COMPUTER SCIENCE AND ECONOMETRICS

STUDIES OF SECOND DEGREE

COURSE DIRECTORY

Since 2013/2014

ACTUARIAL METHODS

Course code: 11.5-WK-IiE-SD-MA

Type of course: optional

Language of instruction: English/Polish

Director of studies: dr hab. Mariusz Michta, prof. UZ

Name of lecturer: dr hab. Mariusz Michta, prof. UZ

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					5
Lecture	30	2	II	Exam	
Class	30	2		Grade	

COURSE AIM:

Knowledge about selected topics on actuarial and insurance mathematics: mortality models, net premium calculations, reserves, collective risk model, ruin probability.

ENTRY REQUIREMENTS:

Mathematical analysis, probability theory, introduction to financial mathematics, foundations of stochastic analysis

COURSE CONTENTS:

1. Mortality models, survival probability, life tables.
2. Life insurances payable at the moment of death.
3. Life insurances payable atth end of the Lear of death.
4. Single net premiums and relationships between different kinds of insurances.
5. Live annuities and their single net premiums.
6. Commutation function formulas for annuities and insurances.
7. Net premiums: fully continuous and discrete.
8. Net premium reserves: prospective and retrospective formulas .
9. Multiply life functions: the joint-life status and the last-survivor status. Insurances and annuities.
10. Multiply decrement models-basic kinds of insurances and premium calculations.
11. Collective risk models. Lundberg's risk model and Cramer-Lundberg's estimation of ruin probability.

TEACHING METHODS:

Lectures: actuarial and insurance mathematics: mortality models, net premium calculations, reserves, collective risk model, ruin probability.

Classes: exercises

LEARNING UTCOMES:

1. Students are familiar with international actuarial notation and different kinds of insurances (K_W01, K_W04)
2. They are able to estimate expected value of future-lifetime (K_U01, K_K03).
3. They know basic analytical mortality (K_W05).
4. Students know equivalence principle for net-premium (K_W05, K_U05, K_U11, K_K03).
5. They are able to use life-tables for net-premium calculations (K_U08, K_U01, K_K06).
6. Students know mathematical aspects of classical risk theory (K_W05, K_U05, K_K03).

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Evaluation of individual exercises, final exam and grades

STUDENT WORKLOAD:

Lectures - 30 h
Classes - 30 h
Tutoring – 15 h (Lectures - 10 h; Classes - 5 h)
Total: 75 h (3 ECTS)
Individual students` work
Preparing to lectures - 15 h
Preparing to classes - 15 h
Preparing to the exam - 20 h
Total: 50 h (2 ECTS)
Total hours and points per course 125 h (5 ECTS)

RECOMMENDED READING:

1. M. Skałba, Ubezpieczenia na życie, WNT, Warszawa, 2002.
2. T. Rolski, B. Błaszczyszyn, Podstawy matematyki ubezpieczeń na życie, WNT, Warszawa, 2005.
3. N. Bowers, H.U. Gerber et all, Actuarial Mathematics, Soc. of Actuaries, Illinois, 1986.
4. J. Grandell, Aspects of Risk Theory, Springer, Berlin,1992.

OPTIONAL READING:

1. W. Ronka-Chmielowiec, Ryzyko w ubezpieczeniach-metody oceny, AE, Wrocław, 1997.
2. M. Dobija, E. Smaga, Podstawy matematyki finansowej i ubezpieczeniowej, WNT, Warszawa,
3. H. U. Gerber, Life Insurance Mathematics, Springer, Berlin,1990.

ALGORITHMIC METHODS

Course code: 11.0-WK-IiE-SD-MAL

Type of course: optional

Language of instruction: English/Polish

Director of studies: dr Florian Fabiś

Name of lecturer: dr Florian Fabiś,
mgr Katarzyna Jesse-Józefczyk

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					6
Lecture	15	1	III	Exam	
Class	30	2		Grade	

COURSE AIM:

Extensive knowledge of algorithms' constructing and analysis.
The ability to implement typical algorithms in practice and also the skills in adapting and modifying of those in extraordinary situations

ENTRY REQUIREMENTS:

Gaining of competences in computer structured programming. Basic course in algorithms and data structured.

COURSE CONTENTS:

Lecture

1. **NP – complete problems**. (2 h)
2. **Approximation algorithms.** Optimization and decision problems. Optimum and approximate solutions. Absolute performance guarantee and relative performance guarantee of approximation algorithm. Approximation schemes: PTAS, FPTAS. (3 h)
3. **Some approximation algorithms.** Vertex Cover, Set Cover, Bin Packing, Knapsack, Multiprocessor Scheduling, Graph Coloring, Traveling Salesman. (4 h)
4. **Algorithmic methods.** Greedy algorithms. Backtracking algorithms. Branch-and-Bound (BB) method. Dynamic programming. Genetic algorithms. Probabilistic algorithms. (6 h)

Laboratory

1. Generating random number. Generating random graphs. (2 h)
2. Selected combinatorial algorithms for practical applications (4 h)
3. Approximation algorithms. (8 h)
4. Testing of algorithms that use selected algorithmic methods. (6 h)
5. Probabilistic algorithms. (4 h)
6. Selected algorithms with numbers. (6 h)

TEACHING METHODS:

Lecture: problem lecture.

Laboratory: laboratory exercises in computer lab – implementation and testing of selected algorithms.

Each student is supposed to realize three projects during the semester. Each project will consist in implementation of the selected algorithm to solve a concrete practical task, writing a program for it, testing it and presenting a documentation in accordance with the assigned specification. On one out of the three projects the students will work in 2-3 person groups. Furthermore the students will test other algorithms.

LEARNING OUTCOMES:

Student has knowledge of advanced methods of constructing efficient algorithms. [K_W11++]

Student knows the basic approximation algorithms and can implement them in programs [K_W11++], [K_U19++], [K_U20++]

Student knows the concept of probabilistic algorithms and can give examples of their use. [K_W11++]

Student knows the selected algorithms with numbers. [K_W11++]

Student is able to work in project team [K_K03++]

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Lecture. Written examination verifying the education outcome in area of knowledge and skills.

Laboratory. Final grade is granted based on number of points received during studies. Points are received for written tests, active participation in classes and completed project.

Final course grade consists of laboratory classes' grade (50%) and examination grade (50%). Positive grade from laboratory classes is the necessary condition for participation in examination. The positive grade from examination is the necessary condition for course completion.

STUDENT WORKLOAD:

Contact hours

- Participation in lectures: 15*1 h = 15 h
- Participation in laboratory studies : 15*2 h = 30 h
- Consultations: = 8 h
- Participation in the exam:1*2 h = 2 h

Total: 55 h (3 ECTS)

Independent work

- Preparation for laboratory exercises: 15*3 h = 45 h
- Finishing in house exercise laboratory: 15*2 h = 30 h
- Exam preparation: 20 h

Total: 95 h (3 ECTS)

Total for the course: 150 h (6 ECTS)

RECOMMENDED READING:

1. Aho A., Hopcroft J.E., Ullman J.D.: Projektowanie i analiza algorytmów komputerowych, PWN, Warszawa 1983.
2. Błażewicz J. : Złożoność obliczeniowa problemów kombinatorycznych, WNT, Warszawa 1988.
3. Cormen T.H., Leiserson C.E., Rivest R.L., Wprowadzenie do algorytmów, WNT, Warszawa 1997.
4. Vazirani V. V. : Algorytmy aproksymacyjne, WNT, 2004.

