Universitat Autònoma de Barcelona

2018/2019

Logistics Management and Control System Specification and Evaluation

Code: 42639
ECTS Credits: 10

Degree	Type	Year	Semester
4313489 Logistics and Supply Chain Management	OT	2	1

Contact

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Use of languages

Principal working language: english (eng)

External teachers

Prof. Dr. Gaby Neumann

Prof. Dr. Jörg Reiff-Stephan

Prof. Dr. Thomas Masurat

Prerequisites

The student has to have successfully passed the following subjects:

- Decision making (42653)
- Material handling and transportation technologies (42651)
- Information Technology (42657)

Objectives and Contextualisation

This module has two course units: **Cyber-physical Production Systems** (Prof. Dr. Jörg Reiff-Stephan) and **Management system specification in production and logistics** (Prof. Dr. Thomas Masurat, Prof. Dr. Gaby Neumann).

CU1: Cyber-physical Production Systems (5 ECTS)

After the course the student will:

- understand specific requirements of cyber-physical production systems and their complexity
- be able to apply procedure, methods, tools for specifying, selecting, implementing, testing and analysing entities of cyber-physical production systems
- be able to evaluate different digital alternatives and select the entities to be implemented
- be able to knowing the risk in using of autonomous technical entities (i.e. mobile robots) as well as the importance of rules in social and technical level
- elaborate solid arguments to convince and motivate decision makers

CU2: Management system specification in production and logistics (5 ECTS)

After the course the student will:

- understand specific requirements of management systems in production and logistics and their complexity
- understand specification needs and market situation of management systems in production and logistics in general and with regard to Production Planning and Control (PPC) systems and Warehouse Management Systems (WMS) in particular
- be able to apply procedure, methods, tools for specifying, selecting, implementing, testing and analysing PPC systems and WMS
- be able to evaluate alternative solutions and select the management system to be implemented (including tendering procedure)
- elaborate solid arguments to convince and motivate decision makers

Skills

- Address problems of management and coordination of logistics operations in production, transport and services in a holistic approach, by means of the consistent application of the supply chain management concepts and strategies, taking into account the pertinent aspects of environment, human capital, quality, technology, and economics.
- Apply a rigorous and efficient approach to problem solving.
- Apply quantitative methods and techniques based on optimisation and/or simulation models in order to evaluate the different alternatives and select the most promising solution to be implemented
- Demonstrate abilities to document and reflect the problem-solving process in order to extract the lessons learned.
- Elaborate solid arguments based on quantitative models and analytical methods in order to convince and motivate decision makers, determine the adequate LCSM partners and then plan and coordinate the project to implement the solution.
- Face a new problem under a scientific perspective.
- Identify the main aspects to be planned in the resolution of a logistic project, specifying the project boundaries, and leading with a solution
- Select and apply the most relevant analytical methodologies, strategies and current technologies for designing solutions to the problams of management and coordination of material, information and financial flows.
- Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent
- Students should be able to integrate knowledge and face the complexity of making judgements from information which, being incomplete or limited, include reflections on the social and ethical responsibilities linked to the application of their knowledge and judgements
- Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously
- Work collaboratively in a group.

Learning outcomes

1. Address design problems in Logistics Management and Control from a holistic approach.
2. Apply a rigorous and efficient approach to problem solving.
3. Demonstrate abilities to document and reflect the problem-solving process in order to extract the lessons learned.
4. Elaborate solid arguments to convince/motivate decision makers.
5. Evaluate different alternatives and select the Logistics Management and Control solution to be implemented.
6. Face a new problem under a scientific perspective.
7. Identify the main aspects to be planned in the resolution of a logistic project, specifying the project boundaries, and leading with a solution
8. Select and apply the right methodologies and strategies to specify and formalise the requirements of a Logistics Management and Control system.
9. Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent

10. Students should be able to integrate knowledge and face the complexity of making judgements from information which, being incomplete or limited, include reflections on the social and ethical responsibilities linked to the application of their knowledge and judgements
11. Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously
12. Work collaboratively in a group.

Content

CU1: Cyber-physical Production Systems (5 ECTS)

- Concept formation/ definitions
- Control architecture of automated systems
- Technical entities and closed loop controls for cyber-physical production systems
- Methods and tools of a cyber-physical production system
- Information flow horizontally and vertically: methods and examples
- Human/Machine/Factory interaction
- Multi-agent, multi-vendor systems
- Human-robot collaboration/Middleware/Real-time systems

CU2: Management system specification in production and logistics (5 ECTS)

- Management systems in production and logistics - introduction and overview
- Production Planning and Controlling Systems (PPC)
    - Concept and aim of Production Planning and Control (PPC)
    - Model representations within the PPC concept
    - Basic functions of PPC - Aachen PPC model
    - Production Control Loop
    - Overview factory data collection
    - Digitization and 4.0 in production planning and control
    - Selection and implementation of PPC systems
    - Warehouse Management Systems (WMS)
        - Modules and functionality
        - Inventory management - strategies and rules for storage/retrieval and refilling
        - Order picking control - picking systems (pick-by-light, pick-by voice, pick-by visions), picking/routing strategies
        - Management and control of materials handling technology in warehouses
        - Digitization and 4.0 in warehouses and warehouse management
        - Selection and implementation of WMS

Methodology

CU1: Cyber-physical Production Systems (5 ECTS)

The course is organized by means of traditional lectures combined with seminars and practical work. The learning process will combine the following activities:

