

**FACULTY OF  
MECHANICAL ENGINEERING**

**THE OFFER STUDIES FOR  
FOREIGN STUDENTS IN THE  
FRAMEWORK OF THE ERASMUS  
PROGRAMME:**

**MANAGEMENT AND  
PRODUCTION ENGINEERING**

**THE OFFER OF SUBJECTS FOR AREA OF STUDY: MANAGEMENT  
AND PRODUCTION ENGINEERING**

(MINIMUM NUMBER OF HOURS AND ECTS)

<b>Offer of Subjects in English</b>	<b>Numbers of hours</b>	<b>ECTS</b>
1. Operations Research	60	5
2. Integrated Management Systems	30	3
3. Computer Aided Engineering Work	45	3
4. Logistics	60	5
5. Fundamentals of Marketing	30	3
6. Fundamentals of Engineering Design I	45	5
7. Fundamentals of Engineering Design II	30	2
8. Manufacturing Processes	60	4
9. Strategic Management	30	3
10. Production and Services Management	60	5
11. Production and Services Management II	30	3

## OPERATIONS RESEARCH

Course code: 06.9-WM-ZIP-P-20\_14P\_pNadGenFUFPH

Type of course: compulsory

Language of instruction: english

Director of studies: prof. dr hab. T. Nahirny

Name of lecturer: prof. dr hab. T. Nahirny,  
dr inż. T. Belica

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					5
Lecture	30	2	VI	Exam	
Project	30	2		Grade	
<b>Part-time studies</b>					
Lecture	18	2	VI	Exam	
Project	18	2		Grade	

### COURSE AIM:

Provide basic knowledge and skills students acquire competence in the field of operational research that will be used to continue the learning process and useful in their future careers.

### ENTRY REQUIREMENTS:

Mathematics, Probability account

### COURSE CONTENTS:

**Content of the lecture.** The nature and genesis of operations research. Linear programming, basics and uses: geometric method and the simplex method, two-phase and M-method, special cases, duality and sensitivity analysis. Integer programming to optimize operational issues. Transportation and assignment problems. Comparative analysis of multi-criteria optimization issues. Selected methods of network programming. Queuing systems.

**Project:** prepare the individual and group projects relating to:

- the geometric method to solving operational research issue,
- simplex method for all kinds of restrictions,
- sensitivity analysis,
- solving dual issues
- integer programming,

- transportation problem, assignment and traveling salesman problems,
- network methods: the issue of the maximum flow, shortest path, CPM, PERT,
- queuing systems.

#### TEACHING METHODS:

Conventional lecture. Project - Individual and group work of students using literature and lecture notes

#### LEARNING OUTCOMES:

Symbol of course learning outcomes	Learning outcomes (knowledge, abilities, competences)	With reference to learning outcomes in education area within technical sciences
K_W01	The student has knowledge of linear and integer programming, network methods and queuing systems, useful for the formulation and solving simple problems in the field of Production Engineering	T1A_W01
K_U01	Students can obtain information from the literature and other carefully selected sources, it can integrate the information, make their interpretation	T1A_U01
K_U05	Students can prepare in Polish well-documented theses on the use of operations research in issues of Production Engineering	T1A_U03
K_U20	Students can make a preliminary economic analysis of the engineering solutions on the basis of solutions of operations research corresponding problems	T1A_U12
K_K01	The student understands the need for learning throughout life	T1A_K01
K_K03	Students can interact and work in a group	T1A_K03

#### LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

**Lecture:** exam. Rating issued on the basis of a written exam covering basic knowledge verification issues (K\_W01, K\_U20)

**Project:** test to evaluate the rating determined on the basis of evaluation of the component skills associated with the implementation of project tasks (K\_U01, K\_U05, K\_K03) and prepare a report (K\_U05, K\_K03) and component for "defense" by the student report (K\_W01).

#### STUDENT WORKLOAD:

The student workload of 125 hours, including participation in lectures 30 (18 \*) hours, participation in project activities 30 (18 \*) hours, consultation, 5 (9 \*) hours, preparation for classes 15 (25 \*) hours, the development of the project 30 (35 \*) hours, to prepare for the exam 10 (10 \*) hours, read the literature, 5 (10 \*) hours

\* - Part-time studies

#### RECOMMENDED READING:

1. Ignasiak E. (red.), *Badania operacyjne*, PWE, Warszawa, 2001
2. Kukuła K. (red.), *Badania operacyjne w przykładach i zadaniach*, Warszawa, PWN, 2001

#### OPTIONAL READING:

1. Filipowicz B., *Badania operacyjne: wybrane metody obliczeniowe i algorytmy*, Kraków : F.H.U. Poldex, 1997
2. Hillier F.S., Lieberman G.J., *Introduction to Operations Research*, McGrawHill

## **INTEGRATED MANAGEMENT SYSTEMS**

Course code: 06.9-WM-ZIP-D-03\_15W\_pNadGen80T4F

Type of course: Compulsory

Language of course: english

Director of studies: Dr hab. inż. Sławomir Kłos, prof. UZ

Name of lecturer: Dr hab. inż. Sławomir Kłos, prof. UZ

Form of classes	Number of teaching hours persemester	Number of teaching hours persemester	Semester	Form of examination	ECTS
<b>Full-time studies</b>					3
Lecture	15	1	I	Exam	
Project	15	1		Grade	
<b>Part-time studies</b>					
Lecture	9	1	I	Exam	
Project	18	1		Grade	

### **MAIN GOAL OF THE COURSE:**

The main effect of education will be learning of the functionality of integrated management systems and process approach to managing manufacturing companies, where such a system are implemented.

### **PREREQUISITES:**

Production and service management.

### **COURSE CONTENTS:**

Development of enterprise resource planning (ERP) systems. Classification and of ERP systems. Transaction systems and decision support systems. The comprehensive information systems. Modular including the comprehensive system. Evaluation of ERP systems. Material Requirement Planning and Manufacturing Resource Planning (MRP II) systems. The MRP and MRP II specification. Main functions of an integrated management system. Project management of ERP system implementation. Process of choice and methodology of the implementation of the ERP system. Scope, cost and schedule of ERP system implementation. Requirement analysis. Identification of critical areas in the enterprise. Determining the increase in amounts given in the time and appointing guidelines for the computer equipment. Preparing the computer infrastructure: servers, working stations, and the network

infrastructure. Protecting a systems. Customer Relationship Management systems (CRM). Management of information system. Modeling business processes and workflows in the enterprise (Workflow Management). Systems of modeling of the flow business processes in the enterprise. Administration of computer systems of the management. Administration of the server of the database, securities of the system. Repair of the system and the installation (update of ERP). E-biznes, concepts of the application. E-commerce, Business-to-Business (B2B) and Business-to-Customer (B2C). Review of existing answers from field E-commerce. Online shops and payments on the Internet. virtual organizations.