OPTIONAL READING:

1. Aho A., Hopcroft J.E., Ullman J.D., : The Design and Analysis of Computer Algorithms.
2. T.H. Cormen, Ch.E. Leiserson, R.L. Rivest: Introduction to Algorithms, MIT Press, 2001.
3. Knuth D.E.: The Art of Computer Programming.
4. Vazarni V. V. : Approximation Algorithms, Springer, 2003.

COMPUTER NETWORKS

Course code: 11.3-WK-IiE-SD-SK

Type of course: compulsory

Language of instruction: English/Polish

Director of studies: mgr inż Andrzej Majczak

Name of lecturer: mgr inż Andrzej Majczak
mgr in.. Edward Ciaś

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					5
Lecture	30	2	IV	Exam	
Laboratory	30	2		Grade	

COURSE AIM:

The aim of the course is to provide current knowledge of the theory and practice of computer networks and the Internet, showing how running applications and protocols, what is the layering network architecture and how to build a functional and secure applications.

ENTRY REQUIREMENTS:

Information Technology, Computer Programming.

COURSE CONTENTS:

Lecture:

1. Computer Networks and the Internet.
2. Application Layer.
3. Transport Layer.
4. The Network Layer.
5. The Link Layer and Local Area Networks.
6. Wireless and Mobile Networks.
7. Multimedia Networking.
8. Security in Computer Networks.
9. Network Management.

Laboratory:

1. Network access and physical media.
2. Network devices and network traffic.
3. Basic diagnostic tools and solving problems.
4. Analyzing packets introduction to Wireshark.
5. Technology Web and the HTTP protocol.
6. Internet e-mail.

7. The DNS namespace.
8. Transport Protocol TCP connection-oriented.
9. Connectionless UDP transport protocol.
10. IP, transmission and addressing on the Internet.
11. Wireless Networks.
12. Security on the network.
13. Network Design.

TEACHING METHODS:

Lecture: the traditional lecture. Laboratory: individual work at the computer. Processed material according to instructions that every student gets at the beginning of class. Discussions leading to deepen knowledge and understanding of the processed material.

LEARNING OUTCOMES:

Student:

1. has ordered knowledge in the theory, concepts and principles of operation of computer networks and the Internet (K_W15)
2. knowledgeable about the basics of configuring network devices (K_W15)
3. know the basic methods and tools for testing and analysis of connections in the network (K_W14)
4. can use a program analyzing packets and analyze performance of protocols and network applications (K_U17)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

1. Checking the degree of student preparation and their activities during the classes.
2. Getting good ratings from all the laboratory to be implemented under the laboratory.
3. Written exam at the end of the course.

STUDENT WORKLOAD:

Contact hours

Lecture – 30 hours

laboratory – 30 hours

consultations – 10 hours

Together: 70 hours (3 ECTS)

Individual work

preparation for laboratory – 30 hours

preparation to exam –30 hours

Together: 60 hours (2 ECTS)

Together: 130 hours (5 ECTS)

RECOMMENDED READING:

1. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach, 5/E, Addison-Wesley, 2010.
2. Andrew S. Tanenbaum, David J. Wetherall, Sieci komputerowe. Wydanie V, Helion, 2012.

OPTIONAL READING:

1. William Stallings, Data and Computer Communications. Prentice Hall, 2007.
2. Al Anderson, Ryan Benedetti, Head First. Sieci komputerowe. Helion, 2010.
3. Rafał Pawlak, Okablowanie strukturalne sieci. Teoria i praktyka. Wydanie III, Helion, 20011.

DATA WAREHOUSE

Course code: 11.3-WK-IiE-SD-HD

Type of course: compulsory

Language of instruction: English/Polish

Director of studies: mgr inż Andrzej Majczak

Name of lecturer: mgr inż Andrzej Majczak

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					5
Lecture	15	1	II or IV	Grade	
Laboratory	30	2		Grade	

COURSE AIM:

The aim of the course is present the theory in designing a data warehouse, knowledge tools for building queries and reports, and business intelligence.

ENTRY REQUIREMENTS:

Information Technology, Database.

COURSE CONTENTS:

Lecture:

1. Evolution of Decision Support Systems (DSS).
2. Introduction to Data Warehousing (definitions and terminology).
3. Data Warehouse Architecture (conceptual model, logical and physical).
4. Data Warehouse Design (models multidimensional OLAP operations)
5. Data Modeling for Data Warehouse (modeling point).
6. Physical implementation of data warehouse (extraction and loading).
7. Data Warehouse Systems (overview of the typical solutions.

Laboratory:

1. Introduction to DB2 Web Query.
2. Create and edit synonyms.
3. Create a simple report (Report Assistant).
4. Creating graphs (Graph Assistant).
5. Metadata Tools (Converting Existing Query Reports)
6. Create and use active reports (Active Reports).
7. Using OLAP (Online Analytical Processing).

TEACHING METHODS:

Lecture: the traditional lecture.

Laboratory: individual work at the computer. Processed material according to instructions that every student gets at the beginning of class. Discussions leading to deepen knowledge and understanding of the processed material.

LEARNING OUTCOMES:

Student:

1. knows basic theory in the design of the data warehouse. (K_W09)
2. knows the tools for business intelligence. (K_W13)
3. can use an intuitive interface to build queries and reports. (K_U15)
4. is able to build reports based on data stored in databases (K_U16)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

1. Checking the degree of student preparation and their activities during the classes.
2. Getting good ratings from all the laboratory to be implemented under the laboratory.
3. Written colloquium at the end of the course.

STUDENT WORKLOAD:

Contact hours

Lecture – 15 hours

laboratory – 30 hours

consultations – 20 hours

Together: 65 hours (3 ECTS)

Individual work

preparation for laboratory – 30 hours

preparation to colloquium –30 hours

Together: 60 hours (2 ECTS)

Together: 125 hours (5 ECTS)

RECOMMENDED READING:

1. Chris Todman, Designing A Data Warehouse: Supporting Customer Relationship Management, Prentice Hall, 2001.
2. Ramez Elmasri, Shamkant B. Navathe. Wprowadzenie do systemów baz danych, Helion 2005.

OPTIONAL READING:

1. William Harvey Inmon, Building the Data Warehouse. 4th Edition, Wiley 2005.
2. Ralph Kimball, Margy Ross, The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling. 2nd Edition, Wiley 2002.
3. Adam Pelikant, Hurtownie danych. Od przetwarzania analitycznego do raportowania, Helion 2011.

DECISION ANALYSIS AND DECISION THEORY

Course code: 11.1-WK-IiE-SD-ADTD

Type of course: optional

Language of instruction: Polish, English

Director of studies: dr hab. Zbigniew Świtalski, prof. UZ

Name of lecturer: dr hab. Zbigniew Świtalski, prof. UZ
dr Robert Dylewski

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					7
Lecture	30	2	II or IV	Exam	
Class	15	1		Grade	
Project	15	1		Grade	

COURSE AIM:

Knowledge of selected methods, models and applications of decision analysis and decision theory.

