

## *International Program*

<b>Winter Semester</b>	
<b>Module: "Quality Engineering and Management" (5 ECTS)</b>	
Code: 1102-ZP000-MSA-QUMAN	
<b>Learning objectives:</b>	
<p>The module aims to provide advanced knowledge on quality engineering and management in industrial organizations. After completion of the module students should be capable to implement organizational systems applying the Total Quality Management concept, to assess and select relevant technical solutions for the production processes, as well as transform organizational culture.</p>	
<b>Content:</b>	
<ol style="list-style-type: none"> <li>1. Basic concepts</li> <li>2. Engineering for quality</li> <li>3. TQM strategy</li> <li>4. Quality gurus</li> <li>5. Design for quality</li> <li>6. Quality in production</li> <li>7. TQM as a management system</li> <li>8. Process management</li> <li>9. Quality systems and company assessment</li> <li>10. Quality management tools and improvement programs</li> </ol>	
<b>Practise Lessons:</b>	
<ol style="list-style-type: none"> <li>1. Value analysis</li> <li>2. Data collection, histograms and stratification</li> <li>3. Pareto charts and Ishikawa diagrams</li> <li>4. Flow charts and process modelling</li> <li>5. Case studies</li> <li>6. Control charts</li> <li>7. Acceptance models design</li> </ol>	
<b>Module: "ICT and Cax in Production" (5 ECTS)</b>	
Code: 1102-ZP000-MSA-ITCAX	
<b>Learning objectives:</b>	

The module aims to provide advanced knowledge on possible support from ICT and Cax (computer aided systems) in the area of industrial corporate information systems and manufacturing process planning.

**Content:**

1. Organisations and management in global environment
2. Information System ERP, CRM and BI
3. Redesigning the organization with Information
4. Cloud Computing
5. Managing International Information Systems
6. CAD/CAE/CAM systems
7. Rapid Prototyping and Virtual Machining
8. CAM and CNA Programming
9. Numerical modelling - CAE basis

**Project:**

1. Case studies
2. Project on ICT strategy and framework

**Laboratory:**

1. CAE systems environment; basic procedures
2. Numerical modelling of a sample manufacturing process
3. CNC lab

**Exercises:**

1. CAD systems environment
2. Designing with particular systems

**Module: "Design and analysis of manufacturing systems" (10 ECTS)**

Code: 1102-ZP000-MSA-DAMAS

**Learning objectives:**

The module aims to provide advanced knowledge on modelling of production systems from the system design point of view. Moreover design methods will be considered both for fabrication (job-shops, manufacturing cells, flow lines, projects) and for assembly (single point assembly, assembly cells, assembly lines). After completion of the module students should be capable to: analyze and assess performance of the production systems, select appropriate configurations, dimension and balance capacity, optimize material flows throughout the factory.

**Content:**

1. Introduction and fundamentals of industrial systems configurations
2. Industrial production processes classification
3. Performance measures and analysis of production systems
4. Process production plants
5. Industrial production systems: fabrication
6. Group technology
7. Industrial production systems: assembly
8. Material flow analysis
9. TOC in manufacturing systems

10. Dynamics of manufacturing systems
11. Measuring variability of manufacturing processes
12. Taming turbulences in manufacturing systems

**Practice Lessons:**

1. Virtual visit to a process production system and system diagram reading
2. Virtual visit to a discrete production system and system diagram reading
3. Using TOC to tame bottlenecks
4. Sizing of a process system for a continuous production
5. Sizing of a production system for a discrete production (fabrication + assembly)

Module: " Operations and Production Management" (5 ECTS)

Code: 1102-ZP000-MSA-OPMAN

**Learning objectives:**

The module aims to provide advanced knowledge on operations and production management. After completion of the module students should be capable to design, analyze and assess production planning and control systems, including those operating within distributed manufacturing environment.

**Content:**

1. Introduction to production management and performance
2. Aggregate planning
3. Stock management
4. Material Requirements Planning (MRP)
5. Toyota Production System
6. Operational planning and scheduling
7. Capacity planning and control

**Practice Lessons:**

1. Exercise on yield and costs
2. Exercise on aggregate planning
3. Exercise on stock management
4. Exercise on requirements planning
5. Exercise on Kanban
6. JIT case study

Module: " International Industrial Marketing" (5 ECTS)

Code: 1102-ZP000-MSA-ININM

**Learning objectives:**

The module aims to provide advanced knowledge on marketing of industrial products and services within the global business environment. After completion of the module students should be capable to apply market research.

