (MPS), level and chase approaches, outline of linear programming models, the bill of materials (BoM), the materials requirement planning (MRP), lot sizing for MRP systems, capacity verification plan (CRP), operational scheduling.

Evaluation system and criteria

The assessment of course is based on the following criteria:

I) Final exam (90% of grade):

The examination consists of a written test aimed for ascertaining the abilities to analyze and re-elaborate the studied concepts. The written test includes both numerical exercises and theory questions to be carried out in 90 minutes. The exercises present in the exams will cover the most applicative course modules and, in particular, will focus on Stock Management Techniques and Demand Management Systems. The topics of the theory questions, on the other hand, may concern all the subjects of the course.

Forms and/or notes are not permitted for the written test. Any tables necessary for the resolution of the exercises are provided by the instructor within the text.

II) E-Tivities (10% of grade):

The final grade will be obtained by mediating the mark of the written test (with a weight of 90%), with that of series of interactive activities, called E-Tivities (with instead a weight of 10%). So, the overall evaluation of E-Tivities has a maximum score of 3 points on the final grade. They must be sent to the instructor before the written test: in absence of delivery, a null vote will be applied in the final count.

Bibliography and resources

1. *Materials to consult*

- *Andrea Sianesi – “Production systems management. Planning, scheduling, control, measurement and improvement”, Mondadori Università, 1st edition (2021).*
- *Richard B. Chase, F. Robert Jacobs, Nicholas J. Aquilano – “Operations Management for Competitive Advantage”, McGraw-Hill/Irwin, 11th edition (2006).*

2. *Recommended bibliography*

Other suggested readings are:

- *Jay Heizer, Barry Render, Chuck Munson – “Operations Management: Sustainability and Supply Chain Management”, Pearson, 12th edition (2020).*
- *Eliyahu M. Goldratt, Jeff Cox, David Whitford – “The Goal: A Process of Ongoing Improvement – 30th Anniversary edition”, North River Press (2012).*
- *Wallace J. Hopp, Mark L. Spearman – “Factory Physics: Foundations of Manufacturing Management”, Waveland Press, 3rd edition (2011).*
- *Marco Garetti – “Design and management of production systems: tutorials and case studies”, Franco Angeli, 1st edition (2011).*