QUALIFICATION CHARACTERIZATION

OF MAJOR FIELD OF STUDY "PHYSICS AND MATHEMATICS"

"BACHELOR OF SCIENCE" DEGREE
WITH PROFESSIONAL QUALIFICATION "TEACHER OF PHYSICS AND MATHEMATICS"

I. Requirements to professional qualities and competences of students completed this major field of study

Neofit Rilski South-West University prepares qualified teachers in physics and mathematics that can apply their knowledge and skills in the area of science, culture and education in Bulgaria and abroad.

After completion of Bachelor of Science (BSc) degree in Physics and Mathematics, they can successfully realize themselves as: teachers in physics and mathematics in all types of secondary schools and educators in study halls, boarding houses and related; they should know how to organize and conduct educational process in physics, mathematics, integrated with other physics disciplines and perform work as a class-teacher. These professionals should also know to conduct demonstration and laboratory experiments, to use the learning laboratory and computer equipment. Bachelor degree graduates may hold positions in professional scientific organizations as physicist and mathematicians, head of laboratory, research associate and assistant professor at research institutes and universities after successful contest.

The posts of employment that can be hold by those graduated the specialty "Physics and Mathematics", with Bachelor of Science (BSc) degree , in accordance with National Classifier of Professions and Posts of Employment, are: physicist, mathematician, teacher in physics and mathematics in junior high school, teacher in physics and mathematics in high school, teacher specialist in educational methods, educator, teacher in science and mathematics in out-of-class and school activities, teacher in science and mathematics in subsidiary units of the system of public education.

At completion of Bachelor of Science degree in Physics and Mathematics, students obtain:

- ✓ profound knowledge in the area of physics and mathematics;
- ✓ good preparation in the area of teaching physics and mathematics as well as solid practical skills conforming to modern European standards and requirements;
- ✓ good opportunities for realization as experts in Bulgaria or abroad;
- ✓ thinking style and affinity to the quickly changing requirements of educational development;
- ✓ opportunity for successful continuation of education in higher degrees (Master of Science and PhD) in Bulgaria and abroad.

II. Requirements to preparation of students completing this major field of study

Students completed BSc degree in Physics and Mathematics: get profiled fundamental and thorough knowledge of the school course of physics and mathematics, psychology, pedagogy, methods of teaching physics and mathematics, audio-visual and information technologies in education, methods and technology of school experiments in physics, teaching children and pupils with special needs and others. During their preparation students receive theoretical and practical knowledge and skills in physics, mathematics, microprocessors and computer architecture, computer modeling and WEB-

design, in optical communications and use of modern information technologies in the automation of scientific experiments and exchange of information.

Qualification characterization of major field of study "Physics and Mathematics" for BSc degree is a basic document that determines rules of developing the curriculum. This qualification characterization conforms to legislation in the area of higher education in Republic of Bulgaria.

CURRICULUM

Field of Study: Physics and Mathematics, Period of Study: 4 years (8 semesters)

First Year

First Semester	ECTS credits	Second Semester	ECTS credits
Compulsory Courses		***Compulsory Courses***	
Linear Algebra	7	Mathematical Analysis 2	6.5
Analytic Geometry	7	Higher Algebra	6.5
Mathematical Analysis 1	7	Molecular Physics	8
Mechanics	9	Foreign Language 1	4.5
Sports	0	Pedagogy	4.5
		Sports	0
	Total 30		Total 30

Second Year

First Semester	ECTS credits	Second Semester	ECTS credits
Compulsory Courses		***Compulsory Courses***	
Differential Equations	5	Optics	10
Informatics	4	Theoretical Mechanics	6.5
Electricity and Magnetism	9	School Course of Geometry	9
Psychology	4	Optional 1	4.5
School Course of Algebra and Analysis	8	Sports	0
Sports	0		
		Optional Courses (1 course)	
		General Biology and Biophysics	
		Automatization of Physical Experiments	
		Environmental Physics	
		Mathematical Methods in Physics	
		Renewable Energy Sources	
		Methods of Teaching "The Man and the Nature"	
		Methods of Teaching Optional Physics School Courses	
	Total 30		Total 30

Third Year

First Semester	ECTS credits	Second Semester	ECTS credits
Compulsory Courses		***Compulsory Courses***	
Methods of Teaching Physics	8	Quantum Mechanics	6
Attendance of Physics Lessons	1.5	Methods of Teaching Mathematics 1	3.5
Audio-visual and Information Technologies in Education	1.5	Astronomy	5
		Methods and Technology of School Experiments in Physics	3.5
Atomic Physics and Nuclear Physics	8	Optional 3	3.5
Electrodynamics	6	Modern Methods of Research of Aerocosmic Space and Nature	3.5
Optional 2	5		
Sports	0	Teaching Children and Pupils with Special Needs	5

		Sports	0
Optional Courses (2 course) Mathematical structures Descriptive Geometry Basics of Arithmetic		***Optional Courses*** (3 course) Methods of Educational Research Diagnostics of Academic Achievements in Physics History of Physics	
	Total 30		Total 30

Fourth Year

First Semester	ECTS credits	Second Semester	ECTS credits
Compulsory Courses		***Compulsory Courses***	
Methods of Teaching Mathematics - II part	6	Pre-graduation School Practice in Physics	4.5
Differential Geometry	7.5	Pre-graduation School Practice in Mathematics	4.5
Methods of Solving Problems in Physics	4.5	Optional 5	4
Optional 4	4.5	Optional 6	3.5
School Practice in Physics	3	Optional 7	3.5
School Practice in Mathematics	3	Sports	0
Attendance of Mathematics Lessons	1.5	Preparation of Undergraduate Thesis or Preparation for State Exam	10
Sports	0		
		Optional Courses (5 course) Practice of Solving Problems from School Mathematics Course Comparative Education (Integration Aspects)	
Optional Courses (4 course) Geometry of the circles Basics of Geometry Basics of Computer Graphics Content and Methods of Optional and Out-of-class Studies in Mathematics		***Optional Courses*** (6 course) Psychological and Pedagogical Problems of Teaching Mathematics Formation of Mathematical Concepts Theoretical Bases of Mathematics Education History of Mathematics	
		Optional Courses (7 course) Application of Lasers in Science and Technology Physics of Semiconductors Statistical Physics and Thermodynamics Practice in Astronomy Safety in Extreme Situations Photoenergy General Electrotechnics	
	Total 30		Total 30

