CATALOGUE OF COURSES

MANAGEMENT AND PRODUCTION ENGINEERING

MASTER'S PROGRAMME

STRATEGIC MANAGEMENT

Course code: MD-01-WM-ZIP

Type of course: Compulsory

Person responsible for the course: Prof. PhD Eng. Justyna Patalas-Maliszewska

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Lecture	15	1	I	Graded credit	
Class	15	1		Graded credit	

COURSE AIM:

The main objective of the course is to provide knowledge on the methods and tools of strategic analysis and the importance of formulation and implementation the development strategy in a company.

ENTRY REQUIREMENTS

Microeconomics, Management Essentials

COURSE CONTENTS:

The course constitutes a comprehensive approach to the critical role of strategic analysis and to the formulation of development strategy for a company. The concept, origin and development of strategic management, stages of strategic management, strategic planning methodology, selection methods and tools of strategic analysis: analysis of a further and closer environment (Benchmarking method, Porter's 5 forces method, the PEST method), the analysis of the company's potentials (product life cycle, portfolio methods: McKinsey Matrix, Hofer's Matrix , BCG Matrix, SWOT analysis, strategic balance), the SPACE analysis. Competitive advantage of a company: core competencies, competition in a given sector, a map of strategic groups, the concept of clusters, offering of strategic alliances for the company. Sources of information for strategic analysis: formation and protection of strategic information system in a company. The process of formulation and implementation of development strategies.
The following issues are included in the curriculum of the class activities:

- the analysis of a further and closer environment:: the Benchmarking method, Porter's 5 forces method, the PEST method)
- the analysis of the company's potentials (product life cycle, portfolio methods: McKinsey Matrix, Hofer's Matrix , BCG Matrix, SWOT analysis, strategic balance)
- SWOT analysis, SPACE analysis
- Competitive advantage of a company: core competencies, competition in a given sector, a map of strategic groups, the concept of clusters, offering of strategic alliances for the company.

TEACHING METHODS:

Conventional lecture. Classes.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences

K_W08	The student has structured and theoretically founded knowledge of strategic management, in particular understands the role of business development strategies and their types, the formation of a strategic plan, the portfolio methods ,	T2A_W03
K_W14	The student has ordered and well-grounded theoretical knowledge in the field of knowledge management. Defines the stages of strategy formulation, can interpret the results of the analysis,	T2A_W04
K_W16	The student has knowledge of development trends and new advancements in the field of management, eg. formation of competitive advantage of a company on the basis of competences, formation of a map of strategic groups, defining offers for strategic alliances.	T2A_W05
K_U01	The student is able to acquire information from bibliography, databases and other sources in order to carry out the strategic analysis.	T2A_U01
K_U04	The student can acquire, integrate, interpret, draw conclusions and formulate opinions on the basis of advertising materials, obtained from literature, databases, and other media, i.e. the analysis of competition through benchmarking.	T2A_U10
K_K02	The student is aware of the importance and understanding of the non-technical aspects and effects of engineering activities, including responsibility for decisions - is able to give arguments for their strategic decisions	T2A_K02
K_K06	The student is able to think and act in an entrepreneurial manner - formulate development strategy for the company	T2A_K06

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Lecture: graded credit

The rating is issued based on a written test covering the verification of the knowledge of the issues from the curriculum (K_W08, K_W14, K_W16, K_W19).

Class: graded credit

Assessment: 50%L, 50% Class.

The rating is determined based on the results of the test - evaluation of skills related to the performance of exercise tasks (K_U01, K_U04, KU08).

STUDENT WORKLOAD

Overall student workload 105 hours, including: participation in lecture 15 hours, participation in class 15 hours, participation in consultations 30 hours, preparation for class 15 hours, preparing for credit 15 hours, studying the literature 15 hours,

RECOMMENDED READING :

1. J. Patalas-Maliszewska, Managing Knowledge Workers - Value Assessment, Methods, and Application tools, Springer Verlag, 2013
2. J.-C. Spender, Business Strategy: Managing Uncertainty, Opportunity, and Enterprise 1st Edition, Oxford University Press, 2014
3. R.-S. Kaplan, D.- P. Norton, The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment, Harvard Business School's Press, 2000

OPTIONAL READING:

1. W. Chan Kim, R. Mauborgne, Blue Ocean Strategy, Expanded Edition: How to Create Uncontested Market Space and Make the Competition, Harvard Business Review Press, 2015
2. G. Tovstiga, Strategy in Practice: A Practitioner's Guide to Strategic Thinking, 3rd Edition, Wiley, 2015
3. S. Cummings, D. Angwin, Strategy Builder: How to Create and Communicate More Effective Strategies, Wiley, 2015

ORGANIZATION OF PRODUCTION SYSTEMS

Course code: MD-02-WM-ZIP

Type of course: Compulsory

Person responsible for the course PhD Eng. Michał Sąsiadek

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					**4**
Lecture	**15**	**1**	**1**	**Exam**	
Project	**15**	**1**		**Graded credit** The final evaluation of the course: weighted average:Exam 0,5 + Project 0,5	

COURSE AIM:

The aim of the course is to get familiar with the methods of analysis and design of production systems, to master the techniques of designing and organization of production systems, in particular to master the scope of the issues relating the description of the structure of the system and the production process, methods and management techniques, production systems, modeling and simulation of production processes, formation of logical and structural relationships in the design of a distributed organizational structure of a production system.

ENTRY REQUIREMENTS

Production management

COURSE CONTENTS:

Lecture: Introduction - basic concepts. Trends in development of production systems. The production process, the production system and the environment. Types of forms and varieties of organization of production - examples. Description of a product structure and production processes. Designing of production processes. Resource planning and production project management based on production facilities and technical documentation and the normative demands for consumption of labour and material. Designing of manufacturing systems. Methods and techniques for managing manufacturing systems. Modelling and simulation of production systems. Implementation of the system project. Production planning and scheduling. Planning of flow in constrained resource conditions. Methods and techniques of production planning. TOC - Theory of Constraints in operational planning. Strategies of production control - the basic principles of flow control. Logistics management in production systems. Integrated management systems.

Project: Design of an arbitrary production system including: the analysis of the distribution of posts, design of the production flow, basic calculations of norms of the production flow in the system.

TEACHING METHODS:

Conventional lecture in the form of a multimedia presentation accompanied by an active participation of students (problem questions - during the lecture)

Project: a project method, independent work in teams of 2-3 students - multimedia presentation of material prepared by students, discussion over the content presented.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W12	The student has ordered and well-grounded theoretical knowledge of the organization of production systems, planning and control of production flow in a production system.	T2A _W03
K_W17	The student has ordered knowledge of the management of industrial production and services, the organization of production systems related to Management and Production Engineering.	T2A _W04
K_U02	The student is able to plan experiments and engineering activities and to elaborate the results of these studies and engineering work, to draw and formulate conclusions and to sufficiently justify opinions on technical matters.	T2A_U01
K_U16	The student can apply the learned methods and computer simulations to analyse and evaluate production systems.	T2A_U09
K_U21, K_U24, K_U25	The student is able to design a complex manufacturing/service system, to choose methods of the management of process flows (using the new conceptual methods), to design workstations and to make a critical analysis of the functioning of the proposed solutions.	T2A_U15 T2A_U19 T2A_U17
K_K06	The student is able to think and act in a creative and enterprising way.	T2A_K06

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Form of instruction (conventional lecture actively involving students, discussion of the subjects discussed) allows for an ongoing assessment of the acquired knowledge, especially through oral exam (K_W12, K_W17). Laboratory and the realization of a series of experiments complemented with the analysis of data obtained from experiments and the preparation of the report allows checking of the competences (K_U02, K_U16). Implementation of the project and a multimedia presentation allow the evaluation of the skills (K_U24). Both the lab report, the current observation of students during the implementation of the simulation allow assessment of their social competences (K_K06).

STUDENT WORKLOAD

Overall student workload: **90** hours, including the participation in lecture and project: **30**, consultations **18** hours, participation in the exam **2**, preparing to the exam **10** hours, project preparation/elaboration **20** hours, studying the literature **10.**

RECOMMENDED READING:

1. BELLGRAN, Monica; SÄFSTEN, Eva Kristina. Production development: design and operation of production systems. Springer Science & Business Media, 2009.

OPTIONAL READING:

1. FELD, William M. Lean manufacturing: tools, techniques, and how to use them. CRC Press, 2000.
2. GUPTA, Sushil; STARR, Martin. Production and Operations Management Systems. CRC Press, 2014.

INTEGRATED MANAGEMENT SYSTEMS

Course code: MD-03-WM-ZIP

Type of course: Compulsory

Person responsible for the course Prof. PhD Eng. Sławomir Kłos

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Lecture	15	1	I	**Exam**	
Project	30	2		Credit for project - graded The final evaluation of the course: weighted average:Exam 0,5 + Project 0,5	

COURSE AIM:

The main effect of instruction is learning of the functionality of integrated management systems, learning of a process approach to management of manufacturing companies where such systems have been implemented.

ENTRY REQUIREMENTS

Production and Services Management.

COURSE CONTENTS:

The content of the lecture includes the following issues: Development and classification of integrated management systems. Transactional systems and decision support systems. A complex system vs. integrated system. Module approach to the complex system. Assessment of ERP-class systems. Material Requirements Planning MRP and Manufacturing Resource Planning MRPII. MRP and MRP II specifications. Basic functions of the integrated enterprise management system. ERP-class systems, implementation of information systems. Management of an implementation project of an integrated management system. Package selection process. The methodology of implementation of the ERP system. Formation of an implementation team. Time-cost schedule for an IT system implementation. The pre-implementation analysis. Identification of critical areas in the company. The determination of the increase in the amount of data in time and the determination of assumptions for the IT equipment requirements. Preparing the IT infrastructure. The selection of equipment: servers, workstations, hardware and network infrastructure. Security of the IT system: anti-virus systems, data archiving systems and anti-surge systems. Logistics in ERP systems. Customer Relationship Management (CRM) systems. Management information system. Modelling business processes and workflows in an enterprise (Workflow Management). Systems of modelling of flows of business processes in an enterprise. Administration of integrated management systems. The administration of a database server, ideas for e-commerce applications, Business-to-Business (B2B) and Business-to-Customer (B2C). Review of existing solutions in the field of E-commerce. Online stores and online payments. Virtual organizations.

