POLYTECHNIC OF RIJEKA
BUSINESS DEPARTMENT

PROGRAMME OF STUDY

PROFESSIONAL STUDY OF INFORMATICS

- **LIST OF COURSES**

Professional Study of Informatics

1st year of study - Semester I (Winter Semester)

Course unit no.	Title of the course unit	Hours weekly				ECTS credits	Exam
		L	S	E	P		
1a	Economics Basics	2	-	-	-	2	1
1	Basics of Business Economics	2	1			4	1
8	Business Mathematics	3	-	2	-	6	1
3	Probability Theory and Statistics	2	-	2	-	5	1
4	Basics of Informatics	2	-	3	-	6	1
5	Logical Elements of Information	2	-	1	-	4	1
6	English Language I/1	2	-	1	-	3	-
7	Physical Training			(2)		-	-
	In total per semester	**15**	**1**	**9(11)**	**-**	**30**	**6**

Note: 1) L – lecture, S – seminar, E – exercise, P – practical
2) Physical Training is performed out of time-table

1st year of study - Semester II (Summer Semester)

Course unit no.	Title of the course unit	Hours weekly				ECTS credits	Exam
		L	S	E	P		
24	Electronic Business	2	-	2	-	5	1
9	Basics of Accountancy	2	-	2	-	5	1
10	Graphics, Text, Multimedia	2	-	2	-	5	1
11	System and Information	2	1	-	-	4	1
12	Introduction to Programming	1	-	3	-	5	1
35	Computer Hardware	2	-	1	-	3	1
6	English Language I/2	2	-	1	-	3	1
7	Physical Training			(2)		-	-
	In total per semester	**13**	**1**	**11(13)**	**-**	**30**	**7**

2nd year of study – Semester III (Winter Semester)

Course unit no.	Title of the course unit	Hours weekly				ECTS credits	Exam
		L	S	E	P		
25	Information Systems Security	2	-	2	-	5	1
14	Basics of Management	2	1	-	-	4	1
15	Operating Systems	2	-	3	-	6	1
16	Data and Process Modeling	2	-	3	-	6	1
17	Programming	1	-	3	-	6	1
18	English Language II	2	-	1	-	3	1
	In total per semester	**11**	**1**	**12**	**-**	**30**	**6**

2nd year of study – Semester IV (Summer Semester)

Course unit no.	Title of the course unit	Hours weekly				ECTS credits	Exam
		L	S	E	P		
19	Information Systems Development	2	-	3	-	6	1
20	Database Systems	2	-	2	-	5	1
21	Object-oriented Technologies I	2	-	3	-	6	1
22	Computer Networks	2	-	2	-	5	1
23	English Language III	2	-	1	-	3	1
	Elective Course A	2	-	2	-	5	1
35	*Multimedia Systems*						
13	*Operations Research*						
	In total per semester	**12**	**-**	**13**	**-**	**30**	**6**

Note: A student chooses between two elective subjects i.e. between course unit 24 or 25.

3rd year of study – Semester V (Winter Semester)

Course unit no.	Title of the course unit	Hours weekly				ECTS credits	Exam
		L	S	E	P		
26	Economics of Information Systems	2	1	-	-	4	1
27	Object-oriented Technologies II	2	-	3	-	6	1
28	Development of Web applications	2	-	2	-	5	1
29	Programming – practicum	1	-	3	-	5	1
	Elective Course B	2	-	2	-	5	1
	Elective Course C	2	-	2	-	5	1
30	*Accounting Information System*						
31	*Information Systems of Production*						
32	*Information System for Management and Decision-making support*						
	In total per semester	**11**	**1**	**12**	**-**	**30**	**6**

Note: A student chooses between two elective subjects i.e. between course unit 30, 31 or 32.

3rd year of study – Semester VI

Course unit no.	Title of the course unit	Hours weekly				ECTS credits	Exam
		L	S	E	P		
33	Semester Internship	-	-	-	(x)	13	-
34	Bachelor final paper	-	-	(x)	-	17	1
	In total per semester	**-**	**-**	**(x)**	**(x)**	**30**	**1**

The whole program of Professional study of Informatics

Semester of the study	Hours per semester					ECTS credits	Exam
	L	S	E	P	Totally		
Semester I	195	15	135	-	345	30	6
Semester II	195	15	195	-	405	30	7
Semester III	165	15	180	-	3360	30	6
Semester IV	180	-	195	-	375	30	6
Semester V	165	15	180	-	360	30	6
Semester VI	-	-	(x)	(x)	(x)	30	1
In total for the whole study	**900**	**60**	**885**	**(x)**	**1845**	**180**	**30**

During the studies a student attends the total of 1845 hours of various forms of courses, and by fulfilling the requirements of the programme s/ he acquires the total of 180 ECTS credits.