TOTAL FOR 4 ACADEMIC YEARS: 240 CREDITS

COURSES DESCRIPTION

LINEAR ALGEBRA

Semester: 1 semester
Course Type: Lectures and tutorials
Hours per week /FS/SS: 3 lecture hours and 2 tutorial hours /FS
ECTS credits: 7,0 credits
Lecturer: Assist. Prof. Dr. Ilinka Dimitrova
Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad,
tel. +35973588532, e-mail: ilinka_dimitrova@swu.bg
Course Status: Compulsory course in the B.S. Curriculum of Physics and Mathematics.
Short Description: The education of that discipline includes some of the basic notations in combinatory and complex numbers. Students study matrices, determinants, systems linear equations and methods for their solving, linear spaces, linear transformations, and quadratic forms.
Course Aims: The students have to obtain knowledge and skills to apply the learned theory for modeling and solving real practical tasks, to do basic operations with matrices, to solving determinants and systems linear equations using the methods of Gauss and Kramer, to be able to distinguish the correspondence between algebraic objects, to determine their characteristics and to transfer them on others – difficult to examine.
Teaching Methods: lectures, tutorials, homework, and problem solving tests.
Requirements/Prerequisites: The students should have basics knowledge from school mathematics.
Assessment: permanent control during the semester including homework and two written exams, and written exam in the semester's end on topics from tutorials and on topics from lectures.
Registration for the exam: coordinated with the lecturer and student Service Department
References:
Basic Titles

1. A. Borisov, Il. Guidzhenov, Il. Dimitrova. "Linear Algebra". University Press, South-West University "Neofit Rilski", Blagoevgrad, 2009 /in Bulgarian/.
2. A. Borisov. M. Kacarska. "Handbook on Linear Algebra and Analytic geometry". University Press, South-West University "Neofit Rilski", Blagoevgrad, 2011 /in Bulgarian/.
3. K. Yordzhev, Il. Dimitrova, A. Markovska, Il. Gyudzhenov. Variants for Examinations on Linear Algebra and Analytic Geometry, University Press, South-West University "Neofit Rilski", Blagoevgrad, 2007 /in Bulgarian/.
4. K. Denecke, K. Todorov. "Lectures on Linear Algebra". University Press, South-West University "Neofit Rilski", Blagoevgrad, 1992 /in Bulgarian and German/.
5. M. Aslanski, B. Giurov. "Handbook on Linear Algebra". University Press, South-West University "Neofit Rilski", Blagoevgrad, 1999 /in Bulgarian/.
6. K. Dochev, D. Dimitrov. "Linear Algebra". Sofia, 1977 /in Bulgarian/.
7. D. Dimitrov. "Collections of Problems on Linear Algebra". Sofia, 1978 /in Bulgarian/.

8. A. Kurosh. “Course on Algebra”. Sofia, “Nauka i izkustvo”, 1967 /in Bulgarian and Russian/

Additional Titles

1. D.K. Fadeev, I.S. Sominski. “Handbook on Algebra”. Moscow, “Nauka”, 1968 /in Russian/.
2. I.V. Proskuriakov. “Handbook on Linear Algebra”. Moscow, “Nauka”, 1967 /in Russian/.
3. V.A. Ilin, E.G. Pozniak. “Linear Algebra”. Moscow, “Nauka”, 1984 /in Russian/.

ANALYTIC GEOMETRY

Semester: 1 semester
Course Type: Lectures and tutorials
Hours per week: 3 lecture hours and 2 tutorial hours /Fall Semester
ECTS credits: 7 credits
Lecturer: Prof. Dr. Adrijan Borisov
Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University “Neofit Rilski” – Blagoevgrad,
tel. +35973588532, e-mail: adribor@swu.bg
Course Status: Compulsory course in the B.S. Curriculum of Mathematics and Informatics.
Short Description: The education of that discipline includes learning of vector calculus, affine coordinate systems and analytic representations of straight lines and planes. After introducing the cross ratio, the projective coordinate systems are used as well. The basic elements of the projective, of the affine and of the metric theory of the curves and the surfaces of the second degree are taught.
Course Aims: The students have to obtain knowledge and skills for application of the analytic apparatus for research of geometric objects.
Teaching Methods: lectures, tutorials, homework, problem solving tests.
Requirements/Prerequisites: Linear Algebra and Mathematical Analysis
Assessment: permanent control during the semester including homework and two written exams, and written exam in the semester’s end on topics from tutorials and on topics from lectures.
Registration for the exam: coordinated with the lecturer and student Service Department
References:

Basic Titles

1. A. Borisov. “Lectures on Analytic geometry”. University Press, South-West University “Neofit Rilski”, Blagoevgrad, 2000 /in Bulgarian/.
2. A. Borisov. “Handbook on Analytic geometry”. University Press, South-West University “Neofit Rilski”, Blagoevgrad, 2011 /in Bulgarian/.
3. G. Stanilov. “Analytic geometry”. Sofia, 2000 г./in Bulgarian/.

Additional Titles

1. A. Borisov. “Analytic geometry”. University Press, South-West University “Neofit Rilski”, Blagoevgrad, 1993 /in Bulgarian/.

2. A. Gjonov, N. Stoev. “Handbook on Analytic geometry”. Sofia, 1988 /in Bulgarian/.
3. N. Martinov . “Analytic geometry”. Sofia, 1989 /in Bulgarian/.
4. B. Petkanchin. “Analytic geometry”. Sofia, 1961 /in Bulgarian/.

MATHEMATICAL ANALYSIS - I PART

Semester: 1 semester
Type of the course: Lectures and tutorial
Hours per week /FS /SS: 3 lecture hours and 2 tutorial hour /SS/
ECTS credits: 7 credits
Lecturers: Assoc. Prof. PhD Vassil Grozdanov, assist. prof. Anka Markovska and assist. prof. Tzanka Mitova
Department: Department of Mathematics, FNSM, SWU “Neophit Rilsky”, 073-8889132
Course Status: Compulsory course in the B. S. Curriculum of Physics .
Short Description: The main topics to be considered:

- Numerical sequences
- Numerical series
- Limit, continuity and differentiability of functions
- Integrals of functions of real variables
- Applications of the integral calculation

Course Aims: This course develops in details the problems of numerical sequences, numerical series, differential and integral calculation of functions of one real variable.
Teaching Methods: Lectures, tutorials, homework, problem-solving tests. During the lectures students are acquainted with the basic theoretical material- definitions, theorems, applications, with the methods of theorems proofs. During seminars students solve practical problems. The knowledge obtained within the theoretical practice is used and it is also used in the process of problem solving.
Requirements/Prerequisites: Basic knowledge of courses in Elementary Mathematics, Linear Algebra, Analytical Geometry is necessary.
Assessment: written exam on seminars and discussion on the theoretical material from the lectures.
Registration for the exam: Students and the lecturer agree on the convenient dates within the announced calendar schedule of examination session.
REFERENCES:

A. <u>BASIC TITLES</u>

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.
1. E. Varbanova, Lectures on Mathematical Analysis – I, Publishing house of Technical university Sofia, Sofia, 2009.
2. V. Grozdanov, K. Jordjev, A. Markovska, Methodological conduire for solving

of problems of Mathematical Analysis – I, Publishing house "Neophit Rilsky" Blagoevgrad, 2012.

