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Development of the modernization and support system in IT educational process

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ABSTRACT

Nowadays effective management of the educational process is one of the most important management tasks in the university, which encompasses a large number of people involved in this process - students, teachers, teaching and support, and directly affects the conditions of their work and study. At the same time, normative documents regulating educational activity leave a lot of space for their implementation in the conditions of a particular institution of higher learning. Taking into account all available opportunities and their effective implementation require considerable effort on the part of management personnel. The main study question is how the automated learning support system. The research idea is to describe the principles of automated learning support technologies for education process. The result of the research is the improvement of knowledge flow and the information system.

АННОТАЦИЯ

В настоящее время эффективное управление учебным процессом является одной из важнейших задач управления в университете, которая охватывает большое количество людей, вовлеченных в этот процесс - студентов, преподавателей, преподавание и поддержку, а также напрямую влияет на условия их работы и учебы. В то же время нормативные документы, регулирующие образовательную деятельность, оставляют много места для их реализации в условиях конкретного вуза. Принимая во внимание все имеющиеся возможности и их эффективное внедрение, требуются значительные усилия со стороны управленческого персонала. Основной вопрос исследования заключается в том, как автоматизированная система поддержки обучения. Идея исследования состоит в том, чтобы описать принципы автоматизированных технологий поддержки обучения для образовательного процесса. Результатомисследованияявляетсяулучшениепотоказнанийиинформационнойсистемы.

АҢДАТПА

Қазіргі уақытта оқу үдерісін тиімді басқару университеттегі ең маңызды басқару міндеттерінің бірі болып табылады, ол - студенттерге, оқытушыларға және деоқу процессіне тікелей әсер етеді. Сонымен қатар, білім беру қызметін реттейтін нормативтік құжаттар белгілі бір жоғары оқу орны жағдайында оларды іске асыру үшін көп орын қалдырады. Барлық қолжетімді мүмкіндіктерді ескере отырып және оларды тиімді іске асыру басшылық тарапынан айтарлықтай күш жұмсауды талап етеді. Негізгі мәселе - оқытудың автоматтандырылған жүйесін қалай құру керек екендігі. Зерттеу идеясы - білім беру үдерісіне оқытудың автоматтандырылған технологияларын енгізу принциптерін сипаттау. Зерттеудің нәтижесі білім ағынын және ақпараттық жүйесін жетілдіру болып табылады.

Contents

INTRODUCTION

The object of development is a subsystem of educational process planning. The purpose of the work is to analyze the currently available software products, to develop a universal schedule design.

The present work is devoted to the analysis of the problem of scheduling in higher educational institutions. The literature review contains information on the relevance of the task, the software products presented at the moment, their positive and negative aspects. Methods of scheduling, allocation of resources of premises and teachers, calculation of teacher's load.

Currently, higher education institutions have organizational and financial structures that have changed in relation to those times, have a new organizational and regulatory framework through the introduction of higher education in the system of higher education, all this does not allow in full and with the planned the effectiveness of using these somewhat outdated developments; and taking into account the obvious tendency of the formation of an information society in our country, it is also necessary to take into account the specifics of the information environment of the university and the changed methodology for the formation of the learning process, therefore the number of works describing the management of the educational process, taking into account modern conditions and requirements, accordingly decreases. In addition, in many works devoted to the automation of the management of the educational process, certain individual issues are considered: the drawing up of a schedule of training sessions, the formation of curricula in the specialty, the calculation of the load, etc., without taking into account their interrelations, which does not allow to achieve an effective solution of the general problem generally.

1 Informatization of the management system of the educational process

Automation of any system is only then expedient and gives a practical result when the most complex and laborious processes of this system are automated. The most complex subsystem of the university management system is the subsystem of the automated management of the educational process.

The automated control system of the educational process in the university is proposed to be composed of the following relatively independent automated subsystems:

- subsystems of educational process planning;
- subsystems for managing students' learning activities;
- subsystems of information support of the educational process;
- subsystems of system analysis and audit of the educational process.

In its turn, the most complex, labor-intensive and subject, as practice shows, to the greatest number of defects is the subsystem of educational process planning. At the same time, it is the most significant component in the quality assurance system for training specialists and in the labor-based system, and it is also necessary to take into account how perfect its structure will be, automation and optimization of other subsystems for managing the educational process at the university will be so successful. Therefore, the educational process planning subsystem should be designed in such a way that it ensures the following operations and functions:

- automated planning of curricula in specialties and areas;
- Automated calculation of educational work and planning of the pedagogical load of the university, departments, teachers;
- the automated distribution of the academic load of the department between the teachers of the department;
- the automated formation of the schedule of training sessions taking into account the employment of the teaching staff and the resources of the educational and laboratory base of the university.

In addition, when developing the educational process planning subsystem, the principles of the connection of theory with practice, the coordination of the volume of educational information with the time budget determined by the state educational standard of higher professional education, the sequence of learning subjects and their interrelations, drawn up in the form of a structural and logical scheme of preparation specialists. Only in this case it is possible to achieve optimal planning of the educational process in the university.

Optimal planning of the educational process involves the systematization of the main information flows, the development of unified forms of documents that determine the content and volume of educational information and the sequence of studying the content of the disciplines, optimizing the content of the curriculum and automating the formation and completion of these documents.

Analyzing the existing technology of educational process planning and management system, it is possible to single out a number of significant shortcomings: it is cumbersome, difficult in automation, difficult to manage and laborious, inflexible and does not provide the required quality of planning.

For these technologies, an information technology scheme for planning the educational process in the university has been developed which is the basis for the formation of the optimal information system of the educational process and the development of an algorithm for planning the learning process[1].

A list of documents for the optimal information system of the educational process used in the automated system for planning the educational process was created, namely:

- structure of the university;
- the list of specialties (specializations);
- structural educational units of the university;
- disciplines of choice;
- staff schedules of departments;
- curricula for specialties;

- annexes to the curriculum (by semester);
- the schedule of the educational process;
- the academic load of the departments;
- conventional symbols of specialties in the schedule of training sessions;
- the net of the chair hours;
- mesh watches by specialty;

This is done for the convenience of the automated formation of individual documents on the organization and planning of the educational process: the application to the curriculum, the clock grids of the departments, the summary schedule of the educational process, etc. The curriculum is formed in such a way that its structure and content ensure the given labor intensity of training specialists and fully comply with the requirements and content of the state educational standard of higher professional education in the relevant specialty.

This procedure is facilitated by the application of a single methodological basis for curriculum planning in the curriculum

The main factors determining the complexity of the workload are the composition and structure of the curriculum for the specialty, as well as the size and structure of the recruitment of students; regulation of the value of the average training load requires consideration of the factors that affect the total annual volume of academic work in each curriculum. The influence of these factors is taken into account by the introduction of normative coefficients that normalize the amount of independent work of students by occupation and the amount of work of the teacher to control students 'knowledge, to supervise and guide student's work on individual assignments. In addition, in the process of forming the curriculum, the procedure for allocating the appropriate number of hours of independent work of students to perform the corresponding individual tasks (course projects, term papers, accounting tasks, abstracts, etc.) is automatically tracked, preventing students from overloading

individual assignments . The second operation (the second one can be called conditional, since it is performed in parallel with the operation of forming the curriculum) is the calculation of the educational work and the formation of the academic load of the department .

In order to improve the planning of teachers' teaching work and calculate the workload, it is proposed to use the unified norms for the time of study 9 based on the differential dependence of the hours of control of students' knowledge on the total number of hours in the discipline, which allows one to methodically plan the control of students' knowledge in the subjects and democratically distribute the academic work between the departments. To stimulate highly professional teachers to conduct more intensive and responsible types of educational work in a larger volume, and also to take into account the individual characteristics of each teacher, to make optimal use of his pedagogical and scientific experience and knowledge, and to observe the academic freedom of the teacher in choosing the type and form of educational activity apply the methodology for calculating the teaching load of the teacher, taking into account the actual labor intensity of various types of educational work[2].

The next operation of planning the educational process is the formation of the clock grids of the departments, they are compiled in an automated mode using the document "Supplement to the curriculum" containing all the information necessary for this procedure.

The final stage of planning the educational process at the university is the drawing up of a schedule of training sessions, it is formed on the basis of clock grids by courses and specialties, using data on the auditor fund of the departments and the university, the staff of the faculty, the symbols of specialties and the list of requirements for the timetable. Since the effectiveness and quality of the educational process is largely determined by the quality of the schedule of training sessions, the schedule of training sessions is formed taking into account the requirements and using computer technology.

The scheduling is carried out in two stages: at the first stage, an impersonal schedule of training sessions using the genetic algorithm is formed in an automated mode .At the second stage, in order to optimize the organization of the work of teachers and use of the unique individual pedagogical and methodological experience of teachers, the names of disciplines and types of occupations are placed in an impersonal schedule, taking into account the wishes of the teachers. To create a timetable, algorithms and software have been developed that make it possible to compile a schedule of study sessions in a university for a semester by a standard week or a division into even and odd weeks with a given criterion of optimality of the quality of the schedule of training sessions.

The process of optimal planning of the educational process includes mandatory procedures for analysis, systematization, unification, optimization of information flows, forms of educational documents and processes for their processing with the final procedure - automation of basic operations. Such an approach in planning made it possible to reduce the nomenclature of documents circulating in the educational process, to eliminate duplication of information, to increase the information capacity of documents, to free the staff of the departments, deans and the teaching staff engaged in planning the educational process from routine technical work, to reduce the number of conditional operations in planning technology, improve the quality of planning the educational process while reducing the complexity of the planning process.

All the procedures of the educational process planning subsystem in the university are implemented in the programming environment and support the work with distributed databases using network technologies.

In the process of functioning of the educational process scheduling sub-system in the automated mode, the following output documents are formed:

- curriculum on the specialty;
- an annex to the curriculum with a full calculation of the annual academic work on the subjects of the curriculum, the total amount of educational work in the specialty and the magnitude of the academic work per student;

- The summary schedule of educational process on faculties and as a whole on high school;
- a grid of the chair hours by semesters, indicating the types and scope of the academic work on the assigned disciplines;
- documents for scheduling training sessions: a grid of watches by specialties,
- summary data on the need for audiences for various purposes;
- preparation of the supplement to the diploma of higher education;
- schedule of training sessions and examinations.

All this allows you to reduce costs in planning the educational process, simplify the planning technology, improve the manageability of the educational process and, accordingly, improve the quality of planning the educational process in the university[3].

To assess the effectiveness of the complex of measures to improve the planning of the educational process in a university, a multiplicative criterion for the optimal planning of the educational process is determined .

1.1 Automation of management of the training process in the university

Effective management of the learning process is one of the most important management tasks in the university, which encompasses a large number of people involved in this process - students, teachers, training and support and administrative personnel, and directly affects the conditions of their work and study . At the same time, normative documents regulating educational activity leave a lot of space for their implementation in the conditions of a specific institution of higher learning. Taking into account all available opportunities and their effective implementation require considerable effort on the part of management personnel. The problem is aggravated by the transition to a new education management system, generated by the accession to the Bologna Declaration and the corresponding significant change in normative documents[4].

