Riga Technical University
Course list 2016/2017

Please note that this is a preliminary Course List for the study year 2016/2017 and changes may accour

Autumn

FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
Bachelor Courses

DIP217 Applied Software
2.00 CP (3.00 ECTS)
Overview of integrated application program development principles on the basis of MS Office. Different component usage methods. Text editor (MS Word), spreadsheet (MS Excel), presentation tool (MS Power Point), workflow support (MS Outlook), graphical editor (VISIO). Interrelation of different components. Basics of web-technology.

DIP106 Algorithmization and Programming of Solutions (Part 1)
3.00 CP (4.50 ECTS)
Students receive academic knowledge in computer applications, as well as pragmatic skills in development of algorithms, software development and debugging. The acquired knowledge and skills ensure further successful mastering of computer science courses.

DIP208 Programming Languages
2.00 CP (3.00 ECTS)
Programming language concept, standard and versions, alphabet, syntax and semantics. Classifications, characteristics and usage possibilities of programming languages. Technology of program development. Program structure. Example of simple program. Basic objects of programming languages, operators and data, review of control statements. Functions. Objects and storage classes. Pointers, arrays, string processing. Structures. Files. Graphics. Programming language development tendencies.

DIP320 Adaptive Data Processing Systems
2.00 CP (3.00 ECTS)
Basic Principles of ADPS Design. Application of Business System Planning Method and LIS Technology. Adaptive user dialogue design on the basis of mathematical and linguistic models. Different examples of Adaptive Data Processing Systems are considered: Financial, Banks, Insurance Information Systems.

DPI349 Software Evolution Technologies
3.00 CP (4.50 ECTS)
1968 is the year of identification of software crisis and software engineering was recognized as an engineering discipline, which enables to view software development as an engineering process. The course deals with modern software development techniques and technologies used in different stages of software development process. In general, software development can be divided into the following components: life cycle, process, analysis and design tools, programming environment, quality assurance, project management, team work. These components are discussed during the course, showing their evolution, solved and unsolved problems.

DAI241 Fundamentals of Automation
2.00 CP (3.00 ECTS)
Structures of automatic control systems, main characteristics, stability and quality. Measurement process of automatic control systems operation. Ways, methods and instruments of measuring. Obtaining methods of control

systems equations, transmission functions, time and frequency characteristics. Stability of the system. Analysis of automatic control systems quality. Pulse control. Non - linear control. Simulation of systems. Identification of systems.

DPI343 Computer Organization and Assembly Language
3.00 CP (4.50 ECTS)
This course covers organization principles of CPU, main memory, external devices and basics of Assembly language programming. Students will obtain skills and knowledge to operate computer components using low level programming techniques.

DSP303 Technology of Large Databases
3.00 CP (4.50 ECTS)
The main differences of large databases (LDB) and desk-top databases. Data models of LDB. Architecture of LDB logical and physical data organization. On-line transaction management and On-line Analytical processing database systems. Instance and its structure. Database dictionary and configuration parameters. Optimisation of SQL queries. Tuning and audit. The most popular large database management systems: Oracle, MS SQL Server, DB2, Progress, Postgress. The future trends.

DOP204 Numerical Methods
2.00 CP (3.00 ECTS)
Solution of linear equation systems by direct, iterative and variation methods. Solution of nonlinear equations and systems. Interpolation, aproximation, mean square method, their applications. Incorrect problems. Regularization with Tikhonov method.

DMI201 Fundamentals of Computer Simulation and Modelling
3.00 CP (4.50 ECTS)
The module 'Fundamentals of System Modelling and Simulation' considers fundamental concepts of system modelling, i.e. the concept of computer modelling and standard procedure, modelling motivation and main principles, and model development and application aspects. The module discusses the essential principles of analytical modelling and types of analytical models used in practice, such as differential equations, difference equations, Boolean functions, logical expressions, finite automats, network models and Petri nets. The fundamentals and applications of system statistical modelling are considered. The structure of a computer simulation model and its main components are defined. Discrete event simulation methods for input modelling, time handling and process simulation, simulation on spreadsheets and simulation output analysis are considered. Systems dynamics approach is discussed. Main principles and methods for model testing and validation are given. Software modelling and add-on tools are reviewed.

DSP202 Discrete Structures of Computer Science
3.00 CP (4.50 ECTS)
During their studies students acquire the practical applications of discrete mathematics concepts, graph algorithms and mathematical foundations of data base. Students acquire the properties of binary relations by detailed examination of equivalence and ordering. Students acquire key elements of graph theory, ways of graph representations. Theoretical knowledge has to be used by practical calculations with shortest path algorithm; algorithm for minimal spanning tree and algorithm for maximum flow problem. The course also observes basic concepts of relational database, operations of relational algebra and basics elements of Structured Query Language (SQL).
While studying the subject students have to work out course work; they have to write a program that solves the defined task by using algorithms and concepts given in lectures.

DAA300 Fundamentals of Computer Graphics and Image Processing
2.00 CP (3.00 ECTS)
Contemporary work with computer is connected with graphical object creation in 2D and 3D space, as well as with image processing. Within the framework of this study course students shall learn about different methods of graphical primitives construction, as well as shall acquire different graphical objects transformation and visualization methods. Students are also provided information on various image processing methods, including image quality enhancement and image compression.