ENTRY REQUIREMENTS:

Basic Linear Algebra, Discrete Mathematics (Graph Theory), Probability Theory.

COURSE CONTENTS:

1. General problematics of decision making. Elements of decision situation. Multiple criteria and uncertainty in decision making. Preferences and preference modelling. Mathematical models of decision situations. Decision support and decision support systems.
2. Psychology and sociology of decisions, managerial decision making.
3. Multicriteria decision analysis – discrete models (with finite set of alternatives). Methods, decision rules and examples of applications.
4. Elements of game theory.
5. Decision making under uncertainty and risk. Multi-stage decision processes. Decision trees.
6. Multiple-criteria and group preferences. Pareto optimum. Group and social choice. Methods and rules of social choice. Condorcet paradox and Arrow's theorem.
7. Voting as a method of group decision making. Methods of voting and election systems. Methods of apportionment.
8. Fair division. Methods and formal approaches.
9. Matching and recruitment systems. Gale-Shapley model.

TEACHING METHODS:

Lecture, classes, project.

LEARNING OUTCOMES:

Student:

1. Knows basic models and methods of decision analysis and decision theory. (K_W02)
2. Is able to apply selected methods of multi-criteria analysis in the discrete case. (K_U02)
3. Is able to apply basic methods of decision making under uncertainty and risk. (K_U02)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

1. Verification of activity of students during the classes.
2. Writing tests during the classes.
3. Writing exam.
4. Project (decision analysis of a real-life problem)

Final score = Activity + writing tests (30 %), project (30 %), exam (40 %).

STUDENT WORKLOAD:

Contact hours:

Lecture – 30 h.

Class – 15 h.

Project – 15 h.

Consulting – 5 h. (lecture), 5 h. (class + project)

Self work:

Preparation for the lecture – 20 h.

Preparation for the classes – 30 h.

Preparation of the project – 30 h.

Preparation for the exam – 30 h.

Total: **180 h**. (7 p. ECTS)

RECOMMENDED READING:

1. *Badania operacyjne* (red. W.Sikora), PWE, Warszawa 2008.
2. *Decyzje menedżerskie z Excelem* (red. T.Szapiro), PWE, Warszawa, 2000.
3. *Ekonometria i badania operacyjne* (red. M.Gruszczyński, T.Kuszewski, M.Podgórska), PWN, Warszawa 2009.
4. Z.Jędrzejczyk, K.Kukuła, J.Skrzypek, A.Walkosz, *Badania operacyjne w przykładach i zadaniach*, PWN, Warszawa 2004.
5. T.Trzaskalik, *Wprowadzenie do badań operacyjnych z komputerem*, PWE, Warszawa 2003.
6. Young H.P., *Sprawiedliwy podział*, Wydawnictwo Naukowe SCHOLAR, Warszawa 2003.
7. Cooke, S., Slack, N., *Making management decisions*, Prentice Hall, New York, 1991.

OPTIONAL READING:

1. W.Grabowski, *Programowanie matematyczne*, PWE, Warszawa 1982.
2. Krawczyk S., *Matematyczna analiza sytuacji decyzyjnych*, PWE, Warszawa 1990.
3. Roy B., *Wielokryterialne wspomaganie decyzji*, WNT, Warszawa 1990.
4. Tyszka T., *Analiza decyzyjna i psychologia decyzji*, PWN, Warszawa 1990.
5. *Multiple criteria decision analysis* (J.Figueira, S.Greco, M.Ehrgott – eds.), Springer, Berlin 2005.

ENGLISH 1

Course code: 09.0-WK-IiE-SD-JA1
Type of course: compulsory
Language of instruction: English/Polish
Director of studies: mgr Grażyna Czarkowska
Name of lecturer: mgr Grażyna Czarkowska

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

COURSE AIM:

The course aims to enable students to improve speaking, reading and writing skills, as well as listening comprehension in English. It will help students to develop their ability to apply language functions to effective communication in everyday life. The course also aims to further develop students' ability to use the language of computer science in order to discuss problems connected with introducing computers to everyday life and to master skills of reading, with understanding, specialist texts. It also encourages students to express different ideas using complex language structures, e.g. Passive Voice, and to practise the use of grammar tenses which describe past activities. It provides an opportunity to revise the rules and master the skills of giving a presentation in English.

ENTRY REQUIREMENTS:

B1+/B2 of the Common European Framework of Reference for Languages specified by the Council of Europe.

COURSE CONTENTS:

During the course students will learn to or improve their ability to:

- describe past events using different grammar tenses (4 hours)
- understand and use Passive Voice sentences (4 hours)
- better understand non-specialist texts describing past
- understand specialist texts describing computers and peripheral devices(4 hours)
- exchange information concerning Information Technology and econometrics (2 hours)
- have longer discussions on topics connected with computers and Information Technology, give arguments for and against (2 hours)
- read numbers and mathematical symbols (2 hours)
- use the language of computer science in speaking and writing (4 hours)
- prepare and deliver a presentation on a topic concerning computer science (2 hours)
- form questions to get information concerning Information Technology, as well as give answers to such questions (2 hours)

TEACHING METHODS:

The course focuses on communication activities in functional and situational context. It encourages students to speak with fluency and develop the four skills of reading, writing, listening and speaking by means of group and pair work, discussion, presentation, oral and written exercises.

LEARNING OUTCOMES: K_W13

Depening language skills and competence on level B2 of the Common European Framework of Reference for Languages.

Upon successful completion of the course, the students:

- are able to describe and compare past events using different grammar tenses
- understand and form Pasive Voice sentences
- can form questions about problems concerning Information Technology
- exchange information concerning Information Technology and application of computers
- understand specialist texts
- are able to describe computer architecture
- know professional and in everyday life applications of computers
- know how to prepare and deliver a presentation on a topic concerning computer science
- know and use in speech the language of computer science
- understand the need for lifelong education
- can cooperate with members of a group, exchange information, and discuss problems
- understand the importance of self-study

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Classes – grade: a condition for receiving a credit are positive marks for tests, participating in class discussions, dialogues, delivering a presentation in English, getting information on different topics.

STUDENT WORKLOAD:

Contact time:

- classes – 30 hours
- consultation – 5 hours

Private study – 25 hours, students systematically prepare for the examination.

RECOMMENDED READING:

1. C. Oxenden, V. Latham-Koenig, P. Seligson, *New English File Student's Book,* Oxford University Press 2007.
2. C. Oxenden, V. Latham-Koenig, P. Seligson, *New English File Workbook,* Oxford University Press 2007.
3. E. H. Glendinning, J. Mc Ewan, *Oxford English for Information Technology*, Oxford University Press 2002.

OPTIONAL READING:

1. *FCE Use of English* by V. Evans.
2. L. Szkutnik, *Materiały do czytania – Mathematics, Physics, Chemistry,* Wydawnictwa Szkolne i Pedagogiczne.
3. Internet articles.
4. R. Murphy *English Grammar in Use*.