Within the project, the following topics are covered:

- The entry of structural and technological data in the field of technical preparation of production,
- preparation of offers and sales orders
- production scheduling
- preparation of supply orders
- Issuing documents of material circulation and registration of production operations.

TEACHING METHODS:

Conventional lecture. Project.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W09	The student has ordered and well-grounded theoretical knowledge in the field of computer-aided company management.	T2A _W03
K_W11	The student has ordered and well-grounded theoretical knowledge in the field of integrated management systems.	T2A _W03
K_W14	The student has ordered and well-grounded theoretical knowledge of decision support systems and knowledge management.	T2A _W03
K_U12	Student can choose the relevant modules and use the integrated IT management systems.	T2A_U07
K_U17	The student is able to formulate and solve tasks related to production engineering and management, and to apply systematic approach taking also into account of economic, legal and social aspects.	T2A_U10
K_K02	The student is aware of the importance and understanding of the non-technical aspects and effects of engineering activities, including its impact on the environment, and their responsibility for own decisions.	T2A_K02
K_K06	The student is able to think and act in a creative and enterprising way.	T2A_K06

VERIFICATION OF THE EFFECTS OF EDUCATION AND CRITERIA

Lecture credit is awarded after passing a written exam (K_W09, K_W11, K_W,14). Project credit is awarded based on the assessment of the project presenting issues concerning data structures and models of business processes of an exemplary enterprise Credit for project classes is awarded based on the assessment of the project related to issues of data structures and business process models presented on a sample production enterprise and performed based on a selected ERP system (K_U12, K_U17, K_K02, K_K06).

STUDENT WORKLOAD

Overall student workload 90 hours, including participation In lecture 15 hours, project - 30 hours, preparation for class and elaboration of laboratory reports on the realised projects 20 hours, preparing for the exam 20 hours and consultation while project preparation 15 hours .

RECOMMENDED READING :

1. K. Ganesh, S. Mohapatra, S. P. Anbuudayasankar, P. Sivakumar, Enterprise Resource Planning, Fundamentals of Design and Implementation, Springer 2014
2. K. E. Kurbel, Enterprise Resource Planning and Supply Chain Management, Functions, Business Processes and Software for Manufacturing Companies, Springer 2012
3. Marianne Bradford, Modern ERP: Select, Implement, and Use Today's Advanced Business Systems, lulu.com, 2015

OPTIONAL READING :

1. S. Scott Phillips, Control Your ERP Destiny: Reduce Project Costs, Mitigate Risks, and Design Better Business Solutions, Street Smart ERP Publications, 2013

BUSINESS PROGNOSSIS AND SYMULATION

Course code: MD-04-WM-ZIP

Type of course: Compulsory

Person responsible for the course PhD Eng. Julian Jakubowski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					
Lecture	15	1	1	**Exam**	4
Laboratory	15	1		Graded credit The final evaluation of the course: weighted average:Exam 0,4 + Laboratory 0,6	

COURSE AIM:

Skills and competences: statistical data analysis, time series, the use of econometric models, quality models, methods for modelling discrete and continuous processes, use of methods of forecasting and simulation of processes in the enterprise.

ENTRY REQUIREMENTS

Basic knowledge of: manufacturing processes, economics, statistics. Thorough knowledge of Excel.

COURSE CONTENTS:

Lecture

W1 Production process. Manufacturing company. The importance of forecasts for the company. Basic concepts. Classification of forecasting methods. Forecasting process. Making managerial decisions. Forecasting methods. Forecasting horizon

W2 Measures for the quality of forecasts. Errors of forecast ex post and ex ante.

W3 Quantitative forecasting methods. Forecasts based on time models. Formation of time series. Models of time series with trends.

W4 Analytical models. Linear exponential smoothing models. Autoregression and moving average (ARMA and ARIMA) models.

W5 Methods based on econometric models. Stages of formation of an econometric model. Single equation econometric models.

W6 Qualitative forecasting methods. Forecasting based on heuristics. Analogue models. Models with leading variables. Models of cohort analysis. Market tests

W7 Simulation of continuous and discrete processes.

W8 Application scenarios in forecasting.

Laboratory

L1 Application of the method of least squares in forecasting. Determination of the regression line. Implementation of MNK Excel (LINEST).

L2 Extrapolation of a linear function of trend. Determination of the point and interval forecasts.

L3 Forecasting using non-linear trend model. Linearization of a function.

L4 Forecasting based on time series. Random and seasonal fluctuations. Forecasting based on adaptation models. A naive method. Methods: simple moving average and weighted average.

L5 Exponential smoothing models (Brown's, Holt's and Winters')

L6 Econometric models.

L7 Heuristic forecasting methods.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
Knowledge		
K_W10	The student has a systematic knowledge in the field of forecasting processes. Understands and applies the correct terminology for describing the decision-making processes in an enterprise. Classifies forecasting methods according to various criteria. They can select an appropriate method to problem solving.	T2A_W03
Skills		
K-U11	Students use the acquired knowledge in economics, mathematics and statistics to build forecasting models.	T2A_U07
K_U16	Student applies methods of forecasting and simulation of business processes with the use of information technology..	T2A_U09
Competences		
K_K02	The student demonstrates a modern approach to risk analysis in production activity with the use of forecasting.	T2A_K01

VERIFICATION OF THE EFFECTS OF EDUCATION AND CRITERIA

Lecture: Lecture credit is awarded after passing a written exam which verifies the knowledge of the issues included in the lecture curriculum (K_W10, K_K02)

Laboratory: graded credit, based on the component ratings of current tests (K_U11, K_U16)

STUDENT WORKLOAD

Overall student workload : 75 hours

Tutorial hours: 40 hours (including 15 hours participation in lecture, 15 hours participation in laboratory classes, 6 hours consultations, 4 hours y egzamin)

Hours of student own work: 35 hours, (preparation for laboratory classes 15 hours, preparing for the exam 20 hours).

RECOMMENDED READING :

1.Hanke J.E. Reitsch, Business Forecasting, Prentice Hall, Upper Saddle River, 1998.

2. Makridakis S., S.C. Wheelwright, V.E. McGee, Forecasting, John Wley, New York 1983

3. Chambers J.C. Mullick S.T., Smith D.D. How to chose the right forecasting technique. Harvard Business Review, nr 4., 1991.

OPTIONAL READING :

1. Lapin L.L., StatisticfFor Modern Business Decision. Harcourt Brace Javanovich Inc., New York, 1987.

PROJECT MANAGEMENT AND INNOVATIONS

Course code: MD-05-WM-ZIP

Type of course: Compulsory

Person responsible for the course Prof. PhD Eng. Josef Basl

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Lecture	15	1	I	Graded credit	
Project	15	1		Graded credit The final evaluation of the course: weighted average:Exam 0,5 + Project 0,5	

COURSE AIM:

Acquisition of skills and competences in project management, in particular in innovative project management. Acquisition of knowledge on the nature, role and place of innovation in the processes of development. Understanding of the economic content of innovation and incentive programs for the growth of creativity. Understanding national and European pro-innovation infrastructure, programs and strategies.

ENTRY REQUIREMENTS

Microekonomics, Marketing Essentials

COURSE CONTENTS:

Content of lectures: Project management in a general approach. Schedule and budget of a project . Managing the project team. Directions of development of the concept of project management and management through projects. Innovations. The economic content of innovation. Innovation, creativity and competitiveness. Innovation processes in enterprises. Man and organization in the innovation process - management culture, virtual organizations.The policy and strategy of business development management in terms of products and services, processes, infrastructure, environment, etc. The role of information technology in innovation. Formation and funding for innovative projects. Regional innovation strategies. The activities of regional institutions in terms of stimulating innovation processes. EU programs for innovation. Innovation strategies of Polish companies - an analysis based on case studies.

Project: Regional innovation strategies. The activities of regional institutions in terms of stimulating innovation processes. EU programs for innovation. Innovation strategies of Polish companies - an analysis based on case studies.

TEACHING METHODS:

Conventional lecture.
Project – individual work, group work, based on literature and the lecture notes

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W05,	The student has a broad and deep knowledge of	T2A_W01

K_W20	management in organizations	
K_U14 K_U23	The student is able to select and use appropriate optimization methods to solve simple problems related to project management and innovation management	T2A_U09
K_K06	The student is able to think and act in a creative and enterprising way	T2A_K06

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Lecture: graded credit
The assessment is issued based on a written test covering the verification of the knowledge of basic problems(K_W05, K_K06)
Project: graded credit
The assessment is determined on the basis of the component evaluating skills related to the implementation of project tasks(K_U14), the prepared report and a component for the student's "defence" of the report (K_K06).

STUDENT WORKLOAD

Overall student workload 75 hours, including participation in lecture 15 hours, participation in project classes 15 hours, consultations 8 hours, preparation for class 5 hours, elaboration of the project 15 hours, preparing for credit 5 hours, literature studying 12 hours .

RECOMMENDED READING :

1. Aaron J. Shenhar, Toward a typological theory of project management, Elsevier, 1996.
2. Garold D. Oberlender, Project management for Engineering and construction. McGraw Hill International edition, 2018.

OPTIONAL READING :

1. Project Management Innovations, A Quarterly Publication of the Project Management Institute's New Product Development Specific Interest Group

DECISION SUPPORT SYSTEMS

Course code: MD-06-WM-ZIP

Type of course: Compulsory

Person responsible for the course Prof. PhD Taras Nahirny

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Lecture	15	1	I	Graded credit	
Project	15	1		Graded credit The final evaluation of the course: weighted average: Exam 0,5 + Project 0,5	

COURSE AIM:

Acquisition of skills and competences in decision support system (DSS) and methods used in decision process analysis which are useful in further educational process and vocational work. Also knowledge and skills of chosen tools and technique used in decision support systems will be given.

ENTRY REQUIREMENTS

Basic of computer science, probability, statistic

COURSE CONTENTS

Content lecture. Introduction to the theory of decision-making. Confidence, risk, uncertainty. Mathematical modeling and decisions, operations research models and econometric statistical decision theory, decision analysis, decision trees. The theory of reliability and usability and decision-making. The decisions in terms of inaccuracy. Game theory and the decisions, game double zero-sum and non-zero; importance of information, cooperative games; negotiations; distribution of payments in the coalition; balance, optimal strategies. Examples of applications in business practice. Decision Support Systems and Information Systems Management, Principles of creation and utilization systems.

Project. Development of the project in the field of production engineering issues, taking into account the theoretical basis and principles of the work program concerning:

– selection of probe items,
– forecasting and linear regression,
– allocation of resources and balancing production lines,
– serial work,
– linear programming, integer and 0-1,
– dynamic programming,
– stock management,
– PERT-CPM,
– modelling network,
– systems queuing,
– simulation of queuing systems
– economy materials
– quality control charts.

TEACHING METHODS:

Conventional lecture.

Project – individual work, group work with DSS systems, based on literature and the lecture notes

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W04, K_W15	Student has theoretical detailed knowledge of decision support systems.	T2A_W04
K_W18	Student knows the basic methods and techniques used in decision support systems	T2A_W07
K_U11, K_U26	Student is able to use information technologies relevant to the implementation of selected tasks of decision-making in business engineering	T2A_U07
K_U13	The student can use to formulate and solve engineering tasks selected analytical methods and simulation	T2A_U09
K_K01	The student understands the need for learning	T2A_K01
K_K06	The student is able to think and act in a creative and enterprising	T2A_K06

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Lecture: graded credit
The assessment is issued based on a written test covering the verification of the knowledge of basic problems(K_W04, K_W15, K_W18, K_K01, K_K06).
Project: graded credit
The assessment is determined on the basis of the component evaluating skills related to the implementation of project tasks(K_U11, K_U13, K_K06), the prepared report and a component for the student's "defence" of the report (K_W04, K_W15).

STUDENT WORKLOAD

Overall student workload 75 hours, including participation in lecture 15 hours, participation in project classes 15 hours, consultations 8 hours, preparation for class 5 hours, elaboration of the project 15 hours, preparing for credit 5 hours, literature studying 12 hours .

RECOMMENDED READING (FOR ENGLISH CLASSES):

1. Taylor, James (2012). Decision Management Systems: A Practical Guide to Using Business Rules and Predictive Analytics. Boston MA: Pearson Education.
2. Power, D. J. (2002). Decision support systems: concepts and resources for managers. Westport, Conn., Quorum Books.

OPTIONAL READING :

1. Borges, J.G, Nordström, E.-M. Garcia Gonzalo, J. Hujala, T. Trasobares, A. (eds). (2014). " Computer-based tools for supporting forest management. The experience and the expertise world-wide. Dept of Forest Resource Management, Swedish University of Agricultural Sciences. Umeå. Sweden.
2. Delic, K.A., Douillet,L. and Dayal, U. (2001) "Towards an architecture for real-time decision support systems:challenges and solutions.

PROFESIONAL FOREIGN LANGUAGE SKILLS

Course code: MD-07-WM-ZIP

Type of course: Compulsory

Person responsible for the course MSc. Agnieszka Florkowska

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Laboratory	30	2	I	Graded credit	

COURSE AIM:

The aim of the course is to get the student acquired knowledge of the foreign language in the field of technical communication.

ENTRY REQUIREMENTS

Knowledge of the chosen foreign language on a minimum B2 level **B2.**

COURSE CONTENTS:

1. Introduction of elements of technical and specialist language in the field of management and production engineering, including:
   a. Choosing a career: career selection criteria, characteristics of technical professions
   b. Organizations in business: entrepreneurs, types of businesses, organization of work and job responsibilities
   c. Production and production management systems
   d. Logistics Management in an enterprise
   e. Ecological aspects in a production process.

TEACHING METHODS:

Conventional communication activities, group and individual work with the use of audio-visual and multimedia equipment.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W12	The student has knowledge of a foreign language and, in particular, is able to understand and pass most of the information and uses it in a communicative manner.	T1A _W02
K_U01	The student understands the various forms of correspondence, such as purchase orders, complaints, requests and memos, understands the content of reports, instructions, procedures, commands within their professional competence. They are able to obtain	T1A_U01

	information from the literature, specialized texts using a dictionary, interpret them and draw conclusions.	
K_U05	Student can manage standard correspondence, is able to write a simple report, can write instructions, orders or formulate procedures appropriate for management and production engineering.	T1A_U03
K_U06	The student is able to prepare and to deliver an oral presentation on selected issues of management and production engineering, with the use of audio-visual aids.	T1A_U04
K_U10	Student uses extensive vocabulary connected with management and production engineering	T1A_U01 T1A_U02

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

graded credit: Assessment is the average calculated on the basis of written tests including the verification of proficiency at the appropriate level according to the European Framework of Reference for Languages (K_W12) and a component which evaluates active participation in classes as well as skills related to the performance of specific tasks - carrying out of presentations, written work, individual work and group work (K_U01, K_U04, KU_05, KU_06, KU_10).

STUDENT WORKLOAD

Overall student workload amounts about 54 hours per term, including participation in classes 30 hours, preparation for class and preparation of presentation, speeches and essays 14 hours, preparing for credits 6 hours, studying the literature 2 hours, participation in consultations 2 hours.

RECOMMENDED READING (FOR ENGLISH CLASSES):

1. Vicky Hollet, John Sydes, *Tech Talk Intermediate,* Oxford University Press, 2005
2. Richardson K., Kabanagh M., Sydes J., Emmerson P., *The Business Intermediate,* Macmillan, Oxford, 2008

OPTIONAL READING :

1. Nick Brieger, Alison Pohl, *Technical English: vocabulary and grammar,* Summertown Publishing, 2008
2. *Longman Business Dictionary*, Pearson Education Limited, Harlow, 2007
3. *Słownik Techniczny Angielsko-Polski, Polsko-Angielski*, wyd. REA, 2005
4. Clive Oxenden, Christina Latham-Koenig, Paul Seligson, *New English File Pre Intermediate*, Oxford University Press, 2007
5. Michael Swan, Catherine Walter, *The Good Grammar Book,* Oxford University Press, 2009
6. http://www.onestopenglish.com/

http://www.insideout.net/

DESIGN FOR MANUFACTURING

Course code: MD-8a-WM-ZIP

Type of course: Elective

Person responsible for the course PhD Eng. Julian Jakubowski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Project	30	2	I	Graded credit	

COURSE AIM:

Acquisition of knowledge and skills specific for designing for manufacturing.

ENTRY REQUIREMENTS

Basic knowledge of manufacturing processes.

COURSE CONTENTS:

Producibility. General principles for design for manufacturing. Students, using CAD / CAM, design a manufacturing process of a product taking into account: the cost of production, the possibility of producing, and standardization. Taking into account the specificities of various processes, e.g. lathing, milling, welding, metal sheet bending , plastic products.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
Knowledge		
K_W03, K_W05	The student has expanded and in-depth knowledge of design technological processes supplemented with the feasibility analysis.	T2A _W03
Skills		
K_U01, K_U04	The student is able to use information and communication technologies relevant to the tasks typical for the project undertaken.	T2A_U01
K_U03	Students can work individually and in a team, and skilfully manage the work of the team.	T2A_U02
Competences		
K_K03	The student is able to cooperate and to work in a group, accepting various roles needed to perform a specific design task.	T2A_K03

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Students' progress in the knowledge acquisition as well as their skills and competences development are regularly monitored throughout the course by the systematic assessment of project tasks performed in groups (K_U03, K_W03, K_W05, K_K03)

STUDENT WORKLOAD

Overall student workload **90** hours :

- Tutorials with the teacher: participation in project classes 30 hours,

- Hours of student's own work: studying the literature 15 hours, Preparing for project assignments 45 hours .

RECOMMENDED READING :

1. James G. Bralla, Design for manufacturability, Handbook, McGraw Hill, 1999.
2. Dr. David M. Anderson, Design for manufacturability and concurrent EngineeringCim Press, 2010.

OPTIONAL READING :

1. O. Molloy, S. Tilley, E. Warman, Design for manufacturing and assembly, Spinger 1998.

DESIGN FOR ASSEMBLY

Course code: MD-8b-WM-ZIP

Type of course: Elective

Person responsible for the course Dr Eng. Michał Sasiadek

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Project	30	2	I	Graded credit	

COURSE AIM:

Acquiring the knowledge and skills specific for the design for assembly.

ENTRY REQUIREMENTS

Basic knowledge of production processes.

COURSE CONTENTS:

Types of mounting, separable and inseparable connections. Types of interchangeability of machine parts. The specificity of design for assembly. Producibility of a structure. General principles for design for assembly. Students, using CAD systems, design a technological process of assembly of a product taking into account: costs, standardization, unification. Documentation of assembly processes.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
Knowledge		
K_W03, K_W05	The student has extensive and in-depth knowledge of the design of assembly processes.	T2A _W03
Skills		
K_U01, K_U04	The student is able to use information technologies in the analysis of assembly processes typical for the project undertaken.	T2A_U01
K_U03	Students can work individually and in a team, and skillfully manage the work of the team.	T2A_U02
Competences		
K_K03	Student is able to cooperate and work in a group, accepting different roles needed to perform a specific design task	T2A_K03

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

The students' progress in acquiring the knowledge, skills and competencies is regularly monitored through systematic evaluation of project tasks performed in groups.(K_U03, K_W03, K_W05, K_K03)

STUDENT WORKLOAD

Overall student workload **90** hours :

- tutorials with the teacher: participation in project classes 30 hours,
- hours of student's own work: studying the literature 15 hours, preparing for project assignments 45 hours.

RECOMMENDED READING :

1. ANDREASEN, Mogens Myrup; KÄHLER, Steen; LUND, Thomas. Design for assembly. IFS, 1988.
2. BOOTHROYD, Geoffrey; DEWHURST, Peter; KNIGHT, Winston Anthony. Product Design for Manufacture and Assembly, revised and expanded. CRC Press, 2002
3. REDFORD, A.; CHAL, J. Design for Assembly: Principles and Practice, 1994

OPTIONAL READING :

1. LOTTER, Bruno. Manufacturing assembly handbook. Butterworth-Heinemann, 2013
2. WHITNEY, Daniel E. Mechanical assemblies: their design, manufacture, and role in product development. Oxford university press, 2004

CAM

Course code: MD-09a-WM-ZIP

Type of course: Elective

Person responsible for the course PhD Eng. Julian Jakubowski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Project	30	2	I		

COURSE AIM:

Acquiring knowledge and skills in the basics of the use of CAD / CAM systems in production engineering.