COURSE DESCRIPTION OF PROFESSIONAL STUDY OF INFORMATICS

ECONOMICS BASICS **Course unit number: 1a**

Hours weekly: 2+0+0+0/I **ECTS credits: 2**

Syllabus outline

Basics of economics. Basic elements of supply and demand. Supply and demand on individual markets. Production and company organization. Cost analysis. Supply and price evaluation on markets of full competition. Income and price evaluation of productive agents. Wages and labour market. Consumption and investments. Multiplier model. Economic cycle and unemployment. Cost of inflation.
Basics of business economics. Concept of company, entrepreneur and entrepreneurship. Commercial and social prerequisites for business foundation and success in a business. Business operation: principles of business, planning and financing of company. Theory of costs: concept and types of cost, point of cost, cost dependence on capacity utilization, kinds and methods of calculation, budget costs and theory of costs application in politics. Business results: accounts of business operation and determining company value. Success and criteria of company business: productivity, economy and profitability. Economics of business, sources, work process and functions.

Developing general and specific competence (knowledge and skills)

Students gain knowledge of basics of economy, economics and company organization: they master monitoring procedures for success of company business through economic indicators.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

BASICS OF BUSINESS ECONOMICS **Course unit number: 1**

Hours weekly: 2+1+0+0/I **ECTS credits: 4**

Syllabus outline

Business economics basics. Terms such as company, entrepreneurs, entrepreneurship. Business and social preconditions for establishing and running successfully a company. Running a company: business principles, planning and financing a company. Theory of costs: the term and types of costs, places where costs occur, dependence of costs on using capacities, types and methods of calculation, costing, the application of theory of costs in politics. A business result: costing and establishing the value of a company. Efficacy and measures of efficacy of doing business in a company: productivity, cost-effectiveness and profitability. Economics of a business, source, work process and functions. Economics of business functions. Data and experience of specific companies are used: fundamental characteristics of work and a subject of work; economics of means of work and objects; fundamental indicators of productivity of running a business.

Developing general and specific competence (knowledge and skills)
Acquiring knowledge of business basics and company organization. Mastering the procedures for monitoring the successfulness of running a business using economic indicators.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

BUSINESS MATHEMATICS **Course unit number: 8**

Hours weekly: 3+0+2+0/I **ECTS credits: 6**

Syllabus outline

Definition and characteristics of infinite integral. Basic integrals. Rules of integrating. Methods of integrating. Concept of definite integral. Link between definite and indefinite integral. Application of definite integral. Concept of matrix and some special forms of matrix. Mathematical operations with matrixes. Determinants. Characteristics of determinants. Calculating the value of determinants. Matrix range. Inverse matrix. Matrix equations. System of linear equations. Representation of the system in a matrix form. Methods of calculating linear equations system: Cramer's rule, matrix method, Gaussian method of elimination. System solution conditions. Proportionality. Percentage and promille calculi. Interest calculus: simple and compound; decursive and anticipated. Nominal, relative and equivalent interest rate. Periodic payment and disbursement. Present and final value of periodic payment and disbursement. Loan. Loan conversion.

Developing general and specific competence (knowledge and skills)

The aim is to teach students mathematical methods, to develop their capability of logical reasoning and analytic thinking when solving problem-oriented tasks and accuracy in calculating mathematical facts.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

PROBABILITY THEORY AND STATISTICS **Course unit number: 3**

Hours weekly: 2+0+2+0/I **ECTS credits: 5**

Syllabus outline

Introduction with descriptive statistical analysis. Basic terms. Statistical data. Sorting data. Tabulating. Statistical graphics. Relative numbers. Analysis of numerical progression using the methods of descriptive statistics. Mean values. Dispersion, asymmetry measures. Basics of inferential statistics. Combinatorial skills. Basic concepts of probability. Definitions of probability. Law on large numbers. Converse probability. Total probability. Complex probability. Adding and multiplying of probability. Bayes' formula. Random variable and distribution of probability. Models of probability distribution of discrete and continual random variable. Sample methods. Parameters evaluation. Hypothesis testing. Regression and correlation analysis. The notion of regression and correlation analysis. Basic analysis of time progression. Definition of time progression. Group indexes. Trend models.

