Course 5. Sustainable Supply Chain Management (2-2-0)

Course Objective: The main goal of the course is to acquire the ability to create an effective value chain (the ability to work and manage a team in the process of design/redesign structure of modern sustainable supply chain in Industry 4.0 environment), functioning in a sustainable environment with the use of intelligent and flexible production technologies and modern communication as part of the interaction network between its participants.

Learning Outcomes: The students on the completion of this course would be able to:
- apply the knowledge and competences related to Industrial Engineering in order to improve the supply chain functions
- indicate entrepreneurial activities and implement solutions in the field of Industrial Engineering to improve SSCM
- redesign the supply chain in accordance to the requirements of the Industry 4.0
- analyze and select scientific solutions in the field of Industrial Engineering in building a network of connections in SSCM
- manage a group (interdisciplinary, intercultural and distributed) in order to identify and evaluate trans strategies for the supply chain network functioning in a sustainable development economy

Prerequisite: Basic knowledge in the field: engineering sciences, logistics science including the supply chain and management sciences

Course Outline (L-lecture, W- workshop):

MODULE 1 - Supply Chain Management in sustainability environment

1.1 Role of sustainability in supply chain management (4.5 hours): Lecture: AC + RO (Discussion, Assignment)
- Key factors for sustainable development
- Key economical solutions in sustainable supply chain management
- The impact of sustainable development on supply chain management

1.2 Supply chain redesigning and cooperation in a sustainable interorganizational network (6 hours): Lecture: AC + RO (Discussion, Assignment, Group project)
- Transformation and design of cluster supply chains
- Framework for network structures in a sustainable supply chain
- Engineering assessing the effectiveness of networks in a sustainable supply chain

1.3 Application of network solutions in sustainable supply chain management (4.5 hours): Lecture: AC + RO (Discussion, Group project)
- Development of the supply chain management concept: Application of network as a method of sustainable supply chain management
- Case study presentation

MODULE 2 - Supply Chain Modeling

2.1 Inventory Management and Risk Pooling (4 hours): Lecture: AC + RO (Discussion, Assignment)
- The Role of Inventory
- Inventory Control Policies
- Continuous Review Policy
- Periodic Review Policy
- Risk Pooling
- Centralized vs. Decentralized Systems

- Echelon Inventory

2.2 Supply Contracts (6 hours): Lecture: AC + RO (Discussion, Assignment)
- Buy-Back Contract
- Revenue Sharing Contract
- Other Types of Contracts
- Global Optimization and Supply Contracts
- Contracts for Make-to-Order Supply Chains: Pay-Back, Cost Sharing
- Contracts with Asymmetric Information
- Portfolio Contracts and Risk Trade-Off

2.3 Bullwhip Effect and Distribution Strategies (5 hours): Lecture: AC + RO (Discussion, Assignment)
- Bullwhip Effect
- Impact of Centralized Information
- How to Relieve the Bullwhip Effect?
- Direct Shipment
- Intermediate Inventory Storage Point Strategy
- Central vs. Local Facilities
- Cross-Docking
- Nash Equilibrium
- Critical Search Level
- Transshipment Strategy

MODULE 3 - Applications of Supply Chains in Different Industry Sectors in this Disruptive Era

3.1 Role of Supply Chain in Industry 4.0 (4.5 hours): Lecture: AC + RO (Discussion, Assignment)
- Key technologies in the 4th Industrial Revolution
- Impact of the 4th Industrial revolution on supply chain
- Key elements and digital technologies in smart supply chains

3.2 Supply Chain Redesign and new Collaboration Models (6 hours): Lecture: AC + RO (Discussion, Assignment, Group project)
- Transformation and design into a digital supply chains and logistics
- Creating collaboration framework in a digital supply chain
- Creating information visibility, a new data-driven vision, and exploiting the power of data in smart supply chains

3.3 Applications of Supply Chains in this disruptive era (4.5 hours): Lecture: AC + RO (Discussion, Group project)
- Applications of Supply Chains in this disruptive era: Smart supply chains in industry, agriculture, and tourism
- Case study presentation

Laboratory Sessions: None

Learning Resources:
Textbooks: No designated textbook, but class notes and handouts will be provided.
Scientific Articles: No designated article, but databases containing themed articles will be provide.

Reference Books:

1. Bruno S. Sergi, Elena G. Popkova, Aleksei V. Bogoviz, Tatiana N. Litvinova, <u>Understanding Industry 4.0: AI, the Internet of Things, and the Future of Work</u>, Emerald Group Publishing, 2019
2. Joseph Sarkis, <u>Handbook on the Sustainable Supply Chain</u>, Edward Elgar Publishing, 2019
3. Yui-yip Lau, Adolf K.Y. Ng, Jorge Acevedo, <u>Principles of Global Supply Chain Management</u>, Anthem Press, 2019
4. Anjali Awasthi, Katarzyna Grzybowska, <u>Handbook of Research on Interdisciplinary Approaches to Decision Making for Sustainable Supply Chain</u>, IGI Global, 2019
5. D. Simchi-Levi, P. Kaminsky, and E. Simchi-Levi: <u>Designing and Managing the Supply Chain</u> (3rd edition), McGraw-Hill, 2008.
6. S. Chopra, and P. Meindl: <u>Supply Chain Management</u>, Pearson, 2013
7. M. Watson, S. Lewis, P. Cacioppi, and J. Jayaraman: <u>Supply Chain Network Design</u>, FT Press, 2013

Teaching and Learning Methods:
The course is focused on personal activity and group work. The workshop is a project classes and assignments. The project task concerns work in a group (about 10 people), during which each participant will actively use their own knowledge to write a joint project work. The project group will be create the supply chain in the industry chosen by the group. Presentation the project, discussion and activity at workshop will allow to implement the assumed learning outcomes for the course.

Time Distribution and Study Load:
Lectures: 15 hours
Workshop: 30 hours
Self-study: 75 hours

Evaluation Scheme: The final grade will be computed according to the following weight distribution: Individual reflections (20%); Class discussions (10%); Project outcome (30%); Powerful Public Speaking (20%) and Personal Development (20%).

An "A" would be awarded if a student can demonstrate the use of transferred and self-acquired knowledge in creating a sustainable supply chain.
A "B" would be awarded if a student can show the use of transferred and self-acquired knowledge in the field of sustainable supply chain management.
A "C" would be given if a student can show the use of the knowledge provided in the field of sustainable supply chain management.
A "D" would be given if a student shows the inability to use the transferred knowledge in the field of sustainable supply chain management.

Instructor: