QUALIFICATION CHARACTERIZATION
OF MAJOR FIELD OF STUDY "ECONOMIC MATHEMATICS"
FOR "MASTER OF SCIENCE" DEGREE
WITH PROFESSIONAL QUALIFICATION "MASTER OF MATHEMATICS"

Major "Economic mathematics" is of professional field 4.5 Mathematics. Education in a degree „Master" has a regular form and lasts two years (four semesters).

General characteristics of the program: The students completed this major field of study have specialized knowledge and skills in modern applications of mathematics and mathematical modeling. By incorporating Informatics disciplines, ensure students' knowledge in the field of information systems in the economy. Part of the courses are optional, which allows students to prepare more thoroughly in their desired field of theory and applications of mathematics, and to attend additional courses in mathematics, informatics, economics, insurance and other. The training ends with a state exam or thesis defense, which will allow them to individually solve relevant to mathematics and its application tasks.

Requirements to preparation of students completing this major field of study

Students completed MSc degree in Economic Mathematics have to possess following knowledge, skills and competences:

- Skills to create a mathematical model of a situation to prove mathematical statements and to solve problems with theoretical or applied nature;
- Ability to abstraction, logical development of formal mathematical theories and establishing links between them;
- Ability for mathematical modeling of real world phenomena and describe through mathematical apparatus of the studied processes and phenomena;
- Ability to deal with new tasks from different areas of knowledge;
- Ability to understand problems and derive the general regularities in them;
- Ability to formulate complex problems of optimization, decision making and to interpret the obtained solutions in terms of the context of the problem to be solved;
- Ability to make mathematical arguments and conclusions from them clear, precise and accurate mathematical language, in oral and written form to those for whom it is intended decision of the mathematical problem;
- Knowledge of the process of learning and teaching of mathematics in different levels of training.

Career opportunities: The students completed this Master's program are prepared to apply mathematical formalism and use new technologies in different application areas - banks, insurance companies, the economy and trade, scientific research teams. Graduates of the Master's program "Economic Mathematics" have the opportunity to continuing education at PhD degree. They can work as lecturers and researchers in universities and research institutes.

Qualification characterization of Major field of study "Economic Mathematics" for MSc degree is a basic document that determines rules for developing the curriculum. This qualification characterization is conformed to legislation in the area of higher education in Republic of Bulgaria.

CURRICULUM

Field of Study: Economic Mathematics, 2 years

First Year			
First Semester			
Plan A. For students who have previously completed professional field 3.8. Economics or 3.7 Administration and management (speciality Business Administration)		*Plan B. For students who have previously completed professional field 5. Technical sciences or 4.1. Physical Sciences*	
Compulsory Courses	ECTS credits	Compulsory Courses	ECTS credits
Selected topics from algebra and geometry	7.5	Micro and Macroeconomics	7.5
Mathematical analysis	7.5	Finance	7.5
Differential equations	7.5	Marketing	7.5
Programming and use of computers	7.5	Programming and use of computers	7.5
Second Semester			
Compulsory Courses	ECTS credits	Optional Courses from Group I	ECTS credits
Functional analysis	8.0	European programs and projects	7.0
Mathematical optimization	8.0	Risk management	7.0
Probability theory and statistics	7.0	Specialized statistical software	7.0
Optional Course from Group I	7.0		
Second Year			
Third Semester			
Compulsory Courses	ECTS credits	Optional Courses from Group II	ECTS credits
Numerical methods	9.0	Finance and finantial operations	6.0
Financial mathematics	9.0	Insurance	6.0
Mathematical models in economics	6.0	Econometrics	6.0
Optional Course from Group II	6.0	Technologies, competition and business strategies in the 21st century	6.0
Fourth Semester			
Compulsory Courses	ECTS credits	Optional Courses from Group III	ECTS credits
Information systems in economics	5.0	Game theory	5.0
Stochastic models in economics	5.0	Monte Carlo Numerical methods	5.0
Optional Course from Group III	5.0	Nonlinear dynamics and economics	5.0
Graduation	15.0	Time series	5.0

TOTAL FOR 2 ACADEMIC YEARS: 120 CREDITS

Optional subjects

Students may study in addition as an optional course any course taught in the university, which provides additional training according to their interests regardless of the faculty in which the training is organized.

COURSES DESCRIPTION

COMPULSORY COURSES

SELECTED TOPICS FROM ALGEBRA AND GEOMETRY

Semester: 1 semester
Course Type: lectures and seminars
Hours per Week: 3 lecture hours and 2 seminars hour / Fall Semester
ECTS Credits: 7.5 credits
Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in M.Sc. Curriculum of Economic Mathematics.

Course Description: The curriculum examines issues from algebra and analytical geometry. The basic concepts of sets, images, divisibility of numbers, polynomials, combinatorics and complex numbers are given. Matrices, determinants, systems of linear equations and methods for solving them are also studied, from analytical geometry vectors and actions with them, lines and planes, lines and surfaces of the second degree are considered. The main task of the course is to provide functional preparation for students of the specialty "Economic Mathematics" for mastering the other mathematical disciplines and applying their theoretical knowledge in solving specific problems in economics.

Course Aims: The goal of this course is for students to be able to apply the studied theory to modeling and solving real practical problems; to master one of the classical methods for studying geometric objects - the analytical one; to be able to establish correspondence between algebraic objects, to determine their properties and to be able to transfer the same to others that are difficult to study.

Teaching Methods: Lectures, seminars, homework, consultations, control checks.

Requirements/Prerequisites: Basic knowledge from the school mathematics course.

Assessment: Written exam in the semester's end on topics from tutorials and on topics from lectures.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:
Basic Titles:

1. 1 Божилов, А., П. Сидеров, К. Чакърян. Задачи по алгебра. Веди, София, 2006.
2. Генов, Г., С. Миховски. Т. Моллов, Алгебра, Университетско издателство „Паисий Хилендарски", Пловдив, 2006.
3. Денеке, К., К. Тодоров. Основи на алгебрата. Благоевград, ЮЗУ "Неофит Рилски", 2001.
4. Додунеков, С., К. Чакърян. Задачи по теория на числата. Регалия, 1999.

5. Дочев, К., Д. Димитров, В. Чуканов. Ръководство за упражнения по висша алгебра. София, 1976.
6. Зяпков Н., Н. Янков, И. Михайлов, Елементарна теория на числата, Фабер, Велико Търново, 2008.
7. Михайлов, И., Н. Зяпков. Висша алгебра и теория на Галоа, Фабер, Велико Търново, 2004.
8. Сидеров, П., К. Чакърян. Записки по алгебра. Веди, София, 2006.
9. Борисов А., Ил. Гюдженов. Линейна алгебра и аналитична геометрия, Бл-д, 1999 г.
10. Борисов А., М. Кацарска. Ръководство за решаване на задачи по линейна алгебра и аналитична геометрия, Бл-д, 1996 г.
11. Борисов А., Ил. Гюдженов, Ил. Димитрова. Линейна алгебра, Благоевград, 2009 г.
12. Борисов А., Ил. Гюдженов, Математика I част, Благоевград, 2010 г.
13. Гьонов А., Н. Стоев, Сборник от задачи по аналитична геометрия. С., 2009 г.
14. Димитров Д., и др. Сборник от задачи по линейна алгебра.С., 2010 г.
15. Дочев К., Д.Димитров, Линейна алгебра, С., 1977 г.
16. Станилов Гр. Аналитична геометрия, С., 1979 г.

MATHEMATICAL ANALYSIS

Semester: 1 semester
Course Type: lectures and seminars
Hours per Week: 3 lecture hours and 2 seminars hour / Fall Semester
ECTS Credits: 7.5 credits
Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in M.Sc. Curriculum of Economic Mathematics.

Course Description: The course includes the study of infinite number sequences and series, the limit, continuity, and derivative of a function of one variable, as well as the study of the variation and construction of graphs of functions of one variable. Indefinite and definite integrals are studied.

Course Aims: Mastering the basic methods for studying functions of one variable, as well as the basic methods for solving indefinite and definite integrals.

Teaching Methods: Lectures, seminars, homework, consultations, control checks.

Requirements/Prerequisites: Basic knowledge from the school mathematics course.