Developing general and specific competence (knowledge and skills)

Students learn statistics methods and skills. They gain knowledge of the concept of probability and its use: they master the use of statistics software products.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

BASICS OF INFORMATICS **Course unit number: 4**

Hours weekly: 2+0+3+0/I **ECTS credits: 6**

Syllabus outline

Informatics. Information. Information society. Information technology. A computer. Program support. Communications. Organization and information. System concept and definition. Theory of organization, management and decision-support models. Information systems. Expert systems. Development of data processing. Computer systems and their development. Choice of computer facilities. Mathematical and logical fundamentals of a computer. Presenting and organizing data. Redundancy. Program support for computer functioning. The evaluation of software facilities. Computer networks. Multimedia. Information system security. User information systems.
Windows, Word, Excel, Access and Internet.

Developing general and specific competence (knowledge and skills)

Students gain knowledge of basic terms in informatics as well as their meaning. During the exercises students will master Windows, Word, Excel , Access and Internet.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

LOGICAL ELEMENTS OF INFORMATION **Course unit number: 5**

Hours weekly: 2+0+1+0/I **ECTS credits: 4**

Syllabus outline

Logic and its area. Development of logic from Aristotle to modern symbolic logic. Basic problems of elementary logic: concept, proposition, inference, conclusion.
Problem of truth and the problem of usefulness for researching informatics.
Elements of mathematical logic. Logical starting point of Boolean algebra, proposition, operations with propositions, logical expression of algebraic propositions. Computer logic: basic logic circuits, complex logic circuits, operations with logic circuits, the use of logic assemblies in a computer. Errors in computer logic.

Developing general and specific competence (knowledge and skills)

Students develop capacity of logical reasoning for further education in the field of informatics.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

ENGLISH LANGUAGE I/1 **Course unit number: 6**

Hours weekly: 2+0+1+0/I, 2+0+1+0/II **ECTS credits: 3+3**

Syllabus outline

Computers today. Computers essentials: input/output devices. Storage devices. Basic software: operating systems, the GUI, databases, faces of the Internet. Creative software: graphics and design, desktop publishing, Web design, multimedia. Programming: program design, languages, the Java revolution.
Computer architecture-Cache memory. Data mining.
Language work: vocabulary and grammatical structures and functions common to IT and computing. Present and past tenses, comparison of adjectives, relative pronouns and sentences, passive voice, compound nouns and word formation.

Developing general and specific competence (knowledge and skills)

Students develop reading skills from a wide variety of authentic IT texts, ability to understand native speakers talking about IT; ability to participate in exchanges of information and opinions in the context of IT. Language: to consolidate and extend understanding and use of structures common to IT.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

ENGLISH LANGUAGE I/2 **Course unit number: 6**

Hours weekly: 2+0+1+0/I, 2+0+1+0/II **ECTS credits: 3+3**

Syllabus outline

Computers today. Computers essentials: input/output devices. Storage devices. Basic software: operating systems, the GUI, databases, faces of the Internet. Creative software: graphics and design, desktop publishing, Web design, multimedia. Programming: program design, languages, the Java revolution.
Computer architecture-Cache memory. Data mining.
Language work: vocabulary and grammatical structures and functions common to IT and computing. Present and past tenses, comparison of adjectives, relative pronouns and sentences, passive voice, compound nouns and word formation.

Developing general and specific competence (knowledge and skills)

Students develop skills of reading from a wide variety of authentic IT texts, ability to understand native speakers talking about IT; ability to participate in exchanges of information and opinions in the context of IT. Language: to consolidate and extend understanding and use of structures common to IT.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

PHYSICAL TRAINING **Course unit number: 7**

Hours weekly: 0+0+2+0/I, 0+0+2+0/II **ECTS credits:** -

Syllabus outline

Classes are held in a fitness centre and as outdoor running exercises (cross country).
Through exercises students become aware of the importance of regular exercising.
Students also acquire basic information about physical education which has great influence on general health, on capacity for work and defence mechanisms.
The above mentioned elements influence the development of functional and motoric ability as well as cognative and cognitive characteristics of the human body.

Developing general and specific competence (knowledge and skills)

Students gain knowledge and develop skills in physical education to satisfy biological and psychosocial need for movement.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

ELECTRONIC BUSINESS **Course unit number: 24**

Hours weekly: 2+0+2+0/ II **ECTS credits: 5**

Syllabus outline

Electronic business, electronic economy, internet economy, types of electronic business (B2B, B2C, G2C and the like). Network organizations and electronic commerce. Electronic data exchange. Electronic business in small and middle-sized companies, business models of electronic business. Electronic marketing. Electronic markets. Electronic payment system. Security of electronic business. Legal aspects of electronic business. Transaction costs and other economic aspects of electronic business. Virtual companies. Internet technology. Electronic economy standards. Case studies.