**EDUCATION METHODS:**

Conventional lecture. Project.

**LEARNING OUTCOMES:**

The reference to the effects of the course of study	Description of the results of education	The method of checking the effect of education	Form of teaching	The reference to the results of education in the field of technical sciences
K_W09	Student has structured and theoretically founded knowledge in the field of computer-aided business management.	Exam	Conventional lecture	T2A_W03
K_W11	Student has structured and theoretically founded knowledge in the field of integrated management systems.	Exam	Conventional lecture	T2A_W03
K_W14	Student has structured and theoretically founded knowledge in the field of decision support systems and knowledge management.	Exam	Conventional lecture	T2A_W03
K_U12	Student can choose the appropriate modules and integrated use of management information systems.	Defense of the project and evaluation of the report	Project	T2A_U07
K_U17	Student is able to formulate and solve engineering tasks and production management systems approach applied taking into account the economic, legal and social.	Defense of the project and evaluation of the report	Project	T2A_U10
K_K02	Student is aware of the importance and understanding of the effects of non-technical aspects and engineering activities, including its impact on the environment, and consequently the responsibility for decisions.	Defense of the project and evaluation of the report	Project	T2A_K02
K_K06	Student can think and act in a creative and enterprising.	Defense of the project and evaluation of the report	Project	T2A_K06

## **VERIFICATION OF THE EDUCATION RESULTS AND CONDITIONS OF ASSESSMENT**

Completion of the lecture is a form of written exam (K\_W09, K\_W11, K\_W,14). Form of assessment is to evaluate the activities of the project design including data structures and models of business processes performed exemplary manufacturing company based on the selected ERP system (K\_U12, K\_U17, K\_K02, K\_K06).

### **THE STUDENT WORKLOAD:**

The student workload is 90 hours, including participation in lectures 15 hours (9\*) and Project 15 (18\*) hours, to prepare for classes and study reports on the projects 20 (30\*) hours, to prepare for the exam 20 (20\*) hours and consultants to prepare the project for 15 hours.  
\* - Part – time study.

### **PRIMARY LITERATURE:**

1. Banaszak Z., Kłos S., Mleczko J., Zintegrowane systemy zarządzania, PWE, 2011,
2. Flasiński M., Zarządzanie projektami informatycznymi. Wydawnictwo Naukowe PWN, Warszawa, 2006,
3. Januszewski A., Funkcjonalność informatycznych systemów zarządzania. Tom 1. Zintegrowane systemy transakcyjne. PWN. Warszawa, 2008.
4. Januszewski A., Funkcjonalność informatycznych systemów zarządzania. Tom 2. Systemy Business Intelligence. PWN. Warszawa, 2008.
5. Szmit M., Informatyka w zarządzaniu. Wydawnictwo DIFIN, Warszawa, 2003.

## COMPUTER AIDED ENGINEERING WORK

Course code:

Type of course: compulsory

Language of instruction: english

Director of studies: prof. dr hab. Taras Nahirny

Name of lecturer: prof. dr hab. T. Nahirny

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					3
Lecture	15	1	VII	Grade	
Project	30	2		Grade	
<b>Part-time studies</b>					
Lecture	9	1	VII	Grade	
Project	9	1		Grade	

### **COURSE AIM:**

Provide basic knowledge and skills students acquire and competence in the field of computer-aided management, which will be used to continue the learning process and useful in their future careers.

### **ENTRY REQUIREMENTS:**

Fundamentals of computer science, production management and services.

### **COURSE CONTENTS:**

**Content of the lecture.** Classification and structure of management information systems. General principles and theoretical basis of systems. Areas of application ZSI. Principles for design and implementation of the SI. Enterprise management systems: systems MRP, MRP II, ERP. General characteristics of the available packages. Basic management information processes and methods used in ZSI. Electronic commerce: the electronic characteristics of the market and how to create an electronics store. The integrity and security of data in information systems management.

**The project:** to develop individual and group projects relating to:

- stock on hands, cash flow analysis, material flow documents, offers and sales orders from CRM module, service personnel and payroll module, service offices and bank accounts,

technical preparation of production, design and technological data, creating and maintaining an online shopping.

#### TEACHING METHODS:

Conventional lecture.

Project - Individual and group work with students of literature and lecture notes

#### LEARNING OUTCOMES:

Symbol of course learning outcomes	Learning outcomes (knowledge, abilities, competences)	With reference to learning outcomes in education area within technical sciences
K_W01	The student has knowledge of computer-aided management useful for formulating and solving simple problems related to Management and Production Engineering.	T1A_W01
K_W17	The student has ordered the general knowledge in the basics of customer relationship management, integrated information systems, e-commerce related to Management and Production Engineering.	T1A_W03
K_W36	The student has knowledge of the development trends and new developments in the field of computer-aided management of Production Engineering.	T1A_W05
K_U01	Students can obtain information from literature, databases and other sources, to make their interpretations and draw conclusions and formulate opinions.	T1A_U01
K_U11	Students can use the selected computer-aided management systems in the related Management and Production Engineering	T1A_U07
K_K01	The student understands the need for learning throughout life.	T1A_K01

#### LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

**Lecture:** pass the assessment. Rating issued on the basis of a written exam covering basic knowledge verification issues (K\_W01, K\_W17, K\_W36)

**Project:** pass the assessment. Rating is determined based on skills assessment component of the implementation of project tasks (K\_U01, K\_U11, K\_K01) and preparation of a report and store as a "defense" by the student report (K\_W01).

#### STUDENT WORKLOAD:

The student workload of 75 hours, including participation in lectures 15 (9 \*) hours, participation in project activities 30 (9 \*) hours, preparation for classes 5 (15 \*) hours, the development of the project 15 (25 \*) hours, to know the literature 10 (17 \*) hours.