Assessment: Written exam on seminar exercises and lecture material.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:
Basic Titles:

1.V. A. Ilin, V. A. Sadovnichi, B. H. Sendov, Mathematical Analysis, V. 1 and 2, Sofia, Science and Art, 1989.
2. Ia. Tagamlitzky, Differential Calculation, Sofia, Science and Art, 1971.
3. Ia. Tagamlitzky, Integral Calculation, Sofia, Science and Art, 1971.
4. I. Prodanov, N. Hadjivanov, I. Chobanov, Collection of problems of Differential and Integral Calculation, Sofia, Science and Art, 1976.
5. V. Grozdanov, K. Iordjev, A. Markovska, Guidance for solving of problems of mathematical analysis- first part, "Neophit Rilsky" publishing house, Blagoevgrad, 2012.

DIFFERENTIAL EQUATIONS

Semester: 1 semester
Course Type: lectures and seminars
Hours per Week: 3 lecture hours and 2 seminars hour / Fall Semester
ECTS Credits: 7.5 credits
Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in M.Sc. Curriculum of Economic Mathematics.

Course Description: The course includes the study of the main types of differential equations of the first and higher order. Systems of differential equations are also studied. Partial differential equations of the first order are considered.

Course Aims: Mastering the basic methods for solving the considered types of differential equations and systems of differential equations.

Teaching Methods: Lectures, seminars, homework, consultations, control checks.

Requirements/Prerequisites: Good knowledge of mathematical analysis.

Exam: Written exam on seminar exercises and lecture material.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Differential Equations, 2008, http://www.sosmath.com/diffeq/diffeq.html (наш превод - в ЮЗУ -2011 г)
2. Попиванов П., П.Китанов, Обикновени диференциални уравнения. ЮЗУ Благоевград, 2000.
3. Борисов А., Ил.Гюдженов. Математика, част 3. Елементи на интегралното смятане. Елементи на обикновените диференциални уравнения.Б-д .2003г
4. Босс. В. Лекции по математике. Дифференциальные уравнения. М. 2004г.
5. Живков А, Е. Хорозов, О. Христов http://debian.fmi.uni-sofia.bg/~horozov/DifferentialEquations/book.pdf (X.2007- 2008)

6. http://www.exponenta.ru/educat/class/courses/ode/theme1/theory.asp 2013.
7. Ordinary Differential Equation http://www.mat.univie.ac.at/~gerald/ftp/book-ode/ode.pdf
8. Байнов Д., К.Чимев, Ръководство за решаване на задачи по обикновени диференциални уравнения. ЮЗУ, Благоевград, 1992г. (учебник и ръководство на Д.Байнов от ПУ се намира в ЮЗУ библиотеката в голям брой екземпляри).
9. Пушкаров. Д. Математически методи на физиката.Ч. I., ЮЗУ, Бл.1993г.
10. Эльсгольц. Л.Дифференциальные уравнения и вариационное вычисление. М. 2000.
11. Дорозов, А. Т.Драгунов. Визуализация и анализ инвериантных множеств динамических систем. Москва, 2003г.
12. Ризниченко. Г.Математические модели в биофизике и экологии..М, 2003г.
13. Stewart J. Calculus. III ed. (AUBG). 1996.
14. Сп.Манолов, А.Денева и др. Висша математика, част 3. Техника, 1977г.
15. Методическо ръководство за решаване на задачи по математика, ч. 4, Техника, София, 1975г.- файловете от ръководството са достъпни за студентите в зала 1-115)

PROGRAMMING AND USE OF COMPUTERS

Semester: 1 semester
Course Type: lectures and seminars
Hours per Week: 3 lecture hours and 2 seminars hour / Summer Semester
ECTS Credits: 7.5 credits
Assessment: exam
Department: Informatics, Faculty of Mathematics and Natural Sciences, SWU"Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in M.Sc. Curriculum of Economic Mathematics.

Course Description: The course "Fundamentals of Programming" is an introductory course for students majoring in "Economic Mathematics" (1st year, 1st semester students) in the field of programming, programming languages, and algorithms. As such, it includes the examination of topics for representing information in a computer, description and properties of algorithms, syntax and semantics of programming languages, basic language constructs and their use, tools for developing and testing programs. Visual Basic.NET is chosen as the working programming language in the course.

Course Aims: The aim of the course is for students to acquire basic knowledge in the field of programming and master the basic principles of programming. The knowledge gained through this course will enable students to use a specific programming language, such as when solving problems using a computer and implementing various algorithms, modeling a real problem and solving it.

Teaching Methods: Lectures, seminars, homework, consultations, control checks.

Assessment: written exam (test) on studied material

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Schneider D., An Introduction to Programming Using Visual Basic Int. Ed., Prentice Hall, Pearson Education Inc., 9th Ed 2014, (8th Ed 2010)
2. Дамянов И., (2012) Увод в програмирането, УИ "Неофит Рилски", ISBN 978-954-680-830-1, COBISS.BG-ID – 1248729572
3. Conrod, P. & Tylee. L. (2019). Learn Visual Basic 2019 Edition: a step-by-step programming tutorial. S.l.: KIDWARE SOFTWARE.
4. Zak, D., Programming with Microsoft Visual Basic 2012, Course Technology, Cengage Learning, 6th Ed. 2014

MICRO AND MACROECONOMICS

Semester: 1 semester
Course Type: Lectures and seminars
Hours per week: 3 lecture hours and 2 seminar hours / Fall Semester
ECTS credits: 7.5 credits
Assessment: exam
Department: Economics, Faculty of Economics, SWU “Neofit Rilski” – Blagoevgrad

Course Status: Compulsory course in the M.Sc. Curriculum of Economic Mathematics.

Short Description: The course should help first-year students from non-economic disciplines to understand and make sense of the essence, internal connections and interdependencies between the various objects and subjects in theoretical economics, which will help their correct orientation in all general and specific disciplines that they will subsequently study in the course of their studies. The course is primarily oriented towards the analysis of basic aspects of the theory and practice of a democratic market economy. It clarifies basic methodological propositions and reviews economic laws valid for the entire economic sphere /those of universal significance/.

Course Aims: The course aims to provide students with in-depth knowledge of the essential characteristics of current economic systems, the basic principles of economic thinking, the motivation in the actions of market entities. Emphasis is placed on views on the evolving models of the market economy, the systems, structures and agents of market relations, the trends and dynamics of the determining micro- and macroeconomic indicators.

Teaching Methods: Lectures, seminars**.**

Assessment: The discipline ends with an exam. The priority in the training is the practical and independent work of the students. The knowledge, skills and competence are assessed during the seminar classes, during the implementation of the current control, and the results achieved from the assigned tasks and tests are of serious importance. The course of training in the discipline includes the implementation of an incoming current control. Current control builds in students responsibility for the assigned tasks, self-discipline, systematicity in preliminary preparation, builds habits for optimizing time, develops logical thinking, skills for selecting and analyzing information acquired from various information sources.

The current control is carried out through the following methods:

• Discussion, expression of one's own reasoned opinions regarding the topic treated in the seminar classes;

• Verification of the acquired knowledge by solving tests on the taught material;

• Ability to present and successfully defend one's own ideas and solutions.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

Basic Titles
1. Е. Бояджиева, М. Кьоглер. Основи на икономическата теория. Благоевград 2005.
2. Л. Йотова. Икономикс. Част I и II. Изд. УНСС, София 2008.
3. И. Димов. Обща икономическа теория. Изд. "Абагар". В. Търново 2004.
4. Г. Хартман. Пазарна икономика. Част I и II. Изд. "Булвест-2000", София 2003.
5. Е. Сотирова. Сборник от задачи тестове по макроикономика. УНСС, София 2003.
6. Проф. Стоядин Савов "Икономикс", С. 1996 г. – в два тома.
7. Проф. Камен Миркович, "Икономикс", С. 2001 г.
8. Пламен Пъчев – „Микроикономика" С.-Бл. 2011 г.
Additional Titles
1. Дж. М. Кейнс. Обща теория на заетостта, лихвата и парите. Изд. "Хр. Ботев", София 1994.
2. М. Фридмън. Немирството на парите. Епизоди от монетарната история. ИК "Дамян Яков", София 1994.
3. Р. Рийч. Трудът на нациите. Как да се подготвим за капитализма на XXI век. Унив. изд. "Св. Климент Охридски", София 1992.
4. Р. Хайлбронер, Л. Търоу. Икономика за всички. Изд. "Интерпринт", София 1993.
5. Учебен речник по икономикс. Том I и II. Изд. "Сиела", София 2003.
6. Проф. Поль Самуэлсон "Экономика", М. 1976 г. /Препоръчително е да се ползват учебниците на този автор – самостоятелно или в съовторство с Нордхаус на съответните западни езици, които студентът владее/
7. Проф. Гернот Хартман "Пазарна икономика", С. 1992 г. – в две части

FINANCE

Semester: 1 semester
Course Type: Lectures and seminars
Hours per week: 3 lecture hours and 2 seminar hour /Fall Semester
ECTS credits: 7.5 credits
Assessment: exam
Department: Finance and accounting, Faculty of Economics, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in the M.Sc. Curriculum of Economic Mathematics.

Short Description: The Finance discipline aims to provide students with basic knowledge in the field of financing of commercial companies of different legal registration, the problems of their financial and tax policy, the structure and management of the company's capital and assets, as well as the effectiveness of investment decisions. The material is selected in accordance with the planned hours and the specifics of the specialty, and within the framework of a reasonable compromise between theoretical and practical-applied material, priority is given to the practical side of the topics considered. The developed rich text material, case studies and practical tasks aim to consolidate the knowledge obtained within the lecture course, to further develop it and seek its real application in practice.

Course Aims: The goals and objectives of the course are for students to acquire knowledge about the basic rules of financing and investing, valid for the corporate sector, and skills for independent application of theoretical material in practice.

Teaching methods: Lectures, seminars.

Assessment: The course ends with an exam. The priority in training is the practical and independent work of the students. Knowledge, skills and competence are assessed during the seminar classes, during the implementation of the current control, and the results achieved by the assigned tasks and tests are of great importance. The current control builds in students responsibility for the assigned tasks, self-discipline, systematicity in preliminary preparation, builds habits for optimizing time, develops logical thinking, skills for selecting and analyzing information acquired from various information sources.

The current control is carried out through the following methods:
• Discussion, expression of own reasoned opinions regarding the topic treated in the seminar classes;
• Presentation and defense of the theses set forth in the assigned written work;
• Verification of the acquired knowledge by solving tests on the taught material;
• Ability to present and successfully defend one's own ideas.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

Basic Titles
1. Ч. Николов Д. Стоилова Е. Ставрова “Публични финанси” БОН Благоевград 2010
2. Стоянов, В., Финанси, ИК Галик, София, 2008
Additional Titles
1. R.A. Musgrave, P.B. Musgrave, L. Kullmer “Public Finance in Theory and Practice” McGraw-Hill, Inc 1973
2. H. Rosen “Public Finance” Irwin McGraw- Hill 1998

MARKETING

Semester: 1 semester
Course Type: lectures and seminars
Hours per Week: 3 lecture hours and 2 seminars hour / Summer Semester
ECTS Credits: 7.5 credits
Department: Faculty of Economics, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in M.Sc. Curriculum of Economic Mathematics.

Course description: In the process of training, sufficient information will be obtained about the methods and approaches on how to properly solve the problems of production and sale of companies' products, how to quickly adapt to the needs and changes in the market, why to differentiate in relation to potential consumers, etc. The program provides for the consideration of basic issues concerning the essence, role, means and capabilities of marketing, to further develop the theoretical knowledge obtained in the field of marketing and to give it a practical focus and completeness. Along with the presentation of fundamental knowledge, skills are formed for applying this knowledge in practice. This determines the interdisciplinary nature of teaching and training and the expected results that the knowledge obtained will support the study of both other disciplines and disciplines with an economic and business focus.

Course Aims: This course aims to satisfy the students' need for knowledge about economic methods of management in a market economy.

Teaching methods: Lectures, seminars.

Prerequisites: None required.

Assessment: Written exam on seminar papers and lecture material.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Желев, С. Младенова, Г. Маркетинг. Университетско издателство „Стопанство", С., 2012.
2. Alvin J. Silk, What Is Marketing?, Harvard Business School Presss, 2006

FUNCTIONAL ANALYSIS

Semester: 2 semester
Course Type: lectures and seminars
Hours per Week: 3 lecture hours and 2 seminars hour / Summer Semester
ECTS Credits: 8.0 credits
Assessment: exam

Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in M.Sc. Curriculum of Economic Mathematics.

Course Description: The course includes studying the basic concepts of functional analysis. The course includes studying the main types of functional spaces - metric, topological, linear, normed, Euclidean and Hilbert spaces. The axiomatics of these mathematical objects is presented, a number of properties and various applications are shown.

Course Aims: The discipline Functional Analysis is a basic mathematical discipline and aims to present to students the modern achievements in the field of mathematical analysis and its applications. The knowledge is necessary for studying Ordinary Differential Equations, Mathematical Optimization, Numerical Methods, etc.

Assessment: Written exam. Students take two tests during the semester. After the end of the semester, a written exam and an interview are held for a final grade.

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. A. N. Kolmogorov, S. B. Fomin, Elements of the theory of functions and functional analysis, "Science", Moskow, 1976.
2. A. A. Kirrilov, A. D. Gvashiani, Theorems and problems on functional anakysis, "Science", Moskow, 1979.
3. V. A. Ilin, V. A. Sadovnichi, B. H. Sendov, Mathematical analysis, vol. and 2, "Science and Art ", Sofia, 1989.

MATHEMATICAL OPTIMIZATION

Semester: 2 semester
Course Type: Lectures and tutorials
Hours per week: 3 lecture hours and 3 tutorial hours /Summer Semester
ECTS credits: 8,0 credits
Assessment: exam
Department: Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in the M.Sc. Curriculum of Economic Mathematics.

Short Description: The question of the existence of a solution to extremal problems is considered. The main results and approaches for solving nonlinear optimization problems are presented: John's theorem, Lagrange multiplier theorem, general nonlinear optimization theorem. It is also planned to study the basics of convex analysis and the representability of sets: convex sets, convex hull of a set, Radon's theorem and Hely's theorem, sum of sets and multiplication of a set by a number,

projection of a point onto a set, separability of convex sets, supporting hyperplanes, dimension of convex sets, endpoints and the Minkowski-Krane-Milman theorem, cones, conjugate (polar) cones, representation of convex cones, representation of convex sets, polyhedral sets, convex functions, derivatives in direction, subgradients and subdifferentials, differentiable convex functions. After this preliminary preparation, the main results of convex optimization are presented: Kuhn-Tucker theorem, differential form of the Kuhn-Tucker theorem. The topic of quadratic optimization is also considered.

The seminar and laboratory classes will study the theory and methods of linear optimization: general and canonical linear optimization problems, geometric methods for solving two-dimensional linear problems, simplex methods, artificial basis methods (M-methods) for solving the canonical problem with an unknown initial basis, duality in linear optimization; classical transportation problems, finding an initial support plane, distribution methods and potential methods for solving the transportation problem, integerity of the transportation problem, transportation problems with restrictions, assignment problems. On this basis, matrix games are studied: minimax theorem (by John von Neumann), geometric methods for solving 2 x 2, 2 x n, m x 2 games, as well as the relationship between matrix games and linear optimization.

It is planned to use software products that implement the methods under consideration.

Expected results: mastery of the main theoretical results, application of the studied methods for solving problems, programming of (some of) the methods.

Extracurricular activities in the course include: mastering the lecture material, homework, coursework, work in the library, work in the computer room, preparation for tests, etc.

Course Aims: The objective and main task of studying the course Mathematical Optimization is for students to acquire knowledge of the main theoretical results and methods for solving different classes of optimization (extreme) problems.

Prerequisites: Studying the course requires basic knowledge of mathematical analysis, linear algebra and analytical geometry.

Assessment: The exam is written and consists of two parts.

Part I – problems.

Part II – theory.

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

Basic Titles:
1. P. Kenderov, G. Hristov, A. Dontchev – “Mathematical Programming”, Kliment Ohridski Sofia University Press, Sofia, 1989 (in Bulgarian).

2. “Mathematical Programming Problem Book”, Kliment Ohridski Sofia University Press, Sofia, 1989 (in Bulgarian).
3. Stefan M. Stefanov – “Quantitative Methods of Management”, Heron Press, 2003 (in Bulgarian).
Additional Titles:
4. Stefan M. Stefanov – “Separable Programming. Theory and Methods”, Kluwer Academic Publishers, Dordrecht – Boston – London, 2001.
5. Hamdy A. Taha – „Operations Research. An Introduction”, 9-th ed., Prentice Hall, USA, 2010.