Developing general and specific competence (knowledge and skills)

Students gain knowledge of e-business, they develop skills in its application and in making e-applications.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

BASICS OF ACCOUNTANCY **Course unit number: 9**

Hours weekly: 2+0+2+0/II **ECTS credits: 5**

Syllabus outline

Accountancy and its role in contemporary conditions. Bookkeeping system and methods. Assets, debts and capital. Balance. Balance changes over assets, debts and capital. Expenses and revenues from business operation. Balance changes over expenses and revenues. Profit and loss account. Report on cash flow. Notes. Report on capital change. Accounting documents and business records. Accounting in inflation conditions. Prefinal and final operations. Accounting covering of business changes by accounting system application. System of internal control in accountancy. Accounting information system.

Developing general and specific competence (knowledge and skills)

Students gain knowledge of accountancy and skills in its application in business practice. They master monitoring procedures for success of company business through accounting indicators.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

GRAPHICS, TEXT, MULTIMEDIA **Course unit number: 10**

Hours weekly: 2+0+2+0/II **ECTS credits: 5**

Syllabus outline

Importance of text processing and graphic design in the world of data exchange. Video text. Text formatting. Processors for text editing. Computer graphics and image processing. Techniques of creating graphics. Three dimensional graphics. Computer animation. Multimedia systems. The importance of multimedia systems. The organization of multimedia systems. High quality of multimedia systems. Future prospects of multimedia systems.
The exercises are carried out in groups of students. Basic processing of textual, graphic and image data. Working with MS Office package. Photoshop.

Developing general and specific competence (knowledge and skills)

Students gain knowledge and skills in text formatting and graphic design, and basics of multimedia systems.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

Hours weekly: 2+1+0+0/II **ECTS credits: 4**

Syllabus outline

Introduction into information science. Definitions of information. Relevance of information. Data transfer. Shannon's model of information system. Syntactic, sematic and pragmatic aspects of data. Usefulness of data. System of informing, of information and communication. Entropy. Personal information, a measure for data quantity. Types of channels and their characteristics. Channel capacities, data transfer rate. Types of data sources. Encoding and codes, codes optimality. Digital data transfer. Security and protection. Concept of system. System configuration, characteristics, rules. Types of systems. System access. Algorithmis and heuristic methods. Technique of representing systems and their relationship. Models of a system in informatics. Basics of cybernetics. System management.

Developing general and specific competence (knowledge and skills)

Students gain knowledge of theory of system and information, as well as skills in data searching, transfer and protection.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

INTRODUCTION TO PROGRAMMING **Course unit number: 12**

Hours weekly: 1+0+3+0/II **ECTS credits: 5**

Syllabus outline

Basic concepts of programming and conditions of development. System elements of program support. Generations of programming languages, translating, compiling, emulation, block diagram, flowchart.
Development of programming structural techniques. Structural flowchart. Algorithms. Basic programming structures. Working with databases-basics. Life cycle of a software product, development methods of programming software product Programming language C. Encoding in C language, declaration, simple commands, mathematical operations, strings, matrixes, functions, uses of functions, processing, control instructions. The program structure. Content of exercises: program development from business processes in programming language C.

Developing general and specific competence (knowledge and skills)

Students learn to solve problems in programming; they gain knowledge of basic information and control structures as well as simple algorithms on structures, fields, trees and learn programming language procedure.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

COMPUTER HARDWARE **Course unit number: 35**

Hours weekly: 2+0+1+0/II **ECTS credits: 3**

Syllabus outline

Professional study of Informatics has as its final goal preparation and presentation of the bachelor paper. This bachelor paper represents technical elaboration of a specific problem. The student is expected to demonstrate his ability to use methods and techniques of analysing and presenting business and market situations.

When elaborating the selected theme the student applies the acquired knowledge and expertise.

The choice of the theme is in line with the syllabus of the professional study of Informatics. The student works on the theme supervised by his mentor. The paper has to contain between 30 and 50 pages and has to be handed in four copies. Through presentation of the bachelor paper before a Board, the student's knowledge and presentation of the specific problem is tested as well as his overall knowledge gained during the studies.