ENTRY REQUIREMENTS

Basic knowledge of information technologies, production processes and techniques.

COURSE CONTENTS:

Basic concepts related to CAD / CAM. The role of CAD / CAM systems in production engineering. Traditional and integrated cycle of production preparation. Modern technologies of contemporary production systems. Computer integrated manufacturing - CIM. Modern techniques in production: RE, RP, RT. Basics of designing technological processes in the CAM systems. Process design for numerically controlled machines. Development of a technological process for a specified product, the selection of parameters, execution of documentation.Designing of a technological process of a roller in the CAM system. Designing of a technological process of a part of a machine corps in the CAM system. Comparative analysis of the process performed (in the CAM system) during the classes. Presentation of the prepared projects of technological processes.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
Knowledge		
K_W03,	Student has extensive and in-depth knowledge of production processes using software to design 3D in CAx techniques.	T2A _W03
K_W05	Student has theoretically founded detailed knowledge of the selected issues of modern techniques used in production engineering.	T2A _W04
Skills		
K_U01	Can use information and communication technologies suitable for the realisation of the tasks typical for the project undertaken.	T2A_U01
K_U03	The student is able to work individually and in a team, and skillfully	T2A_U02

	manage the work of the team.	
Competences		
K_K03	The student is able to collaborate and work in a group, accepting different roles needed to perform a specific design task.	T2A_K03

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Project: graded credit

assessment is issued on the basis of a written test verifying the knowledge of basic issues(K_W03, K_W05).

The assessment is determined on the basis of the component evaluating skills related to the implementation of project tasks and its “defense” (K_U01, K_U03) and the preparation of project documentation (K_U01) and the component for the "defense" (K_W03).

STUDENT WORKLOAD

Overall student workload 80 hours, including:

participation in classes: 30. Mastering the operation of the CAM environment 20 hours, preparing and elaborating the project 20 hours, participation in consultations10 hours .

RECOMMENDED READING :

1. Thomson R.,Manufacturing processes for design professionals, 2007,
2. Catia V6 esentials, Kogent learning solutions, Inc, Jones and Bartlett Publishers, 2011

OPTIONAL READING :

1. Catia on Line documentations.

CAX TECHNIQUES IN PRODUCTION ENGINEERING

Course code: MD-09b-WM-ZIP

Type of course: Elective

Person responsible for the course PhD Eng.Julian Jakubowski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Project	30	2		Graded credit	

COURSE AIM:

Mastering the knowledge and skills in the following areas: the selection of CAx tools for a specific problem in the field of quality engineering, the knowledge and the analysis of applied tolerance on 3D models, the application of CAQ systems in the engineering considerations.

ENTRY REQUIREMENTS

Basic knowledge of information technologies, CAD, TQM.

COURSE CONTENTS:

The use of CAx systems in an enterprise. Introduction to 3D CAD modeling systems - the application of the Catia system, basic settings, views, models, geometric and dimensional sketch elaboration. Modeling methods: block, surface and hybrid modelling. Modeling of thin-walled components and assembly techniques of machine parts. Virtual reality from the engineering point of view. CAx techniques in the enterprise strategy development.

Provide students with the principles of efficient use of CAx systems in a manufacturing company on a Catia-related example. The stages of the analyses of an implemented project which integrates the product development with the phases of the development of its manufacturing process. Presentation and evaluation of a selected product supplemented with the full structure-technology-production analysis.

TEACHING METHODS:

Project with the use of a computer.

LEARNING OUTCOMES:

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W09	Student has extensive and in-depth knowledge of production processes using software for 3D designing with	T2A _W03

	the CAx techniques.	
K_W15	Student has theoretically founded detailed knowledge of the selected issues of modern techniques used in production engineering.	T2A _W04
K_U01	The student is able to use information and communication technologies relevant for the realisation of the tasks typical for the project undertaken.	T2A_U01
K_U03	Students can work individually and in a team, and skilfully manage the work of the team.	T2A_U02
K_K03	The student is able to collaborate and work in a group, accepting different roles needed to perform a specific design task.	T2A_K03
K_K06	Knows how to think and act in a creative and enterprising way.	T2A_K06

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Lecture: graded credit

The assessment is issued on the basis of a written test verifying the knowledge of the basic issues (K_W09, K_W15).

Project: graded credit

The assessment is determined on the basis of the component evaluating skills related to the realisation of the project tasks (K_U01, K_U03) and a component including the student's "defense" of the project report (K_K03, K_K06).

STUDENT WORKLOAD

Overall student workload 60 hours, including: participation in project classes 30 hours, mastery of software engineering: program Catia - to the extent necessary for the elaboration of documentation 5 hours, preparation and elaboration of the documentation on the realisation of the project assignments 15 hours, participation in consultations 5 hours, preparation for the "defence" of the final project 5 hours .

ECOMMENDED READING:

1. Michaud M. Catia; Core Tools: Computer Aided Three-Dimensional Interactive Application. The McGraw Hill Companies, Inc. 2012.
2. Thomson R.,Manufacturing processes for design professionals, 2007,
3. Catia V6 esentials, Kogent learning solutions, Inc, Jones and Bartlett Publishers, 2011

OPTIONAL READING:

1. Catia on line documentations.

KNOWLEDGE MANAGEMENT

Course code: MD-10-WM-ZIP

Type of course: Compulsory

Person responsible for the course: Prof. PhD Eng. Justyna Patalas-Maliszewska

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Lecture	15	1	II	Graded credit	
Project	30	1		Graded credit	

COURSE AIM:

The main effect of instruction will be the knowledge of methods and tools for formulation of strategies of knowledge management in an enterprise.

ENTRY REQUIREMENTS

Basic knowledge of: management and economics of an enterprise

COURSE CONTENTS:

The course constitutes a comprehensive approach to build a strategy of tacit and explicit knowledge management in an enterprise. The concept, origin and development of knowledge management, the notion of tacit and explicit knowledge. Concepts of knowledge management. The main trends in knowledge management. Tools supporting explicit knowledge management. Tools helping tacit knowledge management. Knowledge workers. Sources of intellectual property rights. Subject matters of intellectual property rights. Copyright and related rights. Industrial Property Law.

The following topics are elaborated within the project:

- A design of a tool supporting explicit knowledge management: a database, a data warehouse.
- A design of a tool supporting tacit knowledge management: corporate portal.
- A design of a tool supporting tacit knowledge management: knowledge map.
- A matrix map of knowledge by (tacit or explicit) knowledge sources.

TEACHING METHODS:

Conventional lecture. Project.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W04	The student has ordered and well-grounded theoretical knowledge in the field of knowledge management. Defines the stages of strategy formulation, can interpret the results of analyses,	T2A_W04
K_W10	The student has well-ordered, essential knowledge of human resource management and knowledge related to Management and Production Engineering.	T2A_W04
K_U01	Students are able to acquire information from literature, databases and other sources, they are able to integrate / interpret the information, to draw conclusions and formulate opinions.	T2A_U01
K_K02	Student are aware of the importance of and understands the non-technical aspects and impacts of engineering activities, including its impact on the environment, and the responsibility for their decisions.	T2A_K02
K_K05	The student is able to think and act in a creative and enterprising way.	T2A_K06

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Lecture: graded credit

The assessment is issued based on a written test verifying the knowledge of the subject issues (K_W04, K_W10).

Project: graded credit

Assessment: 50%W, 50% Project

Assessment is determined based on the results of the project - assessment of skills related to the realisation of the project tasks (K_U01)

STUDENT WORKLOAD

Overall student workload 90 hours, including: participation in lecture 15 hours, participation in project classes 30 hours, participation in consultations10 hours, preparation for class10 hours, preparing for credit 10 hours, studying the literature 15 hours,

RECOMMENDED READING :

1. J. Patalas-Maliszewska, Managing Knowledge Workers - Value Assessment, Methods, and Application tools, Springer Verlag, 2013
2. Ed. J. Child and M. Ihrig, Knowledge, Organization, And Management, Oxford University Press, 2013
3. K. Dalkir, Knowledge Management in Theory and Practice, Massachusetts Institute of Technology, 2011

OPTIONAL READING :

1. S. Barnes N. Milton, Designing a Successful KM Strategy: A Guide for the Knowledge Management Professional, Information Today, Inc.,2015
2. K. North, G. Kumta, Gita, Knowledge Management, Value Creation Through Organizational Learning, Springer, 2014
3. P. Holdt Christensen, Knowledge Management, Copenhagen Business School Press, 2003

LOGISTIC OF MANUFACTURING ENTERPRISES

Course code: MD-11-WM-ZIP

Type of course: Compulsory

Person responsible for the course Prof. PhD Eng. Sławomir Klos

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Lecture	15	1	II	**Exam**	
Project	30	2		Graded credit The final evaluation of the course: weighted average:Exam 0,5 + Class 0,5	

COURSE AIM:

The main effect of instruction is the knowledge of the essence of logistics management in an enterprise in the area of production as well as of methods and production models.

ENTRY REQUIREMENTS

Production and Services Management.

COURSE CONTENTS:

Definitions of logistics, process of logistics management in an enterprise, identification of processes in an enterprise, a logistics network - limiting conditions, the objective function. Logistic system, logistic system of an enterprise, logistic system vs. logistic process, logistic chain. Warehouse logistics - the minimum level of ordering, controlling of a warehouse (indicators), methods: FIFO and LIFO, the average cost method. IT systems: MRP, MRP II, ERP, ERP II. Development trends of integrated management systems, application examples. Logistics of production: the production function, production flexibility. Cobb-Douglas production function. The CES function. The Zellner and Revankar function. Optimization of production. The Gozinto's graph . New trends in logistics, e-business, B2B, B2C, virtual enterprise.

The curriculum includes performing of the following exercises:

- Designing of a logistics network - specifying the restrictive conditions, the objective function
- Determining the optimal level of orders
- Controlling in a warehouse - calculation of indicators
- Inventory valuation method in stock - methods : FIFO, LIFO, the average cost method
- MRP - Calculations
- The linear correlation of one variable as a method of prognosis
- Production function
- The Cobb-Douglas function
- Other forms of the production function
- The Gozinto's graph
- Optimization of production
- New trends in logistics, e-business, B2B, B2C, virtual enterprise.