PROBABILITY THEORY AND MATHEMATICAL STATISTICS

Semester: 2 semester
Course Type: Lectures and labs
Hours per week: 2 lecture hours and 2 labs hours /Summer Semester
ECTS credits: 7,0 credits
Assessment: exam
Department: Informatics, Faculty of Mathematics and Natural Sciences, SWU “Neofit Rilski” – Blagoevgrad

Course Status: Compulsory course in the curriculum of the specialty “Economic Mathematics”

Short Description: The course is developed as a basic course in probability and statistics. The aim of the course is to familiarize students of the specialty “Mathematics” in the third year of their studies with some basic ideas and methods of probability theory, with a view to using them in the modeling of processes and phenomena in the field of natural science and computer analysis, as well as in the elementary modeling of social processes and phenomena in society and life. With the help of this course, students will acquire knowledge in stochastics, useful for their educational activities, as well as for their future experimental or scientific activities. The course includes laboratory exercises in order to illustrate the learning process and acquire practical skills in working with MS-Excel extensions, as well as with application packages.

Course Aims: After completing the course, students should gain knowledge about the basic concepts of probability and statistics and their relationship with:

- Decision Theory
- Estimation Theory
- Decision Theory for Small Samples
- Testing hypotheses about the type of empirical distribution.

Students should gain knowledge about the interdisciplinary nature of stochastics and discover the connections between Mathematics-Informatics-Physics-Economics and many other scientific fields.

Teaching methods: lectures, discussion, laboratory exercises

Prerequisites: Students must have studied the disciplines “Mathematical Analysis” and “Information Technologies”

Assessment:
• current control - 50% of the grade

• written exam-test 50% of the grade
The course is considered successfully completed with a minimum of 65% of the maximum score.

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

Basic Titles:

1. Каращранова Е. Интерактивно обучение по вероятности и статистика, ЮЗУ, 2010
2. Димитров, Б., Янев, Н., Вероятности и статистика, 1990, София.
3. Калинов К.,Статистически методи в поведенческите и социалните науки, НБУ, 2010
4. П. Копанов, В. Нончева, С. Христова, Вероятности и статистика, ръководство за решаване на задачи, Университетско издателство „Паисий Хилендарски", 2012, ISBN 978-954-423-796-7

Additional

1. http://www.teststat.hit.bg
2. Мадгерова Р., В. Кюрова, Статистика в туризма, ЮЗУ,2009

NUMERICAL METHODS

Semester: 3 semester
Course Type: Lectures and labs
Hours per week: 3 lecture hours and 2 labs hours /Summer Semester
ECTS credits: 9.0 credits
Assessment: exam
Department: Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in the M.Sc. Curriculum of Economic Mathematics.

Short Description: A detailed study of interpolation as a way of approximating functions given in tables is planned: classical interpolation problem, Lagrange's interpolation formula, interpolation error (formula and error estimate), divided differences and Newton's interpolation formula with divided differences, finite differences and finite difference interpolation formulas, interpolation with spline functions (linear and cubic splines), Hermite's interpolation problem, inverse interpolation. Another basic approach to approximating functions is also considered - mean square approximations (least squares method). A place is devoted to the topics of numerical differentiation and numerical integration - Newton-Coates quadrature formulas (rectangle, trapezoid and Simpson formulas) and Gauss. The study of the main methods for numerically solving nonlinear equations is planned: chord method, secant method, Newton's method. Another important topic is the solution of systems of linear equations, which is achieved in many mathematical, physical, technical, etc. problems: exact methods - Gauss and Gauss-Jordan methods, triangular decomposition method (LU-method), Cholesky method (square root method); iterative methods - simple iteration method (Jacobi method), Seidel method. It is planned to study the methods for numerically solving the Cauchy problem for ordinary differential equations (ODE) of the first order - Euler method, Runge-

Kutta methods, Adams methods; numerical solution of the boundary value problem for ordinary differential equations of the second order.

It is planned to get acquainted with software products that implement some of the considered methods.

Course Aims: The objective and main task of studying the course Numerical Methods 1 is for students to acquire knowledge of the basic numerical methods of mathematical analysis, algebra and differential equations, which are used in solving various technical, physical and other problems.

Prerequisites: Studying the course requires basic knowledge of mathematical analysis, linear algebra and analytical geometry.

Assessment: The exam is written and consists of two parts.

Part I – problems.

Part II – theory.

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

Basic Titles:

1. Бл. Сендов, В. Попов – "Числени методи", I част, Университетско издателство "Св. Климент Охридски", София, 1996; II част, "Наука и изкуство", 1978.
2. Б. Боянов – "Лекции по числени методи", София, 1995.
3. Колектив – "Сборник от задачи по числени методи", 2-ро изд., Университетско издателство "Св. Климент Охридски", София, 1994.
4. М. Касчиев – "Ръководство по числени методи", изд. "Мартилен", София, 1994.
5. R. L. Burden, J. D. Faires – "Numerical Analysis", ", 9-th ed., Cengage Learning, Stamford, CT, USA, 2010.
6. J. D. Faires, R. L. Burden – "Numerical Methods", Brooks/Cole Publishing Company, Pacific Grove, CA, USA, 2002.
7. S.M. Stefanov – "Numerical Analysis", MS4004-2203, Limerick, 1998.P. Kenderov, G. Hristov, A. Dontchev – "Mathematical Programming", Kliment Ohridski Sofia University Press, Sofia, 1989 (in Bulgarian).

FINANCIAL MATHEMATICS

Semester: 3 semester
Course Type: lectures and seminars
Hours per Week: 3 lecture hours and 2 seminars hour / Fall Semester
ECTS Credits: 9.0 credits
Assessment: exam

Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in M. Sc. Curriculum of Economic Mathematics.

Course Description:
The training in the subject includes studying the basic concepts of financial mathematics, financial calculations used in banking practice. Students also become familiar with the basics of statistical databases and receive information about models and trends that may arise, their usefulness in assessing and making decisions in certain activities in the banking sector. For this purpose, the theory, tools and application of statistical methods that have become established in various banks are emphasized, namely: collection, organization and presentation of statistical data; presentation of statistical information; descriptive statistics; dispersion; correlation; indexing; time series analysis. Practical applied methods related to the use of various quantitative methods in economics are treated - types of interest and their calculation, features of discount operations and techniques of discounted cash flows; preparation of repayment plans and methods for calculating the profitability of financial instruments.

Course Aims: The Financial Mathematics course aims to offer a thorough and detailed understanding of the concepts, principles, approaches and techniques in the field of financial calculations. Teaching methods: The course is held in lecture halls together with students from both Master's programs in "Economic Mathematics". Exercises are held in groups, usually consisting of 25 students.

Prerequisites: Students should have knowledge and skills in calculations in the financial field, application of discounting operations and discounting of cash flows, repayment plans for loans.

Assessment: Written exam. Students take two tests during the semester. After the end of the semester, a written exam and an interview are held for a final grade.

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Мейсън, А., Браун, Л., Петров, С., Финансова математика, МБИ, София, 2012, г.
2. Дочев, Д., Николаев, Р., Петков, Й., Финансова математика, Варна, Унив. Издат. Наука и икономика, 2010, ISBN: 978 954 21 0499 5.
3. Цончев, Р., Финансови изчисления, НБУ.
4. Йовков, Й. Петков, В., Финансова математика, „Нова звезда", София, 2001,
ISBN: 954 8981 32 7.
5. Van Horn, J., Vachowicz Jr., Fundaments of Financial Menagement, Prentice Hall, Upper Saddle River, New Jersy 07458, 2001.

MATHEMATICAL MODELS IN ECONOMY

Semester: 3 semester
Course Type: lectures and seminars
Hours per Week: 2 lecture hours and 1 seminars hour / Fall Semester
ECTS Credits: 6.0 credits
Assessment: exam
Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Compulsory course in M. Sc. Curriculum of Economic Mathematics.

Course Description: The presented course on mathematical models in economics examines models that are often used in macro- and microeconomics. The set of mathematical models that to one degree or another correctly describe economic processes can be united under the name "Mathematical Economics". This includes models of production activity (the so-called real economy) and financial and credit activity. The course presents methods of modeling pricing and taxation. From the point of view of mathematics, issues of forecasting and regulation of the economy are considered and analyzed.

Course Aims: The course presented in the program introduces mathematics students to mathematical models of economic phenomena, it provides an opportunity to study the possibilities of applying these models and methods in practice.