ENGLISH 2

Course code: 09.0-WK-IiE-SD-JA2
Type of course: compulsory
Language of instruction: English/Polish
Director of studies: mgr Grażyna Czarkowska
Name of lecturer: mgr Grażyna Czarkowska

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

COURSE AIM:

The course aims to enable students to improve speaking, reading and writing skills, as well as listening comprehension in English. It will help students to develop their ability to apply language functions to effective communication in everyday life. The course also aims to further develop students' ability to use the language of computer science in order to discuss problems connected with Information Technology and read, with understanding, specialist texts. It also encourages students to master their skills of expressing ideas using complex language structures, e.g. Passive Voice, and grammar tenses to describe present, past and future activities. It provides an opportunity to revise the rules and master the skills of giving a presentation in English.

ENTRY REQUIREMENTS:

B1+/B2 of the Common European Framework of Reference for Languages specified by the Council of Europe.

COURSE CONTENTS:

During the course students will learn to or improve their ability to:

- describe present, past and future events using different grammar tenses (4 hours)
- understand and use Passive Voice, especially in specialist texts(4 hours)
- exchange information concerning problems of the development of Information Technology (2 hours)
- give descriptions of different types of computers (2 hours)
- read mathematical symbols (2 hours)
- understand vocabulary used to describe notions and ideas connected with computer science (2 hours)
- use properly the language of computers in speaking and writing (4 hours)
- better understand specialist texts (4 hours)
- prepare and deliver a presentation on a topic concerning computers (2 hours)
- discuss problems of modern technology in class, give arguments for and against (2 hours)
- understand and write abstracts (2 hours)

TEACHING METHODS:

The course focuses on communication activities in functional and situational context. It encourages students to speak with fluency and develop the four skills of reading, writing, listening and speaking by means of group and pair work, discussion, presentation, listening, oral and written exercises.

LEARNING OUTCOMES:

Depening language skills and competence on level B2 of the Common European Framework of Reference for Languages.

Upon successful completion of the course, the students:

- are able to describe and compare past,present and future events using different grammar tenses
- understand and form Pasive Voice sentences, especially in specialist context
- can form questions about problems caused by the use of modern technologies
- exchange information concerning the discussed problems
- understand specialist texts
- know and are able to give basic information about programming languages
- can name storage devices
- know how to prepare and deliver a presentation on a topic concerning computer science
- know and use in speech the language of computers
- know rules for writing abstracts
- understand the need for lifelong education
- can cooperate with members of a group, exchange information, and discuss problems

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Classes – grade: a condition for receiving a credit are positive marks for tests, participating in class discussions, dialogues, delivering a presentation in English, getting information on different topics.

STUDENT WORKLOAD:

Contact time:

- classes – 30 hours
- consultation – 5 hours

Private study – 25 hours, students systematically prepare for the examination.

RECOMMENDED READING:

1. E. H. Glendinning, J. Mc Ewan, *Oxford English for Information Technology*, Oxford University Press 2002.

OPTIONAL READING:

1. FCE Use of English by V. Evans
2. Internet articles
3. R. Murphy English Grammar in Use.

MANAGEMENT INFORMATION SYSTEMS

Course code: 11.9-WK-IiE-SD-SIZ

Type of course: compulsory

Language of instruction: English/Polish

Director of studies: dr hab. inż. Silva Robak, prof. UZ

Name of lecturer: dr hab. inż. Silva Robak, prof. UZ

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					5
Lecture	30	2	III	Exam	
Project	30	2		Grade	

COURSE AIM:

Introducing the problems of identification, usage and improvement of management information systems in enterprises and firms, especially those functioning in the e-business.

ENTRY REQUIREMENTS:

Basic knowledge of the information technology.

COURSE CONTENTS:

Lecture:

1. Management information systems in organizations and in e-business world. E-business: roles, challenges, classification, business solutions: ERP systems, CRM systems (Customer Relationship Management Systems), SCM (Supply Chain Management Systems); e-commerce, B2B systems.
2. Business strategy; strategic planning. Control structures: markets and hierarchies; networks, value-adding partnerships. Influence of IT and information systems on control structures.
3. Business Models. Definitions and classification of e-business models.
4. E-business relationships. Business processes, business process management. Value chain model.
5. E-markets: definitions and functions of e-markets; e-markets versus traditional markets; impact of e-markets, factors warranting their success. Replenishment - a part of the Supply Chain Management; e-replenishment.
6. Technological Infrastructure of the distributed management information systems. Information technology for collaborative work: EDI (Electronic data interchange) systems, workflow systems.
7. Foundations of the XML technology; characteristics, structure definition, presentation and transformation of the XML documents.
8. Security and control aspects of (distributed) management information systems.
9. Development principles for management information systems; business process modelling methods.
10. Improvement of the management information systems. Business processes reengineering.
11. Component-based software engineering for development of the management information systems.
12. Enterprise Applications Integration, business processes integration.

TEACHING METHODS:

Traditional lecture, project exercises. Students will develop an own project according to the instructions given at the beginning of the term; discussions to practice, reinforce and ingrain what the students have learned in the lectures.

LEARNING OUTCOMES:

Student:

1. Has a basic knowledge in development, usage and improvement of management information systems and their supporting role in organization for management (K_W09, K_K06).
2. Knows and understands the role of the information technology in management and coordination of the business processes in the organization (K_W13, K_W14).
3. Can recognize and explain the business models for e-business (K_U13).
4. Uses the e-business term and know the items of the e-business solutions (K_W11, K_W13).
5. Knows the information flow in EDI systems (K_W13).
6. Knows how to define the needs for information technology infrastructures and information systems (K_U10, K_K06).

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Final written review quiz graded with points, with comprehension questions at the end of the term - the scoring allows estimating if the student has reached the outlined aims; or an oral exam with theoretical and problem solving questions.

STUDENT WORKLOAD:

Contact hours:

Lecture – 30h.

Project – 30h.

Consultations - 5h (lectures) and 5h (project).

Own work:

Preparing for the lecture – 5h.

Preparing the project – 30h.

Preparing for the test – 20h.

Together for the whole item: 120h. (5 ECTS)

RECOMMENDED READING:

1. E. Kolbusz W. Olejniczak, Z. Szyjewski (red.), Inżynieria systemów informatycznych w e-gospodarce, Polskie Wydawnictwo Ekonomiczne, Warszawa, 2005.
2. A. Januszewski, Funkcjonalność systemów informacyjnych zarządzania, Tom I i II. PWN, Warszawa, 2008.
3. P. Adamczewski, Zintegrowane systemy informatyczne w praktyce, Wyd. II. Mikom, Warszawa, 2000.

OPTIONAL READING:

1. Nowicki, J. Unold (red.), Organizacyjne aspekty doskonalenia systemów informacyjno-decyzyjnych zarządzania, AE, Wrocław, 2002.
2. S. Wrycza, B. Marcinkowski, K. Wyrzykowski, Analiza i projektowanie systemów informatycznych zarządzania. Metodyki, techniki, narzędzia, PWN, Warszawa, 1999.
3. Sommerville, Inżynieria oprogramowania, Wydawnictwa Naukowo-Techniczne, Warszawa 2003.
4. M.P. Papazoglou, P. Ribbes, e-Business. Organizational and Technical Foundations, John Wiley and Sons, Ltd, London, 2006.