Obviously, carrying out activities to inform the procedures for managing the educational process in principle can significantly improve the quality of management and reduce its labor intensity. At present, there are a large number of educational management systems that are both initiative and commercialdevelopment. Most often they are aimed at solving the following main tasks:

- enrollment, transfer and deduction of students ("contingent");
- control of academic progress of students ("session");
- formation of working educational plans
- new;
- distribution of training load between faculties, departments and teachers;
- formation of staffing;
- drawing up and adjusting the schedules of classes and exams.

The peculiarity of these tasks is that, on the one hand, they are deeply interrelated, and on the other - that they affect the interests of large groups of people with different, though not opposite, interests. For this reason, in particular, the organization of the educational process at the university is very conservative, and the introduction of any innovations meets with obvious or implicit resistance. The ill-considered use of information and computer technologies often causes an increase in the workload of both teachers and students, without giving the desired effect, which generates sabotage moods and actions. This is particularly noticeable when trying to implement third-party developments that implement a partial solution of management tasks that, on the one hand, change the established traditions, and on the other, require binding to existing information systems.

In the present article, the structure of the information system for managing the educational process is considered, providing for a comprehensive approach to this problem. Its development is conducted in Yaroslavl State University. Demidov for several years and has already led to a marked improvement in the quality of management.

Central to the system is the management of curricula. Qualitative curricula greatly facilitate the implementation of all the main tasks of managing the learning

process. Together with it, one can not help but note that the curriculum has a very complex structure: in the presence of a basic component for all students, it has a variable part, its own for each student. In third generation standards, this trend is even more pronounced, and the situation is further complicated by the introduction of a competence approach. The existing curriculum development system: from the standard to the curriculum, from the curriculum to the annual curricula, in this situation is poorly adapted toreal educational programs, for which students are trained. In essence, each student, due to the availability of various specializations and elective courses, has his own curriculum.

The output here can be not a linear, but a multilevel structure of the curriculum, when the base level contains the base part and the stubs of the variable parts, and the variational elements of the curriculum themselves are located at lower levels. Such a structure requires, in addition to the top-level curriculum, other organizational and administrative documents: a list of specializations, a list of elective courses, taking into account the relationship between them, lists of students attending certain courses, etc. Documents of this kind very often have a non-unified structure and are made very unsynchronously. All this considerably complicates the automated processing of information related to the learning process.

An effective tool for taking into account the hierarchical structure of the curriculum is the XML language, which was originally adapted to the description and processing of documents of a hierarchical structure with complex connections. Its use allows a unified way to describe the complex structure of curricula and make it suitable for automated processing. This is all the more important because, in addition to complying with the educational standards, other curriculum constraints must be taken into account when formulating curricula: the number of weekly and general hours, the number of exams and the exam in the semester, and t . Having a formal description of the curriculum makes it much easier to draw up plans that meet all the constraints.

An important issue arising in planning the development of an information system is the choice of tools. Very often, in this capacity, the tools of the Microsoft

Office suite, primarily Excel spreadsheets, are used, due to the almost universal prevalence of this package. It should be noted, however, that the laboriousness of using such tools increases sharply as the tasks to be accomplished become more complicated.[5] Taking into account the fact that, in essence, each student receives his own curriculum, a single database must be created that provides the learning process and includes information on students and teachers.

Creating such a database based on Excel, although possible, but very inefficient. At the same time, there are both commercial and free tools for developing software applications and database management systems (including those from Microsoft) that allow you to build complex information processing systems with reasonable costs, management of the learning process. The use of traditional programming tools makes it possible to provide users with a familiar interface based not only on tables, but also on input forms. This greatly facilitates the training of personnel and the development of the new system. In addition, the use of a familiar interface and a branched user error management system leads to a significant reduction in the psychological burden of personnel and a general reduction in control errors.

It is clear that the creation of such a system requires considerable expenditures. Unfortunately, the lack of standard solutions forces universities to solve this problem based on their own capabilities. Usually, they are used either by the development of their own specialists, or the order for the development of a third party organization. Both ways have well-known advantages and disadvantages: development by one's own forces is usually delayed, tearing away all conceivable timeframes, and outside organizations tie a typical solution from another sphere, not sufficiently taking into account university specificity. Perhaps the best solution here is to organize a temporary team of developers, consisting of university staff and working on a contract with the university. This allows to solve two tasks, the ignoring of which subsequently causes considerable difficulties in the implementation: preparation of qualitative documentation and training of personnel. Since a large number of people with different job responsibilities and different levels of computer training are

involved in the process of preparing the work curriculum and the corresponding basic educational program, the process of implementing the system usually takes place with great difficulty, especially at first , while users have not accumulated a certain experience. The availability of documentation that provides an answer to questions arising in normal and contingencies, as well as training of various categories of users, significantly reduces the period of entry of the system into a working ex- operation. In addition, the availability of documentation developer will continue to develop and after the contract.

The choice of a curriculum management system as the basis for the construction of an integrated educational process management system allows for its sequential expansion, adding smaller subsystems, for example, the formation of progress records in the rating system, the printing of applications to the diploma, etc.

The transition to new educational standards leads to a further complication of the management system of the educational process. The competence approach further complicates the interconnection of the academic disciplines among themselves, requiring new approaches to the organization of the educational process, integration into the system of assessment tools and methods of accounting for their use. It is necessary to reconsider the assessment of the labor intensity of educational disciplines and other elements of the educational process from the point of view of teachers, thus forming incentives for improving both content and forms of education, ensuring the needs of all stakeholders: students, teachers, employers, the state and society. An effective solution to these problems is possible only if a deeply-layered integrated educational management system is created.

1.2 Features of the use of the planning program

The task of planning has been the subject of scientific research since the middle of the last century. The field of their application includes various spheres of human activity, such as transport, mass service, industry, education, etc. Practice poses many problems that can not be effectively solved by careful search. For most models of scheduling theory, searching for the optimal schedule is a difficult task,

and it is even more difficult to solve problems close to real conditions, since these solutions must satisfy the numerous, often contradictory limitations of the production, organizational and psychophysiological nature. The way out of this situation is to abandon the approach when only the best solution is deemed acceptable. Consider the task of this class, arising in a certain area of management activity, - drawing up schedules of training sessions at the university[6].

Quantitative and qualitative growth of higher education requires a new approach to solving the problems of managing the educational, scientific and economic activities of universities. This approach in recent years has been embodied in the application of modern means of computer technology and mathematical methods in the management of higher education institutions. In the modern world, various types of automation systems for technical processes, which have always been done manually, are becoming increasingly common. For example, decision-making systems in marketing, expert systems, replacing experienced professionals, predictive systems in the most diverse fields of science and technology. To the same processes is the preparation of a timetable, which is still being created manually in many educational institutions on the basis of many years of experience. Modern science has the means to best organize any process, including training.

The task of planning the schedule of training sessions is the task of scheduling a combinatorial type, the characteristic feature of which is the enormous dimension and the presence of a large number of constraints of complex shape. In fact, at the present time, there are no universal methods for solving such problems. The mathematical (classical) theory of schedules covers only a narrow range of well-formalized problems, which usually boil down to the traveling salesman, the transport problem, and so on. Direct application of these methods to the task of scheduling training sessions is not possible. Nevertheless, there are a number of heuristic and exhaustive methods that are quite amenable to programming.

There is an opinion that an experienced dispatcher will be able to schedule so that it will meet the interests of the educational process and the public life of the educational institution. However, this can not be accepted. The manual solution of the

task of scheduling occupations is time-consuming, qualified specialists, at the same time, the result of such a decision often turns out to be far from optimal. After input of the initial information, its coordination is required, while the impossibility of obtaining the required schedule can be determined even at the analysis stage. At the time of scheduling, deadlock situations may arise. All this requires changing the initial data and easing the restrictions, and here you can not do without a person. Without making these changes, the timetable will not be of practical value. It should also be taken into account that the schedule can change and during its use, i.e. after compilation, and here the human factor is very important. In this regard, it is important to support this processautomated methods and procedures.

The main advantage is that automated compilation eliminates a lot of routine work, such as: searching for possible options for adding regular items to the schedule, checking the requirements, searching for random errors in the finished schedule, scheduling on paper in the form of various tables (for teachers, groups , cabinets), leaving a person more time for more intelligent actions. The computer in this case is also a tool that greatly enhances a person's abilities, because people are not able to sort through and analyze the same number of scheduling options as a computer.

Studying the experience of creating such systems shows that in recent years, many attempts have been made to improve the planning of the educational process by constructing algorithms for optimizing the tasks of planning the academic work of the university and their subsequent implementation on computer technology. Such studies at different times have been and continue in some universities. However, practical implementation of the planning of the educational process using computer technology takes place only in a few universities.

Analysis of the state of these developments allows us to draw the following conclusions:

- The development and implementation by universities of the tasks of the automated management system is carried out on an initiative basis, and these works are usually aimed at solving certain problems. Separation of groups of researchers

and developers led to the creation of many systems aimed at developing algorithms and programs designed to serve only a particular institution.

• Many systems impose on the schedule developer all responsibility for accounting for real requirements. In particular, taking into account the requirements of teachers,restrictions on the number of sessions per day, per week - all these and many other routine tasks in such systems should be solved at random using brute force methods.

• Existing programs do not assume a multi-user mode of operation and do not support all necessary electronic workflow.

• Practically there is no development of standard unified elements for the creation of a unified automated system for the management of higher education.

• The existing programs have a very inconvenient interface for entering the initial data and editing the received schedule.

In connection with the extension works on the improvement of higher education management system through the creation and implementation of the various universities in the automated control systems became necessary to commonality means drawing up a training schedule for computing. To do this, it is necessary to clearly formalize the requirements for the schedule and develop the appropriate algorithmic support[7].

When developing algorithms for automated scheduling, the problem of creating universal algorithms that take into account the specific conditions of each specific problem is acute. Such algorithms should be sufficiently "flexible", i.e. without substantially changing them, it would be possible to include and exclude requirements from the system of requirements for the schedule. However, the attempt to solve the problem by any one single universal algorithm at the moment is not possible. Algorithms that make it possible to solve a wide class of problems do not

yield the efficiency that is provided by more specific algorithms that are adapted to specific conditions.

For the systems of scheduling, there is a strong dependence on the specifics of specific educational institutions already at the level of mathematical models and data representation, which makes the use of standard systems more difficult. The system, created in one university, usually can not be used effectively in the other without modification and refinement. In addition, many of them were created quite a long time and with their help it is impossible to effectively solve the task.

To solve existing problems, it is required to build a flexible and easily adaptable system based on new principles, using modern computer technologies. A system is needed that makes up the schedule in accordance with the selected criteria and the specified requirements, i.e. It takes as many human functions as possible so that the schedule has to be reduced manually. These capabilities should also be implemented without changing the source code of the system. To cover the most typical cases, it is necessary to create several typical algorithms that implement scheduling. This system should be able to supplement and modify the existing database and user interface. All this would make it possible to specify in each institution the requirements that meet its conditions, and by selecting and setting the appropriate algorithm to obtain the required schedule.