B. Additional Titles:

1. S. M. Nikol'skii, Course of Mathematical Analysis, V. 1 and 2, Moskow, Science, 1973.
2. L. D. Kudrjavcev, Mathematical Analysis, V. 1 and 2, Moskow, Science, 1976.

Abbreviation

SS: Spring Semester

FS: Fall Semester

MECHANICS

Semester: I

Type of presentation: Lectures/ Seminar classes /Laboratory classes

Hours per week / AS / SS: 3 Lecture hours / 1 Seminar hours / 2 Laboratory hours / AS

ECTS credits: 9

Lecturer: Assoc. Prof. Dimitrina Kerina, PhD;
Assistant Prof. Darina Kaisheva
Assistant Prof. Rumiana Popova

Department: Physics Department, Faculty of Mathematics and Natural Sciences

Course Status: Compulsory course for subject Physics and Mahematics, B.Sc. Curriculum.

Short Description: The general loading of the course is 90 hours (it includes 45 lecture hours, 15 hours seminar exercises and 30 hours laboratory exercises) and 180 out auditorium hours. Material is selected depending of the specificity of the speciality. In this course are considered the following main topics: Basic Concepts of Kinematics and Dynamics, Relative Physical Principals, Inertial and Non-inertial Co-ordinate Systems, Mechanics of Absolutely Solid State, Gravitation, Oscillations's Mechanics, Distortion in Solid State and Fluids's Mechanics.

Course Aims: Students acquire knowledge about objective fundamental natural laws, basic Physical methods of investigation and basic Physical concepts and relations.

Teaching Methods: Lectures are prepared on Power point. The contemporary technical equipment as multimedia, software, models, etc. is used for these lectures. Lectures are visualised by demonstrations and laboratory tasks performance during the laboratory classes.

Requirements / Prerequisites: Basic knowledge in General Physics and Mathematics.

Evaluation Method: The final rating is formed at the end of the course on the basis of the rating of a written test (WT) on all topics mentioned above and of the student's routine control (RC) in the following ratio: 0.4RC+0.6WT.

Final grade calculation is done by using a 6-point rating scale: the rating 6 equals level A on ECTS; the rating 5 equals level B on ECTS; the rating 4 equals level C on ECTS; the rating 3 equals level D on ECTS; the rating 2 equals level E on ECTS.

Inscribing for tuition: Not necessary.

Inscribing for exam: Agreement with the lecturer and the Students Service Department

References:

1. С. Тошев, И. Баев, М. Маринов, Л. Бончев. *Физика*, Наука и изкуство,

София, 1987.
2. М. Маринов, Биофизика, София, 2006.
3. М. Надолийски, З. Пейков, "Учебник по физика", УАСГ, София, 2011.
4. А. Детлаф, Б. Яворский. *Курс физики*, Высшая школа, Москва, 1989 (in Russian)

Abbreviation:
AS: Autumn Semester
SS: Spring Semester

MATHEMATICAL ANALYSIS II

Semester: second semester
Course Type: lectures and seminars
Hours per Week/SS: 3 lecture hours and 2 seminars hour per week
ECTS Credits: 6.5 credits
Lecturers: Associete Professor Vasil Grozdanov, Ph.D.
Assistant Professor Ani Markovska
Assistant Professor Tscanka Mitova
Department: Mathematics, telephone: (073) 8889132
Course Status: Compulsory course.
Course Description: The course in Mathematical Analysis II includes basic concepts of mathematical analysis: improper integral, functions of two and more variables; continuity of functions of several variables; partial derivatives, local and relative extrema; implicit functions; double and triple Riemanm integral, and their applications for finding arias and volumes; line integrals of first and second type; surface integrals of first and second type; basic formulas for integrals of Mathematical Physics.
Course Aims: Students should obtain knowledge for Mathematical Analysis II, which is a basic mathematical discipline. This knowledge is necessary for studying, Mathematical Analysis III, Ordinary Differential Equations, Numerical Methods, Optimization.
Teaching Methods: lectures and seminars
Requirements/Prerequisites: Mathematical Analysis I
Assessment: written final exam, two problems solving tests per semester
Registration for the Course: by request at the end of the current semester
Registration for the Exam: coordinated with lecturer and Student Service Department
References:

1. Yaroslav Tagamlitski – Differential Calculus, Nauka and Izkustvo Publishing House, Sofia, 1971 (in Bulgarian).
2. Yaroslav Tagamlitski – Integral Calculus, Nauka and Izkustvo Publishing House, Sofia, 1978 (in Bulgarian).
3. V. A. Ilin, V.A. Sadovnichi, B.H. Sendov – Mathematical Analysis, Vol. 1, Vol.2, Nauka and Izkustvo Publishing House, Sofia, 1989 (in Bulgarian).
4. I. Prodanov, N. Hadjiivanov – Problem book in Differential and Integral Calculus, Nauka and Izkustvo Publishing House, Sofia, 1976 (in Bulgarian).
5. E. Varbanova, Lectures on Mathematical Analysis – I, Publishing house of Technical university Sofia, Sofia, 2009.
6. V. Grozdanov, K. Jordjev, A. Markovska, Methodological conduire for solving of problems of Mathematical Analysis – I, Publishing house "Neophit Rilsky" Blagoevgrad, 2012.

HIGHER ALGEBRA

Semester: 2-nd semester
Course Type: Lectures and tutorials
Hours per week /FS/SS: 3 lecture hours and 2 tutorial hours /SS
ECTS credits: 6,5 credits
Lecturer: Assist. Prof. Dr. Ilinka Dimitrova
Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad,
tel. +35973588532, e-mail: ilinka_dimitrova@swu.bg
Course Status: Compulsory course in the B.S. Curriculum of Physics and Mathematics.
Short Description: The education of that discipline includes some of the main notations of the semigroup and group theory, ring and field theory, algebraic polynomials. The definitions are introduced in an abstract way and explained with many examples. The Cayley theorem, the Lagrange theorem and the main theorem for the cyclic groups are proved. The main tools for investigations of the symmetric group are described and the importance of the symmetric group is underlined in applications. Characteristic of field and simple fields are introduced. There is detailed analysis of certain important rings. The finite field theory is developed. In the last part the classical polynomial questions like quotient/remainder theorem, Euklid's algorithm, Horner's scheme, roots of polynomials, symmetric polynomials, followed by the modern applications over finite fields.
Course Aims: The students have to obtain knowledge and skills for the theoretical foundations of the semigroup and group theory, ring and field theory, and polynomials as well as the applications of this apparatus for solving some practical tasks, related to other mathematical and informatical subjects. The obtained knowledge on this fundamental discipline are directed to be used by students in their education on other subjects.
Teaching Methods: lectures, tutorials, homework, and problem solving tests.
Requirements/Prerequisites: The students should have basics knowledge from Number theory and Linear algebra.
Assessment: permanent control during the semester including homework and two written exams, and written exam in the semester's end on topics from tutorials and on topics from lectures.
Registration for the exam: coordinated with the lecturer and student Service Department
References:
Basic Titles

1. Денеке, К., К. Тодоров. Основи на алгебрата. Благоевград, ЮЗУ "Неофит Рилски", 2001.
2. Генов, Г., С. Миховски. Т. Моллов, Алгебра, Университетско издателство „Паисий Хилендарски", Пловдив, 2006.
3. Михайлов, И., Н. Зяпков. Висша алгебра и теория на Галоа, „Фабер", Велико Търново, 2004.
4. Сидеров, П., К. Чакърян. Записки по алгебра. „Веди", София, 2006.
5. Божилов, А., П. Сидеров, К. Чакърян. Задачи по алгебра. „Веди", София, 2006.

