<p align="center">**QUALIFICATION CHARACTERISTIC**</p>

<p align="center">**of**</p>

<p align="center">**"TECHNOLOGY OF TEACHING MATHEMATICS AND INFORMATICS" Master's degree programme**</p>

<p align="center">**in 1.3. "Pedagogy of Education in..." vocational area**</p>

<p align="center">**"Teacher in Mathematics, Informatics and Information Technology" Vocational Qualification**</p>

## I. Vocational Qualification and Competences Requirements for Students Candidates

In "Technology of Teaching Mathematics and Informatics" Master's degree programme can be admitted students with Bachelor's degree graduated in:

- "Mathematics and Informatics", Bachelor's degree;
- "Pedagogy of Education in Mathematics, Informatics and Information Technology";
- "Physics and Mathematics" with "Teacher in Informatics" or "Teacher in Informatics and Information Technology" additional postgraduate qualification;
- "Mathematics" or "Applied Mathematics" with "Teacher in Informatics" or "Teacher in Informatics and Information Technology" pedagogical qualification and additional postgraduate qualification
- "Informatics" with "Teacher in Mathematics" additional postgraduate qualification.

## II. Vocational Qualification and Competences Requirements for Students Graduated This Major

In the "Technologies of Teaching Mathematics and Informatics" Master's degree programme competences of students, future teachers in Mathematics, Informatics and Information technology are upgraded and expanded in compliance with tendencies in curriculum development in subjects studied in the secondary school and in line with the 2012 European Commission's Education Strategy and UNESCO ICT Competency Framework for Teachers. Students also acquire thorough competencies in the field of:

- pedagogical research modern methods and technologies;
- e-learning;
- specialized learning software for Mathematics and Informatics.

Students develop an affinity and capacity for independent scientific and research work in methodology of teaching Mathematics, Informatics and Information technology in school. The education received provides a solid foundation for continuing their education in Doctoral degree in the same vocational field.

**III. Preparation Requirements for Students Graduated This Major**
**Graduate students should be able to:**
- put into practice the acquired knowledge in their profession;
- use and apply competently basic knowledge in the field of Mathematics, Informatics and Information Technology;
- apply modern educational technologies;
- apply Information Technology in learning process;
- carry out independent research, model real processes and create computer applications to support learning;
- conduct pedagogical experiments.

A specialist who has graduated from SWU, the "Technologies of Teaching Mathematics and Informatics" Master's degree programme, is eligible to work as a:
- a teacher in Mathematics, Informatics and Information technology;
- a head of computer cabinets at school;
- a system administrator at an educational institution;
- a lecturer in Mathematics, Informatics and Information Technology at corporate learning and vocational qualification centers;
- a methodologist or expert in Mathematics, Informatics or Information Technology at the Regional Education Inspectorate and Ministry of education and science;
- a designer of e-learning materials;
- an Information Technology consultant in training;
- a specialist in Mathematics;
- a specialist in Informatics and Information Technology.

Qualification characteristic of the "Technologies of teaching Mathematics and Informatics" Master's degree programme for "Master" educational qualification degree with "Teacher in Mathematics, Informatics and Information Technology" vocational qualification is a main document-guideline for the development of courses curriculum and content. It complies with the Higher Education Act, with the Public Specialty Requirements, and with the SWU "Neofit Rilski" Regulations.

# CURRICULUM STRUCTURE

## "Technologies of Teaching Mathematics and Informatics" Master's degree programme

| First year | | | |
|---|---|---|---|
| First Semester | Credits | Second Semester | Credits |
| ***Compulsory Courses*** | | ***Compulsory Courses*** | |
| Pedagogical Researches Methodology and Methods | 3 | Stochastic Models in Pedagogical Researches | 3 |
| Selected Topics from School Mathematics Course | 6 | Selected Topics from School Informatics and Information Technology Course | 3 |
| Multimedia Technology | 5 | e-Learning Technology and Methodology | 3 |
| Extremum Problems and Modelling in High School Mathematics Course | 5.5 | An elective course from group 3 | 3 |
| An elective course from group 1 | 5 | An elective course from group 4 | 3 |
| An elective course from group 2 | 5.5 | Preparation and thesis defense | 15 |
| Total: | 30 | Total: | 30 |
| ***Elective Courses - I group*** | | ***Elective Courses - III group*** | |
| Fundamentals of Arithmetic | 5 | Teaching Mathematics Specialized Software | 3 |
| Fundamentals of Geometry | 5 | Computer Systems for Mathematical Calculations | 3 |
| Monte Carlo Numerical Methods | 5 | Dialogic Teaching Software in Mathematics Development Metodology | 3 |
| Symmetric Inverse Semigroup Theory | 5 | Intercultural Education | 3 |
| History of Mathematics | 5 | | |
| Extracurricular Mathematics Work Content and Methodology | 5 | | |
| | | | |
| ***Elective Courses - II group*** | | ***Elective Courses - IV group*** | |
| Information Systems Development | 5.5 | Computer Programming Learning Environments for Children Development | 3 |
| Mathematics and Informatics Educational Computer Games | 5.5 | Information Technology in Teaching Students with Special Educational Needs | 3 |
| Specialized Statistical Software | 5.5 | MATLAB Mathematical Modelling Practical Course | 3 |
| Interactive Multimedia Technology | 5.5 | Practicum for Solving School Mathematics Course Problems | 3 |
| Internet Programming | 5.5 | | |
| Event-Driven Programming | 5.5 | | |
| | | Total for 1 study year: | 60 |

## TOTAL FOR 1 STUDY YEAR: 60 CREDITS

# PEDAGOGICAL RESEARCHES METHODOLOGY AND METHODS

**Semester:** 1st semester
**Course type:** Lectures and seminars
**Hours (per week):** 1 hour lectures, 1 hour seminars
**Credits:** 3.0 credits
**Assessment:** An exam
**Lecturer:** Assoc. Prof. Itska Derizhan, Ph.D.
**Department:** Pedagogy, Faculty of Pedagogy, SWU "Neofit Rilski"– Blagoevgrad, Phone: 0882/540 168, e-mail: popkochev@swu.bg

**Discipline Curriculum Status:** A compulsory course in the "Technology of Teaching Mathematics and Informatics" curriculum
**Brief Description:** The "Pedagogical researches methodology and methods" course introduces students to the essence and different aspects of the research process in upbringing and school education.
**Course Aims and Objectives:** The course aim is to provide students with knowledge of:
- designing scientific pedagogical research;
- methods of research and evaluation of pedagogical phenomena and processes;
- using mathematical and statistical methods for quantitative processing of empirical pedagogical information;
- structure of research text;

It also forms in students skills to: build conceptual foundations of pedagogical research; design experimental pedagogical methodologies; analyze essential aspects of empirical pedagogical information.
**Teaching Methods:** Lectures, seminars, consultations and tests
**Assessment:** The final grade is formed on the basis of an exam and current testing. The current testing includes: a test on the lectures material, two tests (current tests) on the seminars material, homework.
**Exam Registration:** Students agree with the lecturer the desired dates within the announced calendar for the exam sessions.