1.3 Formulation of requirements for the subsystem

All approaches to the question of scheduling are based on heuristic methods that come to the person with work experience. It is problematic to formalize these methods, since they are connected with making decisions by the operator making up the schedule, which is guided by experience and intuition. Often, the employee who composes the schedule can not answer the question why he chose a certain accommodation optionclasses, and not some other among the permissible. But, despite the complexity of the formalization of algorithms, it is possible to distinguish the features of such heuristic approaches, based on the requirements for scheduling. Undoubtedly, for each educational institution these requirements are different,

because they are historically due to the peculiarity of the organization of the educational process itself. However, even with all the details, we can single out the general requirements for the schedule:

- Minimum number of sessions a student a day;
- Maximum number of hours of study load per week for each student;
- The maximum number of classes a student a day;
- Minimizing windows for students;
- Allowance for the time distances between corps when the case is changed for students;
- Accounting of the wishes of teachers;
- The cycle of lessons in discipline should not end with a lecture if there are seminars (practical) classes;
- The cycle of lessons in discipline should not begin with a seminar (practical) lesson, if there are lecture classes;
- For each lecture, all groups of the stream should be approached, having received the same number of hours of seminars (practical) classes;
- Minimum number of sessions per teacher;
- The maximum number of lessons a teacher a day;
- Minimizing windows at the faculty (hereinafter PPP)
- Formation of group flows, and their partitioning for laboratory works, practices[8].

2 Development of the subprogram for planning the educational process

In order to draw up a technical task, it is necessary to consider the products available on the market, to determine their strengths and weaknesses, and to write the terms of reference in such a way that a new product takes place, competitively capable, does not follow erroneous paths of similar products and offers a more interesting and affordable alternative option for higher education institutions.

Consider two main companies that now offer software products in this area. This is the company MMIS LAB with the program "AVTOR" and the company 1C with the program "1C: Automated scheduling. University ". Let's start with the program from 1C. This platform is widely distributed and known in Russia, and is well adapted to Russian legislation, and has a common base, but is customized by specialists for each individual educational institution, and there are also problems with the search for errors with a non-relational rather than hierarchical structure of the program. 3 Comparative analysis of AVTOR program work and programs of other developers was repeatedly conducted by specialists of various educational institutions. The results of the research are published on known Websites on the Internet, as well as in reports at conferences and master classes. It is concluded that AVTOR has the most powerful algorithm for automatic scheduling and optimization, the program builds better schedules for many criteria. For example, the number of "windows" in the schedule of teachers is 2-3 times less than when using other programs. 4 But, as in the previous case, it requires customizationspecialist for certain requirements and the user of the program can not in any way affect this himself and add the necessary restrictions to him in the shortest possible time. Thus, the designed program should allow:

- build a schedule without "windows" for classes (study groups);
- optimize the "window" of teachers in the timetable;
- take into account the required range of days / hours for classes, for teachers and for audiences;
- take into account the nature of the work and the wishes of both full-time employees and part-time employees;

• It is optimal to place classes in classrooms (classrooms), taking into account the features of classes, subjects, teacher priorities and cabinet capacity;

• enter the schedule of calls;

• set the time of transition (moving) between educational buildings;

• optimize the number of transfers from the cabinet to the cabinet, and from the case to the case;

• it is easy to connect any classes (study groups) into streams during any classes;

• to divide classes (study groups) into classes of foreign language, physical culture, work, computer science (and any other subjects) by any number of subgroups;

• Introduce combined lessons for subgroups (such as "foreign / informatics") in any subject;

• optimize the uniformity and laboriousness of the timetable;

• easily and quickly enter and adjust the original data;

• have any number of schedule options;

• automatically convert schedules when changing a database;

quickly make any necessary adjustments to the schedule;

• automatically monitor the schedule, excluding any "overlays" and contradictions;

• Quickly recalculate the schedule when the curriculum and the schedule change

• Allow the operator to make restrictions for the ability to customize the program yourself, adding features to the institution, and more optimal work.

2.1 Designing the program of planning the training process

To develop the conceptual design of the scheduling subsystem, we will use the StarUML editor. Let's create a diagram of usage cases named Educational process management.

In Fig. 2.1.1 is a diagram of the VI Management of the educational process. The diagram shows that both the Administration, the Students and the Teachers are involved in the process of writing the timetable. The administration makes inquiries on operational management and planning of the educational process, based on the working curriculum. In the process of preparation of the learning process, Teachers and Students are distributed according to the curricula of the disciplines in accordance with the resource of teachers and facilities, as well as in accordance with the wishes of students and teachers. As a result, with subsequent editing, operational management is carried out at the request of the Administration

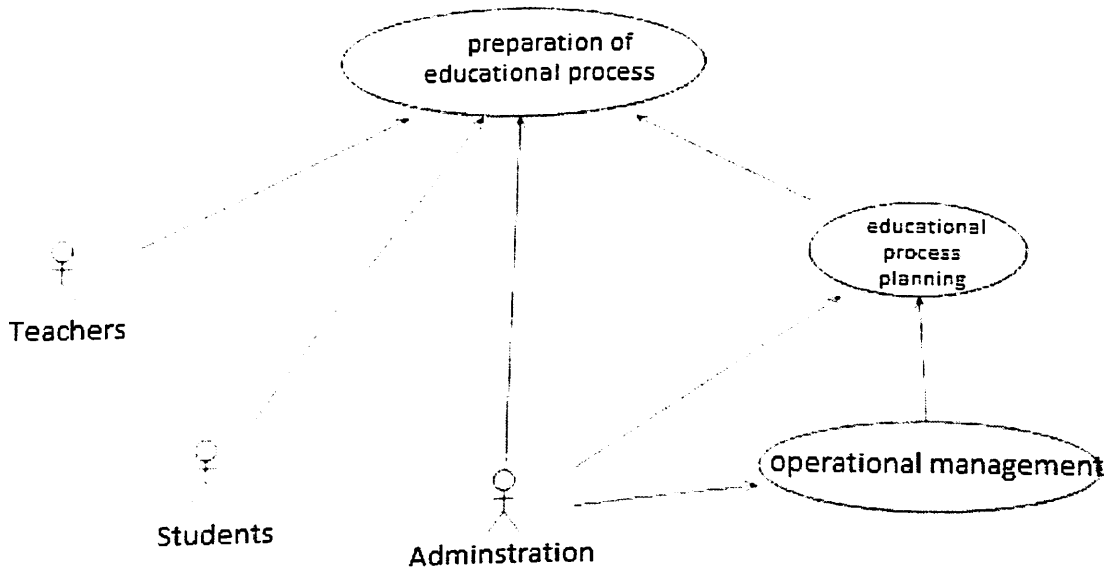

Fig. 2.1.1- Diagram for the task Management of educational process 5

In Fig. 2.1.2 provides a more detailed diagram of use cases, for a better presentation of the structure of educational process planning. The processes of scheduling and planning of the educational process are presented in more detail. Planning of the educational process includes such large sections as: Formation of the curricula, Calculation of the lengthy plan for the period, Formation of the schedule. We will be interested in such an aspect as the Formation of the schedule, the other two will be considered fulfilled and taken as a set of initial data. Formation of the schedule includes such basic entities as: Formation of flows, Distribution of teachers' resources, Consolidation of classrooms, formation of schedule of classes.

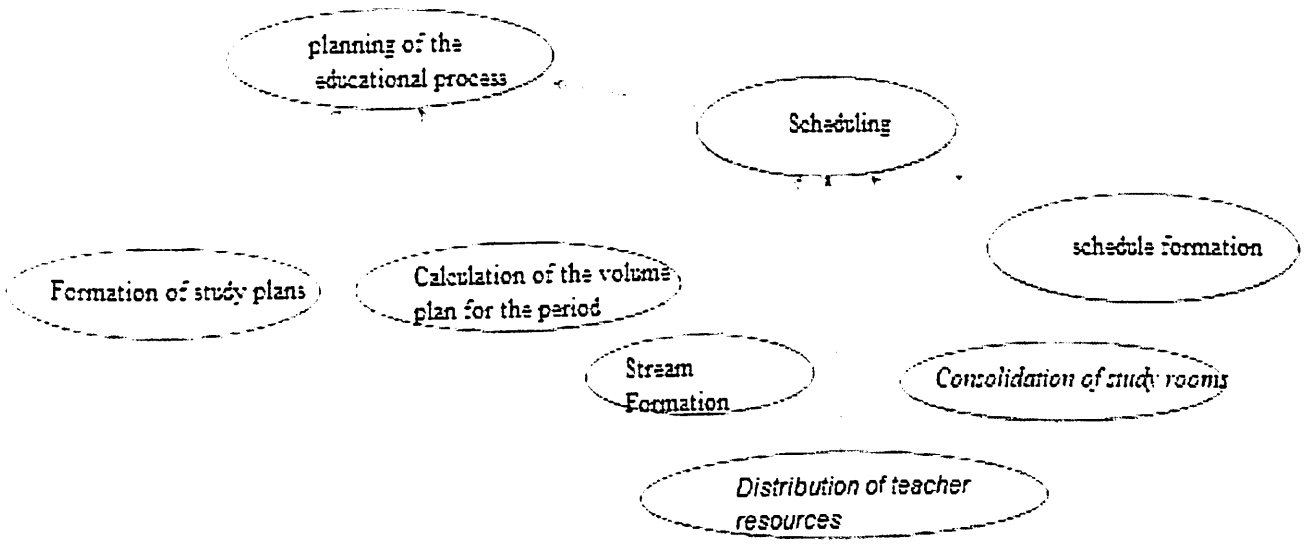

Fig. 2.1.2- Detailed diagram of the Planning of the PM. 5

2.2 Development of a class model for the subsystem

Consider the composition and structure of the objects needed to support some of the presented uses.

One of the important resources in planning the educational process is the resource of the premises.

The main entity The premises using the housing room association are attached to the educational building, from which, respectively
is a university.

For the educational building, information such as the address and the number of audiences is necessary so that there will be no conflicts over time as groups move between the corps and the enclosure overflows. Responsibility for the premises is indicated using the association Responsible unit. Association Technical equipment and essence TS instance Allows to describe the technical equipment of premises. Essence Technical means allows you to maintain a nomenclature reference book of equipment. Entities The audience and the Learning Laboratory are inherited from the entity. The room contains information about the number of seats in it and the possibility of calculating the distance to it. The audience, like the Training Laboratory, contains information about its number and location (floor, wing, serial

number). In educational laboratories should also be information about the method of their visit, their appointment and the number of jobs, adapted for employment. Audiences are divided into streaming and audiences for one group, this separation will be convenient for grouping the groups into streams and searching for the desired room.

Another important resource that needs to be considered is the teaching staff. The main essence is the Teacher Resource, through which teachers are distributed in the subjects and days of the week. It is also necessary to take into account the replacement of teachers for illness and other reasons. To do this, you need a teacher replacement function for a position that should put a replacement person for a certain period or define it as the main one. Information for this is obtained with the help of the essence of the Teacher, which contains all the information about a particular teacher, and also using the Entities Accessible Objects and Available Time information you can get information about qualifications, time opportunities and load, respectively.

The main essence is the Position of the three-dimensional plan, which allows to distribute the premises, teachersand students on a schedule at certain times. The drawing up of a three-dimensional plan is based on the requests for the essence of the Work Curriculum. [9] To support the process of creating a schedule, entities such as the Instructor for the position, the Place, the Schedule Point, with which it is possible to determine the volume plan for a particular semester, are entered.

Essence A teacher for a position allows you to find an available teacher for the position of the schedule, taking into account the teacher's wishes, his overall workload and workload for the day, as well as his location on the previous pair, so that he can comfortably move to another audience. Essence Semester allows you to calculate the volume plan for each individual time interval and course, this allows you to track and make changes to the curriculum of each course and group. And since the administration is making changes to the curriculum, the Work Curriculum is constantly changing; it allows you to store control data for each position and object of the curriculum and change the types of control.

For a more convenient calculation of the schedule, we introduce a construction such as the Schedule Point, which should allow to conveniently allocate teaching resources and premises resources and build a timetable using the time scale. In essence The point of the schedule includes such information as: the day of the week, the parity of the week and the number of the training pair, the generalization of these data should simplify the calculation algorithm, since the data points will be only about one hundred.

This design as a whole should ensure the optimal operation of the scheduling subsystem, provide a rapid response to changes in the curriculum of the administration, use the points of the schedule to distribute teachers and training groups to the classrooms in the immediate vicinity and create as few windows as possible between classes between students and teachers . In the diagram of the classes of planning the educational process, all necessary forthis class and the relationship between them. Based on this diagram, you can start writing a software product, strictly relying on the presented entities.

To solve the problems of the formation of the schedule, you need data on the organizational model of the university.

The basic essence is the subject of activity in its composition includes both students and employees, which are distributed according to the training groups and positions of the staffing table, respectively. Also in the subjectsenter the university and such units as: department, faculty, administration, laboratory.

We will develop diagrams of data flows for automation, which are performed at the university. DFD - diagrams of data flows. The business process information flow model (DFD) represents the business process as a set of operations performed in relation to the flow of information flows. Methodology Geographic structural analysis describes external to the system, data sources and destinations, logic functions, data flows, and data storage to be accessed. The data flow diagram is one of the main tools for the structural analysis and design of information systems that existed before the widespread use of UML.

General principles of the model and DFD methodologies IDEF3 similar to IDEF0: a model is a set of hierarchical dependency diagrams, rectangles represent the work or processes arrows - is also some data to build a model from the top down through the decomposition of major works into smaller diagrams[10].

Data streams are used to describe the workflow and information processing. They can be used as a supplement to the IDEF0 model to more clearly display the current workflow operations in corporate information processing systems. DFD describes the functions of processing information (work, activities), documents, objects, employees and departments that participate in the processing of information tables for storing documents. Scheduling the schedule, performed using CASE BPwin 4.0. 5.

It can be seen that the DFD language allows you to perform a hierarchical decomposition of processes, highlight the stored data and processes of working with them, reflect the scenario of interaction of processes on data exchange events.

The data drive is different from the data essence. This can be a variable, a group of variables, a file, a relational table, a group of related relational tables. The uncertainty in the description of the data significantly reduces the modeling capabilities of the DFD language. The control flow is not explicitly represented in the DFD diagrams. Each process can be viewed as some activity that accepts and processes events on the input and generates requests to other processes and generates responses to requests from third processes. These diagrams can be considered as a scenario of the system operation, describing the data exchange, both between the components of the system, and between components and its environment. Presence of fragments of event management allows you to partially specify the constraints and conditions for the formation of the reaction of processes to incoming events.

The process in DFD is more in line with the task in the Ada programming language. Each process processes streams of external events (which can queue up). At the same time, it can generate streams of events for its environment. In some cases, the process may be in the waiting mode for the arrival of events. 5

Reflected aspects in the mode of business processes in the DFD language:

- The composition of the processes - the hierarchy of processes by composition
- External entities interacting with the system
- Data storage devices that allow you to specify storage objects
- Process interaction events, accompanied by data exchange
- The operations of modifying these drives, performed by processes.

Aspects that are not reflected in the DFD language:

- User-defined process classification
- Custom event classification
- Custom Classification of Objects
- Process executors
- Typification of component interconnection schemes - process templates
- Logic of interaction of processes

3 Review of existing complex automation solutions management of the educational process

A rather large number of solutions are presented in the modern market for software products for managing the educational process.

The preliminary analysis of the decisions made it possible to form a shortlist of applicants who meet the following criteria:

1. A "boxed" solution, the implementation and subsequent maintenance of which can be carried out by the IT staff of the university (this criterion, for example, did not fall into the list of AIS applicants "Naumen University" 8).

2. A complex solution, the declared functionality of which provides automation of the whole set of tasks of management of the educational process (according to this criterion, numerous private solutions, such as "electronic decay", "automatic schedule", "accounting of settlements with students " etc.).

The systems that passed the preliminary selection are:

- Galaxy Management of the university;
- GS-Vedomosti;
- Complex of programs of the MIIS laboratory;
- GiSoft;
- Beat-Aurobus.

The presented systems solve such problems as:

- registration of entrants and document circulation of the selection committee;
- accounting and management of personal files of students and post-graduate
- students;
- accounting and planning of student contingent;
- formation of training load;
- monitoring and analysis of students' progress;
- calculation of staff and distribution of training load among teachers;
- creation of individual teacher plans;
- planning the implementation of the educational process within the semester;

printing of diplomas,

- applications and academic certificates.

The systems have a modular structure. Thus, a separate subsystem is responsible for automating each of the processes that form a single process of learning activity.

The user selects the subsystems independently, however all modules work with a common, consolidated database. Each subsystem can work as a stand-alone, or in combination with others, automatically exchanging information[11].

3.1 Galaxy Management of the university

Corporation "Galaxy" offers educational institutions a system "Galaxy Management of the university, built on the basis of the system" Galaxy ERP. "

Advantages of the system:

- A reliable tool for rational management: allows to increase the productivity of managerial personnel, eliminate duplication of documents, reduce the volume of paperwork, improve the efficiency of information collection and processing, and promptly generate reports.
- The means of building a quality management system and obtaining the relevant certificates: the system has a certificate that meets the requirements of the international standard ISO 9001.
- The ability to create a single information space: can create and supplement existing systems and programs.
- Flexible support of legislation, external and internal changes: helps the school to organize the educational process in accordance with the requirements and requests of the state and society.

Structure of Galaxy Management of university is shown in the figure 3.1.1.

Fig 3.1.1 Galaxy University Management System

Technological advantages:

- Possibility of work in two- and three-level architecture.
- Multiplatform: Pervasive SQL, MS SQL, ORACLE.
- Administration tools: delineation of access rights and rights to functionality; writing to the user activity log; operation of remote services in off-line or on-line mode.

The management system of the university provides:

- sustainable development of the university and increase its rating;
- effective management of the learning process;
- control and effective use of financial, material and personnel resources.
- Automation of the admission campaign:
- planning the recruitment of applicants;
- registration of entrants, maintenance of files of personal files, formation of a package of documents of the entrant;
- scheduling of entrance examinations and consultations;

- forming a package of documents for the work of the selection committee;
- automated input of results of entrance tests (identification by bar-code).

Automation of the educational process:

- keeping the card index;
- conducting academic groups;
- accounting for progress and attendance; formation of orders.

Automation of the educational process of the university:

- the formation of a basic curriculum in full accordance with the state educational standards of higher professional education;
- the formation of curricula in the specialties and the planning of the flow of training groups by species;
- planning the amount of pedagogical workload and the management of all types of practices;
- Planning staff by budget, by department and educational institution;
- the formation of the schedule of the educational process and the net of classes for the semester, including individual ones, taking into account the employment of the teaching staff and the resources of the audit and laboratory funds;
- Planning the work of the state attestation commission, state examination board; formation of the schedule of the examination committee;
- generation of reporting and analytical data.

This management system of the university is represented in the Russian market of ERP-systems and is one of the most expensive. The system is used in educational institutions with a large auditor fund, many branches that have sufficient technical equipment and material resources.

3.2 GS-Vedomosti

GS-Vedomosti is a software product that allows you to automate processes related to the management of secondary professional and higher education institutions.

The main advantages of the "GS-Vedomosti" system:

- Modular architecture.
- Using a shareware database with open source - FireBird allows you to reduce the cost of acquiring the system, as well as the cost of its implementation and maintenance.
- The ability to use the system in a heterogeneous environment, both under Windows operating systems, and under Unix / Linux.
- Using a single database.
- High performance of the client part due to the introduction of business logic application to the level of the DBMS.
    - A simple and intuitive interface that will allow you to master the system in a record-but short time.
- High degree of product integration with main office applications, such as Word and Excel, which provides customary and convenient ways of working with printed forms and documents.
- Powerful tools for creating reports - the report wizard based on the report generator FastReport allows you to create reports of any complexity.
- The possibility of integration with 1C and other automation systems - uploading and uploading data through open intermediate formats.
- The ability to import and export data from / to other automation systems.
- The ability to directly import data from primary documents by scanning. Ability to work with the all-Russian address classifier KLADR.
- Great opportunities for configuring the system for a specific educational institution without the involvement of developers and technical specialists.

- Rich possibilities for database administration, user management, assignment of access rights to information and keeping records of the work of individual users of the system.
- CSU (Centralized System Update) technology, which allows you to update system components on users' workstations over the network, without having to manually update at each workplace. Availability of open API (Application Programming Interface). Low system requirements.

3.3 Complex of programs of the Laboratory of MIIS

The program complex of the MIIS Laboratory is designed to automate the management of the educational process in higher and secondary special educational institutions. Its implementation allows us to come up with a comprehensive approach to solving the problems facing a modern educational institution.

The main processes that the system automates:

- the development, verification and approval of curricula of all levels of education;
- preparation of curricula for the procedure of state accreditation;
- accounting and planning of student contingent;
- formation of the training load and the list of training groups;
- calculation of staff and distribution of training load among teachers;
- creating individual teacher plans, taking into account the wishes of teachers on the working schedule during the week;
- planning the implementation of the educational process within the semester; automatic scheduling based on the distributed training load and individual wishes of teachers;
- registration of entrants and document circulation of the selection committee; accounting and management of personal files of students and post-graduate students;
- management of the movement of student contingent;

- computer and paper testing; electronic document flow of rating progr sheets;
- monitoring and analysis of students' progress; printing of diploma applications and academic certificates;
- Flexible access control to the system based on roles; reporting;
- publication of information about the educational process on the Internet.

In the figure 3.3.1 is shown information window in MIIS system.

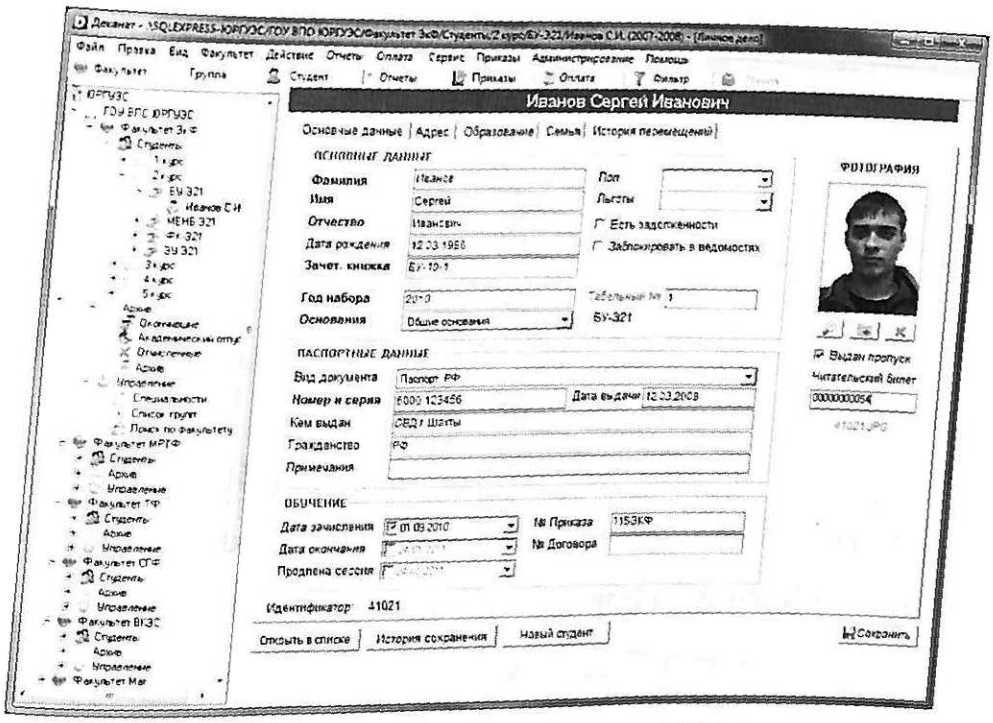

Fig 3.3.1 Student Information on program MIIS

The implementation of the software package allows:

- to accelerate processes through the use of electronic document management;
- to improve the speed of monitoring the implementation of processes;
- automate time-consuming operations for calculating the workload, compiling a schedule, analyzing progress and generating reports;
- facilitate the preparation of reports and statistical data;
- improve the image of the educational institution;
- improve transparency of processes and distinguish responsibility of employees; standardize the forms of documents in an educational institution;

- Ensure the availability of all necessary information to each employee.

The software product includes the following information subsystems:

- a selection committee;
- dean's office;
- electronic statements;
- plans;
- autorecord;
- laboratory practical work;
- GosInsp;
- NGOs;
- STR;
- plans for STR;
- diploma master

3.4 ASU Universys Web Server 3.5

The software product of GiSoft is based on Web technologies. To access the software part of the product, the Internet browser and its capabilities are used.

The main advantages of ASU Universys Web Server 3.5:

- a wide range of tasks to be solved - from the integration of the admission committee with the site and the management of the internal logic of the educational institution to the organization of distance learning;
- flexible adjustment of educational, administrative, economic, business processes of the educational institution; customization of design and ease of use of the system; reliability of technology; individual implementation plan;
- developer support; outsourcing processes and tasks; dynamic development of the system.

The main functional blocks of which the system consists:

- an automated selection committee (access can be organized through the existing web site of the school or through a separate DNS);
- the student's office (access can be organized through the existing web site of the school or through a separate DNS);
- Customer's office (access can be organized through the existing website of the school or through a separate DNS).[12]

3.5Program "BIT-AUROBUS: Management of the University"

The program "BIT-AUROBUS: Admission Committee" is intended for automation of the whole cycle of tasks of the admissions office of the university: registration of the data of entrants, formation of lists admitted to entrance exams, examination sheets, admission plan, lists of enrolled, order for admission, and reporting on results of the work. The configuration of "BIT-AUROBUS: Preparatory Courses" is designed to automate the management of training at the preparatory courses of the university.

The product is included in the line "BIT-AUROBUS: Management of the university", which provides:

- operational control of attendance and student achievement, payment of training, demand for various specialties, planned and actual workload of teachers and departments;
- the work of various departments to exclude the re-entry of information and related errors: the admission committee, the educational-methodical department, deans, the separation of preparatory courses;
- improving the quality of the administration of the educational process, and therefore, the attractiveness of the university for students and partners.

The program solves the problems:

- registration of personal data of entrants - with the formation of the necessary package of documents (receipts, inventories, questionnaire, etc.);

- registration of applicants' applications, when submitting an application, the results of a unified state examination . target directions and letters of sending organizations may be taken into account;
- approval of the list of disciplines for which entrance examinations are submitted for each competitive group;
- the formation of lists recommended for admission on the basis of test results, taking into account the applicant's availability of benefits for admission to the university, documents with honors and results of the Olympiads;
- the formation of reports for the analysis of data on applicants, applications submitted and the results of admission tests;
- creating an information system of personal data of any class, with additional certification of the solution is not required.

Results of implementation:

- increasing the reliability and completeness of the information received; significant reduction in labor costs for data processing;
- more efficient use of staff time;
- ensuring prompt access to information and obtaining reports;
- data processing and generation of resulting information in real time.

4 Vaadin - framework for creating web applications

In the client-server architecture, the place of the Java application is predomin
on the server side, while the web interface is written by a separate group of front
developers in JavaScript. Java does not offer adequate tools for creating a moc
web interface (when was the last time you saw a Java applet ..?)[13] Either in ter
of design or from the point of view of implementing client-server interaction.

And what if the entire client-server application was entirely written in Java, but
client part would be "native" for the browser and would correspond to the mos
modern ideas about usability?

Vaadin (by the way, in Finnish this word means "deer") supports all the common
browsers of both conventional computers and mobile devices and tablets. All
development is carried out in Java, but the Java code is executed only on the server,
the client is running pure JavaScript.

Structurally, Vaadin consists of a server API, a client API, a set of user interface
components on both sides, a theme engine for designing an interface, and a data
model that allows you to bind server components directly to data. Vaadin architecture
is demonstrated infigure 4.1. Two main development models can be used: on the
server side and on the client side (browser).

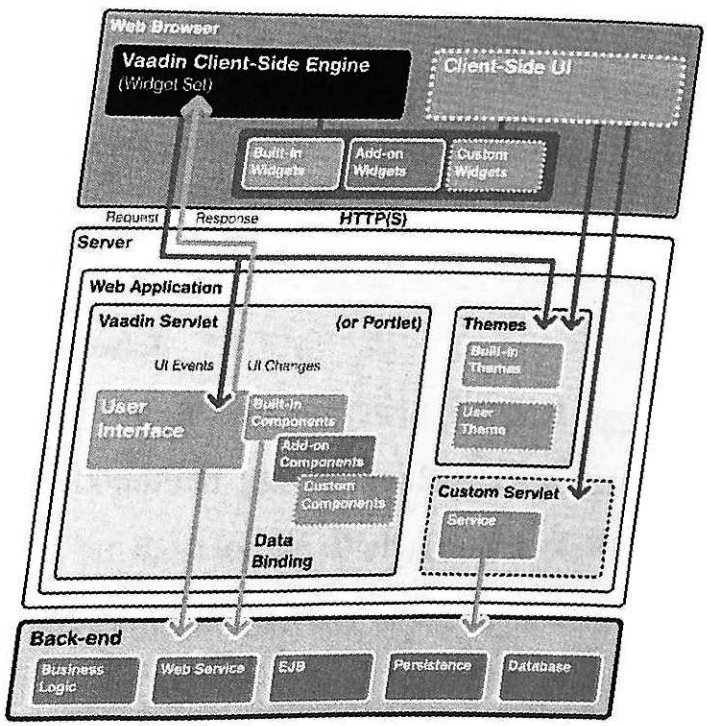

Fig 4.1Vaadin Architecture

4.1 Server-side development model

The server development model for Vaadin is the main one and allows you to create complete applications without development on the client side. This uses the AJAX engine Vaadin Client-Side Engine, which forms the user interface in the browser. The server approach allows you to virtually forget that the development is under the web, and develop the user interface almost like a traditional Java program with direct access to data and services on the server. In this case, the server part of Vaadin will take care of the formation of the user interface in the browser, and about the AJAX-interaction between the browser and the server. The Vaadin engine renders the user interface of the server side application in the browser and implements all the details of the client and server exchange.[14]

The server portion of the Vaadin application runs as a regular Java application server servlet. It is a pure Java in a JAR file that can be added to any standard Web application and runs on any servlet container or portlets from Tomcat to Oracle WebLogic. The servlet accepts HTTP requests from the client and interprets them as events of a particular user session. Events are associated with the components of the user interface and are delivered to the event listeners defined in the application. If the UI logic changes the user interface components on the server side, the servlet renders them for display in the web browser and generates a response. The client engine running in the browser receives a response and on its basis makes changes to the web page loaded in the browser.

4.2 Client development model

The client model allows you to develop widgets and applications in the Java language, which are then compiled into a JavaScript executable using the Vaadin Compiler compiler, based on the Google Web Toolkit (GWT). You can also use JavaScript directly. This provides full access to the DOM structure and maximum control over the browser.

4.3 Difference of Vaddin from other Java web frameworks

In short, Vaadin allows you to write a Web application in the style of Swing:

```
importcom.vaadin.ui. *;

public class HelloWorld extends com.vaadin.Application {


  public void init () {
     Window main = new Window ("Hello window");
     setMainWindow (main);
     main.addComponent (new Label ("Hello World!"));
  }
}
```

It is considered an advantage, when using Vaadin it is necessary to program only in one language - Java, that is, you do not have to bother with XML, JavaScript, Html, etc. and you can take full advantage of the powerful Java tools: refactoring, unit tests, stubs (moks), and so on. You write a new Label ("Hello World!"), And Vaadin itself already puzzles how to turn it into Html and JavaScript.[15]

A similar concept is used in GWT, Wicket and Tapestry. Personally, Wicket seems to me less convenient, because there it is necessary to support two files: the Java class and the corresponding HTML file, and they must be synchronized with each other. In Vaadin there is no synchronization of this problem.

The concept of GWT is almost the same as that of Vaadin: you write code only in Java. Only GWT translates your Java code into JavaScript. Difficulties begin when you need to handle an event coming from the browser (for example, processing button clicks or form submissions). To generate the code on the server side from the generated JavaScript code, you need to make several magical passes: create an abstract factory class, implement it, and so on.

Vaadin relieves you of these problems. By the way, Vaadin actually uses GWT, so it can even be considered an add-on for GWT, which solves the problems of communicating with the server.

```
Button thebutton = new Button ("Do not push this button");

thebutton.addListener(new Button.ClickListener() {
    public void buttonClick(ClickEvent event) {
        thebutton.setCaption ("Do not push this button again");
    }
});
```

Fig 4.3.1 Vaadinlistener

By default, Vaadin does not select the entry for which we opened the context menu. And this behavior can not be changed without special tweaks. Add a selection with the right click for the tree, for the table the process is similar. As shown in figure 4.3.1.

We call our tree SuperTree and we will set accordingly SuperTree, SuperTreeWidget and SuperTreeConnector. SuperTree is a simple Tree successor. And in SuperTreeWidget we completely copy the code from VTree, in SuperTreeConnector - the code from TreeConnector. Next, change the code to SuperTreeConnector so that it uses the SuperTreeWiget widget and the @Connect annotation (SuperTree.class).

We have our own implementation of the client part for the server component Tree. In SuperTreeConnector we will create the contextMenuSelection flag and its accessors. In the updateFromUIDL method, when the flag is set, we will reset the rendering flag = false for the widget and interrupt execution. This is necessary so that our context menu is not collapsed. Further in SuperTreeWidget.TreeNode we add to the showContextMenu method the selection of the node.

5 Support and planning system "SDU – Education portal "

SDU- Education Portal - is a web application that is any computer program that performs a specific function by using a web browser as its client. The application can be as simple as a message board or a contact form on a website or as complex as a word processor or a multi-player mobile gaming app that you download to your phone.

When forming the SDU – Education Portal , it is expedient to distinguish two groups of indicators-general and private (personal) indicators. General indicators are used for automated information systems of various industries, while private, or personal, - in specific cases and depend on the requirements of the organization in which the system is implemented. In this case, general indicators were generated, based on the indicators and selection criteria for automated information systems, and personal, formed on the basis of analysis of the requirements of a higher educational institution.