TEACHING METHODS:

Conventional lecture. Project.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W01	The student has ordered knowledge of logistics associated with Management and Production Engineering.	T1A_W03
K_W03	The student has knowledge of the development trends and new advancements in IT applications, as well as of development trends in ERP-class systems: B2B and B2C systems.	T1A_W05
K_U04	The student is able to select and use appropriateoptimization methods for solving engineering tasks related to the Management and Production Engineering - the Gozinto's graph, Cobb-Douglas production function, WOS-type indicators, CES function. The Zellner and Revankar function.	T1A_U09
K_U10	The student is able to formulate the requirements for supply chain and to design a logistics system.	T1A_U10
K_K04	Potrafi odpowiednio określić priorytety służące do realizacji określonego przez siebie i innych zadania – potrafi rozwiązać zadania optymalizacji produkcji.	T1A_K04

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Lecture: egzamin

The assessment is issued based on the results of the written exam verifying the knowledge of the subject (K_W01, K_W03).

Project: graded credit

The assessment is determined based on the results of the two tests (K_U04, K_U10, K_K04).

Assessment: 50%L, 50%Class.

STUDENT WORKLOAD

Overall student workload 90 hours, including: participation in lecture 15 hours, participation in project classes 30 hours, participation in consultations10 hours, preparing for the exam 10 hours, elaboration of the project 25 hours .

RECOMMENDED READING :

1. M. Christopher, Logistics & Supply Chain Management, FT Press, 2016
2. G. G. Fenich, Production and Logistics in Meeting, Expositions, Events and Conventions, Pearson, 2014
3. S. C. Ailawadi, P. R. Singh, Logistics Management, PHI; Second Edition, 2013

OPTIONAL READING:

1. F. R. Jacobs, W. Berry, Manufacturing Planning and Control for Supply Chain Management, McGraw-Hill Education, 2011

QUALITY MANAGEMENT

Course code: MD-12-WM-ZIP

Type of course: Compulsory

Person responsible for the course PhD Eng. Julian Jakubowski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Lecture	15	1	V	**Exam**	
Project	30	2		Graded credit The final evaluation of the course: weighted average:Exam 0,5 + Project 0,5	

COURSE AIM:

The aim of the course is to provide basic knowledge of quality management, TQM in an enterprise.

ENTRY REQUIREMENTS

Management essentials

COURSE CONTENTS:

The lecture content includes the following issues: Basic concepts related to quality. Evolution of quality management systems. The philosophy of quality management. The concept of total quality. The concepts of quality management. Quality management through the widespread involvement - the concept of TQM. Quality management through compliance with recognized standards - ISO 9000 standards; automotive, defensive and food standards. Quality management by measuring the effectiveness and efficiency of operations - SPC, SIX SIGMA. Eight principles of quality management. Deming's philosophy, Deming's model, 14 principles by Deming. Quality management tools. Tools supporting quality management. Methods of designing for quality (QFD, FMEA. DoE). Control methods, including techniques of statistical control. Implementation of quality management. Quality costs. Quality awards. Standards of quality management systems: quality management system ISO 9000-2015. **within the project classes:** The student acquires skills in the application of selected methods, as instruments of continuous improvement of processes or products. Students learn methods: QFD, FMEA DoE and acqiure skills how to use them in quality management to solve practical problems related to the identification, analysis of defects in products or processes. Students acquire skills how to identify and prioritize the causes of their occurrence, as well as how to indicate actions that could eliminate or at least reduce the possibility of potential drawbacks in the article.

TEACHING METHODS:

Conventional lecture. Project – group work.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in

		technical sciences
K_W07	Student has well-ordered, essential knowledge of quality management, related to Management and Production Engineering.	T1A_W08 T1A_W09
K_U16	The student is able to select the appropriate method for decision support in management.	T1A_U16
K_U17	The student is able to interpret the standards of the ISO	T1A_U15
K_K02	Student are aware of the importance and understanding of the non-technical aspects and impacts of engineering activities including its impact on the environment, and the associated responsibility for their decisions.	T1A_K02

VERIFICATION OF THE EFFECTS OF EDUCATION AND CRITERIA

Lecture – The credit for the lecture is awarded after passing the exam which verifies the knowledge of basic issues. (K_W07).

Project – The credit for the project classes is awarded based on the positive assessments of partial Projects, confirming the acquisition of skills related to the project tasks. (K_U16, K_U17),

Credit for the course: The final grade for the course is the arithmetic average of the sum of grades obtained for the exam and the average mark of the projects.

STUDENT WORKLOAD

Overall student workload 90 hours, including participation in lecture 15, participation in project classes 30 hours, preparation for class10, elaboration of the project 20 hours, preparing for the exam 10 hours, participation in consultations 5 hours .

RECOMMENDED READING:

1. Taguchi, G, Introduction to quality engineering: designing quality into products and processes, ARRB Group Limited, 1986.
2. Yoji Akao, Quality Function Deployment, 2004.
3. Jurans Quality Handbook by A. Blanton Godfrey, 5 Edition, 2006.

OPTIONAL READING :

1. Shewhart W.A., Economic control of quality of manufactured product. 1980.

MODELLING AND SYMULATION OF PRODUCTION PROCESSES

Course code: MD-13-WM-ZIP

Type of course: Compulsory

Person responsible for the course Prof. PhD Eng. Sławomir Kłos

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Lecture	15	1	2	Graded credit	
Laboratorium	30	2		Graded credit	

COURSE AIM:

The aim of the course is to acquaint students with the method of computer simulation and familiarization with the techniques of building simulation models of processes and production systems. After completion of the course students should be able to use the selected software to simulate production processes (eg. Tecnomatix Plant Simulation, Enterprise Dynamics, Arena, etc.), model building (mapping the actual system in a form of a simulation model), Designing of simulation experiments and analysis of research results.

ENTRY REQUIREMENTS

Knowledge of basic production processes implemented in enterprises.

COURSE CONTENTS:

1. Computer simulation as a research method - introduction.
2. Stages of the construction of a simulation model.
3. Generating pseudorandom data based on various probability distributions.
4. Basic objects needed to build the simulation model of the production system.
5. Planning of a simulation experiment.
6. Modelling and simulation of discrete manufacturing processes.
7. Modelling and simulation of assembly processes.
8. Analysis of the efficiency of utilization of production resources.
9. Analysis of the efficiency of logistics processes and inventory levels of work in progress.
10. Analysis of the effectiveness of employees on the basis of a simulation model of the production system.

TEACHING METHODS:

Lecture - Conventional lecture with the use of a videoprojector.

Laboratory – practical classes carried out with the use of a selected simulator.

LEARNING OUTCOMES AND METHODS OF VERIFICATION OF THE ACHIEVEMENT OF LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W8	The student has ordered and well-grounded knowledge of basic manufacturing techniques associated with Management and Production Engineering.	T1A _W02
K_W12	The student has ordered, well-grounded knowledge in the area of management of industrial production and services and the organization of production systems related to Management and Production Engineering.	T1A _W04
K_U8	The student is able to choose and use appropriate computer applications for calculation, simulation, designing and verification of solutions related to Management and Production Engineering.	T1A_U07
K_U17	The student is able to: plan and carry out experiments, including measurements and computer simulations, interpret the results and draw conclusions	T1A_U08
K_K02	Students understand and are aware of the importance of non-technical aspects and impacts of engineering activities, environmental impact including, and the associated responsibilities for their own decisions.	T1A_K02

CONDITIONS FOR COURSE CREDITION:

Lecture - a written test at the end of the semester.

Laboratory – final grade is the weighted sum of grades obtained for the completion of individual laboratory classes. The contribution of individual components of evaluation: grade for laboratory classes - 50%, grade for the lecture – 50%.

Final grade = 50 % of grade for lecture + 50 % of grade for laboratory classes.

STUDENT WORKLOAD

Full-time studies			
contact hours :	15 h Lecture + 30 h proj.	=	45 h
Preparation for classes:			30 h
Studying the recommended literature:			30 h
Project completion	:		30 h
Preparing for the test :			30 h

RECOMMENDED READING :

1. S. Bangsow, Tecnomatix Plant Simulation: Modeling and Programming by Means of Examples, Springer; 2016
2. S. Bangsow, Manufacturing Simulation with Plant Simulation and Simtalk: Usage and Programming with Examples and Solutions, Springer, 2010
3. G. L. Curry, R. M. Feldman, Manufacturing Systems Modeling and Analysis, Springer, 2010

OPTIONAL READING:

1. W. D. Kelton, R. Sadowski, Simulation with Arena, McGraw-Hill Education, 2009

PRODUCTION CONTROLLING

Course code: MD-14-WM-ZIP

Type of course: Compulsory

Person responsible for the course Prof. PhD Eng. Anna Saniuk

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Lecture	15		I	Graded credit	
Project	15	1		Graded credit	

COURSE AIM:

The aim of the course is to learn the fundamental principles of the functioning of accounting in a company, to learn how to use correctly the financial data collected on accounts in the decision-making processes in manufacturing companies, and how to measure the efficiency of production processes, how to analyse the data and how to evaluate the effectiveness of the company operation based on the analysis of indicators, both financial and non-financial.

ENTRY REQUIREMENTS

Essentials of Economics

COURSE CONTENTS:

The course covers the following issues:

Accounting as the enterprise information system. Keeping accounting books and simplified forms of records. Balance sheet. The principle of the balance sheet equilibrium. Profit and Loss Account. The financial statements as a source of information on the condition of the company. Reading the balance sheet. Analysis of profit and loss account. Financial result determination. The importance of the financial result in the assessment of the financial condition of the company. Records of business transactions. Balance sheet business operations vs. result-affecting business operations. Principles of operation of accounts, chart of accounts. Income and expenses in the company accounting. Method of valuation of materials, goods and finished products. Balanced scorecard. Key performance indicators. The specificity of measurements of production processes. The analysis, monitoring and control of production processes. The principles of operational planning and creating budgets.

Within the project classes: students work in teams (2-3 people) and individually executing the project tasks in the area of:

- the selection of forms of economic records in the moment of business establishing and the assessment of their impact on the financial result,
- Classification of balance sheet items, preparation of the balance of economic entities,
- the analyses of the balance sheet and profit and loss account,
- developing a strategy map,
- developing key performance indicators to measure the implementation of the strategic goals of an enterprise and to evaluate the effectiveness of manufacturing processes,
- development of simple tools for operational controlling which relate to production.