DST203 Introduction to Computer Architecture

3.00 CP (4.50 ECTS)

Data representation; minimization and technical implementation of logical functions; basic functional elements in computers and their synthesis; organization and architecture of computers; control unit; memory and its addressing modes; input/output subsystems; direct memory; virtual memory; computer buses; machine cycle; computer architecture concept; management of computer systems; RISC and CISC architectures;

DSP344 Systems Analysis and Knowledge Acquisition

2.00 CP (3.00 ECTS)

The course concerns systems analysis tasks in the context of information systems development. It focuses on various methods of knowledge acquisition and business and information systems modeling used by the systems analysts for the identification of organizational requirements for new ICT solutions or changes of ICT solutions. Methods included in the course conform to the first three levels of four - level competence framework defined by International Institute of Business Analysis. The course helps also to acquire specific skills, which are indicated in the national professional standard of systems analysts PS 0067. It provides basic theoretical knowledge and practical skills in systems analysis in an integrated manner.

DSP332 Fundamentals of Artificial Intelligence

3.00 CP (4.50 ECTS)

Artificial intelligence is a sub-field of computer science that deals with the design and development of such computer systems that possess characteristics (ability to understand, solve problems, infer, learn, etc.) related with the intelligence in human behaviour. Last decades influence of artificial intelligence on society is growing extremely quickly: speech recognition and natural language processing technologies, strategic planning and diagnosis, process and systems control and management, computer vision and authentication, information retrieval and data mining are only some directions where progress is impossible without artificial intelligence. Such quickly growing role of artificial intelligence in the modern and future society determines the necessity for academically educated specialists, which have mastered fundamentals of artificial intelligence, know its perspectives and have experience in solving problems of artificial intelligence. This course considers questions related to the two fundamental research objects of artificial intelligence: solution search and knowledge representation. The main attention is paid to the construction of a state space of a problem and searching of a solution using uninformed and heuristically informed search algorithms, representation of knowledge about a problem using semantics networks, conceptual graphs, scripts, production rules and frames, implementation of two-person games using the Minimax and Alfa-beta algorithms, as well as use of the propositional and predicate calculus for representation and solving of real world problems.

Master Courses

DIP485 Software Metrology and Planning Models *(graduate)*

4.00 CP (6.00 ECTS)

Software project management: development process models, task planning and assignment, project calendar, human resource management models, cost estimation models, software metrics, quality management models, testing and risk management. Management of "Mission Impossible" projects. Variety of software engineering. Tasks distribution. Tasks implementation graphic. Software cost estimation. Analytic, algorithmic, COCOMO models. Maintenance costs.

DPI503 Evolution of Object-Oriented Software *(graduate)*

4.00 (6.00 ECTS)

Students learn the implementation of object-oriented approach (OOA) principles in several programming languages. Both fundamental OOA principles (abstraction, encapsulation, inheritance, polymorphism) and some additional principles (parallelism, typing) are discussed. In the focus of attention there are three object-oriented programming languages: Ada, Java, Python. The course includes a survey of some specific questions: applet development, server script development, creation of complex data structures and others.

DIP501 Special Data Processing Technologies *(graduate)*

4.00 (6.00 ECTS)

Theoretical aspects and practical aspects of data processing systems (DPS) development are described. The main attention is paid to distributed DPS design and development. The main goal of the course is to strengthen competence in the field of application of DPT based on the set of mathematical models. To formalise application

domain, to form and analyse user information requirements. To advance skills in the development of DPS demonstrators based on mathematical models and in the application of special case tools for mathematical models processing

DSP555 Requirements Engineering *(graduate)*
The course explains the role of requirements engineering in the organizational development and information systems design. During the course students learn several requirements engineering methods, such as soft systems methodology, process oriented methods, and architecture, service, decision analysis, business rules, and agent oriented methods. The main emphasis in the course is on training the ability to understand in which situations which requirements engineering methods and tools are to be used and how they are to be combined to achieve desired level of requirements acquisition detail and manageability.

DIP483 Development Methods of Applied Intelligent Software Systems *(graduate)*
The main goal of the course is to strengthen competence in the field of IACS design and development. To present basic principles of knowledge base modelling and creating. To form basic skills in development of IACS prototypes based on Artificial Intelligence methods and Web solutions.
The following major issues are considered within the course: basic principles and methodology of IACS development; knowledge base modelling and creating; implementation of logical deduction algorithms; development of IACS demonstration prototypes based on Artificial Intelligence models and advanced IT solutions

DSP411 Theory of Systems and Processes *(graduate)*
4.00 CP (6.00 ECTS)
The goal of systems and process theory is to develop a general system structure and functioning description methods which are founded on system thinking that allows to consider all the relevant factors for the system operation. In this course students get acquainted with philosophical foundations of system theory as well as with general and specific system theories. They also acquire basic conceptions of the system structure, classification, laws, rules and principles, general characteristics of system functioning, mathematical models and analysis of system structure, and basics of structural modeling and multilevel flow modeling.