General indicators:

- platform: a single, adapted for universities of different scale and profile;
- the possibility of integration with other systems;
- business logic: the developer's understanding of the methodological foundations of business processes of the university;
- technologies: open source and the possibility of obtaining it;
- experience: proven successful implementation experience;
- interface: friendly, user-friendly interface, features and ease of configuration;
- training: the availability of tools for the rapid development by users and specialists of technical support of the functions of the system;
- support and maintenance: high-quality and understandable documentation, prompt and skilled work of customer support.

Private (personal) indicators:

- automation of work of the selection committee;
- automation of work with a contingent of students;
- automation of accounting and analysis of academic performance;

5.1 User interface

For creating UI for SDU Educational portal I used Vaadin Framework. Vaadin Framework user interfaces are built hierarchically from components, so that the leaf components are contained within layout components and other component containers. Building the hierarchy starts from the top (or bottom - whichever way you like to think about it), from the UI class of the application. You normally set a layout component as the content of the UI and fill it with other components. Login page is shown in figure 5.1.1.

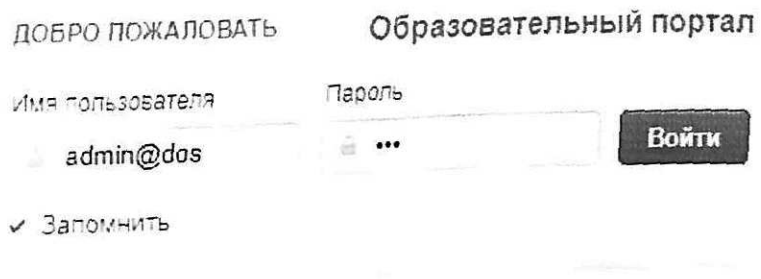

Fig 5.1.1 Login page of Web Application

A login is a special form that collects user credentials and communicates with an authentication mechanism to check the validity of the credentials, then if the credentials are valid the user is routed to a secure area else if the credentials are invalid the page keep asking for a valid input, there are a multiples approach to this problem.

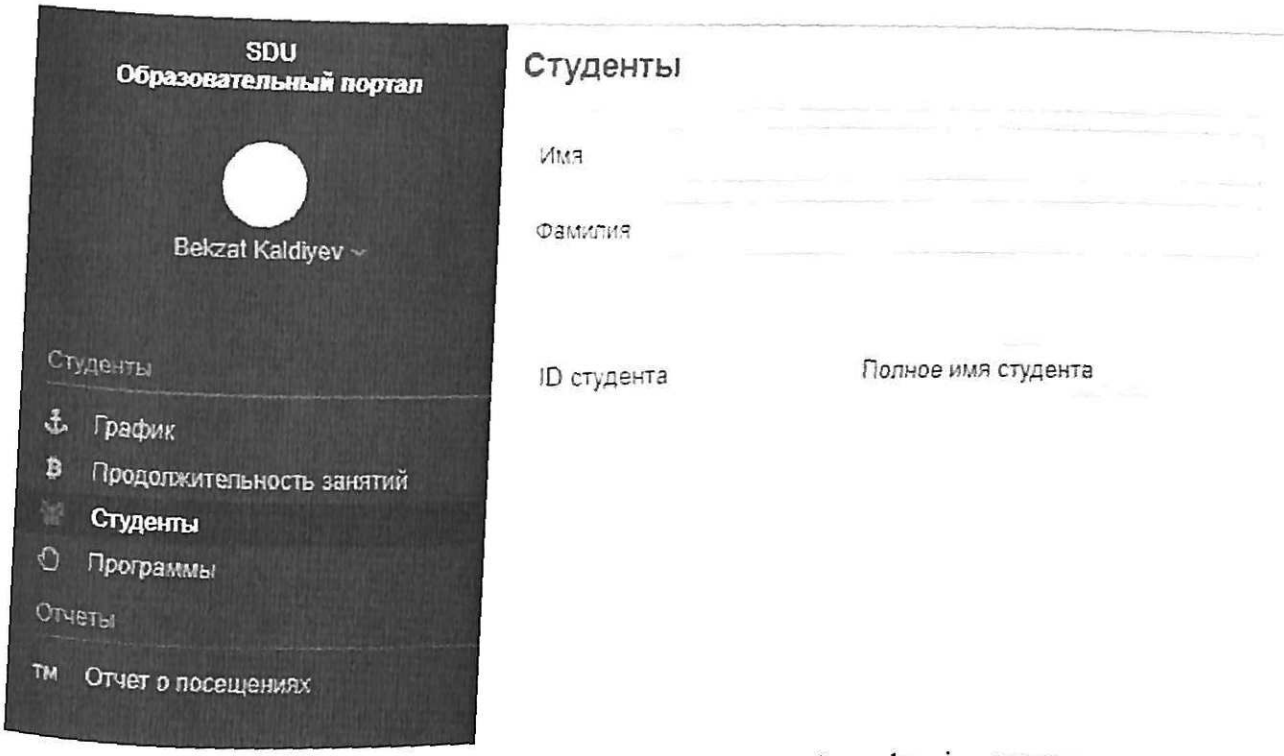

Fig 5.1.2The main window of the curriculum planning program.

This program consists of these types of windows as shown in figure 5.1.2:

- Graph
- Duration of studies
- Students
- Programs
- Report of attendance

SDU – Educational Portal works in two languages. Language selection shown in figure 5.1.3.

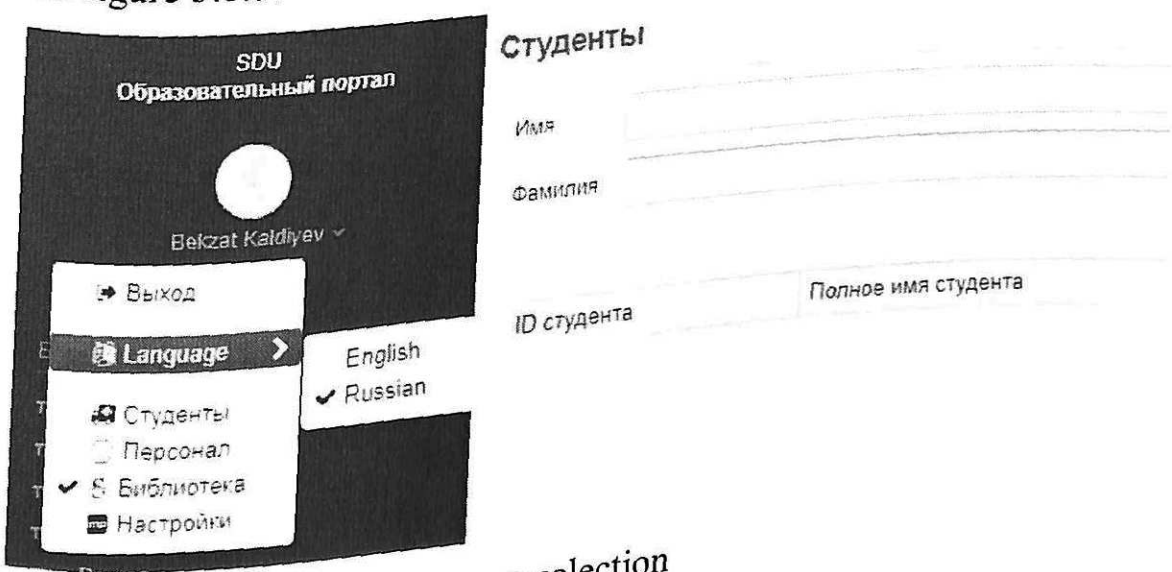

Fig 5.1.3 Language selection

One of the important thing for the university is that to hold all information about students. And our web-application allow toeasily create and hold all information of students. This process is shown below on images

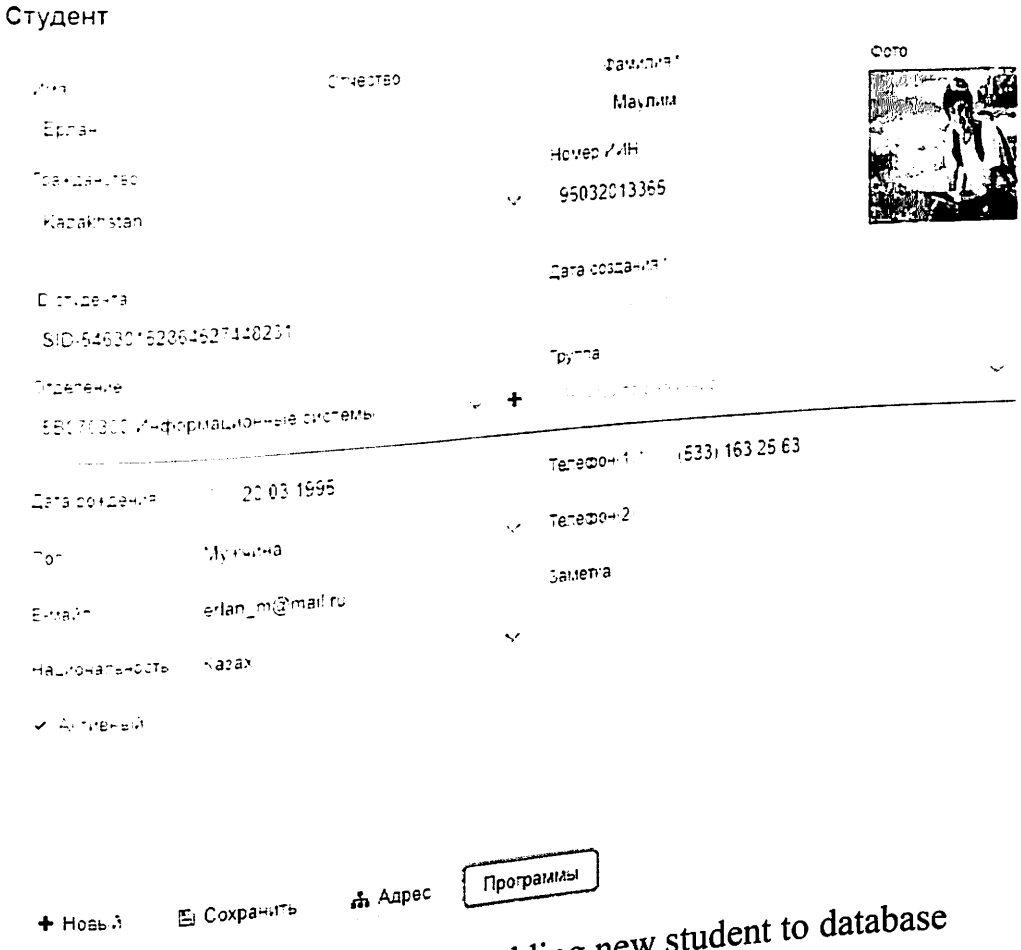

Fig 5.1.4 Process of adding new student to database

When we want to add student to our portal we must fill information about this student. Adding of student to database is shown in figure 5.1.4. Such as name surname , telephone numbers , email, nation and also country name. And we choose faculty and group of student.