# SELECTED TOPICS FROM SCHOOL MATHEMATICS COURSE

**Semester:** 1st semester
**Course type:** Lectures and seminars
**Hours (per week):** 2 hours lectures, 2 hours seminars
**Credits:** 6.0 credits
**Lecturer:** Assoc. Prof. Kostadin Samardzhiev, Ph.D.
**Department:** Mathematics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 557, e-mail: k_samardzhiev@swu.bg

**Discipline Curriculum Status:** A compulsory course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** Constructing and developing a concept of number are difficult processes both in their mathematical and philosophical aspect, but also in their learning and teaching aspect. Following the well-known from the Arithmetic concept of number construction, this course (for master students in Mathematics and Informatics) begins with basic algebraic laws formulation – communicative, associative, non-idempotent elements in the actions of addition and multiplication, along with distributive law combining the two operations of the natural numbers N. Based on addition and multiplication actions, corresponding regulations are also defined. Basic features of the linear ordinary are listed – bounded below by each set of natural numbers, Archimedes, etc., along with the method of mathematical ordinary associated with the two ordinaries. The question of divisibility of natural numbers and the concept of a prime number is also considered. All this is illustrated by specific examples. The question of recording a natural number in different number systems is also considered.

Since it is shown that for every two positive integers a, b the equations a + x = b and ax = b in the half-ring of natural numbers have no solutions, the need to extend the half-ring respectively to the ring of integers Z, the half-field of fractions Qt and finally to the field of rational numbers Q, is clarified. For each of these structures, the validity of the basic features of the ordinaries introduced in the semicircle of natural numbers is emphasized. All of this is illustrated with relevant examples and problems. Most of the time spent in the study hours is in the field of real numbers and corresponding problems in this field – quadratic equations and inequalities, systems of equations and inequalities, including such with irrational expressions, and such equivalents with the participation of special functions such as exponential, logarithmic, trigonometric and other.

Extracurricular activity includes homework, course papers, work in libraries and computer rooms, consultations, tests preparation, understanding and learning the lectures material and more.

**Course Aims and Objectives:** Students should learn and understand basic concepts, actions and regulations of the number concept various extentions, along with use successfully the methods for solving equations, inequalities and systems of equations and inequalities in these extentions.

**Teaching Methods:** Lectures, seminars, consultations, homework, course papers, tests

**Preliminary Enrollment Conditions:** Students are expected to have good knowledge of "High School Mathematics" course.

**Assessment:** A written exam on the seminars and lectures contents.

**Exam Registration:** Students agree with the lecturer the desired dates within the announced calendar for the exam sessions.


# MULTIMEDIA TECHNOLOGY


**Semester:** 1st semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 1 hour lectures, 2 hours lab exercises

**Credits:** 5.0 credits
**Lecturer:** Assist. Prof. Boyana Garkova, Ph.D.
**Department:** Mathematics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/ 588 557, e-mail: big@swu.bg

**Discipline Curriculum Status:** A compulsory course in the "Technology of Teaching Mathematics and Informatics" curriculum
**Brief Description:** The course offers specialized practical education in the fields of multimedia, computer design, three-dimensional modelling and computer graphics. The education is carried out in three main areas – development and integration of multimedia applications, three-dimensional modelling and design, computer animation. The content and structure of the lectures reflect the latest trends in the development of relevant technologies.

Extracurricular activity includes projects, practical assignments, course papers.
**Teaching Methods:** Lectures and lab exercises
**Preliminary Enrollment Conditions:** Basic knowledge of numerical methods and mathematical optimization is required.
**Assessment:** A written exam on two topics of the syllabus, randomly drawn (60% weight); current testing: two course papers (40% weight).
**Course Registration:** Automatically (a compulsory course)
**Exam Registration:** In agreement with the lecturer and the School office.


# EXTREMUM PROBLEMS AND MODELLING IN HIGH SCHOOL MATHEMATICS COURSE

**Semester:** 1$^{st}$ semester
**Course type:** Lectures and seminars
**Hours (per week):** 2 hours lectures, 1 hour seminars
**Credits:** 5.5 credits
**Assessment:** An exam
**Lecturer:** Prof. Oleg Mushkarov, D.Sc.
**Department:** EEA, TF, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 557, e-mail: muskarov@swu.bg

**Discipline Curriculum Status:** A compulsory course in the "Technology of Teaching Mathematics and Informatics" curriculum
**Brief Description:** Extremum problems occupy an important part of the "High School Mathematics" course. Main types of extremum problems that are studied in the "High School Mathematics" course are covered. Extremum problems of Antiquity and other known extremum problems are formulated: Didon's problem, isoperimetric problem, Fermat's problem, Kepler's problem, brachystochron problem, along with extremum problems in nature (especially in optics).
**Course Aims and Objectives:** The aim and main objective of the "Extremum Problems and Modelling in High School Mathematics" course is to provide students with:

- knowledge of the basic results and methods of solving different classes of extremum problems, which are studied in the "High School Mathematics" course;
- ability to develop mathematical models;
- ability to apply extremum problems in mathematical modelling and elements of approximation theory.

**Teaching Methods:** Lectures, seminars, consultations, tests, homework

**Assessment:** The exam is written and consists of two parts:
- Part I – Problems. It consists of two problems.
- Part II – Theory. It consists of two topics from the syllabus, randomly drawn.

Students who have at least a Satisfactory (3) grade of the Part I are admitted to the second part of the exam. Students who have at least a Very good (4.50) grade as average score of the two current tests on sections 1, 2, 3 and 4 of Part I – are released from the first part of the exam.