\* - Part-time studies

#### RECOMMENDED READING:

1. Adamczewski P. Zintegrowane Systemy Informatyczne w Praktyce, MIKOM, Warszawa, 2003
2. Lech P.: Zintegrowane systemy zarządzania ERP/ ERP II: Wykorzystanie w biznesie, wdrażanie, W-wo Difin, Warszawa, 2003

#### OPTIONAL READING:

1. Noris M., West S.: E-biznes, WKL, Warszawa, 2001

## LOGISTICS

Course code: 06.9-WM-ZIP-P-40\_14W\_pNadGenNA72M

Type of course: compulsory

Language of instruction: english

Director of studies: Dr hab. inż. Justyna Patalas-Maliszewska,  
prof. UZ

Name of lecturer: Dr hab. inż. Justyna Patalas-Maliszewska,  
prof. UZ

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					5
Lecture	30	2	3	Exam	
Class	30	2		Grade	
<b>Part-time studies</b>					
Lecture	18	2	3	Exam	
Class	18	2		Grade	

### **COURSE AIM:**

The main result of this course is to know the essence of logistics management in the enterprise, and the methods and tools for logistics management

### **ENTRY REQUIREMENTS:**

Mathematics, Economics

### **COURSE CONTENTS:**

Definitions of logistics, business logistics management process, identification of business processes in the enterprise, logistics network - constraints, the objective function. Logistics system in the enterprise. Logistics magazine - a minimum level of ordering, controlling warehouse (indicators), FIFO, LIFO, average cost method. ERP systems - MRP, MRP II, ERP, ERP II. Trends in the development of integrated management systems, examples of applications. Logistics of production processes - forms of organization of production, linear regression, least squares method, Gantt schedule, critical path method

(CPM), Method PERT (Programme Evaluation and Review Technique), Gantt chart, the production function. Logistics distribution processes - Distribution Requirements Planning. Logistics customer service processes - analysis by ABC customers. New trends in logistics: e-business, B2B, B2C, virtual enterprises

Class:

- Creating logistics network - constraints, the objective function
- Formulating a minimum level of ordering
- Controlling warehouse (indicators)
- Calculation FIFO, LIFO, average cost method
- Calculation MRP
- linear regression
- least squares method
- Gantt schedule
- critical path method (CPM)
- method PERT (Programme Evaluation and Review Technique)
- Distribution Requirements Planning
- analysis by ABC customers
- e-business, B2B, B2C, virtual enterprises

**TEACHING METHODS:**

Lecture, classes

**LEARNING OUTCOMES:**

<b>Symbol of Learning Outcomes</b>	<b>Learning (knowledge, competences)</b>	<b>Outcomes abilities,</b>	<b>Symbol of Learning Outcomes in technical science</b>
K_W20	Student has ordered knowledge of the logistics according with the Management and Production Engineering		T1A_W03
K_W36	Student has knowledge on new trends in the field of of integrated management systems, the ERP systems, B2B, B2C		T1A_W05
K_W39	Student knows the basic methods, techniques, tools used to solve simple engineering tasks: ABC, CPM, PERT, DRP.		T1A_W07
K_U14	Student is able to select and apply appropriate methods to solve the optimization of engineering tasks related to Management and Production Engineering: ABC, CPM, PERT, DRP		T1A_U09
K_U22	Student is able to formulate the		T1A_U10

	requirements for logistics network design	
K_K04	Student is able to determine the priorities for the tasks – he is able to built Gantt schedule, CPM, PERT.	T1A_K04

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**

**Lecture:** exam

Evaluation of the results of the written exam covering knowledge of the content of the subject (T1A\_W03, T1A\_W05, T1A\_W07).

**Class:** grade

Evaluation of the results of the written 2 tests (K\_U14, K\_U22).

**STUDENT WORKLOAD:**

Student workload 137 (126\*) hours, lecture 30 (18\*) hours, classes 30 (18\*) hours, Consultation 15 (18\*) hours, prepare for the lecture 2 (2\*) hours, prepare for the classes 30 (30\*) hours, prepare for the exam 15 (20\*) hours, prepare for the test 15 (20\*) hours.

\* – part-time

**RECOMMENDED READING:**

1. Emmett S., Crocker B., Excellence in Supplier Management, Liverpool Academic Press, 2009
2. Emmett S., A Quick Guide to a Systems View of the Supply Chain, Liverpool Academic Press 2012
3. Al-Mashari M., Al-Mudimigh A., Zairi M., ERP: A taxonomy of critical factors, European Journal of Operational Research, 2003, pp. 352-364.
4. Davenport T.H., Mission Critical: Realizing the Promise of Enterprise Systems, Harvard Business Review Press, 2000
5. Kumar V., Maheshwari B., Kumar B., Enterprise resource planning systems adoption process: a survey of Canadian organizations. International Journal of Production Research 2002; vol. 40: 509-523

**OPTIONAL READING:**

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**REMARKS:**

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## **FUNDAMENTALS OF MARKETING**

Course code: 06.9-WM-ZIP-P-22\_14P\_pNadGenDPW9F

Type of course: compulsory

Language of instruction: English

Director of studies: Dr hab. inż. Justyna Patalas-Maliszewska,  
prof. UZ

Name of lecturer: Dr hab. inż. Justyna Patalas-Maliszewska,  
prof. UZ

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					3
Lecture	15	1	3	Grade	
Project	15	1		Grade	
<b>Part-time studies</b>					
Lecture	20	2	3	Grade	
Project	10	1		Grade	

### **COURSE AIM:**

The main result of this course is to know the elements of marketing, marketing management, and the essence of building a marketing plan as a necessary element of the business plan

### **ENTRY REQUIREMENTS:**

Economics

### **COURSE CONTENTS:**

Course provides a comprehensive approach of theory of marketing, strategic and operational marketing. The steps and procedures of marketing management. Marketing mix: product - the product life cycle, offer positioning, market segmentation, the benefits of buying the product, the concept of range, the steps of introducing new products, the concept of brand positioning and repositioning, price - pricing strategies, , types of prices, price calculation, distribution - distribution channels, types of distribution, distribution systems, promotion - advertising, packaging, sales promotion, public relations, publicity, propaganda,

personal selling, promotion. The marketing information process: market research methods - interviews, observations, questionnaires, surveys, etc., Support system marketing decisions. Marketing plan in the business plan - market analysis, the project schedule, SWOT analysis, analysis of resources.