6. Дочев, К., Д. Димитров, В. Чуканов. Ръководство за упражнения по висша алгебра. София, 1976.
7. Курош, А. Курс по висша алгебра. София, "Наука и изкуство", 1967.

Additional Titles

1. Скорняков, Л.А. Элементы алгебры, Москва, 1986.
2. Окунев, Л.Я. Высшая алгебра, Москва, 1949.
3. Фаддеев, Д. К., И. С. Соминский. Сборник задач по высшей алгебре. Москва, "Наука", 1968.
4. Проскуряков, И. В. Сборник задач по линейной алгебре. Москва, "Наука", 1967.

MOLECULAR PHYSICS

Semester: 2-nd semester
Course Type: Lectures and tutorials
Hours per week /FS/SS: 3 Lectures / 2 Lab. exercises / 1 Seminar / Spring Semester
ECTS credits: 8,0 credits
Lecturers: Assoc. Prof. Radost Ivanova Vassileva, Ph.D.
University / Faculty / Department: South-West University „Neofit Rilski" – Blagoevgrad; 66 Ivan Mihailov Blvd. / Natural Sciences & Mathematics / Physics
Course Status: Obligatory course in Pedagogy of Teaching Physics and Mathematics B.S. Curriculum
Short Description: The main topics to be considered:

- Bases of equilibrium thermodynamics
- Thermodynamic and statistical interpretation of basic thermodynamic quantities
- Surface tension
- Variation of physical condition
- Elements of non-equilibrium thermodynamics. Transmission processes – diffusion, thermal conductivity and internal friction.

Specific Goals of the Course: The course aims to gives students a necessary minimum basic knowledge about the main macroscopic physical phenomena in the field of the thermodynamics and molecular physics. Some practical applications of this knowledge are an object of treatment in laboratory exercises and seminars.
Pedagogical Methods: lectures, laboratory exercises, seminars, tutorials, individual student's work, test-papers.
Requirements/Prerequisites: basic knowledge in mechanics and mathematics
Subsidiary Materials: physics textbooks and manuals, handbooks, physics encyclopedic dictionaries
Assessment: written exam on the theoretical material from the lectures
Registration for the exam: Students and the lecturer agree on the convenient dates within the announced calendar schedule of examination session.
References:

Basic Titles:

1. Maksimov, M. Bases of Physics – Part I. Sofia, Bulvest – 2000, 2010. (in Bulgarian).
2. Gramatikov, P. Physics – I. Blagoevgrad, SWU "Neofit Rilski", 2009. (in Bulgarian).
3. http://www.e-booksdirectory.com

- Joseph M. Powers. Lecture Notes on Thermodynamics –University of Notre Dame**,** 2010.
- J. B. Tatum. Heat and Thermodynamics **,** 2008.
- Eric Bertin. Introduction to Statistical Physics **,** ENS Lyon **,** 2010.

Additional Titles:

1. H. Young, R. Freedman. University Physics. N.Y., Addison-Wesley Publishers Co, 2000.
2. Hans Kroha. Thermodynamics and Statistical Physics , 2005.

FOREIGN LANGUAGE

Semester: Second semester
Course type: Seminars
Hours per week: 4 hours per week / Summer Semester
ECTS credits: 4,5
Lecturer: Assist. prof. Bilyana Georgieva
Course Status: Compulsory course.
Course description: Introducing students to the basic components of English phonology, morphology and syntax. It helps students learn and practice communicating in everyday situations including asking and answering questions, using the telephone, taking messages, initiating conversations, asking for directions, making invitations and closing conversations. Class activities include role-playing, small-group activities and short presentations. It also develops skills in reading speed and comprehension. Students are introduced to reading strategies such as skimming, scanning, guessing meaning from context, previewing, predicting, making inferences and giving opinions. Reading materials include short stories, news articles, computer passages and a simplified novel.
Goal: The goals of the course is to enable students to speak and write effectively and confidently in their professional and personal lives. Students become acquainted with the basic terminology in the specific field.
Teaching methods: Seminars
Prerequisites: The knowledge acquired at high school is useful.
Examination and assessment procedures: The estimation of the acquired knowledge is based on a written exam
Registration for examination: coordinated with the lecturer and the academic affairs department

PEDAGOGY

Semester: 4 semester
Type of Course: lectures and seminars
Hours per week: 2 hours lecture and 2 hours seminars/ Summer Semester
ECTS credits: 4,5 credits
Lecturers: Assoc. prof. D.Sc. Lidiya Tsvetanova - Churukova
Department: Department of Pedagogy, Faculty of Pedagogy, South-West University "Neofit Rilski" – Blagoevgrad, tel. 0888492612, e-mail: lidycveta@swu.bg

Course Status: Compulsory course in the B.S. Curriculum of Mathematics and Informatics.

Course description: The purpose of the preparation of this course is for students to master the scientific bases of institutional organized training. It is important to develop their theoretical thinking, their ability to penetrate into the essence of didactic phenomena and processes, to analyze the legitimate links between tradition and innovation in education, navigate the changing pedagogical reality. Their attention will be offered to current theoretical issues and concepts arising from practice, the system of organized and targeted training in Bulgaria and the world. By modern interpretation of the problems students will be able to master thoroughly the nature, regularities, technology and training.

Scientific status of pedagogy. Personal development - biological and social factors. Role and importance of education and self-education. Family as an educational factor. Educational process. Methods, forms and principles of education. Didactics in the system of scientific knowledge. Learning as a comprehensive educational system. Didactic research and innovations. Learning process. Problem - evolving learning and the formation of higher intellectual skills. Content of the training. Theory of textbooks and academic literature. Principles of training. Methods, approaches and techniques . Assessment and evaluation in education. Organizational systems and training forms. Today's lesson - structuring and typing. Individualisation and differentiation of training. Failure of students in learning and their overcoming.