The final grade is formed as follows: 30% – the homework grade, 40% – the grade from the Part I test and 30% – the grade from the Part II exam.

**Exam Registration:** Students agree with the lecturer the desired dates within the announced calendar for the exam sessions.

## STOCHASTIC MODELS IN PEDAGOGICAL RESEARCHES

**Semester:** 2nd semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 1 hour lectures, 2 hours lab exercises
**Credits**: 3.0 credits
**Lecturer:** Assoc. Prof. Elena Karashtranova, Ph.D.
**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: helen@swu.bg

**Discipline Curriculum Status:** A compulsory course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course is designed as an upgrade of the base course in probability and statistics.

The aim of the course is to introduce students to the nature and numerous applications of nonparametric statistical methods, along with the possibilities for implementing part of these procedures with the tools of Information Technology (MS-Excel, VBA, SPSS, etc.).

The structure and content of the course are consistent with the students' computer skills and their knowledge of probability and statistics acquired in respective courses. The subject matter of the syllabus is related to all disciplines in which the analysis of empirical data is required.

**Course Aims and Objectives:** Upon completion of the course, students should be able to:
- apply statistical modelling methods;
- implement specific applications using various technological tools.

**Teaching Methods:** Seminar, discussion, lab exercises

**Preliminary Enrollment Conditions:** Students should have studied "Probability and Statistics" and "Information Technology".

**Assessment:**
- A course paper – 30% of the grade;
- a written exam – 70% of the grade.

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

**Course Registration:** Automatically (a compulsory course)

**Exam Registration:** In agreement with the lecturer and the School office.


## SELECTED TOPICS FROM SCHOOL INFORMATICS AND INFORMATION TECHNOLOGY COURSES

**Semester:** 2nd semester

**Course type:** Lectures and lab exercises

**Hours (per week):** 2 hours lectures, 1 hour lab exercises

**Credits:** 3.0 credits

**Lecturer:** Prof. Daniela Tuparova, Ph.D.

**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– B lagoevgrad, Phone: 073/588 532, e-mail: ddureva@swu.bg


**Discipline Curriculum Status:** A compulsory course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course is designed to expand the preparation of future teachers of Mathematics, Informatics and Information Technology in the field of school courses in Informatics and Information Technology in line with the rapidly changing technologies in Informatics and its applications. Topics studied in elective and extra-curricular courses on Informatics and Information Technology are included.

Topics about: structured texts and automatic content creation in word processing programs, spreadsheet processing of large volumes of data, interactive presentations with VBA, development and management of software projects, etc., are discussed.

**Course Aims and Objectives:** Upon completion of the course, students should be able to:
- process large volumes of data using spreadsheets;
- create interactive presentations using VBA;
- apply approaches to developing and documenting software projects.

**Teaching Methods:** Lectures, discussions, lab exercises

**Preliminary Enrollment Conditions:** Students should have studied "Information Technology" and "Event Programming".

**Assessment:**
- A current grade – 50% of the grade;
- a written exam-test – 50% of the grade.

The course is considered to be successfully completed with a minimum of 53% of the maximum score.

**Course Registration:** Automatically (a compulsory course)

**Exam Registration:** In agreement with the lecturer and the Student office.

# E-LEARNING TECHNOLOGY AND METHODOLOGY

**Semester:** 2$^{nd}$ semester

**Course type:** Lectures and lab exercises

**Hours (per week):** 2 hours lectures and 1 hour lab exercises

**Credits:** 3.0 credits

**Assessment:** An exam

**Lecturer:** Prof. Daniela Tuparova, Ph.D.

**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: ddureva@swu.bg

**Discipline Curriculum Status:** A compulsory course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course is designed to provide training for future Mathematics, Informatics and Information technology teachers in e-learning technologies.

Topics related to the nature of e-learning, technologies for creating e-learning content are covered. Psychological and pedagogical aspects of e-learning are discussed. Using the Moodle e-learning environment is thought in detail.

**Course Aims and Objectives:** Upon completion of the course, students should be able to:
- describe technologies for creating e-learning content;
- create self-contained e-learning modules in an e-learning environment;
- administer users in an e-learning course.

**Teaching Methods:** Lectures, lab exercises, discussions

**Preliminary Enrollment Conditions:** Students should have studied the "Psychology", "Pedagogy" and "Information Technology" courses.

**Assessment:**
- A current grade on the topics developed in the e-learning environment. (70% of final grade);
- an exam: defending developed electronic content (30% of final grade).

In case of a Poor (2) grade from the current testing, the student should additionally cover the requirements for a Suffcient (3) grade of the current testing in order to be admitted to the exam.

**Course Registration:** Automatically (compulsory course)

**Exam Registration:** In agreement with the lecturer and the Student office.

# ELECTIVE COURSES

## FUNDAMENTALS OF ARITHMETIC

**Semester:** 1st semester
**Course type:** Lectures and seminars
**Hours (per week):** 3 hours lectures, 1 hour seminars
**Credits:** 5.0 credits
**Assessment:** An exam
**Lecturer:** Assoc. Prof. Ilinka Dimitrova, Ph.D.
**Department:** Mathematics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 557, e-mail: ilinka_dimitrova@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum
**Brief Description:** The main aim of the comprehensive "High School Algebra course" is to construct a concept of number and related operations and relation of ordinary, starting with natural numbers, going through natural and rational numbers, and reaching real, and in individual cases and complex numbers. The overall theoretical construction and development of the above concepts is also an aim of the course. The basis of the course is theoretical-multiple. It begins with the definition of the term finite set, following the term induction set, introduced in the early 20th century by Bertrand Russell. Particular attention is paid in the beginning to the term natural number, to the operations of addition and multiplication of two natural numbers and the laws which satisfy them, and to the inequality between two natural numbers. It goes from decimal to arbitrary number system and continues with extensions of the half-ring of natural numbers to the ring of integers, to the half-field of fractions and their ordinaries, as extensions of the already established in the half-ring of natural numbers. The course ends with the review of real and complex numbers.
**Course Aims and Objectives:** It is introducing students to the modern theoretical ideas and presentation of the comprehensive "High School Algebra course".
**Teaching Methods:** Lectures, seminars, consultations, course papers and tests
**Preliminary Enrollment Conditions:** Basic knowledge of higher algebra and number theory is required.
**Assessment:** Current testing during the semester, including course papers and tests, and a written exam on the seminars and lectures contents.
**Course Registration:** It is necessary to apply to the Student office.
**Exam Registration:** In agreement with the lecturer and the Student office.