The project: Marketing plan in the business plan for a new company - market analysis, the project schedule, SWOT analysis, analysis of resources

**TEACHING METHODS:**

Lecture, project

**LEARNING OUTCOMES:**

<b>Symbol of Learning Outcomes</b>	<b>Learning Outcomes (knowledge, abilities, competences)</b>	<b>Symbol of Learning Outcomes in technical science</b>
K_W17	Student has ordered a general knowledge in the basics of marketing related to the management and production engineering.	T1A_W03
K_W18	Student knows marketing theory, can distinguish between strategic and operational marketing. Student can explain the marketing management process.	T1A_W04
K_W38	Student can define the life cycle of products, distinguish phases in the life cycle of the product, explain the critical point in the life cycle of products	T1A_W06
K_W41	Student has an elementary knowledge of the business - can determine the scope of the project, identify the marketing team skills, build a marketing strategy for the business plan	T1A_W09
K_W43	Student has ordered a general knowledge in the individual entrepreneurship	T1A_W11
K_U01	Student can obtain information from literature, databases and other sources for the purpose of marketing research: can integrate them, to make their interpretations and formulate conclusions	T1A_U01
K_U03	Student is able to work independently and in a team, can create a marketing team, can manage a small team, establish roles and responsibilities in the team	T1A_U03
K_U06	Student is able to prepare and present presentation about marketing plan in Polish or English	T1A_U04
K_K03	Student is able to work in a group together and to adopt different roles in a marketing team	T1A_K03
K_K04	Student is able to determine the priorities for the tasks in the marketing formulation process	T1A_K04
K_K06	Student is able to be entrepreneurial	T1A_K06

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:****Lecture:** grade

Evaluation of the results of the written test covering knowledge of the content of the subject (K\_W17, K\_W18).

**Project:** grade

Evaluation of the results of the project and making presentation (K\_U01, K\_U03, K\_U04), (K\_U06)

**STUDENT WORKLOAD:**

Student workload 95 (85\*) hours, lecture 15 (20\*) hours, project 15 (10\*) hours, Consultation 20 (10\*) hours, prepare for the project 15 (15\*) hours, prepare for the presentation 15 (15\*) hours, prepare for the test 10 (10\*) hours, literature study 5 (5\*) hours.

\* – part-time

**RECOMMENDED READING:**

1. Drucker, P. (1994). 'The theory of the business'. Harvard Business Review, September–October
2. Hamel, G. and Prahalad, C. K. (1994). Competing for the Future. Boston, MA: Harvard Business Press
3. See Miller, A. and Dess, G. (1993). 'Assessing Porter's 1980 model in terms of its generalisability, accuracy and simplicity'. Journal of Management Studies, 30/4: 553–85

**OPTIONAL READING:**

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**REMARKS:**

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## **FUNDAMENTALS OF ENGINEERING DESIGN I**

Course code: 06.9-WM-ZIP-P-34\_14W\_pNadGenL56V4

Type of course: Compulsory

Language of instruction: english

Director of studies: Dr inż. Wojciech Babirecki

Dr inż. Wojciech Babirecki,

Name of lecturer: Dr hab. inż. Michał Szaśiadek, prof. UZ

Dr inż. Tomasz Belica

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					5
Lecture	15	1	IV	Exam	
Project	30	2		Grade	
<b>Part-time studies</b>					
Lecture	18	2	IV	Exam	
Project	18	2		Grade	

### **COURSE AIMS:**

Provide Basic knowledge of engineering design. To familiarize students with the identification of components and machine parts, general knowledge of the construction and operation of the equipment and components such as: connections, couplings, gears, springs, bearings, etc. Another aim of the course is to learn the basic principles of calculation and design of basic machine elements.

### **PREREQUISITES:**

Engineering Graphics, Mechanics, Strength of Materials, Computer Aided Design, Materials Science

### **COURSE CONTENTS:**

**Lecture content.** Basic definitions and terms. Models of the design and construction process. The rules of construction. Standardization, typification and unification of parts and assemblies. The rational selection of materials. Efficient construction parts. Contemporary models of design process. Concurrent engineering. The main differences between concurrent and the "traditional" model of the design process. Cost, quality and time in concurrent design. Catalogs relative costs. Connections: welded, riveted, press, keyway, spline, pin, bolt, wedge, screw - construction rules, calculations. Rules for selection of all types of connectors. Advantages and disadvantages of each model. Supporting structures. Tasks of springs, construction, principle of operation. Bearings. Types of bearing selection, bearing shafts. Axles and

shafts. Retaining elements, seals. Screw mechanisms. Types of screw mechanisms, principle of operation, construction. Couplings and brakes. Tasks couplings and brakes. Types, construction, working principle couplings and brakes. Gears, belt drives, chain. Types of gears. Construction and operation. Advantages and disadvantages, design features. Rules practical use of theoretical knowledge in the implementation of a project weldment.

**Project:** In class project, students in groups of two-man realize weldment design. This design is a pressure vessel. Issues performed in the classroom include:

- Determining the main dimensions of the pressure vessel; preliminary selection of design details - making a sketch
- The calculation of the cylindrical pressure vessel and bottoms,
- Selection of materials for a cylindrical and bottoms,
- Calculation of strengthening holes in the shell of the pressure vessel and bottoms,
- Preparation of design documentation of the pressure vessel,

**TEACHING METHODS:**

**Lecture content:** lecture, demonstration.

**Project:** group work, discussion, brainstorming, exchange ideas, work at the computer.

**LEARNING OUTCOMES:**

Symbols of field specific learning outcomes	Field specific learning outcomes	Symbols of discipline specific learning outcomes
K_W09	Student has an elementary knowledge of the principles of workplace design and mechanical equipment constructions	T1A_W02
K_W21	Student has ordered, encouraged by the general knowledge theory, covering key issues in the Fundamentals of Engineering Design	T1A_W03
K_U01	Student can obtain information from literature, databases and other sources, in English or another foreign language; able to integrate the information, make their interpretation, as well as draw conclusions and formulate and justify opinions	T1A_U01
K_U25	Student is able to identify and formulate the specification of simple engineering tasks of practical, in the field of Engineering Design Fundamentals	T1A_U14
K_U24	Students can set according to the design specifications of a simple device, in the field of Engineering Design Fundamentals, using appropriate methods, techniques and tools	T1A_U16

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**

**Lecture content:** Exam,

In order to obtain a positive evaluation is to achieve at least 60% of the marks possible (K\_W09, K\_W21).