Methods of teaching: The training uses, as traditionally established and interactive methods (multimedia presentations, case studies, etc.). Examination grade is based on the successful completion of the written examination and protection of training portfolio. Practical exercises thematically follow lectures. Continuous assessment during the semester grade is based on the fulfilled independent work by students and the verification tests in modules or tests. The share of current assessment is 60% in the final grade of the student.

Assessment and Evaluation: written exam

Registration for the Exam: coordinated with the lecturer and the Student Service Office

References:

1. Kuzovlev V.P, Gerasimova E. H. , Ovchinnikova A.Z. , Tsvetanova – Churukova L.Z. , Popkochev T.A. Pedagogy . - Blagoevgrad : Publishing SWU " N.Rilski " Publishing EGU " I.A.Bunin " , 2010, 2011.
2. Experience in usage of integrated forms of training in primary grades in the Bulgarian schools (Text) / LZ Cvetanova - Churukova / / Educational psychology in the multicultural space - Elets, 2010 № 3 . - V.1 -2.
3. Tsvetanova - Churukova L.Z. Integrated education in primary grades. Monograph. - Blagoevgrad: SWU "N.Rilski", 2010 + CD; Toihurst, W. & Group Using The Internet, Yndianopols, 1996 .
4. Education trends in perspective: Analysis of the world education indicators. - 2005 ed. - Paris: UNESCO, 2005. - 229 p.
5. The encyclopedia of comparative education and national systems of education / Ed. By T. Neville Post lethwaite. - Oxford: Pergamon Press, 1988. - XXVIII, 778 p.
6. Global education digest 2004: Comparing education statistics across the world. - Montreal: UNESCO inst. for Statistics, 2004. - 153 p.

7. Bruner, Jerome Seymour The culture of education. - Cambridge, Mass: Harvard Univ Press, 1996. - XVI, 224 p.
8. E-LEARNING and training in Europe: A survey into the use of e-learning in training and professional development in the European Union. - Luxembourg: Office for office. Publ. of the Europ. Communities, 2002. VI, 65 p.
9. INTERNATIONAL mobility of the highly skilled: OECD proceedings. - Paris: OECD, 2002. - 348 p.
10. NATIONAL action to implement lifelong learning in Europe. - Brussels: Eurydice, 2001. - 151 p.
11. WHAT schools for the future? Schooling for tomorrow. - Paris: OECD, 2001. 250 p.
12. CHANG, Gwand-Chol et al. Educational planning through computer simulation / G. - C.Chang, M.Radi - Paris: UNESCO, 2001. - [VIII], 85 p.
13. Learning to bridge the digital divide: schooling for tomorrow. Paris: OECD, 2000. 137p.
14. LEARNING to change: the experience of transforming education in South East Europe, Ed. By Terrice Bassler. - Budapest etc.; Centr. Europ. Univ. Press, 2005. - XIX, 220 p.
14. Marty Nicole Informatique et nouvelles pratiques d ecriture. Paris: Nathan, 2005. - 256p.
15. Charlier Bernadette, Peraya Daniel Technologie et innovation en pedagogie. - Bruxelles: De Boeck & Larcier sa; Editions De Boeck Universite, 2003. - 230 p.

DIFFERENTIAL EQUATIONS AND APPLICATIONS

Semester: 3 semester
Course Type: lectures and seminars
Hours per week: 2 lecture hours and 2 tutorial hours /Fall Semester
ECTS credits: 5,0 credits
Lecturer: Assoc. Prof. Marek Tasev,
Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad,
tel. +35973588532, e-mail: matassev@abv.bg
Course Status: Obligatory course.
Course Description: Mathematical methods of investigation are used in every field of science and technology. Differential Equations are the foundations of the mathematical education of scientists and engineers. The main topics are: First-order Linear equations with constant coefficients: exponential growth, comparison with discrete equations, series solutions; modeling examples including radioactive decay and time delay equation. Linear equations with non-constant coefficients: solution by integrating factor, series solution. Nonlinear equation: separable equations, families of solutions, isoclines, the idea of a flow and connection vector fields, stability, phase-plane analysis; examples, including logistic equation and chemical kinetics. Higher-order Linear equations: complementary function and particular integral, linear independence, reduction of order, resonance, coupled first order systems. Examples and PC-models of nonlinear dynamics, order and chaos, attractors, etc.

Course Aims: The main goal is the students to master the instruments and methods of modeling in science.
Teaching Methods: lectures, tutorials, homework, tests, etc.
Requirements/Prerequisites: Calculus I and II, Linear Algebra and Analytical Geometry.
Exam: tests, homework, final exam
Registration for the exam: Coordinated with lecturer and Students Service Department
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.Гюджженов. 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)

INFORMATICS

Semester: 3 semester
Course Type: lectures and laboratory work
Hours per week: 1 lecture hours and 1 laboratory work /Fall Semester
ECTS credits: 4,0 credits
LECTURER: Assoc. Prof. Stanko Shtrakov, Ph.D
South-West University, Computer Systems Department
COURSE STATUS IN THE CURRICULUM: Compulsory for the students of speciality “Pedagogy of Teaching Physics and Mathematics” – bachelor degree.

DESCRIPTION OF THE COURSE: The main topics concern: Development of computer‘s systems; Mathematical and logical foundations of computer systems; Data representation in memory of computer systems; Software, BIOS, operating systems - Windows; Key application software packages; Basic concepts of programming; Algorithms and problem solving; Integrated programming environment; Computer programming (language Pascal);.

AIMS AND OBJECTIVES OF THE COURSE:

The course aims to introduce students to the physical and logical foundations of computer systems. The basis of the course is built on the architectural features of the most common types of computer systems and PC microprocessor family processors 'Intel', focusing on the latest advances in computer technology.

The course aims to provide students with knowledge of modern programming languages and their application to solve different types of problems. Principles of computer programming is studied on the basis of programming language Pascal.

TEACHING METHODS: Lectures (with slides, multimedia projector) and additional text materials; laboratory work (based on instructions) with a tutorial for every laboratory theme.

PREREQUISITES: Basic knowledge in informatics.

AUXILIARY MEANS FOR TEACHING: Computer and multimedia projector for the course. Computer, development software, Internet and a tutorial for every laboratory theme.

METHOD OF ASSESSMENT: computer tests.

ARRANGEMENT FOR EXAMINATION: in the department office, co-ordinated with the lecturer

ELECTRICITY AND MAGNETISM

Semester: 3 semester

Course Type: Lectures/ Seminars/Laboratory classes

Hours per week: 3 lecture hours, 1 seminar hour and 2 laboratory hours /Fall Semester

ECTS credits: 9,0 credits

Lecturer: Assoc. Prof. Luben Mihov Ivanov, Ph.D.