**Content:**

1. The role of marketing in the competitive systems
2. The value generation process and value analysis

3. Value proposition definition
4. From the value proposition to the marketing plan
5. International marketing

**Practice Lessons:**

1. Case studies
2. Teamwork on development of international marketing strategy
3. Project on overseas market entry

Module: "Modeling of production Systems and Supply Chains" (5 ECTS)

Code: 104-ZP000-MSA-MOPSC

**Learning objectives:**

The module aims to provide advanced knowledge on possible support from simulation systems and software for supply chains modelling.

**Content:**

1. Discrete-event simulation
2. Monte-Carlo Simulation
3. Simulation life-cycle analysis
4. Input-output analysis
5. Model verification and validation
6. Basics of continuous simulation
7. System Dynamics
8. Simulation in the Process Industry

**Practice Lessons:**

1. Projects
2. Labs

Module: "Maintenance Management" (5 ECTS)

Code: 1104-ZP000-MSA-MAINM

**Learning objectives:**

The module aims to provide advanced knowledge on maintenance management of manufacturing facilities in industrial organizations. After completion of the module students should be capable to implement organizational systems applying the Total Productivity Management concept and taking the holistic perspective of the Total Cost of Ownership, to assess and select relevant organizational solutions for the maintenance processes, as well as to transform organizational culture.

**Content:**

1. Objectives of maintenance. Maintenance systems.
2. Repair. Inspection. Service. Depreciation and Machine Life
3. Replacement policies. Partial closure/opening tests. Test frequencies.
4. The types of maintenance.
5. The organization of maintenance management
6. Computer-aided maintenance management
7. Evaluation of maintenance performance. OEE.TCO
8. TPM

9. Best practices case studies

**Practice Lessons:**

1. Case studies
2. Developing OEE reporting
3. Developing maintenance management system

## Summer Semester

### Module: "International Trade, Business & Economics" (10 ECTS)

Code: 1101-ZP000-MSA-INTBE

**Learning objectives:**

The module aims to provide advanced knowledge about international business, trade and economics. Students learn how to prepare a strategy of internationalization for a company.

**Content:**

1. Globalization and international business. Background, causes and effects of the globalization process. Drivers of Corporate Internationalization.
2. International Business Analysis. Country competitiveness. Country evaluation and selection. National Market Analysis. Analyzing Global Industries and Competitors
3. The international market selection process. The company's international competitiveness. Country and market screening
4. Market Entry Strategies. Contractual Forms of Market Entry. Exporting Strategies. Investment Options
5. The strategy of international business. Organization of international business. Organization Design. Coordination Mechanism
6. International marketing. Global Market Segmentation and Positioning. Distribution strategies. International Product Strategies. Social and cultural considerations in international marketing
7. International Supply chain Management. Retailing in Global Markets. Wholesaling in Global Markets. Global Supply-chain Management
8. Managing Human Resources Management Globally. Staffing, Training and Development, Compensation, Performance Appraisal. International Accounting and Finances a global context.
9. Cultural underpinnings of international business. Context and culture. Intercultural communication. International Negotiations
10. International business in emerging markets. Economic systems. Emerging countries as target markets, global sourcing destinations. Challenges of doing business in emerging markets
11. International Trade Theories: The Mercantilist Doctrine. Absolute Advantage Theory. Comparative Advantage Theory. Heckscher-Ohlin Theorem. The Leontief Paradox. Human Skills and Technology-Based Views. Factor Mobility. The Product Life Cycle Model. The New Trade Theory. External and internal economies of scale. Inter- and intra-industry trade patterns

12. Types of Trade Barriers: Tariff Barriers, Tariffs, Quotas. Export Controls. Dumping and Anti-Dumping. Non-Tariff Barriers. Administrative Barriers. Production Subsidies. Emergency Import Protection. Foreign Sales Corporations. Embargoes and Boycotts. Technical Standards. Corruption. Barriers to Service Trade