## FUNDAMENTALS OF GEOMETRY

**Semester:** 1st semester
**Course type:** Lectures and seminars
**Hours (per week):** 2 hours lectures, 1 hour seminars

**Credits:** 5.0 credits
**Assessment:** An exam
**Lecturer:** Assoc. Prof. Nikolay Kitanov, Ph.D.
**Department:** Mathematics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 557, e-mail: nkitanov@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** Three of the Euclidean geometry's axiomatics are outlined: D. Hilbert's axiomatics, Kagan-Birchov-Kolmogorov's metric axiomatics, and H. Weil's axiomatics, and their equivalence are proved. Particular attention is paid to the fact that in metric axiomatics the concept of a real number is taken as a primary object, which is why complete metric axiomatics contains in addition the six geometric axioms and axioms for real numbers. This necessitates, in the proof that the Hilbert's axioms follow the axioms of metric axiomatics, to prove that the axioms of real numbers follow the Hilbert's axioms, which is done in detail.

We believe that the course will enrich the students' knowledge of the deductive construction of Euclidean geometry, which will allow the future Mathematics teacher to acquire a solid professional training and to look at "School Geometry course" from a higher perspective.

**Course Aims and Objectives:** Students should acquire knowledge and skills for rigorous axiomatic method of constructing mathematical discipline.

**Teaching Methods:** Lectures, seminars, consultations, course papers and tests

**Preliminary Enrollment Conditions:** Basic knowledge of "Analytical geometry" and "School Geometry" course is required.

**Assessment:** Current testing during the semester, including homework and tests, and a written exam on the seminars and lectures contents.

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** Students agree with the lecturer the desired dates within the announced calendar for the exam sessions.

## MONTE CARLO NUMERICAL METHODS

**Semester:** 1st semester
**Course type:** Lectures and seminars
**Hours (per week):** 2 hours lectures, 1 hours seminars
**Credits:** 5.0 credits
**Lecturer:** Assoc. Prof. Vasil Grozdanov, Ph.D.
**Department:** Mathematics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/ 588 557, e-mail: vassgroz@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course includes the study of elements of probability theory as the basis of Monte Carlo methods of financial mathematics. The basic components of this discipline are also studied – the Brownian movement, technique of variation reduction, stochastic methods of these problems, and applications for the study of American Options.

**Course Aims and Objectives:** Students should acquire knowledge of the basic concepts and methods for stochastic study of random variables.

**Teaching Methods:** Lectures, seminars, consultations, homework, current tests

**Preliminary Enrollment Conditions:** Good knowledge of mathematical analysis, probability theory, differential equations and other fields.

**Assessment:** A written exam on the lectures material.

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** Students agree with the lecturer the desired dates within the announced calendar for the exam sessions.

# SYMMETRIC INVERSE SEMIGROUP THEORY

**Semester:** 1st semester
**Course type:** Lectures
**Hours (per week):** 3 hours lectures
**Credits:** 5.0 credits
**Lecturer:** Assoc. Prof. Ilinka Dimitrova, Ph.D.
**Department:** Mathematics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/ 588 557, e-mail: ilinka_dimitrova@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The concept of semigroups originated in the early XX century, but the development of semigroup theory actually began in the late 1920s. By the 1960s, the semigroup theory became a dynamically developing field of modern algebra with a wealth of problems and diverse applications. During these years, the first books on the semigroup theory appeared. Today, both Bulgarian once and many well-known mathematical centers abroad work in this field. The semigroup theory finds application in a number of mathematical disciplines, such as automation theory, coding theory, differential equations, functional analysis, mathematical linguistics, and many other fields. The course begins with the study of basic concepts, properties and examples of the semigroup theory. Ideals and congruences are discussed, along with theorems for homomorphism and isomorphism of semigroups. Particular attention is given to Green's relations and symmetric inverse semigroup. A number of symmetric inverse semigroups with specific properties are studied, such as semigroups of transformations preserving or inverting, semigroups of transformations preserving or reversing, symmetric inverse semigroups of partial transformations.

**Course Aims and Objectives:** The aim of this course is to acquaint students with the basic results in the semigroup theory, along with the applications of this apparatus in other mathematical disciplines. The volume of material studied enables students to further study the

semigroup theory on their own, to be able to take other courses using the semigroup theory, to attend specialized scientific seminars in algebra, and to read articles and books in the relevant field.

**Teaching Methods:** Lectures, consultations, a course paper

**Preliminary Enrollment Conditions:** Basic knowledge of higher algebra is required.

**Assessment:** Current testing during the semester, including a course paper, and a written exam on the lectures material.

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** Students agree with the lecturer the desired dates within the announced calendar for the exam sessions.

## HISTORY OF MATHEMATICS

**Semester:** 1st semester
**Course type:** Lectures
**Hours (per week):** 3 hours lectures
**Credits:** 5.0 credits
**Assessment:** An exam
**Lecturer:** Assoc. Prof. Kostadin Samardzhiev, Ph.D.
**Department:** Mathematics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 557, e-mail: k_samardzhiev@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course includes the main stages of the development of mathematical knowledge until the end of the 19th century.

**Course Aims and Objectives:** It is to acquaint students with the basic stages in the development of mathematical knowledge by the end of the 19th century and to give them an idea of how this knowledge can be used in their future work as Mathematics teachers.

**Teaching Methods:** Lectures and consultations. The "History of Mathematics" course is taught according to the current plan – lectures, grouped in a block of 3 hours per week.

**Preliminary Enrollment Conditions:** Knowledge from the "School Mathematics" course.

**Assessment:** A written exam on the theory.

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** Students agree with the lecturer the desired dates within the announced calendar for the exam sessions.

## EXTRACURRICULAR MATHEMATICS WORK CONTENT AND METHODOLOGY

**Semester:** 1st semester
**Course type:** Lectures and lab exercises

**Hours (per week):** 2 hours lectures, 1 hour lab exercises
**Credits:** 5.0 credits
**Lecturer:** Corresponding member Prof. Oleg Mushkarov, D.Sc.math.
**Department:** Electronic engineering, electronics and automation, Technical Faculty, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 557, e-mail: muskarov@math.bas.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum
**Brief Description:** The course includes the study of some basic methods for solving extreme geometric problems: inequality method, geometric transformation method, analytical method, principle of touching, etc. They also solve a number of classic extreme problems, such as Heron's, Schwartz's, Toricelli's, Malfatti's and others' problems. Through seminars, students acquire skills to apply theoretical knowledge and methods to solving problems in mathematical Olympiads and competitions, and to develop topics for extracurricular work in Mathematics.