University/Faculty/Department: SWU “Neofit Rilsky”-Blagoevgrad; 66, Ivan Mihailov Blvd./ Natural Sciences & Mathematics/ Physics

Status of the Subject: Compulsory

Subject Description: The course considers the general laws of electrical and magnetic phenomena. The first part studies basic laws of electrical phenomena such as electromotive force, electric fields, electrical potential, Gauss law, dielectrics and metals in electrical field, conductors, and electrical current. The second part considers magnetic phenomena and includes field of moving charge, electrical dipole, magnetic forces, electromagnetic induction, and magnetic properties of mater. The third section concerns questions of movement of the electrical parts in electric and magnetic fields.

Specific Goals of the Subject: Students acquire knowledge about Electromagnetism, Optics, Quantum Mechanics, Modern Atomic and Nuclear Physics. Material is selected depending of the specificity of the specialty. For that reason some specific topics are presented in details. Parts of topics with practical importance are directed to the laboratory classes.

Pedagogical Methods: Lectures are visualized by demonstrations and laboratory tasks performance during the laboratory classes. From methods point of view teaching material is grouped in sections following logical consistency of the cause.
Preliminary Requirements: Basic knowledge in Physics and Mathematics.
Subsidiary Materials: Educational literature on General and Applied Physics and printed materials on the topics given by lecturer.

Evaluation Method: **Final examination in written form and subsequent conversation with the lecturer. Some intermediate tests conduct through the semester.**
Inscribing for tuition: Not necessary.
Inscribing for exam: Agreement with the lecturer.
References:

I. Basic titles:

1. Иванов Л. М. „Електричество и магнетизъм “ Университетско издателство „Н. Рилски“, 2011
2. Иванов Л. М. „Обща физика II част“ Университетско издателство „Н. Рилски“, 2010
3. B. Crowell., “Electricity and Magnetism”, Wiley, 1998
4. Ив. Лалов „Електромагнитни явления” Университетско издателство Св. Кл. Охридски”, София, 1997
5. Т.И.Трофимова, Курс физики”, Университетско издателство Св. Кл. Охридски”, София, 1994.

II. Additional titles:

1. Савельев И.В. „Курс общей физики” 2е изд. Москва, Наука, 1988
2. С.А.Тошев, И.Баев, М.Маринов, Л. Бончев, „Физика” ДИ „Наука и изкуство”, София 1987
3. М. Яворский, А.А. Делтаф, „Курс физики” , „Вышая школа”, Москва, 1989.
4. Фейман Р., Лейтон Р. Сендс, „Файманови лекции по физика”, т.5 „Електричество и магнетизъм”, „Мир”, Москва
5. Ив. Амов „Инженерна физика”, ВПИ, Благоевград, 1991.

PSYCHOLOGY

Semester: 3 semester
Type of Course: lectures and seminars
Hours per week: 2 hours lectures and 1 hour seminar / Fall Semester
ECTS credits: 4,0 credits
Lecturers: Assoc. Prof. Maria Mutafova, PhD
Department: Department of Psychology, Faculty of Philosophy, South-West University “Neofit Rilski” – Blagoevgrad, e-mail: mariamutafova@swu.bg
Course Status: Compulsory course.
Course description: Bachelors acquire specialized theoretical competence in Psychology (General, Developmental and Educational psychology) course. The purpose of the proposed training is students to benefit from advances in world practice in General, Developmental and Educational psychology, and building skills to interpret data from empirical studies for application of appropriate methods of psychological diagnosis,

research design and psychological characteristics of the interaction between teachers and students of varying ages. Competence, skills and research culture in Psychology is stimulated.
Methods of teaching: lectures, seminars, tutorials, discussions.
Pre-requirements: No need
Assessment: permanent control during the semester including homework and written exams, and written exam in the semester's end on topics from tutorials and on topics from lectures.
Registration for the exam: coordinated with the lecturer and student Service Department

SCHOOL COURSE OF ALGEBRA AND ANALYSIS

Semester: 3 semesters
Course Type: lectures and tutorials
Hours per Week: 3 lecture hours, 2 tutorials hours / Fall Semester
ECTS Credits: 8.0 credits
Lecturers: Assoc. professor Kostadin Samardzhiev, PhD
Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad,
tel. +35973588532, e-mail: k_samardzhiev@abv.bg
Course Status: Compulsory course
Course Description: The construction and development of the notion "number" is a difficult process not only for its mathematical and philosophical character, but for its educative character, too. The course "Scholar course of education in Algebra and analysis" for the students from second course in specialty "mathematics and Informatics" follow the development of the4 notion "number", which is known from the course "Bases of the Arithmetic". This course formulates the basic principles of Algebra – commutative, associative and distributive; idempotents (neutral elements); the operations addition and multiplication of natural numbers H. on the base of the operations addition and multiplication, the course defines the respective orders. It lists the basic properties of the linear order – each set of natural numbers is limited from below, Archimedean principle, the method of the mathematical order and etc. the course considers the question about the division of the natural numbers and the notion "prime number". All of this illustrated by concrete examples. The number in different cardinal (countable) systems.
In this course we show that each two natural numbers a, b $\in$ אthe equations a+x=b and a x=b do not have solutions in the semiring of the natural numbers א. This lead to the necessity of enlargement of the semiring א to the ring of the integer numbers Z, to the semifield of the fraction Q_t, and finally to the field rational numbers Q. The course makes clear the validation of the basic properties of the introduced orders in the semiring of the natural numbers, for each of mentioned above structures. All of this is illustrated by appropriate example and problems. The most of the school hours is spared for the field of the real numbers and respective problems, such as quadratic equations and inequality, systems of equations and inequality, some of them with irrational expressions, some equivalent expressions with the collaboration of a special function like exponential, logarithmic, trigonometric and etc. out auditorium work for this course include

homework, course tasks, work in library and computer room, consultation, preparation for test-paper, assimilation of the lection materials and etc. the proportion between auditorium and out auditorium work is 90:135.

Course Aims: The introduced course of lections and tutorials shows the status of the mentioned above material, which is taught in a school course in Mathematics. It is developed on the base of well-known algebraic structures. Students should learn this basic structures and problems which can be solved in them. With the help of the obtained knowledge and skills students should receive a complete canonical form of an algebraic equation or system of algebraic equations, using possible equivalent transformations.

Teaching Methods: lectures and tutorials.

Requirements / Prerequisites: Higher Algebra, Bases of the Arithmetic.