Teaching methods: lectures and seminars

Assessment: written exam

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

Basic titles:

1. Е. В. Бережная и др. Математические методы моделирования экономических систем. Москва. 2006.
2. В. А. Колемаев. Математисекая экономика. М. Юнити Дана, 2002.
3. С. В. Юдин. Математика в экономике. Тула, РГТЭУ, 2009.
4. Э. Петерс. Хаос и порядок на рынках капитала. Новый аналитический взгляд на циклы, цены и изменчивость рынка. Москва, 2011.
5. Н. Ю. Грызина. Математические методы исследования операций в экономике. Москва, ЕООИ, 2008.
6. О. О. Замков. Математические методы в экономике. Москва, МГУ, 2001.
7. А. С. Солодовников и др. Математика в экономике. В 2-х частях, Москва, 2000.
8. С. А. Минюк. Математические методы и модели в экономике. Москва, Тэтра мал.
9. В. А. Малугин. Математика для экономистов: Линейная алгебра, Москва, МГУ, 2006.

10. В. И. Малыхин. Финансовая математика, Москва, 2003.
11. И. Н. Мастяева и др. Исследование операций в экономике, Москва, 2003.
12. М. Ю. Афанасьев и др. Исследование операций в экономике, Москва, 2003.
13. П. Попиванов, П. Китанов Обикновени диференциални уравнения. Благоевград, 2000.
14. В. Босс. Лекции по математике. Дифференциальные уравнения, Москва, 2004.
15. DifferentialEquations, 2008, http://www.sosmath.com/diffeq/diffeq.html
16. Е. Хорозов. http://debian.fmi.uni-sofia.bg/~horozov/ DifferentialEquations/book.pdf
17. Ordinary Differential Equation http://www.mat.univie.ac.at/~gerald/ftp/book-ode/ode.pdf
18. А. Дорозов, Т. Драгунов. Визуализация и анализ инвериантных множеств динамических систем, Москва, 2003.
19. J. Stewart. Calculus. III ed. (AUBG). 1996.

Additional titles:

1. В. П. Дьяконов, В. И. Абраменкова, В. Круглов. Matlab 5 с пакетами разширения. Москва, 2001.
2. С. Поршнев. Вычислительная математика. Санкт Петербург, 2004.
3. С. П. Капица, С. Курдюмов, Г.Малинецкий. Синергетика и прогнозы будущего. Москва, 2003.
4. В.-Б. Занг. Синергетическая экономика. Мир, Москва, 1999.
5. Г. Малинецкий, А. Потапов. Современные проблемы нелинейной динамики. Москва, 2002.
6. М. Тасев. Мултимедийни математически курсове и синергетика. В сб.: Качеството на университетското образование – опит, европейски измерения и нови предизвикателства, Благоевград, 2002, стр. 77-90.
7. М. Тасев. В търсене на съюз между синергетиката и образованието през XXI век, сп. Педагогика, кн. 10, 2001., стр. 3-28.
8. П. Бозарова, М. Тасев, Ив. Иванов. Информационните технологии като изход от кризата на университетското образование. В сб. Качеството на университетското образование, Благоевград, 2002, стр. 68-77.

INFORMATION SYSTEMS IN ECONOMICS

Semester: 4 semester
Course type: Lectures and seminars
Hours per Week: 1 lecture hour and 3 seminar hours seminars per week / Summer Semester
ECTS Credits: 5.0 credits
Assessment: exam
Department: Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course status: Compulsory Course in M. Sc. Curriculum of Economic Mathematics

Course description: The course includes the following sections:

• Information Society;

• Computer Systems – Basics;

• Operating Systems;

• Application Software Systems;

• Application Systems in Business;

• Application Systems in Communications. In terms of its structure and content, the course coincides with similar courses in a number of reputable universities around the world.

Course Aims: The course aims to provide students with knowledge of basic information technologies and systems and their applications in business. Teaching Methods: In lectures, the theoretical material is extensively presented, supported by numerous examples, which is implemented in different variations during laboratory classes. The exercises are conducted in the university's computer laboratories.

Prerequisites: Basic knowledge from the programming course is required.

Assessment: Written exam. Students are required to successfully complete two tests during the semester. The two test scores constitute 40% of the final semester grade. After the end of the semester, a written exam and interview are held, after which the final grade is given.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Пламенка Боровска, Компютърни системи, Сиела, 2009.
2. Ангел Ангелов, Учебна среда за обучение по електронни таблици, София, 2012.
3. Марсел Гание, Преминаване към Linux + CD, СофтПрес, 2010.
4. Windows Vista - в лесни стъпки, СофтПрес, 2010.
5. Венцислав Джамбазов, Уеб базирани потребителски интерфейси, НБУ, 2011.
6. Георги Илиев, Димитър Атамян, Мрежи за данни и интернет комуникации, Нови знания, 2009.
7. Денис Колисниченко, HTML 5 & CSS 3 - практическо програмиране за начинаещи, Асеневци, 2012.
8. Анета Зашева, Информационни системи - Приложение в оперативното управление, София, 2012.

STOCHASTIC MODELS IN ECONOMICS

Semester: 4 semester
Course type: Lectures and seminars
Hours per Week: 2 lecture hours and 2 seminar hours per week / Summer Semester
ECTS Credits: 5.0 credits
Assessment: exam
Department: Informatics, Faculty of Mathematics and Natural Sciences, SWU “Neofit Rilski” – Blagoevgrad
Course status: Compulsory Course in M. Sc. Curriculum of Economic Mathematics

Short Description: The main topics to be considered:

- basic economic tasks that require stochastic modeling;

- construction of stochastic models of real problems of economy and analyzing them;
- practical ability to construct stochastic models and etc.

Course Aims: The aim of the subject is for students to acquire theoretical knowledge and practical experience in building stochastic models in economics. Main tasks:

- Recognize basic stochastic models;
- Work with ready-made models;
- Compile and parameterize simple stochastic models.

Expected results are the development of skills for applying stochastic models to solve economic problems.

Teaching methods: lectures and seminars

Assessment: The semester exam is in two parts:

Part 1. Test, which includes tasks on the topics from the syllabus.

Part 2. Includes development and defense of a project, and a description of the IT used.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

Basic Titles:
1. Аласдър Смит. Математическо въведение в икономиката. Изд. „Кл. Охридски" 2000 2. Oksendal B., StochasticDifferentialEquations, 6th edition, Springer, 2003.
3. Ross S.M., Introduction to ProbabilityModels, 10th edition, AcademicPress, 2010.
4. Божкова М., Случайни процеси, 2012
Additional Titles:
1. Grimmett G., Stirzaker D., ProbabilityandRandomProcesses, 3rd edition, Oxford UniversityPress, 2001.
2. Димитров Б., Янев Н., Вероятности и статистика, Университетско издателство "Св. Климент Охридски", 2002.
3. Стоянов Й., Стохастични процеси – теория и приложение, Наука и изкуство, 1978

OPTIONAL COURSES

EUROPEAN PROGRAMS AND PROJECTS

Semester: 2 semester
Course Type: lectures and seminars
Hours per Week: 2 lecture hours + 2 seminars per week/Fall Semester
ECTS Credits: 7.0 credits
Assessment: exam
Department: Faculty of Economics, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: The lecture course on the subject "European Programs and Projects" covers both basic general topics on the institutions, policies and programs of the European Union, as well as specific problems of the development and financial management of projects for applying for national and international funding. Special emphasis is placed on the specifics of project funding under the European Union programs.

Course Aims: The aim is for students to gain in-depth knowledge in the field of project development and financial management, by becoming familiar with the main approaches and techniques for applying for national and international funding and the possibilities for their application in modern conditions.

Teaching Methods: In order to ensure quality training for students, the subject "European Programs and Projects" flexibly combines different methods and forms of training: lectures on key topics, case studies and independent work. The forms of control are also consistent with the nature of the subject – conducting control checks in the form of tests, discussion of case studies during classroom sessions and a written exam to test knowledge.

Prerequisites: Good mastery of the material provided in the main topics of this curriculum is conditioned by prior preparation in the disciplines "Economics", "Finance", "Management", "Accounting", "Microeconomics", "Macroeconomics", "Law", etc.