Extracurricular activity includes homework, work in a library, consultations and a course paper.
**Course Aims and Objectives:** Students-future teachers should acquire some basic principles when working with students with an increased interest in Mathematics and acquire skills to solve Olympic problems and develop topics for extracurricular Mathematics work.
**Teaching Methods:** Lectures, seminars, homework, consultations, a course paper
**Preliminary Enrollment Conditions:** Good knowledge of school algebra and geometry.
**Assessment:** A written exam on the seminars and lectures and a review of a course paper made.
**Course Registration:** It is necessary to apply to the Student office.
**Exam Registration:** In agreement with the lecturer and the Student office.

# INFORMATION SYSTEMS DEVELOPMENT

**Semester:** 1st semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 2 hours lectures and 1 hour lab exercises
**Credits:** 5.5 credits
**Lecturer:** Assoc. Prof. Velin Kralev, Ph.D.
**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: velin_kralev@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum
**Brief Description:** The course is designed to build and summarize the knowledge of students in Informatics, to introduce them to basic categories of software and to development of information systems. Particular attention is paid to organizational aspects in the use and development of information systems.

Extracurricular activity includes a course paper, work in a library and computer work. The course is a natural extension of the "Programming introduction" and "Databases" courses.

**Course Aims and Objectives:** Upon completion of the course, students should:
- know the main stages and approaches used in software technology;
- be able to develop software products (information systems) in accordance with the principles of software production.

**Teaching Methods:** Lectures, discussions, lab exercises

**Preliminary Enrollment Conditions:** Students should have studied the "Databases" course.

**Assessment:**
- A course paper – 50% of the grade;
- a written exam- test – 50% of the grade.

The course is considered successfully completed with a minimum of 51% of the maximum score.

**Exam Registration:** In agreement with the lecturer and the Student office.


## MATHEMATICS AND INFORMATICS EDUCATIONAL COMPUTER GAMES

**Semester:** 1st semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 2 hours lectures, 1 hour lab exercises
**Credits:** 5.5 credits
**Assessment:** An exam
**Lecturer:** Prof. Daniela Tuparova, Ph.D.
**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: ddureva@swu.bg


**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The "Mathematics and Informatics Educational Computer Games" course is a part of the curriculum and includes 8 summarized topics. Current testing and an exam are provided as a form of control.

The syllabus content covers the main topics related to theoretical, methodological and technical preparation for the creation and use of educational computer games in Mathematics and Informatics.

Those who successfully passed the "Mathematics and Informatics Educational Computer Games" exam will acquire the necessary minimum of knowledge both to create prototypes of elementary educational games and to find ways to implement them in the learning process.

In practical exercises, students are trained in developing a scenario, creating an educational games and finding place and role of computer games in Mathematics and Informatics learning process.

**Course Aims and Objectives:** The aim of the "Educational Computer Games in Mathematics and Informatics" course is to develop knowledge and skills to create scenarios and prototype of educational computer games and apply them in learning process

**Expected Results:** Upon completion of the course, students should be able to:
- create educational computer game scenarios for elementary school students;
- create prototypes of elementary educational games with various technological means;
- plan lesson activities;
- implement educational computer games in learning process.

**Course Registration:** It is necessary to apply to the Student office

**Exam Registration:** In agreement with the lecturer and the Student office.

# SPECIALIZED STATISTICAL SOFTWARE

**Semester:** 1st semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 2 hours lectures, 1 hour lab exercises
**Credits:** 5.5 credits
**Lecturer:** Assoc. Prof. Elena Karashtranova, Ph.D.
**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: helen@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The "Specialized Statistical Software" course is aimed at a thorough study of statistical modelling and its modern applications combined with the use of computer technology. Basic principles for modelling of empirical data and the capabilities of modern technologies for their realization (MS EXCEL, SPSS and STATISTICA, etc.) are included in the course.

**Courses Aims and Objectives:** The main aim is:
- to give students theoretical knowledge of contemporary application programs, along with the specifics of their use;
- to give students the knowledge to create correct statistical models and develop skills for their application;
- to introduce students to modern technologies for statistical data analysis;
- to prepare students for their future research work.

**Teaching Methods:** Seminars, discussions, exercises, simulations

**Preliminary Enrollment Conditions:** Students must have studied "Probability and Statistics" and "Information Technology" courses.

**Assessment:**
- A course paper – 30% of the grade;
- a written exam-test – 30% of the grade;
- performing current assignments – 40% of the grade.

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

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** In agreement with the lecturer and the Student office.


# INTERACTIVE MULTIMEDIA TECHNOLOGY

**Semester:** 1<sup>st</sup> semester

**Course type:** Lectures and lab exercises

**Hours (per week):** 2 hours lectures, 1 hour lab exercises

**Credits:** 5.5 credits

**Assessment:** An exam

**Lecturer:** Prof. Daniela Tuparova, Ph.D.

**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: ddureva@swu.bg


**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course is designed to provide training for future teachers in Mathematics, Informatics and Information Technology in the field of application of Information Technology in education, and in particular in the development of multimedia interactive learning content.

It is aimed at mastering basic principles and technologies for creating, processing and integrating various multimedia objects. The practical implementation is related to the design and development of interactive educational games (serious games, educational computer games). In recent years, there has been an increase in the development trends of so-called "serious games" applicable to various degrees of formal and corporate education and training. The acquired knowledge and skills can be actively used in the field of multimedia advertising and web design.

Questions related to basic concepts in interactive multimedia are included. The main features of authoring environments for creating interactive multimedia content are discussed. Basic technologies for creating interactive mobile applications and virtual reality are also discussed. Emphasis is placed on creating interactive presentations using VBA macros for learning purposes.

Various training methods are used. It focuses on problem solving and project based learning.

**Courses Objectives and Expected Results:** Upon completion of the course, students should be able to:

- create, edit and integrate various multimedia objects;
- develop interactive learning content using MS PowerPoint with VBA;
- apply basic principles and technologies for designing and creating interactive multimedia content.