Developing general and specific competence (knowledge and skills)

Students gain knowledge and develop skills working on practical problems taken from working companies. They present their bachelor paper before a Board.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

INFORMATION SYSTEM SECURITY **Course unit number: 25**

Hours weekly: 2+0+2+0/IV **ECTS credits: 5**

Syllabus outline

Importance of information system for owner and user. Importance of information system security, concept of security, realisation of information system effectiveness, models of information system security. Approach to information system security project and organization: planning, standards, risk analysis, safety measures. Organizational, program, technical and physical safety measures by types and means. Data security during processing and storing. Other aspects of information system protection.

Developing of general and specific competence (knowledge and skills)

Students gain knowledge and skills in developing information system safety.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

BASICS OF MANAGEMENT **Course unit number: 14**

Hours weekly: 2+1+0+0/III **ECTS credits: 4**

Syllabus outline

Management definition; system approach to management; management vs. entrepreneurship, manager person and levels of management; roles and activities of managers, manager's skills. Planning - nature and purpose of planning; types of plans; SWOT analysis, Porter's model of generic strategies, BCG matrix; hierarchy and types of strategies; decision making. Organizing - organization and its contents, organization structure modeling, types of organizational structures - classical and modern forms, modern trends in organizing, organizational culture; organizational conflicts. Human resource management - prediction of needs, recruitment and selection, career management, performance appraisal, education and development, creation of excellent managers, salaries and compensations. Leadership - definition, leader, leadership skills, elements, power and authority, leadership styles, approaches to leadership, motivation theories and techniques. Control - process of control; phases of control; systems and techniques of control.

Developing general and specific competence (knowledge and skills)

Development of general competences reference to managing of companies and/or other organization in general. Usage abilities of methods and techniques of management.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

OPERATING SYSTEMS **Course unit number: 15**

Hours weekly: 2+0+3+0/III **ECTS credits: 6**

Syllabus outline

Operating systems as an integral part of the computer. Classification of the operating system. Definition and types of operating systems. Functions and characteristics. History, development, set up and operation. Interrupt processing. Parallel processes. Structure of operating system. Memory management, control of input and output devices, databases and processors. Distributed systems. Main characteristics and comparison of the most popular operating systems. Development trends.
Exercises are carried out in groups of students. Through discussions students note the differences between various operating systems (MS Windows,OS/2,Unix)

Developing general and specific competence (knowledge and skills)

Students gain knowledge of operating systems functioning. They develop ability to choose an operating system and to install it on the computer.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

DATA AND PROCESS MODELING **Course unit number: 16**

Hours weekly: 2+0+3+0/III **ECTS credits: 6**

Syllabus outline

About modeling in general. Conceptual, logical and physical modeling. Basic concepts of data modeling. Historical outline of the development of data models. Areas of application. Approaches to data modeling. Methods of data modeling. Object-links model. Classical and expanded relational model. Normalization. Relation between relational model and object-links model. Dynamic modeling and business rules. Basic concepts of process modeling. Data flowchart. Diagram of action, tree and decision table. Link between data model and process model. Application of tools in data and process modeling.

Developing of general and specific competence (knowledge and skills)

Students develop abstract way of thinking; they gain basic theoretical knowledge of methods and techniques of data and process modeling and their application in the development of information systems.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

PROGRAMMING **Course unit number: 17**

Hours weekly: 1+0+3+0/III **ECTS credits: 6**

Syllabus outline

Introduction to C++ language. Modular programming and functional decompensation of a program. Lexical preprocessor. Characteristics of structured and object-oriented programming. Modeling and implementation of programmes in C++language: form, function and simple types of data. Class interface, abstraction and implementation. Operator superordination. Polymorphism and inheritance. Abstract class and generic class. Algorithms.
Basic program structure. Working with databases. Life cycle of a program, methods of developing programming products.
Encoding in C++, declaration, simple commands, mathematical operations, strings, matrixes, functions, uses of functions, processing, control instructions. Program structure. Developing a program with GUI Iteration with operating system. Process handling.

Developing general and specific competence (knowledge and skills)

Students gain knowledge of the process when solving problems of programming. They learn about basic data and control structures; algorithms, fields, trees as well as about programming language procedure.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

ENGLISH LANGUAGE II **Course unit number: 18**

Hours weekly: 2+0+1+0/III **ECTS credits: 3**

Syllabus outline

Operating systems: Hidden software. Linux. Graphical User Interface: User Interfaces. Applications Programs: Applications Service Providers. Multimedia: the tricks to MPEG's success. Computing Support Officer.
Commercial correspondence: structure and presentation of a business letter, content and style of a business letter, writing enquires, replies.
Language work:-ing and infinitive,-ing form as a noun and after prepositions, conditional clauses, modal verbs, instructions and complex instructions.

