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Development of computer science studies at the Faculty of Mathematics and Informatics of the Vilnius University

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1. Introduction

The training of *computer science* specialists until 1979 is surveyed in the article.

Although every where in the article the Faculty of Mathematics and Informatics is refered to the Faculty got this name only in 1999. Until 1965 mathematicians and physicists had worked at one Faculty, but in 1965 the Faculty was divided into two: the *Faculty of Mathematics and Mechanics* and the *Faculty of Physics*. The *Faculty of Mathematics and Mechanics* was renamed the *Faculty of Mathematics* in 1978. Although the training of computer science specialists is surveyed in the article, the concept "computer science" came to use only after 11.03.1990 when the independence of Lithuania was restored. The speciality of *computer science* was introduced in the Faculty eleventh years ago. The Departement of *Software* was renamed the Departement of *Computer Science* and a separate acceptance has been announced to the speciality (70 students). Earlier computer science specialists were trained by *mathematics* or *applied mathematics* specialities and were called *programmers*, but it was not written in the University graduation diploma, in which the only speciality (*mathematics* or *applied mathematics*) was certificated.

The author wrote this article basing himself on the reports, curricula, minutes of faculty and departments meetings, other documents as well on the recollections of his colleagues. This theme has almost not been considered. There is only one work [1] (one page). The present article is the first attempt to look at the beginning of training computer science specialists at Vilnius University.

2. The first graduates programmers

In Lithuania programmers training was started in the spring term of 1959, when the *specialization of numerical mathematics* (speciality – mathematics) was introduced. Thirteen four-year students changed their specializations (specializations had been already chosen in the third year) taking the new one – *specialization of numerical mathematics*. Formerly, (a year and a half ago) it was called the *specialization of machine mathematics*. There new special courses formed the basis of the new specialization for some years:

- *Programming*. The course was read one term and consisted of lectures (two hours per week) and practical work (two hours per week). The programming was intended for hypothetic machines. From 1961 on it was the course of algoritmization for hypothetical machines orientated to BESM-2M computers or to *Minsk* type computers.
- *Computers*. The course was read two hours per week during one term. It was on the architecture of computers.
- *Numerical methods*.

S.Strelic (research field – differential equations) was the first lecturer of the course on *programming*, and *B.Voronkovas* (research field – mechanics) was the first lecturer of the course on *computers*. But they lectured only for two academic years. 1961/62 a sixty-hour (34 hours for theory) programming course was read in the fourth year during autumn term. At the meeting, which was held in September, it was decided to correct the programs of both courses including the principles of automatization. Alter that the programmer *J.Ambrasas*, one of the first graduates, took over these courses and has been reading the main obligatory course on programming for mathematicians since.

The first of programmers were turned out in 1960. They had attended a special course based on specialization of numerical mathematics only for a year and a half (it was the accelerated training of programming specialists). I would like to mention one title of the diploma paper: *The Comparison of Programming Routines* PP_1 *and* PP_2. The students having graduated in 1961 were the first, who had chosen the specialization of numerical mathematics in the third year (later students will also be distributed to specializations only in the third year). It was first graduates of the *Department of Numerical Mathematics*. They had industrial practice at the Vilnius Factory of Computers and the Vilnius Factory of Drills. They studied the programming of accounting device EV-80M using a switchboard.

It was the first time in the history of Vilnius University that the third class of programmers did their practice with computers (15.11.1961–30.11.1961). It was carried out in the Computer Center of the University of Latvia which had a BESM-2M computer. During the practice, that lasted two weeks, students attended lectures on programming with machine BESM-2M. They also programmed one exercise (from the sequence of numbers they had first to write out positive numbers, and negative numbers after that, they had to calculate the average as well) and solved it by the machine. But the time of practice was too short to work with a desk individually and to examine the machine in detail.

It was decided to send fourth-year students instead of fifth-year students to the practice. It was the first time that all the students from the speciality of mathematics (not only from the specialization of numerical mathematics) were sent for industrial practice to computer centers. Since there was not any running computer in Lithuania, most of students were sent to computer centers of the University of Riga (07.02.1962–06.03.1962, 15 students) and the University of Minsk (15 students). The other students did their practice in Vilnius – in the computer center of the Academy of Science (9 students), which was equipping or in the Factory of Computers (12 students).

In 1963 a group of students (12) were sent to Minsk for practice again. They attended a ten-hour course on the machine *Ural-1*, learnt to work with desk, solved exercises.

Frequently the calculation was done using a floating point. The larger part of students (51) did their practice in the Computer Center of the Academy of Sciences. They studied programming theory for the machine BESM-2M, learned the basic elements of "programming routine". Everyone got an individual task. Students who did not manage to do it on time, had to finish it after the practice.