**Teaching Methods:** Lectures, discussions, exercises, project based learning

**Preliminary Enrollment Conditions:** The "Information Technology" course

**Assessment:**

- A current grade – 60% of the grade;
- a written exam-test – 40% of the grade.

The course is considered to be successfully completed with a minimum of 53% of the maximum score.

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** In agreement with the lecturer and the Student office.


# INTERNET PROGRAMMING

**Semester:** 1st semester

**Course type:** Lectures and lab exercises

**Hours (per week):** 2 hours lectures, 1 hour lab exercises

**Credits:** 5.5 credits

**Assessment:** An exam

**Lecturer:** Assist. Prof. PhD Nadezhda Borisova

**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: nborisova@swu.bg


**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course is designed as an introduction to the development of Web-based information systems using the widespread and accessible JavaScript, CSS and PHP/MySQL technologies. It covers topics related to the design and implementation process of Internet/Intranet information systems. The course introduces students to the syntax and semantics of JavaScript and PHP, the correct design of information systems related databases, and the rules for building effective applications. Questions have also been raised related to improving the reliability and security of information systems in the context of the global information infrastructure.

**Course Aims and Objectives:** Upon completion of the course, students should be able to:

- design on Web-based information systems with "client-server" architecture;
- implement Web-based information systems using PHP/MySQL technology.

**Teaching Methods:** Lectures, discussions, lab exercises

**Preliminary Enrollment Conditions:** Students should have studied the "Databases" and "Web Design Workshop" courses.

**Assessment:**

- A course paper – 30% of the grade;
- a written exam-test – 70% of the grade.

The course is considered to be successfully completed with a minimum of 65% of the maximum score.

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** In agreement with the lecturer and the Student office.

# EVENT-DRIVEN PROGRAMMING

**Semester:** 1st semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 2 hours lectures, 2 hours lab exercises
**Credits:** 5.5 credits
**Lecturer:** Prof. Daniela Tuparova, Ph.D.
**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: ddureva@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum
**Brief Description:** The course is an introduction to event programming with Visual Basic (VB).

Topics related to graphical user interface design, operating system connection, and more are discussed.
**Course Aims and Objectives:** Upon completion of the course, students should be able to:
- work in a specific integrated visual development environment with graphical user interface;
- list and apply basic algorithmic constructs and operators in the VB programming language;
- create basic data structures in the event-driven programming environment and perform basic operations to work with them;
- set up and use objects to create software products in an event programming environment with graphical user interface.

**Teaching Methods:** Lectures, discussions, lab exercises
**Preliminary Enrollment Conditions:** Students should have studied the "Information Systems Development" course.
**Assessment:**
- A current grade – 50% of the grade;
- a written exam-test – 50% of the grade.

The course is considered to have successfully completed at least 53% of the maximum score.
**Exam Registration:** In agreement with the lecturer and the School office.

# TEACHING MATHEMATICS SPECIALIZED SOFTWARE

**Semester:** 2nd semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 1 hour lectures, 2 hours lab exercises
**Credits:** 3.0 credits
**Lecturer:** Prof. Daniela Tuparova, Ph.D.

**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: ddureva@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course is designed to provide training for future Mathematics, Informatics and Information Technology teachers in applying Information Technology in Mathematics education in accordance with rapidly changing technologies.

Topics related to general characteristics of software applications in Mathematics education, application of general purpose software – spreadsheets, specialized software for dynamic mathematics – Mathematical constructor, Geogebra, Geonect and others are discussed. Methodical aspects in applying software in Mathematics education are also discussed.

**Course Aims and Objectives:** Upon completion of the course, students should be able to:
- evaluate the capabilities of software products for their application in Mathematics education;
- make use of spreadsheet capabilities in Mathematics lessons;
- use adequately specialized software for dynamic mathematical constructions.

**Teaching Methods:** Lectures, discussions, lab exercises

**Preliminary Enrollment Conditions:** None

**Assessment:**
- A current grade – 60% of the grade;
- a written exam-test – 40% of the grade.

The course is considered to be successfully completed with a minimum of 53% of the maximum score.

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** In agreement with the lecturer and the Student office.


## COMPUTER SYSTEMS FOR MATHEMATICAL CALCULATIONS

**Semester:** 2nd semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 1 hour lectures, 2 hours lab exercises
**Credits:** 3.0 credits
**Lecturer:** Assist. Prof.  PhD Margarita Todorova
**Department:** Informatics, PMF, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588532, e-mail: todorova@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** In the process of providing mathematical education, computer systems for mathematical calculations (CSMC) are implemented more and more successfully. They free the learner from complex and tedious calculations and allow him to focus on analyzing and

solving a particular assignment. Unlike programming languages, the dialogue with computer systems for mathematical calculations is in a native language, using traditional notation and formulas. This computer technology is especially effective in solving a variety of application assignments and has sufficient graphical visualization capabilities.

**Course Aims and Objectives:** The main aim is providing practical skills for working with modern computer systems for mathematical calculations.

**Teaching Methods:** Lectures, discussions, practical work with mathematical calculus systems, such as Matlab, Mathematika, Maple, MathCad, Derive

**Preliminary Enrollment Conditions:** Basic knowledge of number theory, algebra, analysis, differential equations, numerical methods and programming is required.

**Assessment:** The exam: two-part writing – problems and a course paper defense. The grade is formed using the following scheme: 50% a written exam and 50% a course paper defense.

Part I (a course paper defense): A practical assignment should be done using a computer system for mathematical calculations of choice.

A written exam: A written exam is allowed for students with a passing grade at least Satisfactory (3).

Part II (Theory): It is conducted on 2 main topics and, if necessary, additional questions on other topics of the syllabus.

Working time – 2 hours (120 minutes).

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** In agreement with the lecturer and the Student office.


# DIALOGIC TEACHING SOFTWARE IN MATHEMATICS DEVELOPMENT METODOLOGY

**Semester:** 2$^{nd}$ semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 1 hour lectures, 2 hours lab exercises
**Credits:** 3.0 credits
**Lecturer:** Prof. Daniela Tuparova, Ph.D.
**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: ddureva@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course is designed to provide training for future teachers in Mathematics, Informatics and Information Technology in the field of applying Information Technology in Mathematics education in regard to the methodology and technology of interactive learning software development.

