



Study Plan

M.Sc. Management and Production Engineering

Faculty of Production Engineering

Study plan for reference only; may be subject to change.

Lc: Lectures Lb: Laboratory E: Exercise P: Project

Semester	Course name	Hours	ECTS
1	Industrial Technologies (Exam)	Lc:60 Lb:20 E:12 P:28	10
	International Trade, Business and Economics (Exam)	Lc:60 E:12 P:48	10
	Project, Innovation, Technology, Engineering & PLC Management (Exam)	Lc:60 E:12 P:48	10
2	Design & Analysis of Manufacturing Systems (Exam)	Lc:60 Lb:24 E:12 P:24	10
	ICT and CAx in Production (Exam)	Lc:30 Lb:12 E:6 P:12	5
	International Industrial Marketing (Exam)	Lc:30 E:10 P:20	5
	Operations & Production Management (Exam)	Lc:30 Lb:12 E:6 P:12	5
	Quality Engineering & Management (Exam)	Lc:30 E:12 P:18	5
3	Global Operations Strategy, Logistics & SCM (Exam)	Lc:30 E:6 P:24	5
	Intermediate Integrating Project (Exam)	P:120	10
	International Accounting and Finance for Production Engineers (Exam)	Lc:30 E:10 P:20	5
	Techniques of Industrial Engineering (Exam)	Lc:30 E:8 P:22	5
	2 Elective Courses *		10
4	Master thesis (Exam)	P:240	20
	Elective Course *		10

* Elective Courses:

Maintenance Management

Modeling of Manufacturing Processes

Modeling of Production Systems and Supply Chains

Description of courses:

Industrial Technologies

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., to according to individual factors and circumstances, finally to evaluate production processes from organizational and economical points of view.

Content:

1. Fundamentals of technological 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 extras material removal and their selection.
12. Components classification.

Practice 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.

International Trade, Business & Economics

Learning objectives: The goal of the subject is to provide the 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 payments methods. Forms of countertrade.

Project, Innovation, Technology, Engineering & PLC Management

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.

Design & analysis of manufacturing systems

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. 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.

ICT & CAx in Production

Learning objectives: The module aims at providing 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.
4. Redesigning the organization with Information.
5. Cloud Computing.
6. Managing International Information Systems.
7. CAD/CAE/CAM systems.
8. Rapid Prototyping and Virtual Machining.
9. CAM and CNC Programming.
10. Numerical modeling – CAE basis.

Project: 1. Case studies. 2. Project on ICT strategy and framework. Laboratory 1. CAE systems environment; basic procedures. 2. Numerical modeling of a simple manufacturing process. 3. CNC lab. Exercises 1. CAD systems environment. 2. Designing with particular systems.

International Industrial Marketing

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 system.
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.

Study Plan M.Sc. Management and Production Engineering Operations & Production Management

The aim of lecture is giving the specialistic knowledge about contemporary production companies which exist in the dynamically changing market conditions. Implementation of system thinking as well as usage of new tools in production plants organisation give a great opportunity to assess particular solutions when discussing the real cases of companies. Additionally, provide the students the knowledge of computer supported applications used in modern management approach.

Lectures:

4h - Introduction

Company and its environment; Stages of scientific and technological development in production companies;

Company objectives; Company's performance models; Virtual organization; Lean, flexible organization.

4h - Japanese management techniques: Just in Time (JIT)

JIT fundamentals as a pull approach to production planning; Production management within JIT; JIT set of techniques; Kanban: operating rules and example of application

4h - Group Technology

Group technology and it's benefits; Product family definition; Opitz code

4h - Requirements planning: Material Requirements Planning (MRP II)

Requirements management; Data and phases of MRP II procedure; MRP II issues

4h - Operational planning and scheduling

Operational planning characteristics; Scheduling; Basic sequencing rules; Types of production control systems and objectives of planning decisions

4h - Introduction to production management and performance indexes

Phases of the production planning process; Approaches to production planning;

Relevant costs in production management; Product typologies and bills of materials; Demand characteristics

4h - Aggregate planning

Definitions, requirements and constraints of aggregate planning; Chase and level planning approaches; Master Production Scheduling

2h - Requirements planning: stock management

Stock management: limits and issues

Tutorials:

SWOT analysis

Prioritizing inefficiencies (Ishikawa diagrams)

Business strategy - Determination of the mission, vision; strategic objectives

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Topics of projects:

CMI Model – basic

Strategic Scorecard (comparison of values to the desired measurement system)

ISO 9000 – basic

TQM,

Kaizen – Basic

TOC

TPM,

SMED

ERP/MRP/II/MRP,

JIT

Laboratories:

Project management for CMI implementation – timetable, list and sequence of implementation stages, resources (human, information, material, financial) Analysis of risks and threats that may arise during the project implementation

Quality Engineering & Management

Learning objectives: 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 to transform organizational culture.

Content:

1. Basic concepts.
2. Engineering for quality.
3. TQM strategy.
4. Quality gurus.
5. Design for quality.
6. Quality in production.
7. TQM as a management system.
8. Process management.
9. Quality systems and company assessment.
10. Quality management tools and improvement programs.

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Practice Lessons: 1. Value analysis. 2. Data collection, histograms and stratification. 3. Pareto charts and Ishikawa diagrams. 4. Flow charts and process modeling. 5. Case studies. 6. Control charts. 7. Acceptance models design.

Global Operations Strategy and Logistics & SCM

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 turbulences.
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.

Practice Lessons: 1. Case studies. 2. Project on developing the framework for global operation strategies and SC planning and control. 3. Beer game.

Intermediate Integrating Project

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

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re-engineering or business improvement complex plan. The standard project should incorporate the following topics: market assessment, technology selection, structuring 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.

International Accounting & Finance for Production Engineers

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 determinants, 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 regulations 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. Derivates and management of fx-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.

Techniques of Industrial Engineering

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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.

Practice 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.