In 1961/62 academic year special disciplines on programming and computers were united. According to the decision of the Faculty Council *Computers and programming* course was included into the list of main disciplines. The course was delivered in the seventh and eighth terms (two hours a week) for students of all specialization. So, *computer science* was started to be read for all the students at the Faculty of Mathematics. In the minutes of the Departement of Numerical Mathematics it one can find a note, that it is the course on "contemporary digital computers".

In 1962/63 academic year two hours were transferred from the eighth term to the seventh term. So the main programming course was read during the autumn term in the fourth year (four hours a week). This change was necessary, because students before going to practice had to learn about programming elements. The list of special disciplines for specialization of numerical mathematics was filled up with new disciplines: *Mathematical logic and theory of algorithms* (36-hours course, after one year – 72-hour course), *Fundaments of logical constructions* (72 h), *Self-correcting systems* (36 h). A special *Programming seminar* for all students was introduced in which the specific machine codes of computer were considered (36 h, were given to a preparation of students for the future industrial practice). It was decided to introduce the third year students with the perforator during a month (4 h a week). For that reason an engineer from the Factory of Computers was invited.

In 1960 the *Department of Numerical Mathematics* was founded. So at that time there were four departments in the Faculty:

- Mathematical Analysis,
- Geometry,
- Probability Theory and Number Theory,
- Numerical Mathematics.

After the Departement of Numerical Mathematics had been founded, in some of graduate's works analysis the possibilities of computers and solution of problems using computers were considered. In 1961 the first students graduated from the Departement.

In the table is shown: 1 – years, 2 – the number of graduates from the Department of Numerical Mathematics, 3 – the number of students, who had written graduation papers in the field of computer science (it is subjective, based on the author's opinion).

We will give the titles of the first graduation papers in the field of computer science.

Table 1

1	2	3
1961	15	2
1962	11	4
1963	19	10
1964	17	4
1965	16	7

1961 *One of the sorting methods using digital calculator.*
Multiplication and division in the ring-like registers.

1962 *Data sorting programming methods.*
Some properties of automatical programming methods
The possibilities of construction of the word with variable length in computer.
The programming of the data processing of the machine manufacturing.

1963 (taken only 2 out of 10 titles)
The extending of reliability of the external memory of the computer BESM-2M using programmed methods.
The test-program for work controlling of the computer BESM-2M.

In 1963 the *Numerical laboratory* was founded in the Faculty. It had only one computer *Minsk-14*. In 1971 the laboratory was reorganized to a *Computer Center* which already had two computers *Minsk-22* and one *Minsk-32*. In 1975 the fourth computer (ES-1020) was started to exploit. The Computer Center grew very fast. In 1978 it had 117 workers (7 with academic degrees): 55 mathematicians, 27 physics engineers and 37 members of the technical staff.

The first *Scientific and methodical seminar* of the Department of Numerical Mathematics took place in 14.05.1962. Senior lecturer V.Kabaila made report on "Logical Construction". The lecturer surveyed the content of special course in short, which was delivered for students by himself. It was decided to organize seminars two times a month inviting the fifth year students.

In 1964–1965 one more programming seminar was organized under the Department of Numerical Mathematics. It was also attended by many scientific workers from others higher schools and institutions of Vilnius. The seminars were held every week. The first one was held in 26.03.1964. These were the first three subjects of reports:

- *The number expression from one number system to another.*
- *Subprogramms: a) the reduction of number expressed in degrees to radians, b) square radical, c) n-multiple radical.*
- *Impressions from the Kiew conference on exploitation of digital calculators.*

In 1964 the University got the curricula for the speciality of mathematics (the number of the speciality was 2013) that were confirmed by the Ministry of Higher Education of the USSR. The obligatory course for all students from of mathematics speciality were in

the curricula:

- *Mathematical logic and elements of set theory* (36 h of lectures). Lectures were given during the first term two hours a week in the first year. The program included: Set operations. Cardinality of sets. Propositional and predicate logic. Algoritmic computable functions.
- *Computer and programming* (100 h course: 50 h for lectures, 20 h for practical work, 30 h for laboratory work). Lectures were given second-year (4th term, 2 h a week) and third-year (5th term, 4 h a week) students. This program included: Positional numeration systems. Basis of algoritmization. Block design. Architecture of computer. Command system for Minsk type machines.

Students got exercises for laboratory work, they had to programme and process them on the Minsk type machines.

- *The training computation practice* was done in the Computer Center using the existing computers. The practice was usually supervised by specialists of this Center.

The special course were delivered for students of numerical mathematics specialization too:

- *Mathematical logic and theory of algorithms.* It covered such chapters as predicate calculus, Turing's machines, recursive functions.
- *Basis of automatical programming.* The course on ALGOL 60 was read. From 1970 a course on ALGOL version for Minsk type machines was read and renamed MALGOL.