DSP451 Large Databases *(graduate)*
4.00 CP (6.00 ECTS)
The problems of large database (DB) design. Multibases systems. Homogeneous and heterogeneous DB systems. The data models of large DB. Optimization of DB structure. Client/server technologies. DB and transaction servers. The adminstration problems of large DB. Security policy of DB. Auditing DB use. Tuning process of DB. Recovering and backing up a DB.

DSP702 Research Methods for Business Informatics *(graduate)*
2.00 CP (3.00 ECTS)
Modern society is being moved towards a knowledge-based model within which innovative solutions are created that can be applied to enhancing the economy. However, innovative solutions can be created through synthesizing existing knowledge. Scientific methods have been designed and are applied specifically for this purpose, therefore being familiar with such methods should be of benefit to students of business informatics program. The main subject of the course is the introduction to and practical application of scientific methods that can be used in computer science research. Given that some of the students may not be familiar with the concept, the course presents the types of scientific methods and possibilities of application thereof. Quantitative and qualitative scientific methods are considered, the research process and its various steps are analyzed, and the stages of drafting a scientific publication are set out. To ensure a more efficient learning process, theoretical studies are complemented with a realistic research project of a nominal volume; the results of this project shall be presented in a written report. A number of lectures are dedicated to honing technical writing skills that can be applied to drafting course and final papers.

DSP707 Service Science, Management and Engineering *(graduate)*
4.00 CP (6.00 ECTS)
The course is about service oriented approach in business and information systems and software engineering. It concerns vertical (inside the enterprise) and horizontal (inter-organisational) service provision situations. The emphasis is put on new innovative service development. The course comprises service design methods, basics of building service oriented architectures (SOA), and other topics of service engineering. Students will experiment with various service development and running technologies. They will learn approaches to service governance according to most popular service management methods and standards. Students are expected to have basic knowledge in

business process modelling, systems theory and portfolio management. The course concerns also research advances in SOA.

DPI704 Quality, Risk, and Security Technologies *(graduate)*
4.00 CP (6.00 ECTS)
A modern enterprise's operations are closely related to the application of information and communications technology. For the most part, enterprises cannot remain competitive and viable without resorting to ICT. However, selecting the most appropriate technologies for a specific company requires an understanding of ICT. Some of the most crucial prerequisites for successful deployment of ICT in an enterprise is the quality of technologies chosen, understanding of the risks associated with such technologies and security of the selected technologies. The main topic of the course is an overview of the existing quality, risk and security technologies from the following viewpoints: 1) Process; 2) Activities; 3) Standards; 4) Methods applied; and 5) Best practice examples. To ensure that the aim of the course is successfully attained, theoretical studies are complemented with practical deployment and analysis of the technologies discussed. During the practical part of the course, narratives of quality, risk and security management processes are created, existing methods and standards are applied to real-life enterprises' situation examples and existing technologies are applied in practice.

DPI721 Business Analytics *(graduate)*
4.00 CP (6.00 ECTS)
Companies are making decisions across all functional areas. The role of information technology specialists is to develop infrastructure to provide decision makers with precise information at the right time and the right place. First part of the course deals with the value chain and analyzes information sources of the main business processes. Accent will be put on the quality management and cost accounting. Second part of the course deals with business intelligence architectures and tools available for enterprise iiue583nformation utilization.

DSP700 Enterprise Architecture and Requirements Engineering *(graduate)*
4.00 CP (6.00 ECTS)
The course presents basic approaches to requirements engineering. Students learn to identify and design enterprise/business architectures and specify requirements for organisational information systems viewing people and computer systems as nodes of information processing. They learn to analyse and design information flows in organisations and organisational networks and how to develop the information logistics model. IBM requirements identification and management tools are used in the course. Acquired knowledge is beneficial not only for requirements identification for information and communication technology solutions; it is applicable also for the design of products and services in general.

DSP703 Systems Theory *(graduate)*
4.00 CP (6.00 ECTS)
The goal of systems theory is to develop general description methods of systems, based on systems thinking, providing inclusion of all critical factors that have influence on systems performance. In this course students acquire foundations of systems theory. The focus is on specific systems theories which represent relevant factors for business development. Students obtain understanding of principles of systems classification and system classes. Foundations of cybernetics are included into the course as well as theories of living systems and viable systems. Students learn to use set theory and graph theory which are needed for systems modelling and are used in other courses.

DSP708 Advanced Data Technologies *(graduate)*
4.00 CP (6.00 ECTS)
In the course above-mentioned models are combined with well-known and very wide used relational database models.
The course includes main groups of query languages used in advanced database systems, such as SQL and its object and temporal extensions; multidimensional query languages for data warehousing systems and artificial intelligence languages.
The course concerns also issues on information systems architecture for large variety of possibilities to organize storing, searching and presenting data, information and knowledge: different client/server architectures with application servers and web servers, distributed database architectures and multibase architectures. Databases are not only for data storage and retrieval, they can perform different algorithms to provide needed information and knowledge. To illustrate this database capability deductive databases, data mining, and intelligent databases are considered.