Developing general and specific competence (knowledge and skills)

Students develop reading skills from a wide variety of authentic IT texts, ability to understand native speakers talking about IT; ability to participate in exchanges of information and opinions in the context of IT.Language: to consolidate and extend understanding and use of structures common to IT.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

INFORMATION SYSTEM DEVELOPMENT **Course unit number: 19**

Hours weekly: 2+0+3+0 / IV **ECTS credits: 6**

Syllabus outline

Concept and definition of information system. Relation between real system and its information system. Life cycle and development phases. Methodological aspects of information system development. Processes and activities of information system development. Managing project of information system development. Structured and object-oriented methods of analysis and information system design. Information engineering. User role in information system development. Evaluation of users' requests. Techniques of collecting users' demands. Designing information system architecture, databases, programs and interfaces. Testing information system models. Test, implementation, documentation. Definition and classification of CASE tools. Role of applications generators and the 4th generation languages in the development of information systems.

Developing general and specific competence (knowledge and skills)

The aim is .to develop systematic approach in solving problems; to gain knowledge and skills in the development of information systems and the importance of methodological approach in the development of information systems.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

DATABASE SYSTEMS **Course unit number: 20**

Hours weekly: 2+0+2+0/IV **ECTS credits: 5**

Syllabus outline

Concept and definition of databases. Logical link between data. Relational databases, relational models of data. Updating a relation, the goal of modeling relational databases. Relational operators, functions of dependence, fuzzy dependence and dependent links. Decompilation of relational scheme. Normal form, non-normalized relational databases. Databases with incomplete information. Logic and databases. Object-oriented databases. SQL. Systems for managing databases. Updating databases. Integrity and security of databases. Distributed databases. Through exercises students implement what they learn during lectures. Practical part of the exercises is carried out on the corresponding systems of database management.

Developing general and specific competence (knowledge and skills)

Students are given an outline of database architecture, the way of using and implementing databases. They develop ability to work with databases, hey learn about safer use of recovering data from a database and about methods of data structuring.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

OBJECT-ORIENTED TECHNOLOGIES I **Course unit number: 21**

Hours weekly: 2+0+3+0/IV **ECTS credits: 6**

Syllabus outline

Software products and their development. Procedural vs.object-oriented programming. Introduction to object-oriented analysis. Concepts of object-oriented approach. Basic phases of object-oriented design. Process of collecting demands. Classes and objects as basic units of abstraction. Classes and objects model. Links between classes. Polymorphism. Encapsulation. Atribute class design, operation/method and relation. Pattern design. Inheritance.
Incremental and iterative processes in the development of applications. Static and dynamic modeling in object-oriented analysis. Identification and analysis of dynamic models. Use of CASE tools. Selection of tools for modeling. UML (Uniform Modeling Language). Oracle Jdeveloper 9i and 10g tool. Object-oriented languages:CV++, Pearl, Java, Script languages. Application on the client server and the network. Security and control. Standars for application expansion.

Developing general and specific competence (knowledge and skills)

Comparative evaluation of object-oriented vs. procedural technologies. Students gain knowledge of object approach. They develop skills in program solving of certain problems, skills in using object-oriented programming languages as well as skills in using development tools.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

COMPUTER NETWORKS **Course unit number: 22**

Hours weekly: 2+0+2+0/IV **ECTS credits: 5**

Syllabus outline

Introduction to computer networks. Role of computer networks. Development of computer communications. Computer network architecture (ISO/OSI) reference models. Functional characteristics of computer network facilities. Data protecting during in transfer. Computer communications security. Data exchange protocols. Computer network architecture and protocols. Definition of standards and protocols. Communication system model for data transfer. System of Internet, its organization and standards, data transfer. Private networks-intranet. Internet access protection. Development and future of computer networks. Network maintenance, network news. User networks. Principles of users activity.

Developing general and specific competence (knowledge and skills)

The aim of the course is understanding of computer networks, specially local ones; to gain knowledge and skills in using networks and their safety.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

ENGLISH LANGUAGE III **Course unit number: 23**

Hours weekly: 2+0+1+0/IV **ECTS credits: 3**

Syllabus outline

Networks: Components of a typical network system, Network Communications. The Internet: Choosing a free ISP, How TCP/IP Links Dissimilar Machines. The World Wide Web: Search engines, Email Protocols. Websites: XML Takes on HTML.
Writing an application letter for a job and a CV.
Language work: relative clauses with a participle, time clauses, ways of expressing future actions, reported speech.