TEACHING METHODS:

Project classes are carried out in a form of project assignments performed in groups (teams) and individually. Case study.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills) After completing the course:	Reference to learning outcomes in education in technical sciences
K_W12	the student has knowledge in the area of of financial management, principles of recording business operations, financial reporting, valuation of business assets and sources of funding, measuring the effectiveness of production processes, principles of efficiency monitoring and control in an enterprise.	T1A _W02
K_W14	the student knows the general principles for the establishment and development of businesses run by individual enterpreneurs, keeping economic records.	T1A _W11
K_U01	The student is able to acquire information from literature or legal provisions relating to current regulations in the field of accounting. He/she is able to interpret them and use them in the decision-making process as well as to draw conclusions.	T1A_U01
K_U02	Students can work individually and in a team; can create a team, assign tasks, and check and evaluate the results of work of individual team members.	T1A_U02
K_K03	The student is able to cooperate and to work in a group taking various roles.	T1A_K03

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Project: graded credit

The grade is determined on the basis of the component evaluating skills related to the execution of project tasks carried out during classes in groups and individually (K_U01, K_K03, K_U02, K_W12, K_W14).

STUDENT WORKLOAD

Overall student workload – **132** (131*) hours :

- classes carried out by the teacher: participation in lecture 15 hours, project classes 15 hours, participation in consultations 10 hours .
- hours of student's own work: studying the literature 5 hours, preparing for project tasks 15 hours .

RECOMMENDED READING :

1. Makysova H., Saniuk A., Logistics Controlling Tools as a Need of Successful Management, Pearson Education Limited, Great Britain 2015.
2. Slack N., Brandon-Jones A., Johnston R., Operations Management, Pearson Education Limited, Great Britain 2013.
3. Davenport T. H., Enterprise Analytics: Optimize Performance, Process, and Decisions Through Big Data, Pearson FT Press, 2012.

OPTIONAL READING :

1. Kaplan R., Norton D., The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment, Harvard Business Review Press, Cambridge 2000.
2. Cammeron S. A., Enterprise Content Management - A Business And Technical Guide, BCS Learning and Development Ltd., 2011.

PROFESIONAL FOREIGN LANGUAGE SKILLS II

Course code: MD-15-WM-ZIP

Type of course: Compulsory

Person responsible for the course MSc Agnieszka Florkowska

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					3
Laboratorium	30	2	II	Graded credit	

COURSE AIM:

The aim of the course is to get students acquired the knowledge of the foreign language in the area of advanced communications technology.

ENTRY REQUIREMENTS

Knowledge of the chosen foreign language in the area of technology.

COURSE CONTENTS:

2. The introduction of advanced elements of technical and specialist language in the field of management and production engineering, including:

a. Quality management.

b. Company Profile. Elements of the organization of service enterprises.

c. Safety at work - procedures, regulations and standards, written instructions and warnings.

d. Monitoring and control – monitoring industrial systems.

e. *Lean Manufacturing*. Toyota Production System.

f. Applying for a job – CV and cover letter, job interview.

g. Business correspondence – faxes, e-mails, Korespondencja biznesowa – faksy, emaile, memos, reports of meetings, etc.

TEACHING METHODS:

Conventional communication classes, pair work, group work, individual work with the use audiovisual multimedia aids.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W12	The student has advanced knowledge of a foreign language and uses it for communication.	T1A _W02
K_U01	The student understands the various forms of technical	T1A_U01

	correspondence, is able to acquire information from foreign literature and specialized texts.	
K_U05	The student is able to conduct technical, standard correspondence, formulate appropriate procedures in the area of management and production engineering.	T1A_U03
K_U10	Student uses advanced terminology related to management and production engineering	T1A_U01 T1A_U02

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

graded credit: The grade is the average calculated from grades obtained in written tests, including the verification of proficiency at the appropriate level according to the European Framework of Reference for Languages (K_W12), and a component evaluating active participation in classes and skills related to specific tasks - carrying out presentation, written tasks, individual work and in groups (K_U01, K_U04, KU_05, KU_10)

STUDENT WORKLOAD

Overall student workload amounts approximately 54 hours per term, including participation for classes 30 hours, preparation for classes and preparation for subject presentations, speeches and essays 14 hours, preparing for credit tests 6 hours, studying the literature 2 hours, participation in consultations 2 hours.

RECOMMENDED READING (FOR ENGLISH COURSE):

1. Richardson K., Kabanagh M., Sydes J., Emmerson P., *The Business Intermediate,* Macmillan, Oxford, 2008
2. Mark Ibbotson, *Cambridge English for Engineering,* Cambridge University Press, 2009

OPTIONAL READING :

1. Nick Brieger, Alison Pohl, *Technical English: vocabulary and grammar,* Summertown Publishing, 2008
2. *Longman Business Dictionary*, Pearson Education Limited, Harlow, 2007
3. *Słownik Techniczny Angielsko-Polski, Polsko-Angielski*, wyd. REA, 2005
4. Clive Oxenden, Christina Latham-Koenig, Paul Seligson, *New English File Pre Intermediate*, Oxford University Press, 2007
5. Michael Swan, Catherine Walter, *The Good Grammar Book,* Oxford University Press, 2009

ADVANCED CAD MODELLING AND RAPID PROTOTYPING

Course code: MD-16b-WM-ZIP

Type of course: Elective

Person responsible for the course PhD Eng. Julian Jakubowski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Project	30	2	II	Graded credit	

COURSE AIM:

Gaining knowledge and acquiring skills in the area of 3D modeling and rapid prototyping technology.

ENTRY REQUIREMENTS

Basic knowledge of CAD.

COURSE CONTENTS:

The role of 3D models in product and process development. Kinematics and simulation of selected working systems. Parameterization. Current trends in the use of the CAD data model in the product development.

The selection and development of a virtual structure of a process for a model performed during the classes, in the Catia system, applying assembly techniques for a virtual product, supplemented with the simulation of the product operation. Presentation of analyses of the system. The shape, material and method of manufacture. Execution of the workpiece with the use of a 3D printer. Analysis.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
Knowledge		
K_W03, K_W05	Student has extensive and in-depth knowledge of 3D modeling using software applications.	T2A _W03
Skills		
K_U01, K_U04	The student is able to use information and communication technologies relevant to the tasks typical for the undertaken project.	T2A_U01
K_U03	Students can work both individually and in a team, and also skillfully manage the work of the team.	T2A_U02
Competences		

K_K03	The student is able to interact and work in a group, taking on different roles needed to perform a specific project task	T2A_K03

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

The students' progress in acquiring knowledge, skills and competencies is regularly monitored through systematic evaluation of project tasks performed in groups (K_U03, K_W03, K_W05, K_K03)

STUDENT WORKLOAD

Overall student workload **90** hours :

- tutorials with the teacher: participation in project classes 30 hours,
- Students' own work: studying the literature 15 hours, preparation to project classes 45 hours .

RECOMMENDED READING:

1. Michel Michaud, CATIA' Core Tools: Computer Aided Three-Dimensional Interactive Application. The McGraw Hill Companies, 2012
2. Richard Cozzens Advanced Catia V5 Workbook, Knowledgeware and Workbenches SDC Publication s 2006

OPTIONAL READING:

1. Thomson R.,Manufacturing processes for design professionals, 2007,
2. Catia V6 esentials, Kogent learning solutions, Inc, Jones and Bartlett Publishers, 2011

ADVANCED MANUFACTURING TECHNOLOGY

Course code: MD-16b-WM-ZIP

Type of course: Elective

Person responsible for the course PhD Eng. Michał Sasiadek

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Project	30	2	II	Graded credit	

COURSE AIM:

Mastering skills and knowledge in the area of advanced technologies used in engineering production.

ENTRY REQUIREMENTS

Basic knowledge of manufacturing processes.

COURSE CONTENTS:

Practical application of modern production technologies. HSM, the use of composite materials.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
Knowledge		
K_W03, K_W05	Student has extensive and in-depth knowledge of production processes using software for 3D designing including CAx techniques.	T2A _W03
Skills		
K_U01, K_U04	The student is able to use information and communication technologies relevant to the tasks typical for the undertaken Project.	T2A_U01
K_U03	Students can work both individually and in a team, and also skillfully manage the work of the team.	T2A_U02
Competences		
K_K03	The student is able to interact and work in a group, taking on different roles needed to perform a specific project task.	T2A_K03

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

The students' progress in acquiring knowledge, skills and competencies is regularly monitored through systematic evaluation of project tasks performed in groups (K_U03, K_W03, K_W05, K_K03)

STUDENT WORKLOAD

Overall student workload **90** hours :

Overall student workload **90** hours :

- tutorials with the teacher: participation in project classes 30 hours,
- Students' own work: studying the literature 15 hours, preparation to project classes 45 hours .

RECOMMENDED READING:

1. Thomson R., Manufacturing processes for design professionals, 2007,
2. BENHABIB, Beno. Manufacturing: design, production, automation, and integration. CRC Press, 2003.

OPTIONAL READING :

1. ANDERSON, David M. Design for manufacturability & concurrent engineering: how to design for low cost, design in high quality, design for lean manufacture, and design quickly for fast production. CIM press, 2004.
2. James G. Bralla, Design for manufacturability, Handbook, McGraw Hill, 1999.

COSTING FOR ENGINEERS

Course code: MD-17a-WM-ZIP

Type of course: Elective

Person responsible for the course Prof. PhD Eng. Anna Saniuk

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Project	30	1	II	Graded credit	

COURSE AIM:

The aim of the course is to learn the principles of accounting and cost management in production companies and to acquire skills how to analyse data contained therein and how to correctly use the data in decision-making processes.