**Project:** Completion of the assessment.

Completion of the course is done by the project. (K\_U24), with using appropriate methods and techniques (K\_U24). During the project, students have to identify a simple engineering tasks (K\_U25). To achieve it, it is necessary to obtain relevant information from the literature (K\_U01).

**STUDENT WORKLOAD:**

The student workload is 125 hours, including: Lecture content 15 (18\*) hours, work on the project activities 30 (18\*) hours, preparation for classes 10 (15\*) hours, development project 30 (35\*) hours, exam preparation 5 (10\*) hours, consultations 18 (8\*) hours, exam 2 (2\*) hours, read the literature 15 (19\*) hours.

\* - part-time studies

**RECOMMENDED READING:**

1. M. Dietrich, red., PKM – tom I, II, III, WNT, Warszawa 1999,
2. L. W. Kurmaz, PKM – projektowanie, PWN, Warszawa 1999,
3. R. Knosala, A. Gwiazda, A. Baier, P. Gendarz, PKM – przykłady obliczeń, WNT, Warszawa 2000,
4. W. Juchnikowski, J. Żółtowski, PKM pomoce do projektowania z atlasem, oficyna wydawnicza Politechniki Warszawskiej, Warszawa 1990.

**OPTIONAL READING:**

1. K. Szewczyk, Połączenia gwintowe, PWN, Warszawa 1991,
2. K. Ferenc, J. Ferenc, Konstrukcje spawane – projektowanie połączeń, WNT, Warszawa 2000,
3. A. Biegus, Połączenia śrubowe, PWN, Warszawa 1997,

## **FUNDAMENTALS OF ENGINEERING DESIGN II**

Course code:

Type of course: Compulsory

Language of instruction: english

Director of studies: Dr inż. Wojciech Babirecki

Dr inż. Wojciech Babirecki

Name of lecturer: Dr hab. inż. Michał Szaśniadek, prof. UZ

Dr inż. Tomasz Belica

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					2
Project	30	2	V	Grade	
<b>Part-time studies</b>					
Project	18	2	V	Grade	

### **COURSE AIMS:**

Aim of the course is to learn the basic principles of calculation and design of basic machine components (perform a engineering project: a screw mechanism, the transmission)

### **PREREQUISITES:**

Fundamentals of engineering design I, Engineering Graphics, Mechanics, Strength of Materials, Computer Aided Design, Materials Science

### **COURSE CONTENTS:**

#### ***Issues of project activities:***

In class project, students in groups of 2-person carry out the project screw mechanism. This is a car jack. Issues carried out on individual classes are as follows:

- Determination of the main design features: core diameter of the screw, thread selection, calculations nut, calculation of the efficiency of the screw mechanism,
- geometric calculations,
- designing a structural elements of mechanism and their connections,
- development of design documentation

**TEACHING METHODS:**

**Project:** group work, discussion, brainstorming, exchange ideas, work at the computer.

**LEARNING OUTCOMES:**

Symbols of field specific learning outcomes	Field specific learning outcomes	Symbols of discipline specific learning outcomes
K_W09	Student has an elementary knowledge of the principles of workplace design and mechanical equipment constructions	T1A_W02
K_U01	Student can obtain information from literature, databases and other sources, in English or another foreign language; able to integrate the information, make their interpretation, as well as draw conclusions and formulate and justify opinions	T1A_U01
K_U25	Student is able to identify and formulate the specification of simple engineering tasks of practical, in the field of Engineering Design Fundamentals	T1A_U14
K_U24	Students can set according to the design specifications of a simple device, in the field of Engineering Design Fundamentals, using appropriate methods, techniques and tools	T1A_U16

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**

**Project:** Completion of the assessment.

Completion of the course is done by the project. (K\_U24), with using appropriate methods and techniques (K\_U24). During the project, students have to identify a simple engineering tasks (K\_U25). To achieve it, it is necessary to obtain relevant information from the literature (K\_U01).

**STUDENT WORKLOAD:**

The student workload is 50 hours, including: work on the project activities 30 (18\*) hours, development project 15 (20\*) hours, exam preparation 5 (10\*) preparation for classes 5 (12\*) hours.

\* - part-time studies

**RECOMMENDED READING:**

1. M. Dietrich, red., PKM – tom I, II, III, WNT, Warszawa 1999,
2. L. W. Kurmaz, PKM – projektowanie, PWN, Warszawa 1999,
3. R. Knosala, A. Gwiazda, A. Baier, P. Gendarz, PKM – przykłady obliczeń, WNT, Warszawa 2000,
4. Juchnikowski, J. Żółtowski, PKM pomoce do projektowania z atlasem, oficyna wydawnicza Politechniki Warszawskiej, Warszawa 1990

**OPTIONAL READING:**

1. K. Szewczyk, Połączenia gwintowe, PWN, Warszawa 1991,
2. A. Biegus, Połączenia śrubowe, PWN, Warszawa 1997,

## **MANUFACTURING PROCESSES**

Course code: 06.9-WM-ZIP-P-13\_14W\_pNadGenWTPDC

Type of course: Compulsory

Language of instruction: english

Director of studies: dr inż. Julian Jakubowski

Name of lecturer: dr inż. Julian Jakubowski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					4
Lecture	30	2	V	Exam	
Laboratory	30	2		Credit with a grade	
<b>Part-time studies</b>					
Lecture	18		V	Exam	
Laboratory	18			Credit with a grade	

### **COURSE AIM**

Skills and competences in range: designing of technological processes, productive systems as well as the productive processes; the choice of process and the technology in dependence on: material, shape, function and the size of productions

### **ENTRY REQUIREMENTS**

Basic knowledge about manufacturing technique, materials, metrology, engineering graphics

### **COURSE CONTENTS:**

Topics: theories of production process, manufacturing process, technological process, surroundings of production process, the productiveness, product. Classifications of production processes. Production system and its organization. Manufacturing process planning. Factory layout planning and analysis walk path planning. Product and its feature: functional, usable, trade. Quality computer aided assurance. Computer aided manufacturing, numerical control, direct numerical control. Tooling, equipment, fixtures development. Computer integrated manufacturing (CIM). The Sheer's concept of information flow. Process simulation tools. Chosen examples of processes in different

fields of technique. The form of organization of technological process and productive (the team technology). Technological specialisation and objective. FMS. The functional structure of productive process - the examples. Planning of technological process. The process of development of new product and the technology. Standardization, ISO 10303 norm. Virtual production. Elements of bill of costs. Traditional and integrated cycle of product development. Modern technologies in production systems. Assembly process design. Planning process: sizes of production, efficiency. Rapid tooling, rapid prototyping, rapid manufacturing.