13. Issues in trade policy. Technology and externalities. Strategic Trade Policy. Trade and Labor. Trade and Environment

14. Organization of international trade. Export and import. Sales of goods in international trade. International trade documentation. Modes of international transport. Special trade terms in import/export sales. Incoterms. International payment methods. Forms of Countertrade

**Module: "Industrial Technologies" (10 ECTS)**

Code: 1101-ZP000-MSA-INDTE

**Learning objectives:**

The module aims to provide intermediate knowledge on assessment and selection of materials processing technologies, supported by process planning competence. After completion of the module students should be capable to choose appropriate processes and process equipment, including machines and robots, jigs, fixtures, tools, etc., according to individual factors and circumstances, finally to evaluate production processes from organizational and economical points of view

**Content:**

1. Fundamentals of technical process planning
2. Basic knowledge on engineering materials
3. Metal casting
4. Forming and shaping
5. Material-removal processes and machines
6. Abrasive processes
7. Joining processes and equipment
8. Surface technology
9. CAPP
10. Technological processes
11. Machining extra material removal and their selection
12. Components classification

**Practise Lessons:**

1. Selection of the technology or technologies
2. Welding lab
3. Metalforming lab
4. Polymers processing lab
5. Raw material design
6. Technological process design
7. Technological operations design
8. Economical assessment of production processes

**Module: "Project, Innovation, Technology, Engineering & PLC Management" (10 ECTS)**

Code: 1101-ZP000-MSA-PRITE

**Learning objectives:**

The module aims to provide advanced knowledge on innovation and development processes within globally operating or distributed industries and supply chains. Moreover participants will be familiarized with project management systems and tools and also with the basic concepts of product life-cycle management. After completion of the module students should be capable to analyze and organize innovation and development processes, in different industries exposed to the global business environment.

**Content:**

1. Introduction to project management
2. Project Management Framework
3. Project planning
4. Project Executing and Control
5. Basic concepts of innovation management
6. Theories of innovation management
7. Enhancement of innovations
8. R&D and technology management
9. Product development
10. Technology ideation workshop
11. Engineering & PLC Management

**Practise Lessons:**

1. Case Study: Project Management and the Project Manager (based on J.R. Meredith and S.J. Mantel, Project Management: A managerial approach, 2003, John Wiley & Sons).
2. Case Study: Reading and Discussing the paper "Linking Projects to Strategy", R.I. England and R.J. Graham, Journal of Product Innovation Management, vol 1, No. 1, pp. 58-69, 199 included in the text by J.R. Meredith and S.J. Mantel.
3. Case studies on knowledge based innovations and innovation based entrepreneurship.
4. Case Study: JWD Consulting Project Management Intranet Site Project (based on K. Schwalbe, IT Project Management, 2006, Thomson Course Technology).
5. PRINCE2 Case Study - Electricity Supply Board, APM Group, [www.apmgroup.co.uk/](http://www.apmgroup.co.uk/)
6. Introduction to Microsoft Project.
7. Defining Project plan - Project teamwork.

**Module: "Techniques of Industrial Engineering " (5 ECTS)**

Code: 1103-ZP000-MSA-TECIE

**Learning objectives:**

The module aims to provide advanced knowledge on selected production engineering tools and techniques. After completion of the module students should be capable to implement a wide range of productivity improvement techniques related to technological processes.

**Content:**

1. Work and work methods

2. Work measurement and work standards
3. Human factors in work system design
4. Organizational factors in work system design
5. Japanese techniques of industrial engineering

**Practise Lessons:**

1. Process analysis
2. Balancing work
3. Setting work standards
4. Designing workplace
5. Designing wage payment system
6. SMED
7. Poka-yoke
8. Visual management

**Module: "Modelling of Manufacturing processes" (5 ECTS)**

Code: 1103-ZP000-MSA-MOMAP

**Learning objectives:**

The course is aimed to provide the knowledge and to develop the competence and skills related to modelling of various manufacturing processes, including hard (i.e. physically based) and soft (black-box) models.