MATHEMATICAL ECONOMICS

Course code: 11.1-WK-IiE-SD-EM

Type of course: compulsory

Language of instruction: English/Polish

Director of studies: dr hab. Zbigniew Świtalski, prof. UZ

Name of lecturer: dr hab. Zbigniew Świtalski, prof UZ

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					5
Lecture	30		II	Exam	
Class	30			Grade	

COURSE AIM:

Knowledge of basic mathematical models used in economics (mainly in microeconomics). Understanding possibilities and limitations of mathematical modeling in economics. Training skills of formal description of economic notions and interdependencies between them.

ENTRY REQUIREMENTS:

Basic Linear Algebra and Mathematical Analysis

COURSE CONTENTS:

1. The role of mathematics in economics. Possibilities and limitations of mathematical modelling in economics. (2 h.)
2. Consumer preferences (preference relations, utility functions). (6 h.)
3. Optimization models in consumer theory. Mathematical demand theory. (4 h.)
4. Production spaces and production functions. (4 h.)
5. Optimization models in the neo-classical theory of the firm. (4 h.)
6. Partial and general equilibrium. Cobweb model. Edgeworth box. Arrow-Hurwicz theorem. (6 h.)
7. Leontief's input-output model. Productive matrices and their properties (4 godz.).

TEACHING METHODS:

Lecture, classes (solving the problems, discussions, consultations).

LEARNING OUTCOMES:

Student:

1. Knows basic mathematical models used in economics, is able to present them in a formal manner and to interpret them, understands simplifying assumptions appearing in such models. (K_W02)
2. Knows basic economic notions which appear in the models of mathematical economics and is able to formalize them. (K_W02)
3. Knows basic measures of economic quantities and is able to interpret them formally. (K_W03)

4. Is able to analyze and solve graphically the problem of utility maximization and the problem of expenditure minimization for the consumer and the optimization problems in the neo-classical theory of the firm. (K_U02, K_U03)
5. Is able to compute marginal quantities, elasticities, rates of substitution and interpret them. (K_U04)
6. Is able to study basic properties of production functions and production spaces. (K_U02, K_U03)
7. Is able to analyze relationships between outputs, final demands and flows in the Leontief model. (K_U02, K_U03)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

1. Verification of activity of students during the classes.
2. Writing tests during the classes.
3. Writing exam.

Final score = Activity + writing tests (50 %), exam (50 %).

STUDENT WORKLOAD:

Contact hours:

Lecture – 30 h.

Laboratory – 30 h.

Consulting – 2 h. (lecture), 3 h. (lab.)

Self work:

Preparation for the lecture – 15 h.

Preparation for the classes – 25 h.

Preparation for the exam – 45 h.

Total: **150 h**. (5 p. ECTS)

RECOMMENDED READING:

1. Chiang A., Podstawy ekonomii matematycznej, PWE, Warszawa 1994.
2. Panek E., Elementy ekonomii matematycznej. Statyka, PWN, Warszawa 1993.
3. Panek E., Elementy ekonomii matematycznej. Równowaga i wzrost, PWN, Warszawa 1997.
4. Panek E., Ekonomia matematyczna, Wyd. AE, Poznań 2000.
5. Panek E., Podstawy ekonomii matematycznej. Elementy teorii popytu i równowagi rynkowej, Materiały dydaktyczne nr 165, Wyd. AE Poznań, 2005.
6. Panek E., Podstawy ekonomii matematycznej. Elementy teorii produkcji i równowagi ogólnej, Materiały dydaktyczne nr 173, Wyd. AE Poznań, 2005.
7. Moore, J.C., General equilibrium and welfare economics, Springer, Berlin 2007**.**

OPTIONAL READING:

1. Allen R.G.D., Ekonomia matematyczna, PWN, Warszawa 1961.Ostoja-Ostaszewski A., Matematyka w ekonomii, cz. 1,2, PWN, Warszawa 1996.

MULTIMEDIA IN BUSINESS

Course code: [Kliknij i wpisz kod przedmiotu]

Type of course: compulsory for Business Analytics specializ.

Language of instruction: polish

Director of studies: dr hab. inż. Silva Robak, prof. UZ

Name of lecturer: dr hab. inż. Silva Robak, prof. UZ; mgr inż. Andrzej Majczak

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					
Lecture	15	1	3	Exam	5
Project	30	2		Grade	

COURSE AIM:

Knowledge of main characteristics and principles for usage of multimedia techniques in business;

Knowledge of capabilities of social networks and Web 2.0;

Knowledge of principles for a multimedia presentation.

ENTRY REQUIREMENTS:

Basic skills in computer usage and Internet.

COURSE CONTENTS:

1. Basics of multimedia technologies (essence and historical development). Internet and multimedia popularization, contemporary multimedia tools and their usage.
2. The role of pictures, sound and animation in multimedia presentations.
3. Web 2.0 concepts and tools. Social networks based on Web 2.0 concepts.
4. Mash-up applications and their usage.
5. Development of Internet – Semantic Web; Web 3.0 concepts.
6. Application of multimedia technologies in economics domain. Multimedia in enterprise, business and teaching.
7. Copyright in multimedia content.
8. Preparation and holding a presentation using multimedia techniques. Review of main errors in planning, preparation and holding a multimedia presentation.

TEACHING METHODS:

Traditional lecture. Group project in form of a multimedia presentation.

LEARNING OUTCOMES:

Knowledge (K_W01, K_W15, K_W20):

Knowledge of tools and the techniques and tools for multimedia presentation usable for solution of the business problems;

Good knowledge of work principles of social networks and Web 2.0;

Knowledge of changes in the society caused by modern technologies.

Knowledge and understanding of basic concepts of copyright.

Skills (K_U10, K_U12, K_U14, K_U15):

The student can choose and assess the usability of the technology for solution of a given business problem;

The student can apply the copyrights in a multimedia domain.

Social competences (K_K03, K_K05):

The student understands the need of continuous studying and systematic investigating of modern technologies, and internet sources.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Checking of a preparation of the students and their activity during the lectures.

A team project - a multimedia presentation.

Graded exam in written form.

Grade (Project: 50% and exam 50 %).

STUDENT WORKLOAD:

Contact hours:

Lecture – 15h.

Project – 30h.

Consultations - 2h (lectures) and 3h (project).

Own work:

Preparing for the lecture – 10h.

Preparing the project – 35h.

Literature review in Internet – 15h

Preparing for the test – 15h.

Together for the whole item: 125h. (5 ECTS)

RECOMMENDED READING:

1. Szewczyk, Multimedia w biznesie, Difin, 2008.
2. USTAWA z dnia 4 lutego 1994 r. o prawie autorskim i prawach pokrewnych (and later changes).

OPTIONAL READING:

1. Multimedia w biznesie i zarządzaniu, Leszek Kiełtyka (red.), Kantor Wydawniczy Zakamycze, Grupa Wolters Kluwer, Kraków 2009.
2. Amy Shuen, Web 2.0. Przewodnik po strategiach, 2009.
3. D.Flisak, Utwór multimedialny w prawie autorskim. Wolters Kluwer, Warszawa, 2008.
4. K. C. Laudon, J. Laudon: Management Information Systems. Managing the Digital Firm. Pearson, Prentice Hall 2011.