## TEACHING METHODS

Lecture – aided by multimedia presentations, laboratory – using CAM systems

## LEARNING OUTCOMES:

Reference to direction outcomes	Description of learning outcomes	Reference to outcomes for technical science range
<b>Knowledge</b>		
K_W10; K_W21 K_W29	Has systematic knowledge of the production processes - continuous and discrete. Can apply the appropriate terminology for the description of technological processes and production. Understand the structure of processes. Can classify production processes in according to various criteria. Can choose the appropriate process due to process function, shape and material of the product.	T1A_W03 T1A_W02
K_W21 K_W22	Presents ways of organization and forms of production flow, optimize the production processes and the necessary documentation related to the flow of production.	T1A_W04
K_W36	Explains the need and ways of improvement of processes.	T1A_W05
<b>Skills</b>		
K_U11 K_U21 K_U31	Can plan the technological process of production and mechanical engineering with the use of computer assisted tools.	T1A_U07 T1A_U13
K_U27	Can create and use the documentation related to the flow of production (serial, unit of mass).	T1A_U15
<b>Social competences</b>		
K_K03	Can interact in a group in terms of a comprehensive development process.	T1A_K03

## LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA

Lecture: exam in writing form which includes verification of knowledge presented in the course of the lecture content (K\_W10; K\_W21, K\_W22, \_W29, K\_W36)

laboratory: on the basis of studies carried out evaluations of components of technological processes (K\_U11, K\_U21) and presentation of the project for the selected product (K\_27, K\_U21; K\_K03).

Lecture – Exam.

Laboratory – credit with a grade. Credits are awarded on the basis of attendance, participation in classroom activities and project presentation.

Final grade: 0,5L+0,5E

**STUDENT WORKLOAD:**

The amount of total student workload: 127 hours

Contact hours: 67 hours (including 30 hours of participation in lectures, 30 hours of laboratory classes, 5 hours of consultations, a 2-hour exam) their own working hours: 60 hours (preparing for classes, mastering the CAM system, to elaborate final draft process of 35 hours, 25 hours of exam).

**RECOMMENDED READING:**

Feld M. *Projektowanie procesów technologicznych* WNT 2004.

Erbel i inni *Encyklopedia technik wytwarzania* cz. I i II. WNT 2005.

Pająk Edward, *Zarządzanie produkcją. Produkt, technologia, organizacja* Wydawnictwo naukowe PWN, 2006

Pająk Edward, *Zaawansowane technologie współczesnych systemów produkcyjnych*, Wydawnictwo Politechniki Poznańskiej, Poznań 2000.

Józef Matuszek, *Inżynieria produkcji*, Bielsko-Biała 2000

Durlik I., *Inżynieria zarządzania. Strategia i Projektowanie systemów produkcyjnych*. T.1 i 2. Gdańsk, Agencja wydawnicza PLACET 2004.

Tomaszewski Z., *Wprowadzenie do techniki*. Wyd. Politechniki Poznańskiej, Poznań 2002.

**OPTIONAL READING:**

Weiss Z.: *Techniki komputerowe w przedsiębiorstwie*. Poznań, Wydawnictwo Politechniki Poznańskiej 1998

Honczarenko J., *Elastyczna automatyzacja wytwarzania*. WNT 2000.

Plichta J. Plichta S. – *Komputerowo zintegrowane wytwarzanie*. Koszalin 1999.

Matuszek J., *Inżynieria produkcji*, Bielsko-Biała 2000.

Karpiński T. *Inżynieria produkcji*. WNT, W-wa 2004.

## **STRATEGIC MANAGEMENT**

Course code: 06.9-WM-ZIP-D-01\_15Ć\_pNadGenBDHPO

Type of course: compulsory

Language of instruction: English

Director of studies: Dr hab. inż. Justyna Patalas-Maliszewska,  
prof. UZ

Name of lecturer: Dr hab. inż. Justyna Patalas-Maliszewska,  
prof. UZ

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					3
Lecture	15	1	1	Grade	
<b>Class</b>	15	1		Grade	
<b>Part-time studies</b>					
Lecture	9	1	1	Grade	
<b>Class</b>	9	1		Grade	

### **COURSE AIM:**

The main result of this course is to know the methods and tools of strategic analysis, requirements for formulation and implementation strategy, and the essence of enterprise development strategy

### **ENTRY REQUIREMENTS:**

Marketing, Economics

### **COURSE CONTENTS:**

Course provides a comprehensive approach of strategic analysis and strategy formulation for the company. The concept, origin and development of strategic management, stages of strategic management, strategic planning methodology, selection of methods and tools of strategic analysis: analysis of the environment further and closer (benchmarking method, the method of Porter's five forces, PEST method), analysis of the potential of the company (product life cycle methods portfolio: McKinsey matrix, matrix Hofer'a, BCG matrix, SWOT analysis, strategic balance), analysis of SPACE. The

company's competitive advantage: the key competencies, competition in the sector, the map of strategic groups, concept clusters, offering strategic alliances for the company. Strategic analysis of information sources: building and protection of strategic information system in the enterprise. The process of formulation and implementation of strategy.

Class:

- analysis of the environment further and closer (benchmarking method, the method of Porter's five forces, PEST method),
  - analysis of the potential of the company (product life cycle methods portfolio: McKinsey matrix, matrix Hofer'a, BCG matrix, SWOT analysis, strategic balance),
  - analysis of SPACE,
- company's competitive advantage: the key competencies, competition in the sector, the map of strategic groups, concept clusters, offering strategic alliances for the company