Developing general and specific competence (knowledge and skills)

Students develop reading skills from a wide variety of authentic IT texts, ability to understand native speakers talking about IT; ability to participate in exchanges of information and opinions in the context of IT.Language: to consolidate and extend understanding and use of structures common to IT.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

ECONOMICS OF INFORMATION SYSTEM **Course unit number: 26**

Hours weekly: 2+1+0+0/V **ECTS credits: 4**

Syllabus outline

Role of informatization. Basic characteristics of information society. Informatization of production processes and services. Position of work in information environment. Business in information environment. Communication and performance of computerized companies business association. Life cycle of information system. Methods of evaluation and assessment of information system. Evaluation methods of information system. Information and its value. Absolute and applicable value of information, information processes and information system. Stratification of information system. Defining goals and tasks of business in information environment. Business success in information environment. Monitoring and evaluation indicators. Efficiency of information system.

Developing general and specific competence (knowledge and skills)

Students learn about evaluating techniques of information system, from designing to maintenance. They gain knowledge and develop skills in the application of methods and techniques of evaluating information systems and information products.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

OBJECT-ORIENTED TECHNOLOGIES II **Course unit number: 27**

Hours weekly: 2+0+3+0/V **ECTS credits: 6**

Syllabus outline

Object-oriented technologies on the client, network and server. Swing/AWT.GUIs and applets as tools for visualisation of programming parts. Introduction to tools: to deepen the knowledge of Swing/AWT and JFC components. Scripting and script languages. Basic concepts of HTML: usage, graphical elements HTML tags, hyperlinks. Selection and sorting. Basics of JavaScript: characteristics of script languages, variables, functions and built-in functions of JavaScript, event handlers. Object Model Java Script, JavaScript language objects, objects and their building-in the applications, cookies and security of JavaScript. Object-oriented technologies on the client, network and server. JavaScript from the client's and the server's side, image maps and browser detection. Communication between JavaScript and Java Applets. Dynamic Object of Model Java Script. Joint commands (JFC). Methods of rapid connection (RMI). Security. Control and extension standards. Tools: Oracle Jdeveloper 10g.

Developing general and specific competence (knowledge and skills)

Comparative evaluation of object-oriented vs. procedural technologies. Students gain knowledge of object approach. They develop skills in program solving of certain problems, skills in using object-oriented programming languages as well as skills in using development tools.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

DEVELOPMENT OF WEB APPLICATIONS **Course unit number: 28**

Hours weekly: 2+0+2+0/V **ECTS credits: 5**

Syllabus outline

Concept of a Web page and applications. Web page design and development. Organization and content of the Web. Development of a Web application. Process of creating a Web publication. Using Web servers. Using relational bases in Web applications. Web system security and controlling the access to the server and performances. Developing Web interaction and data integration. Web expansion. Optimization of the Web server. Security filters. Releasing content on the Web. Visibility of Web pages when browsing. Tools for advancing Web pages. Back office integration. Exercises are carried out in groups of students. Single Web pages are designed as well as complete applications.

Developing general and specific competence (knowledge and skills)

Students gain knowledge of the development of web applications and skills in developing and using them.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

PROGRAMMING – PRACTICUM **Course unit number: 29**

Hours weekly: 1+0+3+0/V **ECTS credits: 5**

Syllabus outline

Access to more complex forms of programming. Principles of structured program modeling. Techniques of programming, interactive work with a computer, operations with numbers, principles of selection and conditioned procedures. Programming language Visual Basic. Introduction into Visual Basic. Working environment. Application booting. Basics of programming languages. Modules. Procedures. Declaration of variables and types of data. Operators. Visual Basic controls. Menus. Accelerators. Visual effects. Working with dialogs. Graphics and graphical methods. Print methods. Interactions with environment. Databases. Bugs. Projects. MIDI application tables. Databases access. Communication between applications. Optimization.