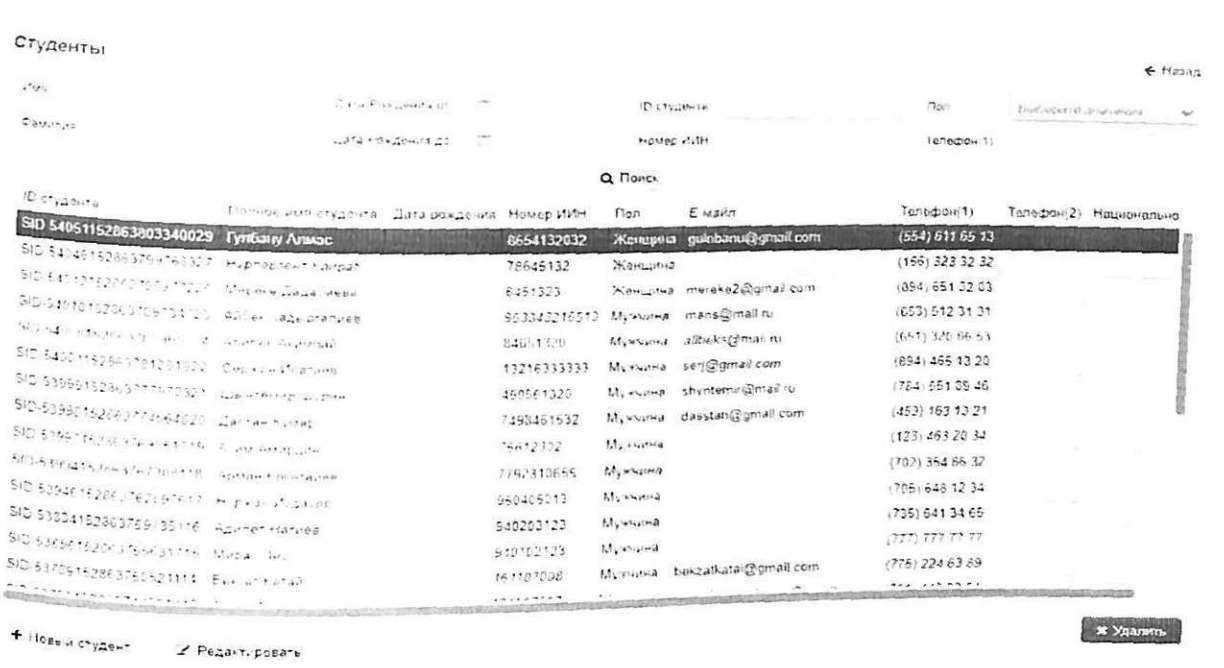

Fig 5.1.5 List of students

In figure 5.1.5 we can see list of students which is we created and saved. In anytime teachers can search any student from database by using search bars. It will save time to teachers than searching student's documentation and faculty journals.

5.2 Timetable planner

SDU Educational Portal supports teacher lesson planning function. This means any teacher can create his subject by filling information, also choose days of week in which days lesson will be. After that system automatically fills this teachers calendar In during of time which subject owner choosed. This process you can see on these pictures:

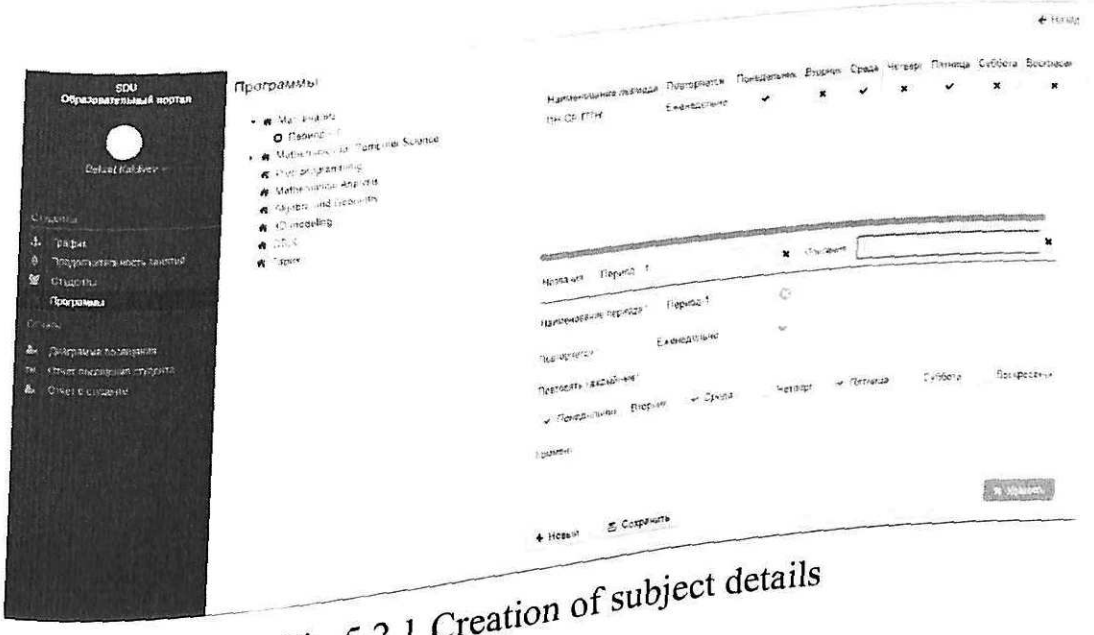

Fig 5.2.1 Creation of subject details

From the image figure 5.2.1 we can see Creation of subject details. Aft adding subject to portal teacher can choose students, groups who will take this lesso Portal automatically generates timetable with filled time and student names. It's ver useful for creating semester timetables. This process is shown in image below Timetable is demonstrated in figure 5.2.2.

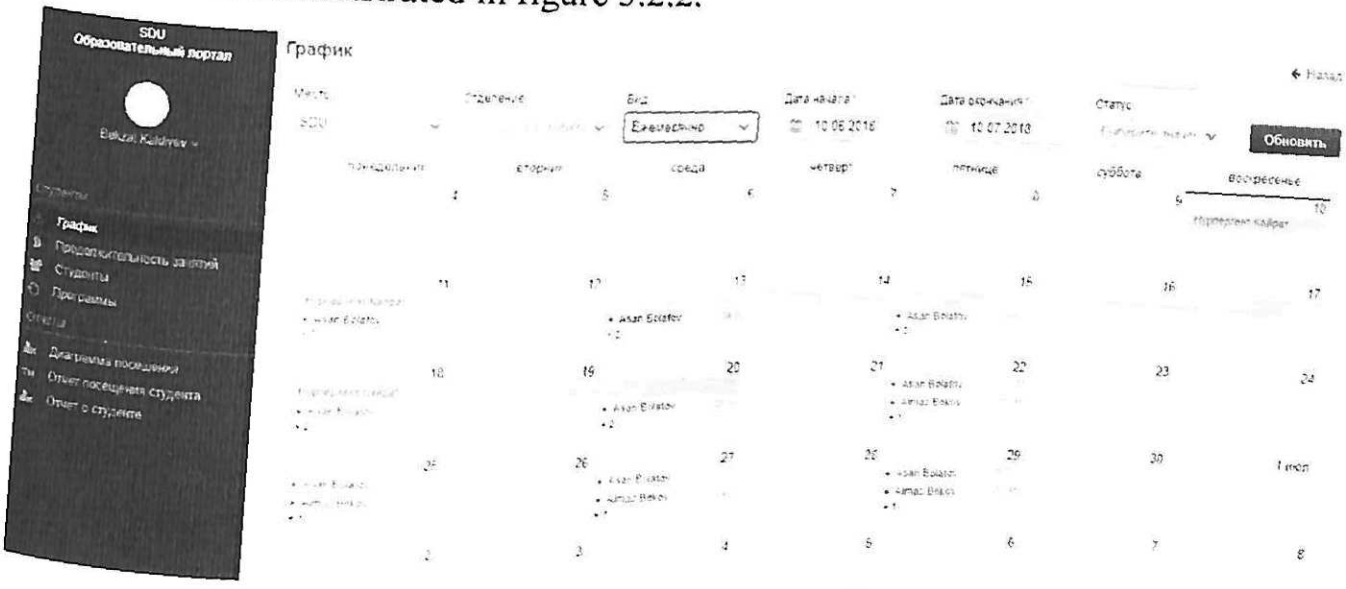

Fig 5.2.2 Timetable

5.3 Attendance System

As a result of the course work, there was a developed database structure of the study attendance log, certain attribute properties and support for data integrity. The obtained structure provides independent preservation and maintenance of data on students, teachers. The proposed structure guarantees the exclusion of a number of anomalies, such as data redundancy, the addition and removal of different categories of data independently of each other. Such a guarantee is confirmed by the fact that the structure was developed on the basis of a formal apparatus for normalization. Summary of attendance is shown in figure 5.3.1.

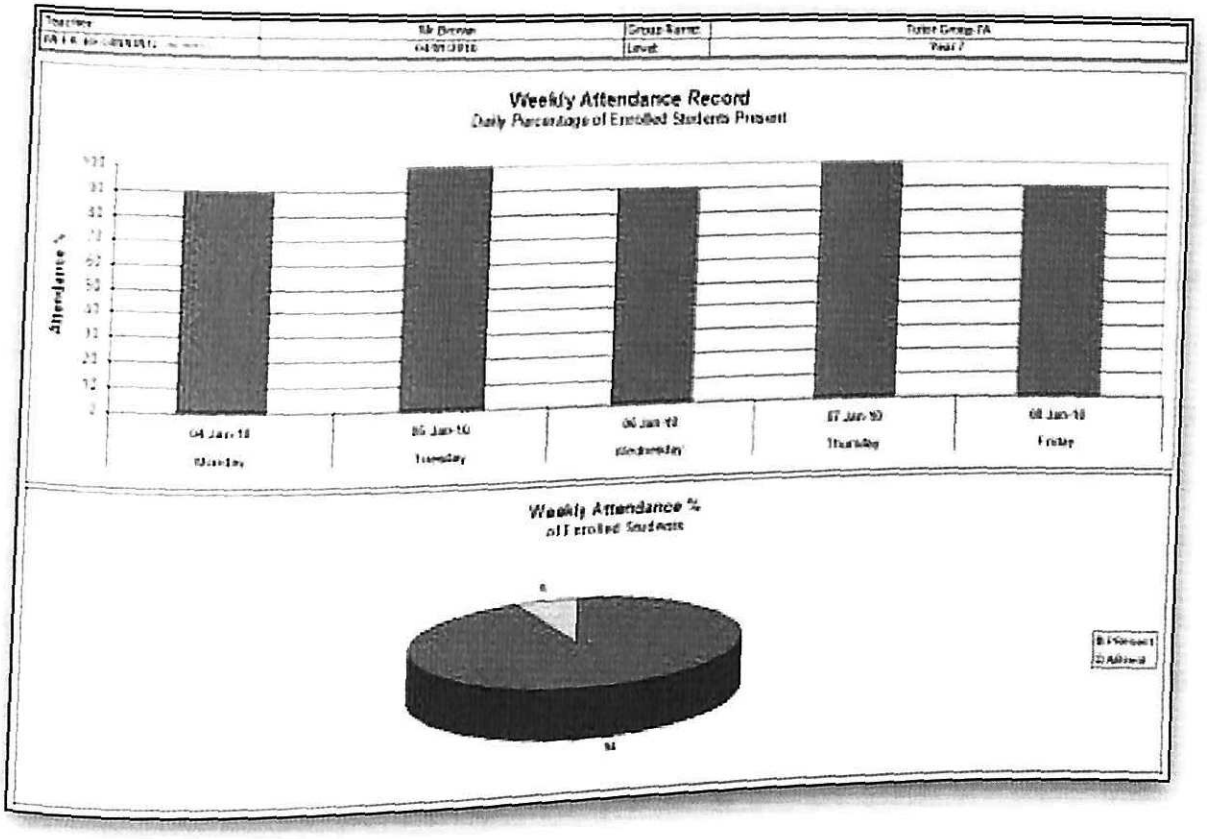

Fig 5.3.1 Attendance summary

The proposed queries show that, using the SQL language, it is possible to obtain information from the database, forming natural language constructs of any complexity.