Topics related to common features of interactive learning software, structuring and software development applications are discussed. The course allows students to choose development technology such as: Interactive Presentations with MS Power Point and Visual Basic for Application, Adobe Captivate, Adobe Flash and Java Script.

**Course Aims and Objectives:** Upon completion of the course, students should be able to:

- design interactive software;
- develop interactive software;
- analyze the functional features of interactive learning software.

**Teaching Methods:** Lectures, discussions, lab exercises, a project work

**Preliminary Enrollment Conditions:** The school course in "Information Technology", the school courses in "Algebra" and "Geometry", the "Teaching Mathematics Methodology" course, the "Audio-Visual and Information Technology in Teaching" course

**Assessment:**

- A current grade – 70% of the grade;
- a written exam-test – 30% of the grade.

The course is considered to be successfully completed with a minimum of 53% of the maximum score.

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** In agreement with the lecturer and the Student office.


# INTERCULTURAL EDUCATION

**Semester:** 2$^{nd}$ semester
**Course type:** Lectures and seminars
**Hours (per week):** 2 hours lectures, 1 hours seminars
**Credits:** 3.0 credits
**Assessment:** An exam
**Lecturer:** Assoc. Prof. Anastasia Pashova, Ph.D.
**Department:** Pedagogy, Faculty of Pedagogy, SWU "Neofit Rilski"– Blagoevgrad, Phone: 0882/540 168, e-mail: asia_p@swu.bg


**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course consists of 30 hours lectures, 15 hours seminars and 75 hours of extracurricular activity.

The course is one of the first attempts to find alternative solutions for intercultural education at university level and in particular for the preparation of bachelors, teachers in Mathematics and Informatics.

The course includes knowledge of the philosophy, subject, aims and objectives of intercultural education. It clarifies the terminological apparatus used in the discipline. The content of the curriculum addresses the topics of intercultural education and pedagogy. Various theories of culture and ethnicity are discussed and the connection between them is sought. The psychological aspects of intercultural interactions are discussed. Students are provided with information about interculturalism – its nature, cultural misunderstandings and conflicts, the factors for effective intercultural interactions; models for assessing students' needs and problems of differences.

**Course Aims and Objectives:** The course main objective is to form students' generalized ways to analyze independently the philosophical and pedagogical dimensions of culture, ethnicity and intercultural education and to provide students with mastery of intercultural competences that will allow them to be more effective in cultures other than their own. The content of the course will address the major problems of intercultural interactions and students will master approaches to work in a different intercultural environment.

**Teaching Methods:** The lecture part is designed as multimedia presentations in the course. Independent research activity of the students themselves is strongly advocated in the course education. It is illustrated with literature and photo material.

**Expected Results:** It is:

- to stimulate students' educational and research activity;
- to learn the conceptual apparatus related to intercultural education and pedagogy and interpret critically and creatively, and use it reasoned when defending a scientific thesis;
- to acquire skills to relate theoretical concepts to the language and problems of working with minority children;
- to motivate critical attitude to pedagogical theories and to build technology for management and decisions in educational practice when working in different ethno-cultural environment;
- to introduce a wide range of teaching strategies for working with minority students and parents;
- to acquire knowledge of students' ethno-cultural specificity and cultural identity;
- to have opportunities to acquire skills for analyzing and adapting different programs and study documentation when working in an intercultural environment;
- to adopt attitudes towards: sensitivity to "the other" and "the other culture", tolerance for ambiguity, which is greater in multicultural groups; maintaining a personal cultural identity; patience; interpersonal communication, interest in students and their culture; openness to their problems and openness to the "other culture".

**Assessment:** Organization of the assessing and the current testing credits earning during the semester. Total credit is 5 (five) units:

- Credits from auditing. 1.5 (one and a half) credits are earned from lectures and seminars attendance and participation degree. Attendees of less than 10 hours do not receive this 1.5 credit.
- Credits from extracurricular activities. 3.5 credits are earned from the current testing during the semester, which checks students' self-study. Student activity at the seminars is assessed, and each student can choose the participation form in them – an abstract, a report, active participation in a discussion on a predefined topic, lessons planning, student publications, and participation in student scientific conferences. A student who has not been active during the seminars is tested.
- Conditions for exam admission. 5 credits are required for exam admission. Students who have not earned 5 credits are not eligible for the semester exam.

- ExamRequirements. Students whose overall average grade from curricular activity and self-study is Excellent (5, 50) are exempt from the exam and the grade is considered final for the semester.
- Assignments for students who are not admitted to the exam due to a Poor (2) grade of curricular activity and/or current testing:
  - making a test;
  - abstracts development on three set topics.

  The total cumulative grade of the three assignments should be no lower than Satisfactory (3).

**Course Registration:** It is necessary to apply to the Student office.
**Exam Registration:** In agreement with the lecturer and the Student office.


# COMPUTER PROGRAMMING LEARNING ENVIRONMENTS FOR CHILDREN DEVELOPMENT

**Semester:** 2nd semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 2 hours lectures, 1 hour lab exercises
**Credits:** 3.0 credits
**Lecturer:** Prof. Daniela Tuparova, Ph.D.
**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: ddureva@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum
**Brief Description:** The course is designed to provide training for future Informatics and Information Technology teachers in the field of applying computer programming learning environments for children.

Topics related to common features of computer programming learning environments for children are considered. Specific features of Scratch, Kodu, Tynker, etc., block programming environments. Game-based online training resources for programming are also considered. Methodical aspects of teaching children in elementary and upper secondary education are also discussed.
**Course objectives and Expected Results:** Upon completion of the course, students should be able to:
- program in a block programming environment;
- use online game-based programming environments;
- select appropriate resources and programming training assignments appropriate to age characteristics of students.

**Teaching Methods:** Lectures, laboratory exercises, consultations, course assignments
**Preliminary Enrollment Conditions:** Basic knowledge of the "Teaching Methodology in Informatics", "Teaching Methodology in Mathematics", "Pedagogy", "Psychology",

"Information Technology in Teaching Students with Special Educational Needs" courses is required.

**Assessment:** The exam includes defending developed projects and providing a practical assignment solution on the spot.