Developing general and specific competence (knowledge and skills)

Students gain knowledge of the process when solving problems of programming. They learn about basic data and control structures; algorithms, fields, trees and about programming language procedure. Programming tasks through Information System project.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

ACCOUNTING INFORMATION SYSTEM **Course unit number: 30**

Hours weekly: 2+0+2+0/V **ECTS credits: 5**

Syllabus outline

Introduction to accounting information system; characteristics and structure of business information system, accounting and accounting information, classification and value of accounting information. Need for accounting information system development. Property and capital; developing of business process.
Development of information system parts. Business and bookkeeping changes. Accounts. Accounting principles and standards, Balance sheet, Business books, Preparation, selection and delivery of accounting information.
On seminars students work out exercises which are chosen from practical environment and magazines.

Developing general and specific competence (knowledge and skills)

Students gain knowledge and skills in creating Accounting information system.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

INFORMATION SYSTEM OF PRODUCTION **Course unit number: 31**

Hours weekly: 2+0+2+0/V **ECTS credits: 5**

Syllabus outline

Concept of information system of production. Functional description of the business process: purchasing, selling and production. System structure. Information subsystems of purchasing, selling and production. Structuring of input and output data. Need for system development. Preparation, selection and data input into the system.
Students elaborate different tasks selected from practice or literature.

Developing general and specific competence (knowledge and skills)

The aim is to give students knowledge and skills in developing Information System of production. .

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

INFORMATION SYSTEM FOR MANAGEMENT AND DECISION-MAKING SUPPORT **Course unit number: 32**

Hours weekly: 2+0+2+0/V **ECTS credits: 5**

Syllabus outline

Information systems for management support. Systems for decision support. Systems for group decision support. Data warehouses. Data warehouses methodology development. Systems for analytical data processing. Data mining. Expert systems. Bases of knowledge.
Students perform tasks of collecting and presenting information for management and decision support. Every task is presented and evaluated.

Developing general and specific competence (knowledge and skills)

Students gain knowledge and skills in developing information system for management and decision-support

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

MULTIMEDIA SYSTEMS **Course unit number: 33**

Hours weekly: 2+0+2+0 **ECTS credits: 5**

Syllabus outline

Processing of sygnals for media integration. Interface for the multimedia interaction between a man and a machine. Multimedia communication and networking. Multimedia security and content protection. Multimedia data bases. Multimedia computer systems and tools. Hardware and software support for multimedia systems. Multimedia systems standards. Multimedia application. Multimedia services quality.

Developing general and specific competence (knowledge and skills)

By successfully fulfilling their tasks and obligations, students acquire the contents of the course. The emphasis is on developing of the ability for logical concluding and analytical reasoning at solving problem exercises in the field of defining modern systems with the intention to control processes in a company.

Types of classes and methods of assessment

The course is carried out weekly, in the form of consultancy.

SEMESTER INTERNSHIP **Course unit number: 33**

Hours weekly: (x) Semester VI **ECTS credits: 13**

Syllabus outline
With the goal of successful carrying out of educational syllabus and introducing students to specific practical problems from working companies, the Business Department organizes specialist internship of 300 hours supervised by a mentor. Before starting internship, a student prepares the practical part working on a special assignment (50 hours).Following the specially defined assignment the student writes a
paper which in its final version represents the specialist final paper.
1. Preparations are carried out under the supervision of a professor,
2. Recording of necessary information in a company,
3. Information system project design or similar,
4. Designing a computer program,
5. Processing of specified data,
6. Note on the accomplished results.

Developing general and specific competence (knowledge and skills)
Students gain knowledge and develop skills working on practical problems taken from working companies. They also test their theoretical and practical knowledge when preparing and taking the exams.

Types of classes and methods of assessment
The internship is carried out in two parts. Preparatory work with a mentor, and practical part in one or more companies under the supervision of the mentor.

BACHELOR FINAL PAPER **Course unit number: 34**

Hours weekly: (x) Semester VI **ECTS credits: 17**

Syllabus outline
Professional study of Informatics has as its final goal preparation and presentation of the bachelor paper. This bachelor paper represents technical elaboration of a specific problem. The student is expected to demonstrate his ability to use methods and techniques of analysing and presenting business and market situations.
When elaborating the selected theme the student applies the acquired knowledge and expertise.
The choice of the theme is in line with the syllabus of the professional study of Informatics. The student works on the theme supervised by his mentor. The paper has to contain between 30 and 50 pages and has to be handed in four copies. Through presentation of the bachelor paper before a Board, the student's knowledge and presentation of the specific problem is tested as well as his overall knowledge gained during the studies.

Developing general and specific competence (knowledge and skills)
Students gain knowledge and develop skills working on practical problems taken from working companies. They present their bachelor paper before a Board.

Types of classes and methods of assessment
The student work on the bachelor paper is supervised by a mentor.