Assessment: written final exam

Registration for the Exam: coordinated with lecturer and Student Service Department

References:

Basic Titles

1. Денеке, Кл., Тодоров, К., Основи на аритметиката, Благоевград, 1999
2. С. Е. Ляпин, М. И. Баранова, Сборник задачи по элементарной математике, Учпендгиз, 1963г.
3. Л. Чакалов и др. Сборник задачи по алгебра.
4. Ил.Гюдженов, К.Самарджиев Методическо ръководство за решаванене на задачи по математика.,1994г.Благоевград
5. Ярослав Тагамлицки, Диференциално смятане, наука и изкуство София 1978г.
6. Божоров Е. Висша математика Държавно издателство Техника-София 1975г.
7. Чимев К.,А.Петрова-Денева Математика Благоевград 1985г.
8. Чимев К.,Тасев М.и др. Методическо ръководство за решаване на задачи по математика Издателство Благоевград 1988г.
9. Ларичев П.А. Сборник задач по Алгебре част първа Учпедгиз 1961г. Москвы

Additional Titles

1. Чимев К.,Мирчев И.,Щраков Сл. Математика Благоевград 1995г.
2. Киркоров И.,Недев А. Сборник задачи по висша математика част втора Издателство Наука и изкуство София-1975г.
3. Миланов С.,Стоянов Н.,Денева А. и др. Висша математика 1,2,3,4,5 част Държавно Издателство Техника София-1977г.

OPTICS

Semester: 4 semester

Course Type: Lectures/ Seminars/Laboratory classes

Hours per week: 3 lecture hours, 1 seminar hour and 2 laboratory hours /Spring Semester

ECTS credits: 10,0 credits

Lecturer: Assoc. Prof. Luben Mihov Ivanov Ph.D.

University/Faculty/Department: SWU "Neofit Rilsky"-Blagoevgrad; 66, Ivan Mihailov Blvd./ Natural Sciences & Mathematics/ Physics

Status of the Subject: Compulsory

Subject Description: The course considers optics phenomena on the base of theory of electromagnetic wave propagation. It starts with Maxwell's equations and describes the

general properties of the light waves. Particular attention is paid to such phenomena as refraction on the dielectric and metal surface, total internal refraction. Important part of the course is the consideration of the interference and the diffraction of the light, some types of interferometers and principles of the working of diffractive gratings. In addition the basic principles of geometric optics are present**.**

Specific Goals of the Subject: Students acquire knowledge about general phenomena and laws of light wave propagation. The course gives a base for others special courses such as Quantum electronics and Optical communication.

Pedagogical Methods: Lectures are visualized by demonstrations. During the seminar classes students solve varied problems on optics. Parts of topics with practical importance are directed to the laboratory classes.

Preliminary Requirements: Basic knowledge in Physics and Mathematics.

Subsidiary Materials: Educational literature on General and Applied Physics and printed materials on the topics given by lecturer.

Evaluation Method: Written examination and additional conversation with the lecturer upon course topics. Some intermediate tests conduct through the semester.

Inscribing for tuition: Not necessary.

Inscribing for exam: Agreement with the lecturer.

Note: The lecture course is suitable for students of all natural and technical sciences.

References:

II. Basic titles:

1. Иванов Л. М. „Обща физика II част“ Университетско издателство „Н. Рилски“, 2010
2. Justin Pedtrose, Mihael Ware, “Physics of Light and Optics” Brigham Young University, 2011.
3. Н. И. Колитевский, “Волновая оптика” Москва 1992 М.
4. Борн, Волф, “ Основы оптики” Москва 1984
5. Г. С. Ландсберг, “Оптика” Наука, Москва 1976
6. Т.И.Трофимова, Курс физики”, Университетско издателство Св. Кл. Охридски”, София, 1994.

II. Additional titles:

1. Савельев И.В. „Курс общей физики” 2е изд. Москва, Наука, 1988
2. С.А.Тошев, И.Баев, М.Маринов, Л. Бончев, „Физика” ДИ „Наука и изкуство”, София 1987
3. М. Яворский, А.А. Делтаф, „Курс физики” , „Вышая школа”, Москва, 1989.
4. Фейман Р., Лейтон Р. Сендс, „Файманови лекции по физика”, т.5 „Електричество и магнетизъм”, „Мир”, Москва 1991**.**

THEORETICAL MECHANICS

Semester: 4 semester

Course Type: Lectures/ Seminars

Hours per week: 2 hours lecture and 2 hours seminar

ECTS credits: 6,5 credits

Lecturer: Assistant Prof. Ralitsa Stanoeva, Ph.D.
University/Faculty/Department: SWU "Neofit Rilsky"-Blagoevgrad; 66 Ivan Mihailov Blvd./ Natural Sciences & Mathematics/ Physics
Status of the Subject: Compulsory
Subject Description: The course considers theoretical bases of Classical Mechanics. The development follows where possible the axiomatic lines, the Newton's concepts of time and space and the variational principle in its Lagrangian and Hamiltonian forms. The equations of motions are derived from these principles. The mechanical systems of harmonic oscillator, particle in central field and solid body are considered in greater detail. A stress is put on the equations of motion, conservation laws and Galilean relativity in mechanics.
Specific Goals of the Subject: Students acquire knowledge about basic principles and properties of the classical mechanical phenomena. The course gives a base for others special courses such as Electrodynamics, Quantum mechanics, Atomic physics etc.
Pedagogical Methods: Lectures and seminar classes. During the seminar classes students solve varied problems on mechanical systems and their description. Parts of topics with practical importance are directed to the seminar classes.
Preliminary Requirements: Basic knowledge in General Physics (Mechanics) and Mathematical Calculus.
Subsidiary Materials: Educational literature on Classical Mechanics.
Evaluation Method: Written examination and additional conversation with the lecturer upon course topics. Some intermediate tests conduct through the semester.
Inscribing for tuition: Not necessary.
Inscribing for exam: Agreement with the lecturer.
References:

Basic titles:

1. В.Д. Бертяев, Л.А. Булатов, А.Г. Митяев, В.Б. Борисевич. „*Краткий курс теоретической механики*", Серия „Высшее образование", Феникс – 2011.
2. Иродов И. Е. „*Механика. Основные законы*". Бином. Лаборатория знаний, Москва 2010.
3. Д. Трифонов. *Класическа механика.* ИЯИЯЕ, 'Авангард', София 2002.
4. Стефан Иванов, *Основи на теоретичната и квантова механика*, УИ „Св. Климент Охридски", София 1998.
5. И. Златев, А. Николов. *Теоретична механика*. 'Наука и изкуство', София 1985.
6. Л. Ландау, Е. Лифшиц. *Механика*. Учебн. пособ.: Для вузов. Т.1. «Физматлит», Москва 2007.
7. И.В. Савельев. *Основы теоретической физики*. т. 1. 'Наука', Москва 1975.

