FACULTY OF NATURAL SCIENCES
CONSTANTINE THE PHILOSOPHER UNIVERSITY NITRA
ACTA MATHEMATICA 16

FINANCIAL MATHEMATICS IN ELECTRONIC STUDY MATERIALS

FINANČNÁ MATEMATIKA V ELEKTRONICKÝCH ŠTUDIJNÝCH MATERIÁLOCH

RADOMÍRA GREGÁŇOVÁ

ABSTRACT. *In the article we deal with the some possibilities of different types of applications in electronic study materials. A financial mathematics study materials were created in the form of electronic study materials, on-line courses or web sites. Creating electronic study materials allows us to study independently. Electronic study materials influence the methods and forms of a university study of mathematics.*

KEY WORDS: *mathematics, applications, financial mathematics, electronic study materials*

ABSTRAKT. *V príspevku sú uvedené niektoré možnosti rôznych typov aplikácií v elektronických študijných materiáloch. Študijné materiály s finančnou matematikou boli vytvorené vo forme elektronických študijných materiálov, on-line kurzov alebo webových stránok. Vytvorené elektronické študijné materiály umožňujú samostatné a aktívne učenie sa. Elektronické študijné materiály ovplyvňujú metódy a formy štúdia vysokoškolskej matematiky.*

KĽÚČOVÉ SLOVÁ*: matematika, aplikácie, finančná matematika, elektronické študijné materiály*

CLASSIFICATION: *R25, M35*

The university education system

The university education system gives students a general theoretical basis for the bachelor's degree in education and vocational training courses, learning applications for undergraduate and master's study. Then graduates of the Faculty of Economics and Management, the Slovak University of Agriculture (FEM SUA) in Nitra, have a better possibility of inclusion in the fields of economics, management, marketing, banking, finance, insurance, social services, in general, and in many other areas (Gregáňová, Országhová, 2010).

The transformation of education is connected with the reduction in the curricula of mathematical subjects. The basic assumption for successful learning of mathematics at university is a good base of secondary curriculum (Országhová, 2009). The reducing of scope and content of mathematics is done at secondary schools. It is very difficult to join secondary knowledge with knowledge of higher mathematics.

Basic knowledge of higher mathematics student obtained by passing compulsory subjects Mathematics I, II, in the 1st year bachelor's degree. These subjects provide a basic course of higher mathematics with examples of applications in economics and technical courses (Gregáňová, Országhová, 2010).

Students pass the exam in the compulsory subjects at the end of the first term and of the second term in the first year of university studies. The Chart 1 shows faculties of the university, number of terms of the teaching of compulsory subjects in mathematics and their actual hour range in the academic year 2012/2013.

Slovak University of Agriculture in Nitra			
Faculty	Number of Terms	Hour Range of Reading	Hour Range of Seminar
FEM , FE	2	2	2
FBFR, FESRR	1	1	3

Chart 1: FE - Faculty of Engineering, FEM - Faculty of Economics and Management, FBFR - Faculty of Biotechnology and Food Resources, FESRR - Faculty of European Studies and Regional Development

From long-term experience from the teaching of mathematics at the Slovak University of Agriculture in Nitra we can state that teaching of compulsory subjects is carried out with hour range of contact teaching getting smaller and smaller. This is followed by the content reduction of the taught thematic units. Requirements of teachers on the individual study are increasing. This is mainly demanding for the students in the 1st year because they have to cope with changes regarding new requirements and a system of studying being moved form the secondary school to the university. In the teaching of mathematical subjects it is important to consider specificity of the process of acquisition and fixation of mathematical knowledge (Országhová, Gregáňová, Majorová, 2007).

The aim of the teacher is to motivate the students to arise their interest in mathematics. It is important for them to realize that the acquired knowledge will be necessary in other economical subjects. One of the possibilities of motivating the students is to show the necessity of acquiring of mathematics and its consecutive applications in which the use of mathematics results in simplification of many situations and problems of various areas.

Mathematical education supported by IT

Mathematical education without information technology is not possible now. The implementation of e-learning methods into the teaching of mathematics is one way of the improvement of the university education.

The areas in which we can monitor the effect of using information technology in education include:

- Information and communication technologies influence the form and content of the educational process,
- New requirements for independent work of full-time and external study form students,
- Information technology promote active independent learning and individual work of each student, then therefore the success of the study,
- Production of educational materials in the form of electronic documents,
- Electronic testing and evaluation of students' knowledge through computers.

One particular application possibilities of electronic documents in education is the use of Web pages, which should meet the following requirements:

- Easy and comfort handling,
- Multimedia content,
- Clarity of content,
- Availability and reasonable price.

The role of educators is that students understand that information technology and the Internet are not objective knowledge, but primarily a tool for communication, information retrieval and collaboration. They are a means of implementing new forms of education, whether students or teachers.

Tools of information technology allow applications of mathematics teaching in the modern form by e-learning. It is important to choose an appropriate methodological approach creation of interactive curriculum materials in mathematics, making it a useful didactic tool for individual study (Gregáňová, Országhová, 2010).