Assessment: The discipline ends with an exam at the end of the semester. The priority in the training is the practical and independent work of the students. Knowledge, skills and competence are assessed during classroom work, during the implementation of the current control, and the results achieved by the assigned tasks and tests are of serious importance. The course of study in the discipline includes conducting current control of each seminar session. The current control builds in students responsibility for the assigned tasks, self-discipline, systematicity in preliminary preparation, builds habits for optimizing time, develops logical thinking, skills for selecting and analyzing information acquired from various information sources.
The current control is carried out through the following methods:
• Presentation and defense of the theses set out in the assigned written work;
• Verification of the acquired knowledge by solving tests and control checks on the taught material.

Registration for the course: an application is submitted to the Department of Mathematics.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Стоилова, Д. (2017) ***Европейски програми и проекти,*** БОН, Благоевград
2. European Commission (2004) ***Project Cycle Management Guidelines***, EuropeAid Cooperation Office, Brussels
3. Novartis Foundation for Sustainable Development (2011) ***Project Management Handbook: A Working Tool for Project Managers***, NOVARTIS
4. Министерски съвет на Република България, ***Информационна система за управление и наблюдение на структурните инструменти на ЕС в България*** (ИСУН), http://umispublic.government.bg/
5. Министерски съвет на Република България, ***Единен информационен портал: Структурни фондове на Европейския съюз***, http://eufunds.bg/bg/
6. Министерски съвет на Република България, ***Оперативни програми 2014-2020***, http://eufunds.bg/bg/page/1165
7. Фондация за развитие на предприемачеството (2004) Европейски програми – ръководство за попълване на формуляр за кандидатстване, София

RISK MANAGEMENT

Semester: 2 semester
Course Type: lectures and seminars
Hours per Week: 2 lecture hours + 2 seminars per week/Fall Semester
ECTS Credits: 7.0 credits
Assessment: exam
Department: Finance and accounting, Faculty of Economics, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: Theoretical foundations of business decision-making in the conditions of risk and uncertainty. Risk in business decisions. Main directions in the theory of business decisions. General characteristics of the "tools" for the effectiveness of business decisions in the conditions of risk and uncertainty. Principles and practice of business decisions in the conditions of risk and uncertainty. Business decisions and the organization's management system in the conditions of risk and uncertainty. Personal and situational factors in business. Techniques of the preparation phase of business decisions. Techniques in the selection, implementation and control of decisions. Challenges facing business decisions in "Knowledge Organizations". Initial concepts for "change to succeed in the future. "Economic behaviorism" and the phenomena of collective decision-making. Possibilities of games as a business procedure in the field of decisions. Situational role-playing game "meeting". Educational role-playing games. Story games in heterogeneous problem situations.

Course Aims: The aim is to satisfy the students' need for knowledge about risk and uncertainty in the information society and the behavior that is required of them in this regard in the organizations where they will work. In the process of training, sufficient information will be obtained about the approach, models, practices and forms of how to correctly formulate problems, effectively conduct a dialogue and act jointly to solve them in conditions of dynamic changes and uncertainty. The course is consistent with the planned timetable, allowing to master the principles, techniques, possible heuristics and forms for making and implementing effective business decisions.

Teaching methods: Training in the course is carried out in the form of lectures and seminars, which are conducted in the established traditional manner.

Assessment: The training in the discipline is carried out in the form of lectures and seminars. The discipline ends with an exam. The priority in the training is the practical and independent work of the students. The knowledge, skills and competence are assessed during the seminars, during the implementation of the current control, and the results achieved from the assigned tasks and tests are of great importance.

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.
References:

1. Габровски, Р. и др., „Корпоративен риск мениджмънт", Свищов, 2004;
2. Георгиев, Р., "Управлението на риска и застраховането", учебно помагало http://www.rgeorgiev.com/p/blog-page_2744.html, 2010;
3. Василев, В., „Рисково-базиран надзор върху работата на неживото-застрахователните дружества в България", изд. „Фабер", 2010;
4. Наредба за реда и методиката за образуване на застрахователните резерви;
5. Застрахователен кодекс;

SPECIALIZED STATISTICAL SOFTWARE

Semester: 2 semester
Type of Course: Lectures, seminars
Hours per week: 2 hour lectures, 2 hour seminars /Summer Semester
ECTS credits: 5.0 credits
Assessment: exam
Department: Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Optional course in the M. Sc. Curriculum of Economic Mathematics.

Course description: The course is developed as an extension of the basic course in probability and statistics.The aim of the course is to familiarize students with the essence and numerous

applications of non-parametric statistical methods as well as with the possibilities for implementing some of these procedures with the help of Information Technology (MS-Excel, VBA, Mathlab, etc.).

The structure and content of the course are tailored to the students' knowledge of informatics and probability and statistics obtained in the relevant courses. The topics of the curriculum are related to all disciplines that require analysis of empirical data.

Course Aims: After completing the course, students should be able to:

• apply the methods of non-parametric statistics

• implement specific applications using various technological tools.

Teaching methods: seminar, discussion, exercises

Prerequisites: Students must have studied the disciplines “Probability and Statistics” and “Information Technologies”.

Assessment:

• coursework - 30% of the grade

• written exam-test 70% of the grade

The course is considered **successfully completed with a minimum of 50%** of the maximum score.

Methods of teaching: seminars, tutorials, discussions, project based method.

Pre- requirements: Probability and Statistics, Information Technology

Assessment and Evaluation

Project- 30%

Final Test- 70%

The course is successful completed with at least 65% of all scores.

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

Basic Titles
1. Каращранова Е. Интерактивно обучение по вероятности и статистика, ЮЗУ, 2010
2. Калинов К.,Статистически методи в поведенческите и социалните науки, НБУ, 2010

3. П. Копанов, В. Нончева, С. Христова, Вероятности и статистика, ръководство за решаване на задачи,Университетско издателство „Паисий Хилендарски”, 2012, ISBN 978-954-423-796-7
4. G.Freiman,Exploratory data analysis,J., Isr.Math, 2002
Additional Titles:
1. http://www.teststat.hit.bg
2. Мадгерова Р., В. Кюрова, Статистика в туризма, ЮЗУ, 2009.

FINANCE AND FINANCIAL OPERATIONS

Semester: 3 semester
Course Type: lectures
Hours per Week: 3 lecture hours per week/Fall Semester
ECTS Credits: 6.0 credits
Assessment: exam
Department: Finance and accounting, Faculty of Economics, SWU “Neofit Rilski” – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: The course "Finance and Financial Operations" aims to familiarize students with the basics of capital market theory, as well as the most important institutional foundations of stock exchange trading and stock exchange operations. The material is selected in accordance with the planned timetable and the specifics of the specialty, and within the framework of a reasonable compromise between theoretical and empirical material, priority is given to the relationship between economic theory and the real market behavior of investors, issuers and other market agents. For this purpose, some topics are considered that do not appear in the curricula of stock exchanges and financial markets for other economic specialties. The discipline is one of the main disciplines in the training of specialists with higher economic education from all specialties. It specifies many theoretical positions related to micro and macroeconomics, while providing specific practical knowledge necessary for successful work in a competitive market environment.

Course Objective: The course aims to provide students with the necessary theoretical knowledge to enable them to interpret the economic behavior of investors, issuers, speculators, stockbrokers and financial supervision authorities correctly. Teaching methods: Lectures are conducted in the classical manner, with students being introduced to the material taught sequentially. Each lecture begins with a brief introduction and a connection to the previous material. During the lectures, questions are asked related to the previous material and questions introducing the new material. The lectures are richly illustrated with graphic materials and the use of multimedia. In the exercises, the material is oriented towards the use of computer programs in solving practical problems.

Assessment: The course ends with an exam. The course gives priority to the practical and independent work of the students, which is planned to be individual and in working groups. Knowledge, skills and competence are assessed in the preparation of both practical exercises and homework, computer tests and coursework.