**Exam Registration:** In agreement with the lecturer and the Student office.

## INFORMATION TECHNOLOGY IN TEACHING STUDENTS WITH SPECIAL EDUCATIONAL NEEDS

**Semester:** 2$^{nd}$ semester

**Course type:** Lectures and lab exercises

**Hours (per week):** 2 hours lectures, 1 hour lab exercises

**Credits:** 3.0 credits

**Lecturer:** Prof. Daniela Tuparova, Ph.D.

**Department:** Informatics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: ddureva@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course is designed to provide training for future Informatics and Information Technology teachers in the field of applying Information and Communication Technology in teaching and working with children with special educational needs (SEN).

Topics related to hardware and software assistive technologies for various types of disruption and educational needs are considered.

The course was developed with the assistance of Assoc. Prof. Lyudmila Yashkova from the Department of Informatics Teaching at Komenski University, Bratislava and assistants from the Assistive Technology Center at Komenski University, Bratislava, Slovakia. With the Slovak Academic Information Agency financial support.

**Course Aims and Objectives:** Upon completion of the course, students should be able to:
- identify appropriate teaching technologies for students specific educational difficulties;
- adapt educational resources for students with different educational needs;
- use game-based teaching;
- select appropriate resources and technologies for teaching special educational needs persons.

**Teaching Methods:** Lectures, lab exercises, discussions, a course paper on a selected topic from the seminars

**Preliminary Enrollment Conditions:** Basic knowledge of the "Pedagogy", "Psychology" and "Information Technology in Teaching Students with Special Educational Needs" courses is required.

**Assessment:** The exam includes presenting and defending a developed course paper.

**Exam Registration:** In agreement with the lecturer and the Student office.

# MATLAB MATHEMATICAL MODELLING PRACTICAL COURSE

**Semester:** 2<sup>nd</sup> semester

**Semester:** $2^{nd}$ semester
**Course type:** Lectures and lab exercises
**Hours (per week):** 1 hour lectures, 2 hours lab exercises
**Credits:** 3.0 credits
**Lecturer:** Assist. Prof. Boyana Garkova, Ph.D.
**Department:** Mathematics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/ 588 557, e-mail: big@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum
**Brief Description:** The course is included as an elective in the "Technology of Teaching Mathematics and Informatics" curriculum and is intended for students with a keen interest in mathematical modelling and mathematical models numerical implementation through software products, in particular – Matlab software environment. It introduces students to the abundant capabilities of Matlab, which is a solid base for performing analytical and numerical calculations in a number of fields, along with creating their own software packages.
**Course Aims and Objectives:** The course discusses basic functions of the Matlab core and how to create new programs (m-files). Particular attention is paid to programming and creating custom programs for solving mathematical models. The aim of the laboratory exercises is to acquaint students with the graphical environment for simulation of Simulink systems and the abundant Matlab capabilities for calculating boundaries, derivatives, integrals, functions study and complex numbers actions or most total with the environment applying in mathematical modelling.
**Teaching Methods:** Lectures, lab exercises, consultations, tests
**Preliminary Enrollment Conditions:** Basic knowledge of the "School Mathematics" course and subjects, such as "Linear Algebra", "Analytical Geometry", and "Mathematical Analysis" is required. It is also an advantage if a programming language is known.
**Assessment:** Current testing during the semester, including two tests, and a written exam on lab exercises and lecture material.
**Course Registration:** It is necessary to apply to the Student office.
**Exam Registration:** In agreement with the lecturer and the Student office.

# PRACTICUM FOR SOLVING SCHOOL MATHEMATICS COURSE PROBLEMS

**Semester:** $2^{nd}$ semester
**Course type:** Lectures and seminars
**Hours (per week):** 1 hour lectures, 2 hours seminars
**Credits:** 3.0 credits
**Assessment:** An exam
**Lecturer:** Assoc. Prof. Kostadin Samardzhiev, Ph.D.

**Department:** Mathematics, Faculty of Mathematics and Natural Sciences, SWU "Neofit Rilski"– Blagoevgrad, Phone: 073/588 532, e-mail: k_samardzhiev@swu.bg

**Discipline Curriculum Status:** An elective course in the "Technology of Teaching Mathematics and Informatics" curriculum

**Brief Description:** The course includes solving problems in the specified topics from the syllabus, analyzing and summarizing the solving methods, applying students' knowledge of the "Methodology" and the courses learned: "School Algebra basics" and "School Geometry basics" course.

**Course Aims and Objectives:** The aim of the course is to acquaint students with the types of mathematical problems from the "School Mathematics" course. It also clarifies the aims pursued by solving mathematical problems; it systematizes and consolidates the methodology learned, thus deepen students' preparation for their future profession; it forms skills to solve problems from the "School Mathematics" course with knowledge of students from the relevant age group.

The problem-solving practicum gives students, in their capacity of future teachers, an idea of the tasks system in the school course in algebra, analysis and geometry, and more precisely algebra: identical transformations of expressions, equations, inequalities and systems; analysis: numerical series, functions – boundaries, derivatives, extrema; geometry: geometric transformations in the plane, vectors, locus, polygons, line and plane in space, geometric shapes.

For every topic reviewed a brief theoretical and methodical summary is made under the immediate guidance of the lecturer. Students are able to individually develop groups of tasks of various complexities, basic methods for solving the tasks reviewed are systemized and clarified.

**Course objectives:**
- Forming skills for solving problems related to the "School Mathematics" course with knowledge of students from the respective age group;
- forming skills for defining objectives, tasks and expected results which solving certain mathematical problem seeks;
- systematization and confirmation of material studied in Mathematics Training Methodic;
- extending and advancing students' training for their future occupation.

**Expected results:** Every student should be able to develop a didactical system of tasks for certain topic from the school Mathematics curriculum and to clarify the basic methods for solving tasks reviewed.

**Teaching Methods:** Seminars, consultations, homework, a course paper, current tests

**Preliminary Enrollment Conditions:** Some knowledge of the "Mathematics teaching methodology" course and knowledge of Mathematics content of V-XII grade (profiled preparation for VIII-XII grade) is required.

**Assessment:** It is carried out by controlling attendance at seminars, making 2 current tests and writing a course paper.

Tests are on the material as follows: first – on modules 1, 2, and 3; the second – on modules 4 and 5.

A course paper is developed by students on a given topic from the "School Mathematics" course – without limitations and with maximum exhaustiveness.

Each test is rated with 20 points, while the course paper presentation and defence is rated with 15 points.

**Course Registration:** It is necessary to apply to the Student office.

**Exam Registration:** In agreement with the lecturer and the Student office.