REMARKS:

The participation in the classes is compulsory.

MULTIVARIATE ANALYSIS

Course code: 11.5-WK-IiE-SD-AW

Type of course: compulsory

Language of instruction: English/Polish

Director of studies: dr hab. Stefan Zontek, prof. UZ

Name of lecturer: dr hab. Stefan Zontek, prof. UZ (lecture), dr Magdalena Wojciech (class)

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					7
Lecture	30	2	I	Exam	
Class	30	2		Grade	

COURSE AIM:

Aim of the course is to familiarize students with statistical methods applied for analyzing multivariate data.

ENTRY REQUIREMENTS:

Passed lectures on: linear algebra, probability theory, mathematical statistics.

COURSE CONTENTS:

Lecture

1. Random vectors and its probability distributions. Multivariate normal distribution. (4 hours)
2. Introduction to point estimation in multivariate models. (4 hours)
3. Fundamental sample distribution for multivariate normal model. (4 hours)
4. Hotelling's T^2 distribution and its applications. (6 hours)
5. Principal components. (4 hours)
6. Analysis of canonical correlation. (4 hours)
7. Discriminant analysis. (4 hours)

Class

1. Some elements form linear algebra used in multivariate statistical inferences. (4 hours)
2. The expectation and the covariance matrix under linear transformation. (2 hours)
3. Calculations of confidence areas and simultaneous confidence intervals. (4 hours)
4. Hotelling's T^2 tests. (4 hours)
5. Test I. (2 hours)
6. Calculation of principal components. (4 hours)
7. Calculation of canonical variables. (4 hours)
8. Calculation of Bayesian classification rules. (4 hours)
9. Test II. (2 hours)

TEACHING METHODS:

Lecture traditional. Class - solving problems from prepared lists.

LEARNING OUTCOMES:

1. Student know that statistical research give approximate knowledge on studied phenomenon. (K_W02)
2. Student can specify distribution of some statistics for multivariate normal model. (K_W06)
3. Student know and is able to apply elementary methods for analyzing multivariate data connected with:
   - point estimation and confident intervals (areas),
   - testing statistical hypothesis,
   - principal components,
   - canonical variables,
   - discriminant analysis. (K_W01, K_W06, K_W16, K_U08)
4. Student is able to interpret results of applied procedures. (K_W08)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

1. Class - tests with problems on different level of difficulties, which allow to assess, that student posses learning outcomes on minimal level.
2. Lecture – exam (I – written, II – oral) with questions from theory (definitions, theorems and its applications).

To take an exam student has to obtain positive grade from class. To complete the course one has to obtain positive grade form exam. The course grade consists of a grade from class (40%) and a grade from exam (60%).

STUDENT WORKLOAD:

contact hours

lecture – 30 hours

class – 30 hours

consultation – 40 hours (lecture - 10 hours; class - 30 hours)

summarize: 100 hours (4 ECTS)

homework

lecture – 5 hours

class – 30 hours

exam – 40 hours

summarize: 75 hours (3 ECTS)

globally: 175 hours (7 ECTS)

RECOMMENDED READING:

1. D.F. Morrison, Wielowymiarowa analiza statystyczna, PWN, Warszawa, 1990
2. M. Krzyśko, Wielowymiarowa analiza statystyczna, UAM, Poznań, 2000

OPTIONAL READING:

1. M.S. Srivastava, C.G. Kathri, An introduction to multivariate statistics, North-Holland Pub., Amsterdam 1979.

REPRESENTATION METHODS

Course code: 11.1-WK-IiE-SD-MR

Type of course: compulsory

Language of instruction: English/Polish

Director of studies: dr hab. Stefan Zontek, prof. UZ

Name of lecturer: dr hab. Stefan Zontek, prof. UZ (lecture),
dr Joachim Syga (laboratory),
dr Magdalena Wojciech (laboratory)

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

COURSE AIM:

Aim of the course is to familiarize students with fundamental sampling schemes and methods of analyzing samples coming from finite populations.

ENTRY REQUIREMENTS:

Passed lectures on: probability theory, mathematical statistics.

COURSE CONTENTS:

Lecture

1. General population – parameters of a general population, complex survey, sample, representative sample. (2 hours)
2. Sampling schemes; estimators of the mean and its properties; comparison of efficiency of sampling schemes:
   - simple random sampling, depended random sampling, (4 hours)
   - stratified sampling, (6 hours)
   - complex sampling, (4 hours)
   - systematic sampling, (4 hours)
   - two stage sampling. (6 hours)
3. Ratio and regressive estimates. (2 hours)
4. Repetition - students refers and are gradated. (2 hours)

Laboratory

1. An introduction-repetition to chosen statistical package. (2 hours)
2. Efficiency of estimators of the mean – comparison of different sampling schemes and designs based on examples from books. (11 hours)
3. Test. (2 hours)

TEACHING METHODS:

Lecture - traditional. Laboratory – using statistical package to compare efficiency of mean estimators.

LEARNING OUTCOMES:

1. Student understands necessity of using representative methods in investigation of finite populations. (K_W01)
2. Student know that representative method give approximate knowledge on investigated population. (K_W02)
3. Student know what is needed to realize design of chosen scheme of sampling. (K_U07)
4. Student know when given sampling scheme is the most efficient. (K_U07)
5. Student can estimate standard parameters of general population on the base of experimental data. (K_U07, K_W07)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

1. Laboratory – tests with tasks on different level of difficulty.
2. On the last lecture students refer schemes of sampling - mainly problem of organization and efficiency. Each student is graded. In the case of negative grade there is a possibility to get another date.

The course grade consists of a grade from laboratory (70%) and a grade from lecture (30%). To complete the course one has to obtain positive grades form laboratory and lecture.

STUDENT WORKLOAD:

contact hours

lecture – 30 hours

laboratory – 15 hours

consultation – 30 hours (lecture - 10 hours; laboratory - 20 hours)

summarize: 75 hours (3 ECTS)

homework

lecture – 15 hours

laboratory – 20 hours

summarize: 35 hours (1 ECTS)

globally: 110 hours **(4 ECTS)**

RECOMMENDED READING:

1. R. Zasępa, Badania statystyczne metodą reprezentacyjną. PWN. Warszawa 1962.
2. J. Steczkowski, Metoda reprezentacyjna w badaniach zjawisk ekonomiczno-społecznych. PWN, Warszawa – Kraków 1995.
3. W.G. Cochran. Sampling techniques (Third ed.). Wiley, 1977.

SOFTWARE ENGINEERING

Course code: 11.3-WK-IiE-SD-IO
Type of course: compulsory
Language of instruction: English/Polish
Director of studies: dr inż. Janusz Jabłoński
Name of lecturer: dr inż. Janusz Jabłoński

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					7
Lecture	15	1	I	Exam	
Laboratory	30	2		Grade	

COURSE AIM:

The student be becomes introduced in compuer systems developments based at models and the methods by Software Engineering recomended.

ENTRY REQUIREMENTS:

The basis of object-oriented programming the as well as basis SQL and the DataBase.