**Content:**

1. Models, main types, role and main tasks of modelling in manufacturing industry
2. Overview of hard modelling and solution methods in manufacturing
3. Heat transfer as an exemplary problem
4. Types of data and types of tasks in soft modelling in manufacturing
5. Statistical models
6. Overview of AI (learning systems) type models
7. Artificial neural networks: fundamentals, practice and applications in manufacturing
8. Comparative analysis of selected types of soft models

**Module: "Global operations Strategy and Logistics & SCM" (5 ECTS)**

Code: 1103-ZP000-MSA-GLOST

**Learning objectives:**

The module aims to provide advanced knowledge on up to date topics of industrial logistics and supply chain management. After completion of the module students should be capable to design, analyze and move up inter-organizational logistical processes and systems, taking the perspective of value stream and demand flow.

**Content:**

1. Western and Eastern business principles
2. Supply chain: structure, processes and tiering. SCOR, VCOR and DCOR
3. Managing customer service and relationships
4. Logistics strategy. Differentiating strategies
5. The global operations strategy content and decision areas



6. Supply chain planning and control
7. Configuring operations capacity. Capacity design and dynamics
8. Networking. Integration in the supply chain. Partnership engineering
9. Network behavior and dynamics. Bullwhip effect. Taming engineering
10. Operation processes technology: selection and assessment. Scaling
11. Organizing and managing inter-organizational operational structures
12. Innovation and development processes in globally distributed structures

**Practise Lessons:**

1. Case studies
2. Project on developing the framework for global operation strategies and S.C. planning and control
3. Beer game

**Module: "International Accounting and Finance for Production Engineers" (5 ECTS)**

Code: 1103-ZP000-MSA-INAFE

**Learning objectives:**

Knowledge: aspects connected with finance and financial/managerial accounting, fundamentals of financial analysis in enterprises.

Skills: calculating of the time value of money, preparing the basic financial analysis of enterprises, analysing of financial enterprise reports.

Attitudes: rational decision taking regarding the financial data, development of work efficiency in enterprise.

**Content:**

1. Basic goals and tasks of finance and financial/managerial accounting
2. Time Value of Money - interest rate and its determinant, examples of market interest rates: rates of central banks, WIBOR, WIBID, EURIBOR, EONIA, LIBOR, LIBID, FIBOR, FIBID, rates of government bonds etc.
3. Chances and risks - measure and analysis. Risk management. Role of rating agencies in assessment of enterprises credibility
4. Financial statements (Balance sheet, P&L, Cash flow etc.) and regulation of financial accounting : NAS, IAS/IFRS, US GAAP
5. Horizontal and vertical assessment of company financial statements
6. Ratios analysis (profitability, liquidity, debt, activity, market value) and its combination (DuPont analysis)
7. Inventories and receivables management, strategy of Working Capital
8. Tools supporting managerial accounting - cost account models, financial planning, Break Even Point, Balance Scorecard etc.
9. Equity - sources, price and management (shares, bonds etc.)
10. External capital - sources, price and management (leasing, factoring, credits etc.) - liabilities management
11. International Financial Market, capital market. Foreign Exchange Market. Derivatives and management of fix-rate differences
12. Impact of external environment on economic decision (economic growth, inflation, tax policy, fx-rate policy, monetary policy, international trade, competition etc.) - analysis of financial crisis

**Module: "Intermediate Integrating Project" (10 ECTS)**

Code: 1103-ZP000-MSA-INTIP

**Learning objectives:**

The purpose of the module is to integrate the knowledge and competence gathered by the students during the preceding studies through a project that aims at planning of development of a new business or redesign/improvement of an existing one.

Market, technical, organizational and economical considerations are taken all together, applying the global perspective on the business. This way students will be prepared to a wide range of industrial development projects, including starting own venture.

**Content:**

The project should typically use the framework of business plan and/or industrial feasibility study. Alternatively it can be run as a preparation of business re-engineering or business improvement complex plan. The standard project should incorporate the following topics: market assesment, technology selection, structring the value delivery system, sourcing and outsourcing, engineering and operations organization, costing and budgeting, human resources, implementation planning, financial analysis, investment appraisal. Normally the project should be prepared by the teams of 2-3 students and should result in a text sized between 30-60 pages.