- Classroom sessions: include theory lectures and guest lectures. Aims to understand specific requirements of cyber-physical production systems and their complexity; understand specification needs, market situation of typical entities; specify and formalize requirements for a CPPS management and control systems; explain procedure, methods, tools for specifying, selecting, implementing, testing and analysing cyber-physical production systems.
- Lab sessions: include demonstrations, experiments in physical environment, classroom discussions. Aims to understand challenges, elements and solutions for cyber-physical production systems (CPPS).
- Practical assignment: experiments in physical environment, classroom discussions, group work, experimentation reporting. Aims to understand working principle, functionality and applicability of sensor technology to control production flows; understand working principle, resulting processes and

constraints in CPPS-control; implement simple control algorithms for social and technical CPPS-system; setup test scenarios, plan and run experiments, report experimentation outcome in a practical setting (seminar work).
- Autonomous work: reading, self-testing, reflecting. Retrieve and analyse information from different sources; reflect learning and problem solving processes in order to derive lessons learned.

CU2: Management system specification in production and logistics (5 ECTS)

The course is organized by means of traditional lectures combined with seminars and practical work. The learning process will combine the following activities:

- Classroom sessions: include theory lectures and guest lectures. Aims to understand specific requirements of logistics and production management and control and their complexity; understand specification needs, market situation of typical categories of management systems in production and logistics; specify and formalize requirements for a logistics/production management and control system; explain procedure, methods, and tools for specifying, selecting, implementing, testing and analysing PPC/WMS.
- Lab sessions: include demonstrations, experiments in physical environment, classroom discussions. Aims to understand challenges, elements and solutions for managing and controlling production and logistics.
- Case study: group work, project reporting, student presentation. Aims to apply procedures, methods, and tools for specifying requirements for management systems in production and logistics; identify and apply criteria for selecting management systems within a given scenario; elaborate solid arguments to convince and motivate decision makers; run and manage a PPC/WMS specification project in order to prepare for respective purchasing activity.
- Autonomous work: reading, self-testing, reflecting. Retrieve and analyse information from different sources; reflect learning and problem solving processes in order to derive lessons learned.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
CU1. Laboratory work	15	0.6	1, 2, 5, 7, 8, 10, 12
CU1. Theory lectures	45	1.8	1, 5, 8, 10
CU2. Laboratory work	15	0.6	1, 2, 5, 7, 8, 10, 12
CU2. Theory lectures	45	1.8	1, 5, 8, 10
Type: Supervised			
CU1. Case study	60	2.4	1, 4, 5, 6, 8, 10, 11, 12
CU2. Seminar work	60	2.4	1, 3, 4, 8, 10, 12
Type: Autonomous			
Self-learning	8	0.32	1, 4, 5, 8, 9

Evaluation

CU1: Cyber-physical Production Systems (5 ECTS)

The final mark of this course will be calculated from the assessment of following evaluation activities:

- Final exam. Theoretical questions on topics addressed throughout the semester in order to present an understanding of cyber-physical production systems.
- Practical assignments. Student teams plan and run experiments in a physical lab environment to experience certain aspects of materials handling control by use of typical methods and systems (from LEGO to PLC). They need to write a seminar paper on the topic of CPPS.

CU2: Management system specification in production and logistics (5 ECTS)

The final mark of this course will be calculated from the assessment of following evaluation activities:

- Final exam. Theoretical questions on topics addressed throughout the semester and small case study in order to present an understanding of model-based decision making in logistics.
- Case study. Student teams identify functional requirements and user needs for a PPC/WMS and describe them in the form of a tender specification. Furthermore, they derive criteria for evaluating and comparing optional solutions. Results are presented towards potential decision makers, i.e. other students (peer review), and in writing in a report.

CU1 and CU2

There is one final exam per module covering courses CU1 and CU2. It is comprised of theoretical questions and small cases on topics addressed throughout the semester in order to present generic understanding on both Cyber-Physical Production Systems and management systems for production and logistics in correspondence to learning objectives. The final exam is run electronically; cases might require additional performance on paper evaluated as part of theexam.

The student passes the module if practical assignment, case study and the final exam are evaluated "sufficient" (grade 4.0 corresponding to a minimum of 50% of the maximum performance per evaluation activity) at least. The student fails if performance in at least one of the evaluation activities does not reach the 50% threshold or if seminar work and case study report are not submitted within the due date specified by the professor.

In case of fail the student needs to retake just that part of module exam s/he failed. The decision about this is in hands of the examiners. If seminar work or case study is failed, the student (team) will either be provided with a new assignment/case study or asked to re-submit seminar work or case study report according to the corrections/indications provided by the professor.

Students who fail an exam may be permitted the opportunity to retake this examination twice at a maximum. After that his/her right for examination terminates. Retaking an exam is allowed only in case the student previously failed, but not to improve grades achieved so far.

Examination dates are announced in due time, but at least two weeks prior to the respective exam. Submission deadlines for practical assignments, project reports and any presentation activities related to them are announced when giving assignments/project to students. The final exam and a first opportunity for eventually retaking it are scheduled within specified examination periods. Specific examination dates are published on the university's website.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
CU1. Practical assignment & seminar work	12.5%	0	0	1, 2, 5, 7, 8, 10, 12
CU2. Case study report and seminar work	12.5%	0	0	1, 2, 3, 4, 5, 6, 10, 11, 12
Final exam (CU1 & CU2)	75%	2	0.08	1, 2, 4, 5, 8, 9

Bibliography

To be provided during lecturing period