ENTRY REQUIREMENTS

Essentials of Economics

COURSE CONTENTS:

Within the project: Students work in teams (2-3 people) and individually performing project tasks in the area of:
- Cost planning,
- carrying out the analysis of deviations from the planned values, and planning corrective actions,
- estimating the costs of individual processes according to the Activity Based Costing method

TEACHING METHODS:

Project in the form of project tasks performed by students in groups (teams) as well as individually. Analysis of cases.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills) After completion	Reference to learning outcomes in education in technical sciences
K_W12	The student has knowledge of cost estimation, operational plans and the analysis of information contained in the budgets of production companies.	T1A _W02
K_W14	The student has general knowledge necessary to understand economic conditions of running business activity, decision-making in an enterprise and the impact of the decisions on the financial result of the business activity.	T1A _W08
K_U03	Students is able to work individually and in a team; can create a team, distribute tasks, and check and evaluate the results of work of individual team members.	T1A_U02

K_U18	The student is able to make a costing for the production company, analyze the data contained in the budgets, calculate and analyze deviations from the planned values and to plan corrective actions.	T1A_U12
K_K03	The student is able to interact and work in a group accepting various roles.	T1A_K03

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

The students' progress in acquiring knowledge, skills and competencies is regularly monitored through systematic evaluation of project tasks performed in groups (K_U03, K_K03, K_W12, K_W14, K_U18)

STUDENT WORKLOAD

Overall student workload **90** hours :

- tutorials with the teacher: participation in project classes 30 hours,
- Students' own work: studying the literature 15 hours, preparation to project tasks 45 hours .

RECOMMENDED READING :

1. Charles T. Horngren, Srikant M. Datar, Madhav V. Rajan, Cost Accounting, Prentice Hall 2014.
2. Church A. Ch., Production Factors in Cost Accounting and Works Management, Buchanan Press 2008.
3. Blocher E., Cost Management: A Strategic Emphasis, McGraw-Hill Medical Publishing, 2010.

OPTIONAL READING :

1. M Kaplan R., Norton D., Time-Driven Activity-Based Costing: A Simpler and More Powerful Path to Higher Profits, Harvard Business Review Press, Cambridge 2007.
2. Blokdijk G., Activity Based Costing - Simple Steps to Win, Insights and Opportunities for Maxing Out Success, Emereo Pty Ltd, 2015.

MARKETING

Course code: MD-17b-WM-ZIP

Type of course: Elective

Person responsible for the course MSc Eng. Aleksandra Szajna

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Project	30	1		Graded credit	

COURSE AIM:

The aim is to familiarize students with: modern marketing, the essence of marketing management and building a marketing plan as a necessary element of the business plan.

ENTRY REQUIREMENTS

Microeconomics.

COURSE CONTENTS:

The course includes the following topics: :

- Determining the scope of the project: listing the data of the potential company (name, location, industry branch, company structure, target group, business area, present competition or offered products and/or services - i.e. the idea and the current state); determining the competences of the Marketing team, defining of the purpose of the project - i.e. the product or service for which the marketing strategy is created.
- Carrying out the analysis of competitors using benchmarking methodology according to the American Productivity and Quality Center, determining the potential life cycle of products (services), defining the process of price calculation, determining of the method of price determination, offer of the price strategy, SWOT analysis
- Determining of distribution strategy: number of channels, description of functions and relationships. The selection of the mix promotion, an offer of a strategy for promotion
- Conducting marketing research - the determination of the research aim, the group of respondents, the elaboration of a questionnaire, conducting pilot tests, introducing the corrective changes in the questionnaire, conducting the research, presentation of research results
- Determination of a marketing plan for the project

TEACHING METHODS:

Project. Group work.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W04	The student has ordered general knowledge in the area of	T1A_W03

	the basics of marketing associated with the Management and Production Engineering.	
K_W13	Students know the theory of marketing, are able to distinguish between strategic marketing and operational markting. They can explain the process of marketing management. They distinguish between categories of marketing, marketing of production goods and consumer goods, of services and information, the behavior of buyers, marketing of services.	T1A_W04
K_U01	Students are able to obtain information from literature, databases and other sources for the purpose of marketing research: they are able to integrate , interpret, draw conclusions and to formulate opinions based on the obtained information.	T1A_U01
K_U03	Student can work individually and in a team; is able to select the marketing team members; to indicate expectations of the team members and to manage a small team, to assign roles and competences.	T1A_U03
K_U18	The student is able to obtain, integrate, interpret, draw conclusions and formulate opinions on the basis of advertising materials, obtained from literature, databases and other modern media; i.e. to carry out the analysis of competition with the benchmarking method.	T1A_U10
K_K03	Student is able to work in a group accepting various roles - responsibility for the implementation of specific tasks as a Marketing team member.	T1A_K03
K_K05	The student is able to think and act in an entrepreneurial way - the formulation of a marketing strategy	T1A_K06

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Project: graded credit

The grade is determined on the basis of the component evaluation of skills related to the implementation of project tasks (K_W04, KW_13, K_U01, K_U03, K_U18) and the preparatio of a presentation (K_K03, K_K05)

STUDENT WORKLOAD

Overall student workload **90** hours :

- tutorials with the teacher: participation in project classes 30 hours,
- Students' own work: studying the literature 15 hours, preparation to project tasks 45 hours .

RECOMMENDED READING :

1. Ph. Kotler, G. Armstrong Principles of Marketing, 2006
2. Ph. Kotler, K. L. Keller, Marketing Management, 2006
3. S. Atchison, J. Burby, Does It Work?: 10 Principles for Delivering True Business Value in Digital Marketing, WPP digital Company, 2015

OPTIONAL READING:

1. A. Dib, The 1-Page Marketing Plan: Get New Customers, Make More Money, And Stand out From The Crowd , 2016
2. T. Hurson, Think Better: An Innovator's Guide to Productive Thinking, McGraw Hill company, 2008

MASTER THESIS (FINAL PROJECT)

Course code: MD-18-WM-ZIP

Type of course: Compulsory

Person responsible for the course Prof. PhD Eng. Sławomir Kłos

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					20
Seminar	225		III	Graded credit	

COURSE AIM:

Preparation of Master Thesis

ENTRY REQUIREMENTS

Completed courses in semester I and II

COURSE CONTENTS:

Within the course, student prepares a diploma paper on a selected topic using the previously acquired knowledge and skills,

TEACHING METHODS:

Student's own work, participation in a seminar

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W01 K_U01, K_U10	The student is able to obtain information from literature, databases, and other appropriately selected sources, also in English or any other language in the area of study; is able to integrate the information obtained, to interpret it, and to draw conclusions and formulate and justify opinions	T2A_U01
K_K04	The student is able to properly identify and justify the priorities for the implementation of tasks set by himself/herself and others.	T2A_K04

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Evaluation of the diploma thesis and the diploma examination (K_W01,K_U01, K_K04).

STUDENT WORKLOAD

Overall student workload 225 hours (student's own work).

RECOMMENDED READING :

1. Yvonne N. Bui, How to Write a Master's Thesis, SAGE 2009.

MASTER THESIS SEMINAR

Course code: MD-19-WM-ZIP

Type of course: Compulsory

Person responsible for the course Prof. PhD Eng.. Sławomir Klos

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					2
Seminar	45	2	III	Graded credit	

COURSE AIM:

The acquisition of career management skills, conscious choice of specialty and subject thesis

ENTRY REQUIREMENTS

Completed undergraduate studies in engineering

COURSE CONTENTS:

Within the course, students will participate in seminars, which aim at developing skills of clear formulation of technical and economic problems and how to solve them. Problems formulated and solved by students during the seminar will cover selected topics which refer to the management of production and services, to integrated production systems, planning and production flow control.

TEACHING METHODS:

Seminar

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_U01, K_U10	The student is able to obtain information from literature, databases, and other carefully selected sources, also in English or any other modern language in the area of study; the student is able to integrate the obtained information, to interpret it, as well as to draw conclusions and formulate and justify opinions	T2A_U01
K_K04	The student is able to properly identify and justify the priorities for the implementation of the tasks set by himself and others.	T2A_K04

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

The assessment includes student's own work and activity at diploma seminars (K_U01, K_K04).

STUDENT WORKLOAD

Overall student workload 60 hours, including participation in seminars 45 hours, studying the literature 15 hours .

RECOMMENDED READING :

2. Murray R., How to write a Thesis, McGraw-Hill Education Pvt Limited 20111
3. Yvonne N. Bui, How to Write a Master's Thesis, SAGE 2009.

PRACTICE

Course code: MD-20-WM-ZIP

Type of course: Compulsory

Person responsible for the course: Prof. PhD Eng. Justyna Patalas-Maliszewska

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					4
Praktyka	160		III	Graded credit	

COURSE AIM:

Preparation of materials for the realization of the diploma thesis

ENTRY REQUIREMENTS

no

COURSE CONTENTS:

Within the course, students do a four-week internship in a selected company, during the holiday season (July-September).

TEACHING METHODS:

Students' own work.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_U01 do K-U22 oraz K_K01 do K_K05	The student is able to properly identify and justify the priorities for the implementation of tasks set by himself and others.	T2A_K04

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

The credit is granted by the tutor based on the internship report, handed to the tutor.

STUDENT WORKLOAD

Overall student workload 160 hours

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ETHICS IN MANAGEMENT

Course code: MD-21a-WM-ZIP

Type of course: Elective

Person responsible for the course PhD Eng. Marek Rybakowski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					2
Class	15	1	III	Graded credit	

COURSE AIM:

The aim of the course is to provide students with the most important concepts related to ethics in engineering activities and with the contemporary ethical problems.

ENTRY REQUIREMENTS:

no

COURSE CONTENTS:

Ethics - one of the basic philosophical disciplines. Difficulties in defining ethics as one of the fundamental philosophical disciplines. Moral norms. The concept of a social system, social and professional groups. Workplace as a social system and professional groups.

The importance of business ethics. Generally accepted norms. Ethical aspects of the rules of economic competition. Wealth creation in the perspective of personal subject. Ethical aspects of a business. Business ethics and common sense. Ethics and the world of finance. Ethics of persuasion. Staff and their "employee rights". The principle of ethical evaluation. Ethical systems, incentives and information. The boundaries of business ethics.

TEACHING METHODS:

Individual and group work.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W12	Knowledge: students understand the need for continuous learning and improvement of their qualifications; understand the importance of ethical implication associated with work.	T1A_W03
K_U14	Students are able to think in ethical terms while making deciding to set up and run businesses, including its organizational structure; are able to independently analyze moral conflicts.	T1A_U01
K_U15	Students are able to independently evaluate contemporary	T1A_U02

	moral problems; they are able to use the library and other knowledge bases, to search independently elaborations related to a set topic, to update and integrate knowledge acquired during the studies.	
K_K02	Students can work in teams, participate in discussions, present and justify their opinions	T1A_K02

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

The grade is determined on the basis of the component evaluating skills related to the implementation of tasks (K_W12) and the preparation of the report (K_U14) and a component including the student's "defense" of the report on the realisation of the task (K_U14, K_U15, K_K02).