#### TEACHING METHODS:

Lecture, classes

#### LEARNING OUTCOMES:

Symbol of Learning Outcomes	Learning Outcomes (knowledge, abilities, competences)	Symbol of Learning Outcomes in technical science
K_W08	Student has structured and theoretically knowledge in the field of strategic management, in particular: - The role of business strategy and its types, - Preparation of a strategic plan, - Methods of portfolio - An integrated strategic management process	T2A_W03
K_W14	Student has structured knowledge in the field of knowledge management. He is able to define the strategy formulation stages, to interpret the results of strategic analysis.	T2A_W04
K_W16	Student has structured knowledge in the field of management trends: company's competitive advantage: the key competencies, competition in the sector, the map of strategic groups, concept clusters, offering strategic alliances for the company.	T2A_W05
K_W19	He is able to define and to analyse the environment further and closer (benchmarking method, the method of Porter's five forces, PEST method).	T2A_W08
K_U01	He is able to obtain the information from literature, databases and other sources for the purpose of strategic analysis.	T2A_U01
K_U04	Student is able to acquire, integrate, interpret, draw conclusions based on literature, databases and other modern means of communication, such as an analysis of competition by benchmarking.	T2A_U10
K_U08	Student is able to fluently communicate using a variety of techniques in the scientific community and in other communities, also in English or another foreign language considered as a language of international communication in Management and Production Engineering.	T2A_U02
K_K02	Student is aware of the importance and understanding of the effects of non-technical aspects and engineering	T2A_K02

	activities, including responsibility for decisions - can argue strategic decisions	
K_K06	Student is able to think entrepreneurial - to formulate a strategy for the company	T2A_K06

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**

**Lecture:** grade

Evaluation of the results of the written test covering knowledge of the content of the subject (K\_W08, K\_W14, K\_W16, K\_W19).

**Class:** grade

Evaluation of the results of the written test ((K\_U01, K\_U04, KU08).

**STUDENT WORKLOAD:**

Student workload 105 (75\*) hours, lecture 15 (9\*) hours, classes 15 (9\*) hours, Consultation 30 (18\*) hours, prepare for the test 15 (15\*) hours, prepare for the classes 15 (15\*) hours, literature study 15 (9\*) hours.

\* – part-time

**RECOMMENDED READING:**

1. Drucker, P. (1994). 'The theory of the business'. Harvard Business Review, September–October
2. Hamel, G. and Prahalad, C. K. (1994). Competing for the Future. Boston, MA: Harvard Business Press
3. See Miller, A. and Dess, G. (1993). 'Assessing Porter's 1980 model in terms of its generalisability, accuracy and simplicity'. Journal of Management Studies, 30/4: 553–85

**OPTIONAL READING:**

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**REMARKS:**

## **PRODUCTION AND SERVICES MANAGEMENT**

Course code: 06.9-WM-ZIP-P-33\_14P\_pNadGen7FIF0

Type of course: compulsory

Language of instruction: english

Director of studies: Prof. dr hab. T. Nahirny

Name of lecturer: Prof. dr hab. T. Nahirny,

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					5
<b>Lecture</b>	30	2	V	Exam	
<b>Class</b>	30	2		Grade	
<b>Part-time studies</b>					
<b>Lecture</b>	18	2	V	Exam	
<b>Class</b>	18	2		Grade	

### **COURSE AIM:**

Transfer and consolidate the basic knowledge and skills students acquire and competence in the field of production management and services, which will be used in the further process of education and useful in their future careers.

### **ENTRY REQUIREMENTS:**

Macro-and microeconomics. Introduction to engineering production. Finance and accounting. Fundamentals of Management.

### **COURSE CONTENTS:**

**Content of the lecture.** Basic business management, provision of services and the manufacture of products, usually 5P management, basic business management and financial management, border point of profitability. Traditional and concurrent product development process. Managing diversity range of products, materials and inputs. Figure revenue-contribution method of Pareto-ABC, Iszikawa diagram. Value analysis. Quality, cost of quality, total quality management, FMEA. Reliability, measurement reliability, the reliability of the system. Products, services and strategies to combat competition. The life cycle of the product. Location enterprises, the factors

affecting the choice of location: distributing objects and jobs, analysis of the sequence of operations course. Principles of designing pipelined line, line balancing method. The choice of production equipment, technical specifications, concepts of economic evaluation, operational service, rules of organization of repairs, curve bath. The organization of production, production design flow, benchmarking, pipelined line balancing, production flow analysis. Statistical process control production control cards, pick random. Control of core business functions, computer aided control. Forecasting, basic techniques. Production capacity management and planning calendar scheduling the operation and allocation of work. Inventory management, independent and dependent demand, supply security, material specification and the graph structure of the product, the method of reduction of inventories of materials. Systems, production planning and control MRP, MRP II, ERP System "Just-in-Time" and kanban, OPT and bottlenecks. Managing projects, technology and demand equilibrium line material. Supplies, objectives and policies, organizing supplies, evaluation of suppliers.

**Topics exercises.** Border point of profitability. Figure revenue-contribution method of Pareto-ABC, Iszikawa diagram. Value analysis. FMEA. Reliability, measurement reliability, the reliability of the system. Products, services and strategies to combat competition. The life cycle of the product. Company location - factors affecting the choice of location, placement of objects and jobs, the analysis of the course of the operation order. Principles of designing pipelined line, line balancing method. Process management service, rules of organization of repairs and renovations. Statistical process control production control cards, pick random. Forecasting, basic techniques. Inventory management, independent and dependent demand, supply security, material specification and the graph structure of the product, the method of reduction of inventories of materials.

#### TEACHING METHODS:

Conventional lecture.

Classes: presentation, roundtable discussion and exchange of ideas.

#### LEARNING OUTCOMES:

Symbol of course learning outcomes	Learning outcomes (knowledge, abilities, competences)	With reference to learning outcomes in education area within technical sciences
K_W17	Student has ordered, encouraged by a general theoretical knowledge covering key issues in the field of production management and services	T1A_W03
K_W37 K_W38	student has a basic knowledge of the life cycle of equipment, facilities, and technical systems	T1A_W06
K_W41	student has a basic knowledge of management, including quality management	T1A_W09
K_U01 K_U10	Students can obtain information from the literature and other carefully selected sources, integrate the information, make their interpretations and draw conclusions for the management of manufacturing and service	T1A_U01
K_U20	Students can make a preliminary economic analysis undertaken activities and production management services	T1A_U12
K_U27	Student is able to evaluate the usefulness of routine methods for the production management characteristics and services to solve simple tasks of practical engineering	T1A_U15
K_K01	The student understands the need for learning throughout life	T1A_K01
K_K06	Student is able to think and act in an entrepreneurial manner	T1A_K06

### **LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**

**Lecture:** exam. Rating issued on the basis of a written exam covering basic knowledge verification issues (K\_W17, K\_W38, K\_W41, K\_K06)

**Exercise:** credit for an evaluation.

Rating is determined based on skills assessment component of the implementation of project tasks (K\_U01, K\_U20, K\_U27, K\_K06) and preparation of a report and store as a "defense" by the student report (K\_K01).