COURSE CONTENTS:

Lecture

1. Projecting software.
2. The technique of planning and the estimating the costs - the Functional Points method
3. Plan of works as well as software development projects monitoring
4. The processes of quality control as well as the problems of reliability of software
5. Technique of team work
6. Verification, validation and testing software
7. Inspections of software. Interaction man - computer.
8. The method and the technique of notation in Software Engineering
9. Software Project Management,

Laboratory

The Java technology as well as the UML diagrams in the Eclipse environment to the projecting and the production of computer software systems. The GUI and event-driven programming in Java. The UML and CASE tools in software system developing. SVN for teleworking support. PRINCE 2 and Software Project Management in the group project.

TEACHING METHODS:

The lecture with multimedia presentations, talk, the students' studies, laboratory practice, discussion.

LEARNING OUTCOMES:

1. It knows the basic methods, technique as well as the tool of modelling and the realization of computer systems in JAVA, the understanding the range and the possibility of uses the DataBase and the project patterns (K_W10, K_W12)
2. it be able to assign task and to organize work of programmers' team (K_U14)
3. it be able to analyse, to specify and to implement the requirement as well as to project the structure and the dynamics of computer system in support about modern tools and the computer technologies, it be able to use specialized libraries, modules and the computer programmes in field of advanced analysis and the processing of data (K_U16).
4. The reason the need of coaching the sie and the following the computer literature as well as the cognition of new technologies and the tools (K_K02).
5. it knows the basic organization the team work and principles in computer projects, the reason the necessity of systematic approach to organization of long life projects (K_K03)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Lecture: Written examination use to verifying the education outcome in area of knowledge and skills.

Laboratory: Final grade is granted based on receipt for: written tests, activity, completed project and documentation.

Final course grade consists of laboratory (65%) and examination (35%) by presumption, that student obtained all the founded effects of education in sufficient degree.

STUDENT WORKLOAD:

Contact hours

Participation in lectures: 15*1 h = 15 h

Participation in laboratory studies : 15*2 h = 30 h

Consultations: = 20 h (10 h - lectures and 10 h laboratory)

Independent work

Preparation for lectures: 10*2 h = 30 h

Preparation for laboratory: 10*2 h = 45 h

Exam preparation: 45 h

Total for the course: 185 h (7 ECTS)

RECOMMENDED READING:

1. B. Bruegge, A. H. Dutoit, Inżynieria oprogramowania w ujęciu obiektowym. UML wzorce projektowe i JAVA, Helion, Gliwice, 2011.
2. I. Sommerville, Software Engeeniering, Addison-Wesley; 9 edition, English 2011.
3. I. Graham, Metody obiektowe w teorii i praktyce, WNT, 2004.
4. K. Sacha, Inżynieria Oprogramowania, PWN, Warszawa, 2010.
5. N. Dai, L. Mandel, A. Ryman, Eclipse Web Tools Platform: Developing Java Web Applications, Kindle Edition, English 2008.

OPTIONAL READING:

1. D. Minter, L. Linwood, *Hibernate od nowicjusza do profesjonalisty*, Apress, Warszawa 2007.
2. D. Alur, J. Crupi, D. Malks, *J2EE Wzorce projektowe*, Helion, Gliwice 2004.
3. C. Horstmann, G. Cornell, JAVA 2. Techniki zaawansowane, Helion, Gliwice 2005.
4. A. Hemrajani, *Java. Tworzenie aplikacji sieciowych za pomocą Springa, Hibernate i Eclipse*, Helion, Gliwice 2007.

SOFTWARE ENGINEERING 2

Course code: 11.3-WK-IiE-SD-IO2
Type of course: eligible
Language of instruction: English/Polish
Director of studies: dr inż. Janusz Jabłoński
Name of lecturer: dr inż. Janusz Jabłoński

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					5
Lecture	15	1	I	Exam	
Project	30	2		Grade	

COURSE AIM:

The student be becomes introduced in compuer systems costing, estimating the risk how also the management and the resource organization and menage in the software projects developing

ENTRY REQUIREMENTS:

The basis of object-oriented programming the as well as basis SQL and the DataBase.

COURSE CONTENTS:

Lecture

1. The discussion of bases of analysis, monitoring and the control of risk in project.
2. The performance of example system of aid team work as well as the system to software versioning control
3. The discussion of standards: The ISO / IEC 9126 of relating qualities of software as product, as also the norm ISO 9126 in range of opinion of quality software.
4. The realization of example project from utilization the tools the for aid of work of teams participating in project CASE of notation in Software Engineering

Project

The installation, configuration as well as the utilization the IBM JAZZ platform as platform the projecting, testing, management and subversioning in the example system realization, the minimum three functionalities of team project of computer system in technology J2EE

TEACHING METHODS:

The lecture with multimedia presentations, talk and discussions in groups, project and documentations for this.

LEARNING OUTCOMES:

1. It knows the basic methods, technique as well as the tool of modelling and the realization of computer systems in JAVA, the understanding the range and the possibility of uses the DataBase and the project patterns (K_W10, K_W12)
2. it be able to assign task and to organize work of programmers' team (K_U14)
3. it be able to analyse, to specify and to implement the requirement as well as to project the structure and the dynamics of computer system in support about modern tools and the computer technologies, it be able to use specialized libraries, modules and the computer programmes in field of advanced analysis and the processing of data (K_U15, K_U16).
4. The reason the need of coaching the sie and the following the computer literature as well as the cognition of new technologies and the tools (K_K02).
5. it knows the basic organization the team work and principles in computer projects, the reason the necessity of systematic approach to organization of long life projects (K_K03)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Lecture: Written examination use to verifying the education outcome in area of knowledge and skills.

Laboratory: Final grade is granted based on receipt for: written tests, activity, completed project and documentation.

Final course grade consists of laboratory (65%) and examination (35%) by presumption, that student obtained all the founded effects of education in sufficient degree.

STUDENT WORKLOAD:

Contact hours

Participation in lectures: 15*1 h = 15 h
Participation in laboratory studies : 15*2 h = 30 h
Consultations: = 20 h (10 h - lectures and 10 h laboratory)

Independent work

Preparation for lectures: 10*2 h = 30 h
Preparation for laboratory: 10*2 h = 45 h
Exam preparation: 45 h

Total for the course: 185 h (7 ECTS)

RECOMMENDED READING:

1. B. Bruegge, A. H. Dutoit, Inżynieria oprogramowania w ujęciu obiektowym. UML wzorce projektowe i JAVA, Helion, Gliwice, 2011.
2. I. Sommerville, Inżynieria oprogramowania, Klasyka Informatyki, WNT, Warszawa, 2003.
3. I. Graham, Metody obiektowe w teorii i praktyce, WNT, 2004.
4. K. Sacha, Inżynieria Oprogramowania, PWN, Warszawa, 2010.
5. N. Dai, L. Mandel, A. Ryman, Eclipse Web Tools Platform: Developing Java Web Applications, Kindle Edition, English 2008.

OPTIONAL READING:

1. D. Minter, L. Linwood, *Hibernate od nowicjusza do profesjonalisty*, Apress, Warszawa 2007.
2. D. Alur, J. Crupi, D. Malks, *J2EE Wzorce projektowe*, Helion, Gliwice 2004.
3. C. Horstmann, G. Cornell, JAVA 2. Techniki zaawansowane, Helion, Gliwice 2005.
4. A. Hemrajani, *Java. Tworzenie aplikacji sieciowych za pomocą Springa, Hibernate i Eclipse*, Helion, Gliwice 2007.