STUDENT WORKLOAD

Overall student workload 45 hours, including: participation in, participation in classes 15 hours, preparation to the classes and student's own work 15 hours, preparation and elaboration of the report on the realisation of the tasks 10, participation in consultations 5 hours .

RECOMMENDED READING :

1. Duska, R.: Contemporary Reflections on Business Ethics. Boston 2007: Springer. ISBN 1-4020-4983-8.
2. Frederick, E.R., Carroll, A.B.: A Companion to Business Ethics. Copyright: by Blackwell Publishers Ltd, 2007. Online ISBN: 9780470998397.
3. Hartman, L., DesJardins, J., MacDonald, Ch.: Business Ethics. Decision Making for Personal Integrity & Social Responsibility. New York 2014. ISBN-13: 978-0078029455.
4. Jones, C.; Parker, M.; et al. For Business Ethics: A Critical Text. London 2005: Routledge. ISBN 0-415-31135-7.
5. Pinnington, A. H.; Macklin, R.; Campbell, T. Human Resource Management: Ethics and Employment. Oxford: Oxford University Press 2007. ISBN 0-19-920379-2.

OPTIONAL READING:

1. 4th International Conference on Applied Human Factors and Ergonomics (AHFE) 2012. 21-25 July 2012. Hilton, San Francisco, Union Square. California. USA.
2. Complete Guide to Ethics Management: http://managementhelp.org/businessethics/ethics-guide.htm#anchor73330

INTERNATIONAL PROJECT MANAGEMANT

Course code: MD-21b-WM-ZIP

Type of course: Elective

Person responsible for the course Prof. PhD Eng. Sławomir Kłos

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					2
Project	15	1		Graded credit	

COURSE AIM:

The aim of the course is to provide students with the most important concepts of issues related to the management of international projects.

ENTRY REQUIREMENTS:

no

COURSE CONTENTS:

Project Class include a discussion of the e-learning materials, opportunity to work on the group project and Microsoft Project exercises covering the following topics: Tour of MS Project, Creating a Task List, Setting Up Resources, Assigning Resources to Tasks Formatting and Sharing Plan, Tracking Progress on Tasks. Fine-Tuning Task Details. Fine-Tuning Resource Details, Assignment Details, Fine-Tuning the Project Plan, Organizing Project Details, Tracking Progress on Tasks and Assignments. Viewing and Reporting Project Status

TEACHING METHODS:

Individual and group work.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W12	Students understand the need for continuous learning and improvement of their qualifications; understand the importance of ethical implications associated with professional work.	T1A_W03
K_W13	The student is able to solve selected problems in an international group, to make business decisions	T1A_U01
K_U15	Students is able to independently evaluate contemporary issues related to project management, to independently search for elaborations on a set topic; to update and integrate knowledge acquired during studies	T1A_U02
K_K02	Sudents can work in a team, participate in discussions, present and justify their opinions	T1A_K02

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Grade is determined on the basis of the component evaluating skills related to the implementation of the project tasks (K_W12, K_W13) and the project preparation (K_U15) and a component of the student's "defense" of the project (K_U14, K_K02).

STUDENT WORKLOAD

Overall student workload 45 hours, including: participation in, participation in project classes 15 hours, preparation for classes and student's own work 15 hours, preparation and elaboration of the project 10 hours, participation in consultations 5 hours .

RECOMMENDED READING :

1. T. W. Grisham, International Project Management: Leadership in Complex Environments, Wiley, 2009
2. K. Koster, International Project Management, SAGE Publications Ltd, 2009
3. B. Lientz, K. Rea, International Project Management, Academic Press/Elsevier Science, 2003

OPTIONAL READING:

1. A Guide to the Project Management Body of Knowledge: PMBOK, Project Management Institute 2013.

ENVIRONMENTAL MANAGEMENT SYSTEMS

Course code: MD-22a-WM-ZIP

Type of course: Elective

Person responsible for the course PhD Eng. Izabela Gabryelewicz

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					2
Class	15	1	III	Graded credit	

COURSE AIM:

The aim of the course is to get students familiar with complex threats to the natural environment resulting from human activities, to persuade them into legal solutions and regulations that ensure the protection of the natural environment.

ENTRY REQUIREMENTS:

no

COURSE CONTENTS:

Basics of ecology of natural resources. Processes occurring in the biosphere. Protection of the lithosphere, hydrosphere and atmosphere. Industrial pollution and its impact on the environment. Protection of the nature and landscape. Municipal pollution and its impact on the environment. Water management. Selected methods of purification of liquids and gases. Noise - sources and its impact on the human body. Vibrations, oscillations. Sustainable development in various fields of industry. Clean (non-waste) technologies. Spread and pollution monitoring. Waste management. Recycling and recovery of raw materials. Integrated management system. Economic instruments in environmental protection. Legal basis for environmental protection in Poland and the EU. The national environmental policy.

Characteristics of the environment on a selected example. Relations environment - business. Ecological limitation for economic growth. Ecological management and environmental auditing (ISO 1400 and EMAS). The integration of environmental management systems (quality, safety, environmental protection).

TEACHING METHODS:

Individual and group work.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W12	The student has ordered, theoretically founded general knowledge in the field of environment and cleaner production related to the management and production engineering, and also related to material recycling.	T1A_W03

K_U01	The student is able to obtain information from literature, databases and other sources, integrate and interpret it, as well as to draw conclusions and form opinions	T1A_U01
K_U02	Students can work individually and in a team.	T1A_U02
K_K02	The student is aware of the importance of the non-technical aspects and impacts of engineering activities, including its impact on the environment and the responsibility for their decisions.	T1A_K02

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Grade is determined on the basis of the component evaluating skills related to the implementation of the class tasks (K_W12) and the preparation of the report (K_U01) and a component of the student's "defence" of the report on the realisation the the task (K_U02,K_K02).

STUDENT WORKLOAD

Overall student workload 45 hours, including: participation in, participation in classes 15 hours, preparation for classes and the student's own work 15 hours, preparation and elaboration of the report of the realisation of the task 10, participation in consultations 5 hours .

RECOMMENDED READING :

1. Weiß P., Bentlage J., Environmental Management Systems and Certification, Book 4 in a series on Environmental Management, The Baltic University Press, Printed by Nina Tryckeri, Uppsala 2006.

OPTIONAL READING :

1. Brady J., ENVIRONMENTAL MANAGEMENT IN ORGANIZATIONS, The IEMA Handbook, The Institute of Environmental Management and Assessment (IEMA), 2005, London, Sterling, VA
2. Health, Safety and Environment Management System, November 2007, ENSIGN, Energy Services INC, Driving to Zero Injuries - Incidents

SYSTEMS OF OCCUPATIONAL SAFETY MANAGEMENT

Course code: MD-22b-WM-ZIP

Type of course: obieralny

Person responsible for the course PhD Eng. Marek Rybakowski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving credit for a course	Number of ECTS credits allocated
Full-time studies					2
Class	15	1	III	Graded credit	

COURSE AIM:

The aim of the course is to get students familiar with the most important concepts related to security management and crisis management.

ENTRY REQUIREMENTS:

Management basics

COURSE CONTENTS:

Concepts of the security management of a company . Management of the legal and organizational safety. Information security management. Management of physical and technical security; security audit; integrated security management system in an enterprise, crisis management.

TEACHING METHODS:

Individual and group work.

LEARNING OUTCOMES:

Effect code	Effect description (knowledge, competence, skills)	Reference to learning outcomes in education in technical sciences
K_W12	Knowledge: students understandsthe need for continuous learning and the improvement of their qualifications; understand the importance of safety management in their professional work	T1A_W03
K_U14	Students are able to think in terms of safety in business decisions (both while setting up and running a business) as well as in its organizational structure; can independently analyze threats and emergencies.	T1A_U01
K_K02	Students are able to work in a team, participate in discussions, present and justify their opinions	T1A_K02

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Grade is determined on the basis of the component evaluating skills related to the implementation of the class tasks (K_W12) and the preparation of the report (K_U14) and a component of the student's "defence" of the report on the realisation the the task (K_U14,K_K02).

STUDENT WORKLOAD

Overall student workload 45 hours, including: participation in classes 15 hours, preparation to the classes and student's own work 15 hours, preparation and elaboration of the report on the realisation of the tasks 10, participation in consultations 5 hours .

RECOMMENDED READING :

1. PN-N-18001: 2004 - "SAFETY MANAGEMENT SYSTEMS AND OCCUPATIONAL HEALTH". The Polish standard for the management of occupational health and safety.
2. OHSAS 18001: 2007 – "OCCUPATIONAL HEALTH AND SAFETY ASSESSMENT SERIES".
3. Audit Matrix for the ILO Guidelines on Occupational Safety and Health Management Systems (ILO-OSH 2001). Programme on Safety and Health at Work and the Environment (SafeWork). Copyright: International Labour Organization 2013. First published. Geneva 2013. Switzerland.
4. OSH MANAGEMENT SYSTEM: A TOOL FOR CONTINUAL IMPROVEMENT. Copyright: International Labour Organization 2011. Turin 2011.
5. Guidelines on occupational safety and health management systems ILO-OSH 2001. Copyright: International Labour Organization 2001. INTERNATIONAL LABOUR OFFICE. GENEVA. First published 2001. Second edition 2009.

OPTIONAL READING:

1. Modern trends in ergonomics and occupational safety. Selected problems. Scientific monograph. Ed. G. Dudarski, J. Martinka, M. Rybakowski, I. Turekova. Publishing House of the University of Zielona Góra. Zielona Góra 2013.
2. RABENDA, A., KOWAL, E., BALOG, K. Work hygiene. Selected issues. Monograph. Copyright by University of Zielona Góra. Zielona Góra 2014.
3. Systems in focus: Guidance on occupational safety and health management systems, Institution of Occupational Safety and Health (IOSH), 2009. http://www.iosh.co.uk
4. Work improvement and occupational safety and health management systems: Common features and research needs, Kazutaka Kogi, Industrial Health 2002, 40, 121-133.