The transition to the new curricula was gradual and was started from the first year. It means, that students of all five years were trained according to the new curricula only since 1968/69 academic year. During the transitional period the undergraduates studied according to the old curricula. The list of special course was changed in 1966/67 and 1967/68 academic years. So the 4th and 5th year students of numerical mathematics specialization attended the special course:

- *ALGOL* (36 h)
- *Programming practice work* (36 h)
- *Programming seminar* (36 h)
- *Mathematical logic and theory of algorithms* (36 h)

The program of *programming seminar*: Logical schemes. Block designs. Problem solution using logical schemes and block designs. Testing of programs. Introduction to the command system of Minsk-22. Programming for computer Minsk-22.

Other special course included: asymptotic and numeric methods, linear programming, theory of game.

Beginning with 1970 from the first year a gradual transition to the new curricula was going on. According to these the number of hours for teaching computer science increased. The obligatory disciplines on computer science for all students of mathematics were the same as for all speciality of applied mathematics. The *Department of Applied Mathematics* took over the training of programmers from the *Department of Numerical Mathematics.*

3. Preparation of specialists in applied mathematics

In 1970 the curricula of new *applied mathematics speciality* were received from Moscow. One of the specializations was *software*. It was fundamental for the later developing of the speciality of *computer science*. The new curricula made a sudden change in the computer science specialists training. In the curricula comparitively many hours were allowed for computer science and it caused the demand for lecturers on computer science, because a few them were working in the Faculty at that time. From 1970 special course were started to read after the curricula of Applied Mathematics, that means, some part of the third-year students were trained according to them.

The main course obligatory of students of all specialization, were included on the list:

- *Mathematical logic.* 60 hours (40 h for lectures, 20 h for practical works).
- *Computer and programming.* 220 hours (90 h for lectures, 30 h for practical works, 100 h for laboratory works).

J.Ambrasas after having read to this course for three years, wrote a training manual. It was the main aid for a few years, even in 1973 FORTRAN-4 was started instead of MALGOL. It was the first manual on computer science published in Lithuanian by the University. The volume was rather large (392 pages) and it was issued in 1000 copies (rather large for the University). Only one book written by G.Grigas in Lithuanian had been published until then. A full list of training and methodical manuals on computer science published by Vilnius University until 1979 is given in [2, 4–11]. It should be noted that all these books were printed by rotaprint of Vilnius University. So those will not be found in any catalogue. But in spite of that, they were the most popular books among students.

- *The training computation practice* was conducted in the forth term (lasting 4 weeks). The practice took 4 hours a week during two terms (5 and 8) from 1972.

There were two specializations at the *Department of Applied Mathematics: Software of SAC* and *Applications of computers*. The later one had two branches, the name of which had been changing. In 1979 the branches of the specialization *Applications of computers* were called: a) application of the methods of probability theory and mathematical statistics, b) application of the methods of optimizations.

The specialization of software was born in 01.09.1980, when the department the same name was founded (1979). In 1993 the department was renamed to *Department of Computer Science.*

Only 7 out of the first 29 graduation papers were dealing with computer science. The most themes of the diploma theses concerned mathematical statistics and probability theory. An interesting graduation paper was that of a successive graduate:*Applications of axiomatic method in verification of programs.*

The first specialists of applied marhematics graduated from the University in 1975 (they were the first to enter the speciality of applied mathematics).

In 1973 a club (seminar)of students-programmers started its work (the first lecture was delivered in 25.10.1973). That was in addition to the lectures fixed on the schedule. Approximately 25 students attented the club every week. Usually there were the best stu-

dents from different specializations interested in computer science. Students made reports as well as professors. The subjects of first three reports were:

- *Technical characteristic of computer Minsk-32. Coordination with Minsk-22.*
- *Input-output operators (FORTRAN).*
- *The third generation computers. Assembler.*

4. Concluding remarks

It was impossible in Lithuania to train specialists for all fields of science. Vilnius University got some purpose places for Lithuanian students at the Universities of Moscow and Leningrad. The Faculty of Mathematics the opportunity to send students for training in those specialities (including computer science), that were impossible to train in Lithuania. Usually the best second-year (sometimes third- or fourth-year) students were sent to study at the Universities mentioned above. In fact they lost a year and for that reason they had to study for 6 years. They hadn't to pass any competitive examination in order to enter the mentioned Universities (only the examination, passed at the Vilnius University were taken into account). The majority of lecturers that are working in the *Department of Computer Science* at present, have graduated from Moscow or Leningrad Universities, or have finished post-graduate course and maintained their theses. In that way Lithuania has prepared the academic personal out of Lithuanian students.

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Informatikos specialistų ruošimas Vilniaus universiteto matematikos ir informatikos fakultete

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Straipsnyje aprašoma informatikos specialistų ruošimo pradžia laikotarpiu iki 1979 metų. Pateikiamos disciplinų programos, gamybinių praktikų atlikimo vietos ir datos, pirmųjų programavimo seminarų pranešimų temos.