In teaching process it is necessary to mediate to students not only theoretical knowledge but also possibilities of application in practice. The solving of applied tasks represents one of the possible ways of the innovation of the content and the teaching of mathematics at universities.

Course APPLIED MATHEMATICS on the web sites

We were created e-learning materials on the web sites for students at the SUA in Nitra which are accessible at URL: http://www.fem.uniag.sk/km/aplikovana_matematika/.

Theoretical knowledge, examples, tasks and also applied tasks from physics and economics are on these web sites. The implementation of applied tasks represents one of the possible ways of the content innovation and the teaching methods of mathematics in universities study.

By solving of applied tasks:

- we increase motivation of students to study theoretical methods of mathematics,
- we support and develop creativity of students,
- we demonstrate connection of theory and practical tasks,
- we develop interdisciplinary relations between mathematics and finance,
- we increase quality of education (Országhová, 2005).

Contribution of created web sites is:

- obtaining mathematical knowledge by attractive way of e-learning,
- implementation of new and non-traditional method of teaching of mathematics at universities by using IT,
- development of interdisciplinary relations, supported by solving of applied tasks for profile subjects and practice,
- support of education and professional growth of teachers in field of using IT in university education (Gregáňová, 2005).

Financial aplications in the course APPLIED MATHEMATICS

We present applied tasks of financial mathematics which are accessible at URL: http://www.fem.uniag.sk/km/aplikovana_matematika/.

Next, we introduce chosen thematic units of financial mathematics which are accessible at above mentioned URL:

- Simple Interest (see Fig. No.1)
- Compound Interest
- Continuous Interest

Web sites provide to students ability to study independently in any time and place.

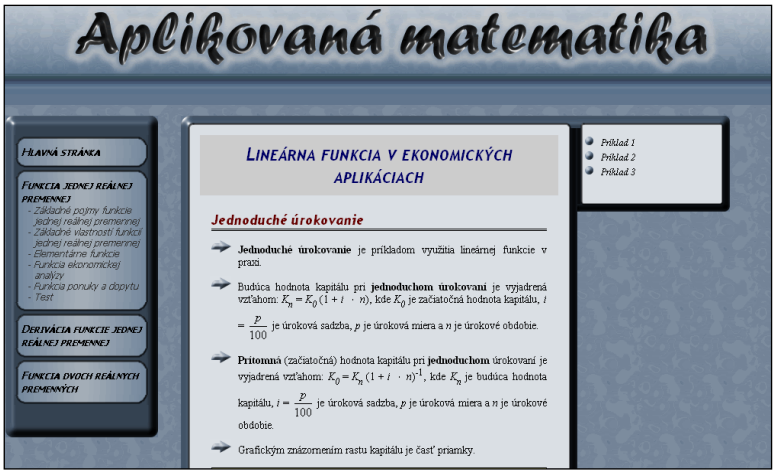

Fig. No. 1: Simple interest tasks - Preview web sites at URL: http://www.fem.uniag.sk/km/aplikovana_matematika/

Tasks of Financial Mathematics in the courses EULER´S NUMBER

At the SUA in Nitra, the practical realization of educational ways and the creation of study materials are supported by LMS MOODLE. Educational system MOODLE offers for the author of teaching course a variety of modules and activities that can be used in the teaching mathematics. We were created electronic study course with the title EULER'S NUMBER like an alternative method to study independently. This electronic study course provides to students of SUA in Nitra to get knowledge about this important mathematical constant and its application in financial mathematics. This course is accessible at URL: http://moodle.uniag.sk/fem/course/view.php?id=85 (see Fig. No. 2).

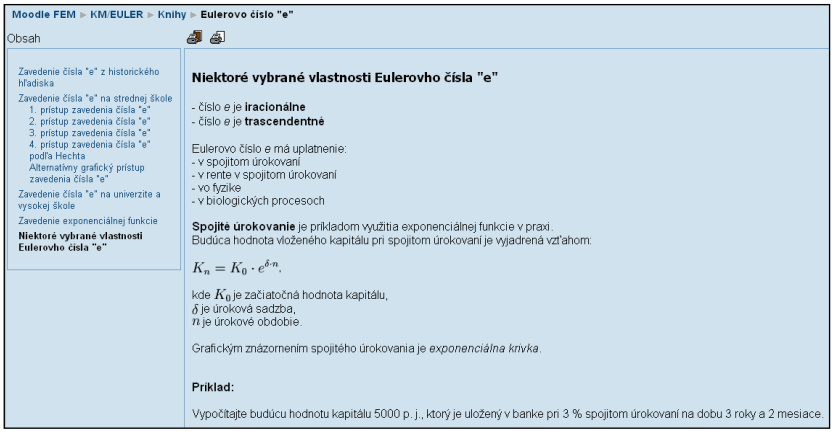

Fig. No. 2: Applied tasks of financial mathematics - preview at URL: http://moodle.uniag.sk/fem/course/view.php?id=85

The next electronic study materials are created in the form of web sites (see Fig. No.3). We present the created electronic course via web sites with the title Euler's number e. This course is accessible at URL: http://www.fem.uniag.sk/km/eulerovo_cislo/. Created electronic study materials present introduction of Euler's number e and they also afford opportunity of applied tasks of financial mathematics.