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

Basic Titles:
1. Кругман П. Р., Международен икономикс, УНСС, София 2014
2. Ганчев Г. Т., Финансите като система, Благоевград, 2010
3. Попов Д., Ценни книжа и фондови борси, Сиела, 2001 г., 367 с.
4. Стоянов С., Фючърси, опции и синтетични ценни книжа, Тракия-М, 1999 г., Б
5. Ганчев Г., Ставрова Е., Международни финанси и финансова политика, Благоевград, 2009.
Additional Titles:
1. 50 Years of Money and Finance: Lessons and Challenges, SUERF, 2013
2. Madura J., Financial Markets and Institutions, South-Western College Publishing, 2001
3. Douglas L. G., Bonds Risk Analysis, New York Institute of Finance, 1990
4. Hyman D., Economics, IRWIN, 1988
5. Gandolfo G., International Monetary Theory and Open Economy Macroeconomics, Springer Verlag, 1987
6. Banking Sector Development in Central and Eastern Europe, Institute for EastWest Studies, 1996
7. Buckle M., Thompson J., The UK Financial System: Theory and Practice, Manchester University Press, 1999
8. Block S., Hirt G., Foundations of Financial Management, RICHARD D. IRWING, INC., 1984
9. Ganchev G., Macroeconomic Problems (The Currency Board Arrangement; Maastricht Criteria; Macroeconic Policy), in Monitoring of Bulgaria's Accession to the European Union, Friedrich Ebert Stiftung, Sofia 2000
10. Стоименов, Милчо, Финансиране на международната търговия, София, 1999
11. Христов М., Христов С., Книга за парите, АБАГАР, 2002
12. Йорданов Й., Инвестиционни фондове: Структура, мениджмънт, оценка, Варна 2002.
13. Неновски, Николай, Свободните пари, издателство "Проф. Марин Дринов", БАН, София, 2000 г.

INSURANCE

Semester: 3 semester
Course Type: lectures
Hours per Week: 3 lecture hours per week/Fall Semester
ECTS Credits: 6.0 credits
Assessment: exam
Department: Finance and accounting, Faculty of Economics, SWU"Neofit Rilski" – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: The types of insurance considered enable future financiers and accountants to be oriented and familiar with the main problems of insurance, emphasizing their essential, unchanging features over time. This will be necessary regardless of which side of the insurance contract the graduates will work on – as experts in an insurance company or as experts of its clients.

Course Aims: The aim is for future economists to become familiar with the content and significance of insurance relations as a specific type of economic relations, with the activity through which these relations are implemented, as well as with the impact of the state on their strengthening and development.

Teaching methods: Lectures on the course are conducted in the established traditional manner, with students being introduced to the material being taught.

A brief introduction is mandatory at the beginning of each lecture, ensuring the necessary transition from one topic to another. In the process of introducing students to the new topic, a discussion is held with them in order to achieve continuity between the individual lectures and for them to come to conclusions themselves, which they can introduce into the new material.

Assessment: The discipline ends with an exam. The priority in the training is the practical and independent work of the students. The knowledge, skills and competence in the implementation of the current control are assessed, and the results achieved by the assigned tasks and tests are of serious importance. The current control builds in students responsibility for the assigned tasks, self-discipline, systematicity in preliminary preparation, builds habits for optimizing time, develops logical thinking, skills for selecting and analyzing information acquired from various information sources.

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Илиев, Б., „Застраховане”, изд. „Фабер”, 2013;
2. Христозов, Ж., Димитров, П., „Застрахователни продукти”, издателство на ВУЗФ, 2012;
3. Илиев, Б., Ерусалимов, Р., „Застрахователни продукти”, изд. „Фабер”, 2009;
4. Йотов, Й., Илиев, Б., „Основи на застраховането”, Свищов, 2004;
5. Илиев, Б. и др., „Основни принципи на застраховането”, изд. Свищов, 2008;
6. Драганов, Хр., Близнаков, Й., „Застраховане”, изд. Тракия-М, 2000;
7. Драганов, Хр., Нейков, М., „Имуществено и лично застраховане”, изд. Тракия-М, 2008;
8. Габровски, Р. и др., „Корпоративен риск мениджмънт”, Свищов, 2004;
9. Георгиев, Р., "Управлението на риска и застраховането", учебно помагало http://www.rgeorgiev.com/p/blog-page_2744.html, 2010;
10. Василев, В., „Рисково-базиран надзор върху работата на неживото-застрахователните дружества в България”, изд. „Фабер”, 2010;
11. Наредба за реда и методиката за образуване на застрахователните резерви;
12. Застрахователен кодекс;

ECONOMETRICS

Semester: 1 semester
Course Type: lectures
Hours per Week: 3 lecture hours per week/Fall Semester
ECTS Credits: 6.0 credits
Assessment: exam
Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: The course "Econometrics" aims to build the theoretical foundations for understanding the problem related to the measurement of economic processes, testing economic theories, evaluating econometric models and their use in practice. The material is selected in accordance with the planned hours and the specifics of the specialty, and within the framework of a reasonable compromise between theoretical and empirical material, priority is given to the relationship between economic theory and the real possibilities for econometric analysis of the behavior of firms, consumers and macroeconomic processes in the economy.

Course aims: The objective of the course is for students to acquire the necessary theoretical knowledge and practical skills, including the use of standard software, allowing for a correct empirical assessment of the economic behavior of the main economic entities, in the context of the tasks arising at the micro and macro levels.

Teaching methods: lectures

Prerequisites: Basic knowledge of numerical methods and mathematical optimization is required

Assessment: written exam on two topics from the Syllabus, drawn at random (the grade has a weight of 60%); ongoing control: two course assignments (the grade has a weight of 40%).

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Introduction in R language, 2013. http://www.r-project.org/
2. Numerical Methods in Finance and Economics A MATLAB Based Introduction Second Edition Statistics in Practice, John Wiley & Sons, 2009
3. Applied Statistics Using SPSS, STATISTICA, MATLAB and R, Springer, 2008
4. Хаджиев, В., Статистически и иконометричен софтуер, Варна, Унив. изд. ИУ, 2002, 112с.
5. Knuth D.E. Postscript about NP-hard Problems, SIGACT News, 1974.
6. Reingold E.M., Neivergelt J., Deo N. Combinatorial algorithms (Theory and Practice), 1980.
7. М. Константинов. Въведение в Matlab. Софт Прес 2008.
8. Introduction in MATLAB. www.mathworks.com, 2011

TECHNOLOGIES, COMPETITION AND BUSINESS STRATEGIES IN THE XXI CENTURY

Semester: 3 semester
Course Type: lectures
Hours per Week:32 lecture hours per week/Fall Semester
ECTS Credits: 6.0 credits
Assessment: exam
Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: The course examines both classical approaches and methods of strategic analysis, as well as relatively newer topics on strategic innovations, creative solving of business problems, a new understanding of competition and cooperation in the ecosystem, differences with other points of view, approaches and methodologies. As a useful addition, topics on strategic audit of information systems are offered.

Course Aims: The aim of the course is to clarify and master basic theoretical knowledge and methods of the program material, to form skills for solving problems on the topics considered, examples and guidelines for applying the knowledge gained.

Teaching Methods: The lecture course is held in computer rooms or rooms with multimedia presentation capabilities, as well as with elements of the traditional method. The teaching also briefly presents the various schemes, approaches, and presentation options of a number of the most famous authors on the issues of the discipline, current sites and software products.

Prerequisites: This course does not assume any particular prior knowledge and skills in the field of strategic management and the student's general knowledge at the level of Bachelor of Science and/or Economics is sufficient.

Assessment: The main form of testing and assessing the students' knowledge is the written exam.

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Василева А. Стратегическо планиране и управление. http://www.bg-ikonomika.com/2012/11/ strategichesko-planirane-i-upravlenie.html.
2. Василева А. Стратегическо мислене: http://www.bg-ikonomika.com/2012/10/17_11.html
3. Христов Ст. Стратегическото мислене в бизнеса. "Данъчна практика" С. 2002 № 6,
4. Гибсън, Р., Преосмисляне на бъдещето,С. 2001.
5. Дракър, П., Практика на управлението, С. 2001.
6. Майкълсън, Дж., Сун Дзъ: Изкуството за войната за мениджъри, С. 2001.

7. Райс, А., Дж. Траут, Маркетинговые войны, М. 2000.
8 . Дракър, П., Мениджмънт предизвикателствата през 21 век, 2000.
9. The World Bank, World Development Report 2002.
10. Холанд, У., Промяната: стилът на XXI век, 2000.
11. Маринов, Р. Стратегически комуникационни подходи. Стратегически комуникации и управление на знанието, НБУ, 2009. http://ebox.nbu.bg/strategicheski_komunikacii/sk1.html
12. Василева, А. Стратегически мениджмънт. http://www.bg-ikonomika.com/2012/10/ strategicheski-menidjmynt.html.
13. Василева А. Стратегическо планиране и управление. http://www.bg-ikonomika.com /2012/ 11/ strategichesko-planirane-i-upravlenie.html
14. Теорията на хаоса и стратегическото мислене. В сп.Геополитика http://geopolitica.eu/drugi- statii/ 933-teoriyata-na-haosa-i-strategicheskoto-mislene С. 2010
15. Ковачева, Р., Вл. Шопов. Как да мислим ЕС стратегически. http://www.mediapool.bg/kak-da-mislim-es-strategicheski-news210523.html. С.2013
16. Антропов М. Стратегия и стратегическое мышление. М. 2012
17. Тасев, М. Синергетика и образование. Педагогика. Кн.10. 2001.