STATISTICAL ANALYSIS IN MARKET RESEARCH

Course code: 11.5-WK-IiE-SD-ASBR

Type of course: compulsory

Language of instruction: polish

Director of studies: dr hab. Stefan Zontek, prof. UZ

Name of lecturer: dr hab. Stefan Zontek, prof. UZ (lecture), dr Joachim Syga (laboratory), dr Magdalena Wojciech (laboratory)

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

COURSE AIM:

To familiarize students with fundamental methods used in statistical analysis of market data.

ENTRY REQUIREMENTS:

Passed lectures on: probability theory, descriptive and mathematical statistics.

COURSE CONTENTS:

Lecture

1. Marketing research. Measuring scales. Availability of data. (2 hours)
2. Methods of liner ordering of objects. (3 hours)
   a. The method of pattern development.
   b. The method of standardized sums.
3. Introduction to classification methods. (4 hours)
   a. The method of center of gravity.
   b. Wroclaw taxonomy.
   c.Decision (classification) tree.
4. Conjoint analysis. (3 hours)
5. Multivariate scaling. (3 hours)

Laboratory

1. An introduction-repetition to chosen statistical package. (2 hours)
2. Partition, distinction and preliminary analysis of market data with respect to measuring scales. (2 hours)
3. Repetition with methods of analyzing market data with respect to measuring scales:
   a. methods used in descriptive statistics, (3 hours)
   b. statistical tests, (3 hours)
   c. analysis of relationships. (3 hours)
4. Test. (2 hours)
5. Statistical methods with distinguish dependent variables. (5 hours)

6. Methods of
    a. classification of objects, (4 hours)
    b. linear ordering of objects, (2 hours)
    c. multivariate scaling. (2 hours)
7. Test. (2 hours)

TEACHING METHODS:

Lecture - traditional. Laboratory – students analyze market data using properly chosen procedures from statistical package.

LEARNING OUTCOMES:

1. Student has theoretical and practical knowledge about statistical methods used in marked research. (K_W01, K_W02, K_W06, K_W16)
2. Student understand significance of market research. (K_W02)
3. Student can classify data with respect to type of measurements, can properly chose and apply statistical methods using in analyzing market data with respect to its type. (K_06, K_U06)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

1. Laboratory – tests with tasks on different level of difficulty.
2. On the last lecture students refer statistical methods used in market research. Each student is graded. In the case of negative grade there is a possibility to get another date.

To complete the course one has to obtain positive grades form laboratory and lecture. The course grade consists of a grade from lecture (30%) and a grade from laboratory (70%).

STUDENT WORKLOAD:

contact hours

lecture – 15 hours

laboratory – 30 hours

consultation – 30 hours (lecture - 10 hours; laboratory - 20 hours)

summarize: 75 hours (3 ECTS)

homework

lecture – 15 hours

laboratory – 20 hours

summarize: 35 hours (1 ECTS)

globally: 110 hours **(4 ECTS)**

RECOMMENDED READING:

1. Stanimir A. - pod red. "Analiza danych marketingowych Problemy, metody, zadania", Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, Wrocław 2006
2. Mazurek-Łopacińska K. - pod red. "Badania marketingowe Teoria i praktyka", PWN Warszawa 2005
3. Walesiak M., Gatnar E. - pod red. "Statystyczna analiza danych z wykorzystaniem programu R", PWN Warszawa 2009
4. Maddala G.S. "Ekonometria", PWN Warszawa 2006
5. Aaker D.A., Kumar V., Day G.S. „Marketing Research”, John Wiley & Sons, Inc., New York, 1995.

OPTIONAL READING:

1. Biecek P. "Przewodnik po pakiecie R", Oficyna Wydawnicza GiS Wrocław 2011
2. Kopczewska K. ‘’Ekonometria i statystyka przestrzenna z wykorzystaniem programu R CRAN’’, Wydawnictwa Fachowe CeDeWu Warszawa 2006
3. Koronacki J., Ćwik J. "Statystyczne systemy uczące się", WNT Warszawa 2005
4. Welfe A. "Ekonometria Metody i ich zastosowanie", PWE Warszawa 1998
5. Welfe A. - pod red. "Ekonometria zbiór zadań", PWE Warszawa 1997
6. Dziechciarz J. - pod red. "Ekonometria Metody, przykłady, zadania", Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu Wrocław 2003
7. Zeliaś A. "Metody statystyczne", PWE Warszawa 2000
8. Zeliaś A., Pawełek B., Wanat S. "Metody statystyczne Zadania i sprawdziany", PWE Warszawa 2002

TOPICS IN DISCRETE MATHEMATICS

Course code: 11.1-WK-IiE-SD-WZMD

Type of course: optional

Language of instruction: English/Polish

Director of studies: dr Elżbieta Sidorowicz

Name of lecturer: dr Elżbieta Sidorowicz

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					7
Lecture	30	2	II, IV	Exam	
Class	30	2		Grade	

COURSE AIM:

The course introduce the advanced notions and ideas of discrete mathematics in theoretical and algorithmic aspects

ENTRY REQUIREMENTS:

Discrete Mathematics 1

COURSE CONTENTS:

1. Hypergraphs, basic properties and the representation.
2. Characterization of classes of hypergraphs and their recognition algorithms.
3. Colourings of hypergraphs and the complexity of this problem.
4. The transversal and covering of hypergraphs.
5. The intersection graph and the middle graph. The algorithmic properties of these graphs and their applications.
6. New directions in hypergraph theory.

TEACHING METHODS:

Lecture: the traditional oral essay, the participatory lecture.

Class: solving selected problems, applying the theory for solving problems.

LEARNING OUTCOMES:

1. Student knows the basic definitions, properties and theorem related with graphs and hypergraphs. (K_W01,K_W16)
2. Student can applies theorems to determine graphs invariants. (K_W01, K_W16, K_U01)
3. Student is able to prepare and present a talk on the particular topic. (K_U18, K_U19)
4. Student understands the need for lifelong education. (K_K02)

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

1. Verifying the level of preparation of students and their activities during the classes.
2. Two written tests.
3. The talk.
4. The written and oral exam.

Assessment criteria:
the mean of the assessment and evaluation of lectures and exams (written and oral)

The necessary condition for taking the exam is positive assessment of two tests (with tasks of different difficulty which help to assess whether students have achieved effects of the course in a minimum degree), positive assessment of the talk and active participation in the classes.

The necessary condition for passing the course is the positive assessment of the exam.

STUDENT WORKLOAD:

lecture – 30 hours

class – 30 hours

consultation – 8 hours

exam – 3 hours

preparing to class – 45 hours

preparing to tests – 15 hours

preparing to lectures – 9 hours

preparing to the exam – 20 hours

preparing to the talk – 15 hours

Sum for the course: 175 hours (7 ECTS)

RECOMMENDED READING:

1. C. Berge, Graphs and Hypergraphs, North-Holland, Amsterdam 1973.
2. Branstadt, V.B Le, J.P. Spinarad, Graph Classes - A survey.

OPTIONAL READING:

1. Recent papers on these topics.