### **STUDENT WORKLOAD:**

The student workload of 125 hours, including participation in lectures 30 (18 \*) hours, participation in class instructions 30 (18 \*) hours, consultations 3 (3 \*) hours, exam 2 (2 \*) hours, to prepare for classes 30 (40 \*) hours, to prepare for the exam 10 (10 \*) hours, to prepare for the test 10 (10 \*) h-not acquainted with the literature 10 (24 \*) hours.

\* - Part-time studies

### **RECOMMENDED READING:**

1. Muhlemann A.P., Oakland J.S., Lockyer K.G., Zarządzanie produkcją i usługami, WNT, Warszawa, 1997
2. Matuszek J., Inżynieria Produkcji. Skrypt Politechnika Łódzka, 2000.
3. Durlik I., Inżynieria Zarządzania. Strategia i Projektowanie Systemów Produkcyjnych T. 1 i 2. Agencja Wydawnicza Placet, 2004.

### **OPTIONAL READING:**

1. Duraj J., Podstawy Ekonomiki Przedsiębiorstwa, Polskie Wydawnictwo Ekonomiczne 2000.
2. Jonson R., Chambers S., Harland Ch., Harrison A., Slack N., Zarządzanie działalnością operacyjną. Analiza przypadków.
3. Dwiliński L.: Zarządzanie produkcją. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa, 2002.
4. Brzeziński M. (red.), Organizacja i sterowanie produkcją, Placet, Warszawa, 2002
5. Waters D., Zarządzanie operacyjne : towary i usługi Warszawa, PWN, 2001.

## **PRODUCTION AND SERVICES MANAGEMENT II**

Course code: 06.9-WM-ZIP-D-14\_15W\_pNadGen8QFWB

Type of course: optional

Language of instruction: english

Director of studies: prof. dr hab. T. Nahirny

Name of lecturer: prof. dr hab. T. Nahirny

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
<b>Full-time studies</b>					3
<b>Lecture</b>	15	1	I	Grade	
<b>Project</b>	15	1		Grade	
<b>Part-time studies</b>					
<b>Lecture</b>	9	1		Grade	
<b>Project</b>	9	1		Grade	

### **COURSE AIM:**

Transmission and strengthening basic knowledge of production management and services, which will be used in the further process of education and useful in their future careers.

### **ENTRY REQUIREMENTS:**

Production systems organization. Project and innovation management.

### **COURSE CONTENTS:**

**Content of the lecture.** Basic business management, rules management, basic business management and financial management, a border profitability. Traditional and concurrent product development process. Diversity management: revenue chart - the contribution Pareto-ABC method, Ishikawa diagram. Value analysis. Quality, total quality management, FMEA. Product and system reliability. The life cycle of the product. Area businesses, deploying and jobs, analyze the course of the operation order. Designing pipelined, a method of balancing the line. Operational support of production equipment, the principles of the organization of repairs. Designing the production flow, benchmarking, pipelined line balancing. Statistical process control production control cards and receive random. Computer-aided control of the core business. Basic techniques

for forecasting. Planning Calendar, scheduling the operation and allocation of work. Inventory management, independent and dependent demand, material specification and the structure of the product, inventory reduction in material ways. Systems, production planning and control MRP, MRP II, ERP, "Just-in-Time", kanban, OPT. Projects management, material requirements planning. Supply, evaluation of suppliers.

**Project.** Topics include design issues: SWOT Analysis, Cut-point profitability. Figure revenue-contribution method of Pareto-ABC, Ishikawa diagram. Value analysis. FMEA. Principles of designing pipelined line, line balancing method. Process management service, rules of organization of repairs and renovations. Quality control charts.

#### TEACHING METHODS:

Conventional lecture.

Project: presentation, roundtable discussion and exchange of ideas.

#### LEARNING OUTCOMES:

Symbol of course learning outcomes	Learning outcomes (knowledge, abilities, competences)	With reference to learning outcomes in education area within technical sciences
K_W12	The student has structured and theoretically founded knowledge in the organization of production systems.	T2A_W03
K_W13	The student has structured and theoretically founded knowledge in the field of project management and innovation.	T2A_W03
K_W18	The student knows the basic methods, techniques and tools used in solving complex engineering tasks related to the management of manufacturing and services	T2A_W07
K_U01	Students can obtain information from literature, databases and other sources, integrate them, to make them interpret and critically evaluate and draw conclusions and formulate and sufficiently justify opinions.	T2A_U01
K_U17	The student is able to formulate and solve engineering tasks related to the production engineering and use systems approach taking into account economic aspects	T2A_U10
K_U20	Student is able to assess the usefulness and applicability of the latest techniques and technologies in the field of Management and Production Engineering.	T2A_U12
K_K06	Student is able to think and act in a creative way	T2A_K06

#### LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

**Lecture:** test to assess

Rating issued on the basis of a written test covering basic knowledge verification issues (K\_W12, K\_W13, K\_W18).

**Project:** test to assess

Rating is determined on the basis of evaluation of the component skills to the tasks of design and preparation of a report (K\_U01, K\_U17, K\_U20, K\_K06) and a component of the "defense" by the student progress reports (K\_W13, K\_W18, K\_U20).

#### STUDENT WORKLOAD:

The student workload of 50 hours, including participation in lectures 15 (9 \*) hours, participation in project activities 15 (9 \*) hours, preparation for classes 5 (10 \*) hours, preparing for test 5 (5 \*) hours, to know 10 with the literature (17 \*) hours.

\* - Part-time studies

**RECOMMENDED READING:**

1. Muhlemann A.P., Oakland J.S., Lockyer K.G., Zarządzanie produkcją i usługami, WNT, Warszawa, 1997
2. Matuszek J., Inżynieria Produkcji. Skrypt Politechnika Łódzka, 2000.
3. Durlik I., Inżynieria Zarządzania. Strategia i Projektowanie Systemów Produkcyjnych T. 1 i 2. Agencja Wydawnicza Placet, 2004.

**OPTIONAL READING:**

1. Duraj J., Podstawy Ekonomiki Przedsiębiorstwa, Polskie Wydawnictwo Ekonomiczne 2000.