Fig. No. 3: Applied tasks of financial mathematics - preview web sites at URL: http://www.fem.uniag.sk/km/eulerovo_cislo/

Electronic e-learning materials are created for:
- students of the Slovak University of Agriculture in Nitra,
- students from other universities in Slovak Republic,
- employ Students, which are study at university,
- the admass, it is accessible on the web sites of the FEM SUA Nitra.

Electronic e-learning materials can be recommended to students as an alternative self-study in preparation for testing of mathematics (Gregáňová, Országhová, 2010).

Conclusion

Information technologies in the teaching at universities represent wide possibilities for the use, the application and the preparation of study materials and courses. Method of e-learning increases the attractiveness of education, as well. From long-term experience from the teaching of mathematics at the Slovak University of Agriculture in Nitra we can state that students are interested in applied mathematical subjects. Applied tasks are important motivating factors of the study of mathematics for future economists and managers. The quality of mathematical knowledge is the important factor for the content of education and we can stimulate it by solving of applied tasks. Suitable applications are the gateway to bring mathematics knowledge to students.

The mathematical knowledge level of students will increase by including applications into learning and teaching. Trying to apply mathematics to specialized subjects, to understand the mathematics in their university education has a significant place (Drábeková, Rumanová, 2007).

By modification of the contents of mathematical education we can improve the ability of graduates to apply special mathematical methods in engineering practice and research (Drábeková, Kecskés, 2010).

In the paper we dealt with the educational content from the field of financial mathematics that can be very useful for future economists and managers. Further, by an appropriate choice of applied tasks we show students the usage of the mathematical apparatus in the profile professional branches.

References

[1] DRÁBEKOVÁ, J., KECSKÉS, N. 2010. Model of bactericidal effect of ultraviolet radiation. In Proceedings of the international conference 9th Interantional conference – APLIMAT 2010. Bratislava: STU, 2010, CD, p. 733-738. ISBN 978-80-89313-47-1

[2] DRÁBEKOVÁ, J., RUMANOVÁ, L. 2007. Proposal for e-learning course on school mathematics for students of non-economic faculties SUA. In Proceedings of the international conference „EMATIK 2007“. Bratislava: FMFI UK, 2007, p. 30-34. ISBN 978-80-89186-34-1

[3] GREGÁŇOVÁ, R. 2005. Web pages of mathematics and its utilization in the education process. In Proceedings of the international conference UNINFOS 2005. Banská Bystrica: UMB, 2005, p. 50-54. ISBN 80-8083-103-3

[4] GREGÁŇOVÁ, R., ORSZÁGHOVÁ, D. 2010. Applied problems of financial mathematics on the web sites. In Proceeding of reviewed articles of international conference ISD 2010"Global Economy: Challenges and Perspectives" May 26-28, 2010, Nitra, Slovak Republic.Nitra: SPU, 2010, p. 2501-2524. ISBN 978-80-552-0385-0

[5] ORSZÁGHOVÁ, D. 2005. Applied tasks as the support of interdisciplinary relations between mathematics and physics. In Proceedings of the international conference “Research and Teaching of Physics in the Context of University Education 2005”. Nitra: SPU, 2005, p. 154-157. ISBN 80-8069-528-8

[6] ORSZÁGHOVÁ, D. 2009. Mathematical Analysis Tasks in the Bachelor’s Study at the Faculty of Economics and Management of the SUA in Nitra. In Proceedings of the 6th Conference on Mathematics and Physics at Technical universities with International Participation. Czech Republic, Brno: UO, 2009, p. 189-196. ISBN 978-80-7231-667-0

[7] ORSZÁGHOVÁ, D., GREGÁŇOVÁ, R., MAJOROVÁ, M. 2007. Professional training of economists and managers in the context of the transformation of university education. In Scientific papers on CD of International workshop Curtea de Arges, Arges County. Romania, Nitra-Bucharest, 2007, s. 259-264. ISBN 978-80-8069-857-7

[8] URL: http://moodle.uniag.sk/fem/course/view.php?id=85

[9] URL: http://www.fem.uniag.sk/km/aplikovana_matematika/

[10] URL: http://www.fem.uniag.sk/km/eulerovo_cislo/

Received on April 17, 2013.

Adress

Mgr. Radomíra Gregáňová, PhD.
Department of Mathematics, Faculty of Economics and Management, Slovak University of Agriculture in Nitra, Tr. A. Hlinku 2, 94976 Nitra, Slovakia
e-mail: radomira.greganova@uniag.sk

Poďakovanie - Acknowledgement

The paper was supported by grant from Grant Agency KEGA with title “Teaching of mathematics with applications - changes in the content of university mathematical education “, No. 021SPU-4/2011.