1. The subject area is analyzed and the task for development is formulated.

2. The constraints of data maintenance in the form of functional dependences between attributes are defined.

3. The proposed data requests are implemented in SQL using the built-in summary functions.

4. The developed interface provides the user with convenient data entry and viewing of output information. [16]

To date, very great importance is attached to the selection of tools that meet the requirements of developers.

Modern life is full of information that permeates all aspects of human activity. To store information and find the right data, you need to create an increasing number of databases and data banks. Not the last place in the list of DBMS offered to the

selection is occupied by Access, due to the fact that it possessing all the features of the classical DBMS is also a convenient system for developing applications that work with the database.

A distinctive feature of Access is the object-oriented programming language, developed visual development tools, support for standard data exchange protocols. Modern information technologies make it possible to save the labor and time not only of programmers, but also specialists in the operation and support of software products. To meet the growing demands for data processing, client-server systems are developing at a revolutionary pace, and the role of MySQL in such systems is significant. Access can be effectively used together with Internet applications not only because of the powerful data processor and the convenient programming language MS SQL Server.

5.4 Online database of SDU Library

The concept of "electronic (digital) library" is relatively new and does not yet have a generally accepted scientific interpretation.

Electronic libraries can be defined as ordered collections of diverse electronic documents, equipped with navigation and search tools. From the point of view of the possibilities of application in information activities, network electronic libraries can be logically divided into two main categories: free electronic libraries and commercial full-text databases.[17]

Electronic libraries today are not even a direction, it's an ideology. Electronic libraries become an integral part of activities in almost any field; Today almost everyone is faced with the need to have, develop and use an electronic library. As previously everyone was trying to get computers, so now, when there was already a certain saturation with computers, they say basically about two things - the Internet and the electronic library.

Moreover, more and more about the electronic library in this sense most unlucky ordinary libraries: on the one hand, it is libraries that are one of the main driving forces for the development of the electronic library, and on the other hand the

very word library in the phrase "electronic library" misleads many and, thus, reduces it to the task of digitizing some fragments or the entire collection of the library.

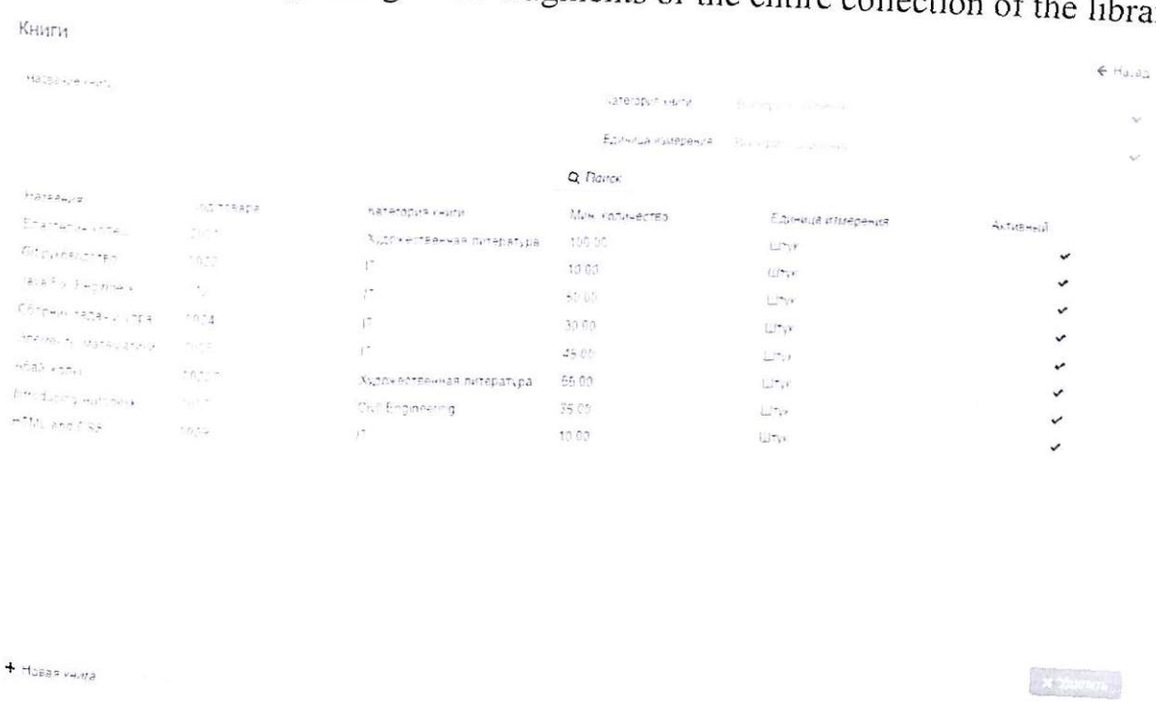

Fig 5.4.1 Library database

Library database is shown in figure 5.4.1. At the moment there is no built-in classification of electronic libraries, taking into account their features and a variety of parameters.

Based on the methods of creation, electronic libraries can be divided into three types:

- Generated electronic libraries, when electronic documents are created by the holders of its fund.

- aggregated from existing electronic publications or entire collections.

- mixed, consisting of both borrowed publications, and those prepared on their own.

The composition of documents electronic libraries can be divided into single-document and polidocument. In general, we can distinguish two main models: the formation of a fund of the same type of electronic documents, mostly texts (modifications - either one type of publication, or mixed); formation of complex multi-media meetings.

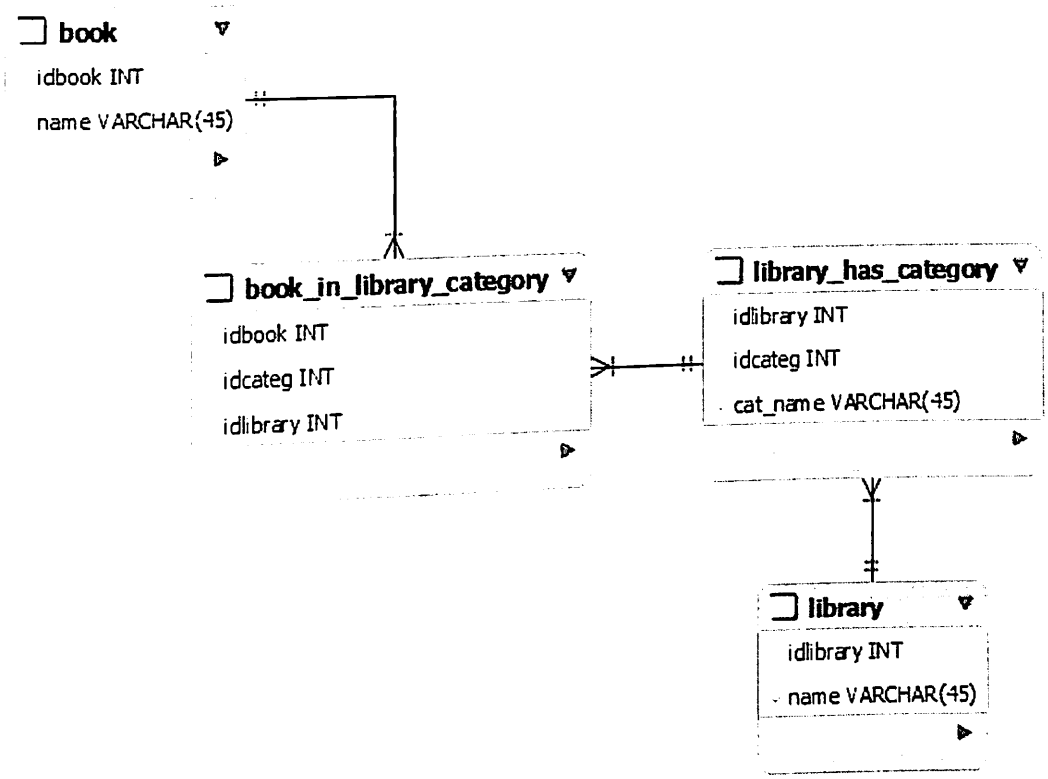

Fig 5.4.2 SQL server

Organizationally, electronic libraries can be self-contained or embedded in a more general resource, say in a scientific and educational complex or a distance learning system; as well as integrated (collections are united by a common theme and a single interface, but electronic documents are on various sites, which is close to understanding the virtual library). In figure 5.4.2 is shown SQL server graph.

In turn, independent electronic libraries can be divided into books that are associated with the book collection and autonomous libraries (the majority of digital libraries belong to them), which are an independent system of electronic information resources.

For the intended purpose, electronic libraries can be divided as follows:

- Memorial, created for the purpose of cumulation of documents about a person or event;

- scientific, intended for in-depth study of the topic (subject) by scientists and specialists;

- educational, educational-methodical, education-oriented;

- reference, created by the type of a universal encyclopedia for obtaining the necessary brief information on all branches of knowledge;

- enlightening, having a popular scientific nature and intended for comprehensive coverage of the topic (subject) at the general educational level;

- without a specific purpose.

According to the creator or initiator of the creation, among the electronic libraries one can distinguish the following types - created by state and public structures; scientific and educational institutions; commercial firms and individual amateurs.[18]

Some of them remain open to external users, other electronic libraries are realized as a commercial project, or differentiate access: to free and paid to different parts of the fund, for example, to directories for previous years.

Types of electronic libraries by content:

1) Universal. The funds of universal electronic libraries are formed in the form of a collection of thematic electronic collections in different fields of knowledge. In such libraries, along with digital versions of works of fiction, you can find articles on scientific topics, philosophical works, etc.

2) Specialized (thematic). The funds of such electronic libraries are formed in accordance with a particular field of knowledge, or taking into account the interests and preferences of the creator of the resource. For example: fiction, historical sciences, natural sciences, culture and art, children's literature, encyclopedias.

CONCLUSION

In general, over the past period, a system of work on information-analytical and documentation support management of the university, contributing to the optimization management process and allows to form Reporting materials to higher-level organizations, analytical internal use, carry out advertising activity and work on the formation of a positive image university in the region.

The foundations for a full-fledged information system management and completion of the transition to electronic workflow: databases and elements of electronic information support, automation system managerial processes. A block of management orders has been prepared and documentation support of the university. Him updating is carried out as necessary.

A systematic analysis of the structure and activity of the higher educational institution (analysis of objectives, structure and management functions).

Developed the method of estimating the weight coefficients of the criteria for the functioning of the system. The most appropriate diagrams describing the scheduling are selected, the main procedures of the program and the user interface are developed.

The section of the feasibility study covers the definition of an economic estimate of the costs incurred during work.

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