GAME THEORY

Semester: 4 semester
Course Type: lectures and seminars
Hours per Week: 2 lecture hours and 2 seminar hours per week/ Summer Semester
ECTS Credits: 5.0 credits
Assessment: exam
Department: Informatics, Faculty of Mathematics and Natural Sciences, SWU“Neofit Rilski” – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: The course "Game Theory" introduces students to the study of strategic decision-making. Game theory is a fundamental method used in mathematical economics and business to model the behavior of competitive interacting agents. Applications include a wide range of economic phenomena and approaches, such as auctions, bargaining, mergers and acquisitions, pricing, fair distribution, social network formation, agent-based computational economics, general equilibrium, mechanism design, and voting systems, as well as between such broad areas as experimental economics, behavioral economics, information economics, industrial organization, and political economy.

Course Aims: The aim of the subject studied is for students to gain knowledge and skills in the field of game theory in economics. Game-theoretic modeling and various models of economic processes in a market economy are examined. These models lead to the solution of various types of games. Students are expected to be introduced to basic properties of non-coalition finite and infinite games.

Teaching methods: lectures and seminars

Prerequisites: Basic knowledge of numerical methods and mathematical optimization is required

Assessment: written exam on two topics from the Syllabus, drawn at random (the grade has a weight of 60%); ongoing control: two course assignments (the grade has a weight of 40%).

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1.Introduction to Game Theory, 2012, http://gametheory.net/lectures/level.pl
2.Game Theory, 2013, Massachusetts Institute of Technology, http://gametheory.net/lectures/level.pl
3.Robert Gibbons, Game theory for applied economists, Princeton University Press,1992.
4.J. McMillan , Games, Strategies and Managers, Oxford, 1992.
5.R. Myerson, Game theory:Analysis of conflict, Harvard University Press,1991
6.H.Scott Bierman and Luis Fernandez, Game theory with Economic Applications, Addison-Wesley Publishing Company, USA, 1998.

MONTE CARLO NUMERICAL METHODS

Semester: 4 semester
Course Type: lectures and seminars
Hours per Week: 2 lecture hours and 2 seminars hour per week/ Summer Semester
ECTS Credits: 5.0 credits
Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: The teaching of the discipline includes the study of elements of probability theory, as a basis for Monte Carlo methods of financial mathematics. The main components of this discipline are also studied - the Brownian motion, the technique of variation reduction, stochastic methods of these problems and applications for research of American Options.

Course Aims: Mastering the basic concepts and methods for stochastic study of random variables.

Teaching Methods: lectures and seminars, homework, consultations, control checks.

Assessment: Written exam on lecture material.

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:
Basic titles:

1.Hui Wang, Monte Carlo Simulations with Applications to Finance, A Chapman & Hall, London, New York, 2012
Additional titles:
Articles on various scientific issues

NONLINEAR DYNAMICS AND ECONOMICS

Semester: 4 semester
Course Type: lectures and seminars
Hours per Week: 2 lecture hours and 2 seminars hour per week/ Summer Semester
ECTS Credits: 5.0 credits
Assessment: exam
Department: Mathematics and Physics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski" – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: The course includes basic concepts of nonlinear dynamics, nonlinear differential equations, systems, singular points, bifurcations, stability, catastrophe, chaotic dynamics, economic interpretation, the application of models for nonlinear dynamic systems to describe economic processes and systems, some PC visualizations and software products, such as WinSet, etc.

Course Aims: The aim of the course on "Nonlinear Dynamics and Economics" is to clarify and master basic theoretical knowledge and methods of the program material, to form skills for solving problems on the topics considered, examples and guidelines for applying the knowledge gained in the process of learning in various mathematical, economic and natural science disciplines.

Teaching methods: Lectures and seminars. The lecture course is held in computer rooms or rooms with multimedia presentation capabilities, as well as with elements of the traditional method. The teaching also briefly presents the various schemes, approaches, and presentation options of a number of the most famous authors on the issues of the discipline, as well as current websites and software products.

Prerequisites: Basic knowledge of mathematical analysis, linear algebra and analytical geometry, ordinary and partial differential equations, probability theory and mathematical statistics, etc. is required.

Assessment: The main form of testing and assessing students' knowledge is the written exam.

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:
1. Puu, T. Nonlinear Economic Dynamics. Springer-Verlag Berlin Heidelberg. 1997. (Пуу, Т. Нелинейная экономическая динамика. РХД, Ижевск. 2000)

2. Панчев, Ст. Теория на хаоса (с примери и приложения), ИК "АИ "Проф. М. Дринов", 2002
3. Петерс Э. "Хаос и порядок на рынках капитала". Москва. "Мир", 2000
4. Милованов, В. Синергетика и самоорганизация. Экономика. Бифозика. Москва, 2005
5. Лысенко Ю.Г., и др. "Економическая динамика", Донецк: ДГУ, 2000
6. Сергеева, Л. "Нелинейная економика: модели и методы", Запорожье, Полиграф, 2003
7. Lorenz , Hans-Walter. Nonlinear dynamical economics and chaotic motion, Springer-Verlag, 1993
8. Goodwin, R. Chaotic Economic Dynamics, 1990
9. Dechert , D. Chaos Theory in Economics: Methods, Models and Evidence.1996
10. Мандельброт, Б. Фракталы, случай и финансы, 2004
11. Мандельброт, Б. Регулярная и хаотическая динамика, 2004
12. Zhang W. B., Synergetic Economics, Time and Change in Nonlinear Economics, Springer, Sprier in Synergetics
13. Занг, В.Б. Синергетическая икономика. Время и перемены в нелинейной экономической теории. http://bookfi.org/book/731035
14. Васин,В , А.Ряшко. Элементы нелинейной динамики.: От порядка к хаосу. М.И., 2006
15. Haken, H. Synergetics: from physics to economics. Cambridge University Press, 2009
16. Тасев, М., Синергетика и образование, Педагогика, Кн.10. 2001.

TIME SERIES

Semester: 4 semester
Course Type: lectures and seminars
Hours per Week: 2 lecture hours and 2 seminars hour per week/ Summer Semester
ECTS Credits: 5.0 credits
Assessment: exam
Department: Faculty of Economics, SWU “Neofit Rilski” – Blagoevgrad

Course Status: Optional course in M. Sc. Curriculum of Economic Mathematics

Course Description: The subject "Time Series" focuses on gaining knowledge and skills in the field of time series and forecasting. Regression models are considered. These models lead to solving different tasks and using different mathematical software. The course will demonstrate the ability of some software packages in the processing of data obtained from various scientific researches. The models will be practically tested. Thorough and detailed understanding of the concepts, principles, approaches and techniques in financial calculations is offered.

Course Aims: The subject "Time Series" focuses on gaining knowledge and skills in the field of time series and forecasting. Regression models are considered. These models lead to solving different tasks and using different mathematical software. The course will demonstrate the ability of some software packages in the processing of data obtained from various scientific researches. The models will be practically tested. Thorough and detailed understanding of the concepts, principles, approaches and techniques in financial calculations is offered.

Teaching Methods: lectures and seminars

Requirements/Prerequisites: Mathematical Analysis I

Assessment: written final exam, two problems solving tests per semester

Registration for the Course: an application is submitted to the Department of Mathematics.

Registration for the Exam: Students coordinate with the lecturer the desired exam days within the announced calendar schedule for the exam sessions.

References:

1. Bovas Abraham. Johannes ledolter. Statistical Methods for Forecasting, A JOHN WILEY & SONS, INC., PUBLICATIONp 2010
2. Introduction to Time Series Analysis http://gauss.stat.su.se/gu/e/ slidesTim e%20Series/Introduction%20to%20Time%20Series% 20Analysis.pdf, 2012
3. H.Scott Bierman and Luis Fernandez, Game theory with Economic Applications, Addison-Wesley Publishing Company, USA, 1998.
4. Norman Matloff. The Art of R Programming, 2011
5. Jim Albert. Bayesian Computation with R, Springer, 2009.
6. Phil Spector. Data Manipulation with R, 2008.