Note: The lecture course could be suitable for students of other natural sciences

SCHOOL COURSE OF GEOMETRY

Semester: IV semester
Course Type: Lectures and tutorials
Hours per week: 3 lecture hours and 2 tutorial hours /Summer Semester
ECTS credits: 9,0 credits
Lecturer: Prof. Dr. Adrijan Borisov

Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad,
tel. +35973588532, e-mail: adribor@swu.bg
Course Status: Compulsory course
Short Description: The course includes studying of the basic geometrical transformations: congruence, similarity, affinity. Some principal topics, connected with the area of polygon and volume of tetrahedron, are considered.
Course Aims: Students should obtain theoretical and practical knowledge, necessary for teaching High School Geometry.
Teaching Methods: lectures, tutorials, homeworks, problem solving tests.
Requirements/Prerequisites: High School Geometry
Assessment: written exam on topics from tutorials and on topics from lectures.
Registration for the exam: coordinated with the lecturer and student Service Department
References:
Basic Titles

1. Borisov, A., A. Langov. School course of Geometry. Blagoevgrad, 2007.
2. A. Borisov, A. Langov. "Handbook on School course of Geometry". University Press, South-West University "Neofit Rilski", Blagoevgrad, 2011 /in Bulgarian/.
3. Lozanov, Ch.; G.Eneva, A.Langov. Synthetic Geometry.Sofia, 1994.

Additional Titles

1. Adamar. J. Elementary Geometry,1,2. Moskow, 1979.
2. Bankov,K.; T.Vitanov. Geometry. Sofia, 2003.
3. Perepolkin.D. I. Course of Elementary Geometry,1,2. Sofia, 1965.
4. Hilbert. D. Foundations of Geometry.Sofia, 1978.

METHODOLOGY OF PHYSICS TEACHING

Semester: V semester
Course Type: Lectures and seminars
Hours per week: 4 lecture hours and 1 tutorial hours /Fall Semester
ECTS credits: 9,0 credits
Lecturers: Assoc. Prof. Radost Ivanova Vassileva, Ph.D.
University / Faculty / Department: South-West University „Neofit Rilski" – Blagoevgrad; 66 Ivan Mihailov Blvd. / Natural Sciences & Mathematics / Physics
Course Status: obligatory course in Pedagogy of Teaching Physics and Mathematics B.S. Curriculum
Course Description: The discipline is constructed implementing the most significant and outstanding ideas and trends in the development of the Methodology of Physics Teaching as an educational science and also in the practice of teaching physics in secondary school. The theoretical and methodological grounds of curriculum, organization and management of the educational process in physics teaching in secondary school are introduced as well as the main state endorsed documents concerning it.
Specific Goals of the Course: The main objective of the course is the students to get a contemporary innovational preparation to apply suitable didactic technologies to organize an effective learning and educational process in physics teaching in secondary school.
Pedagogical Methods: lectures, seminars, tutorials, individual student's work

Requirements/Prerequisites: basic knowledge in Psychology and Pedagogy
Subsidiary Materials: Physics textbooks for the high and higher schools, textbooks on methods for teaching physics, reference books and encyclopedic dictionaries on Physics
Assessment: final written exam on the theoretical material from the lectures
Registration for the exam: coordinated with the lecturer and Student Service Department
References:
Basic Titles:

1. Кюлджиева М. Дидактика на физиката в средното училище. Шумен, УИ „Епископ Константин Преславски", 1997.
2. Методика преподавания физики в средней школе. Под редакцией С. Е. Каменецкого, Л. А. Ивановой. М., Просвещение, 1987.
3. Бугаев, А. И. Методика преподавания физики в средней школе. М., Просвещение, 1981.

Additional Titles:

1. Андреев, М. Процесът на обучението. Дидактика. С., УИ „Св. Климент Охридски", 1996.
2. Гюрова, В., В. Божилова, В. Вълканова, Гр. Дерменджиева. Интерактивността в учебния процес. С., Агенция ЕВРОПРЕС, 2006.
3. Разумовский, В. Г. Развитие творческих способностей учащихся в процессе обучения физики. М., Просвещение, 1975.
4. Пидкасисты, П. И. Самостоятельная познавательная деятельность школьников в обучении. М., Педагогика, 1980.
5. http://www.phys.uni-sofia.bg/annual/arch/101/full/GSU-Fizika-101-10_full.pdf
6. Бижков, Г. Теория и методика на дидактическите тестове. С., 1996.
7. Василев, Д. Проверяването и оценяването на знанията в обучението. С., Народна просвета, 1987.

ATTENDANCE OF PHYSICS LESSONS

Semester: 5
Weekly credid hours: 1 lecture class
Grading format: Continuous assessment
Type of discipline: Obligatory
ECTS credits: 1.5
Methodical guidance: Department of Physics, Faculty of Natural Sciences
Teachers:
Chief Assistant Prof. Rumyana Popova, Department of Physics
Course description:
"Attendance of Physics Lessons" is an inseparable part of the "Physics and Mathematics" learning course. It is taught simultaneously with the theoretical class in "Methods of Teaching Physics" and fills the requirements for real-time training of the students that are to receive a teaching degree. Successful participation in the learning process builds the foundation not only for the methodological practice course but also for the pre-graduate methodological practice in Physics course.
Objectives and aims:

The main purpose of the course is to provide the aspiring teachers with the skills necessary to cope with the challenges in a real-time teaching environment. The participants are expected to: develop a framework for observing and analysing ongoing classes in Physics; become acquainted with the requirements and the approaches in developing methodological procedures on a given topic; to acquire rudimentary skills in planning, organizing and managing the educational process of a given target group; get competent in public speaking, optimal teaching tempo, setting up student discussions, monitoring class behaviour, conducting physical experiments, encouraging student development through individual work etc.

Grading criteria:

Results are graded according to the requirements in Regulation 21 of the Bulgarian Ministry of Educaion from September 30th, 2004, which deals with the system of accumulation and transfer of credits. The total number of credits for the course is 1,5. Grades are based on the following two criteria: continuous assessment and final mark. The final mark is based on the grade from the participation in seminars (SG) as well as the average grade from the turned in home assignments (AG). Both of those grades must be at least passing grades. The final mark is calculated based on the following formula:

Final Mark = 0,6*(SG) + 0,4*(AG)

AUDIOVISUAL AND INFORMATION TECHNOLOGIES IN TEACHING

Semester: 5 semester
Type of Course: tutorials
Hours per week: hour tutorials/ Fall Semester
ECTS credits: 1,5 credits
Lecturers: Assoc. Prof. Vasil Kovachev
Department: Department of Physics, Faculty of Mathematics and Natural Sciences
Course Status: Compulsory course
Course description: The course includes: Tools and technology in education, Basic characteristics of educational software, Multimedia in education, Internet in education, Technologies of E-learning,
Objectives: The student should obtain knowledge of: Rules of using educational software, Development and presentation of learning materials, Use of Internet services for educational goals, E-learning
Methods of teaching: tutorials, discussions, problem passed method, Project based method.
Pre-requirements: psychology, Pedagogy, Word-processing, spreadsheets, Computer's networks,
Assessment and Evaluation Project- 55%, Final Exam- 45%
The course is successful completed with at least 65% of all scores.
Registration for the Exam: coordinated with the lecturer and the Student Service Office

ATOMIC AND NUCLEAR PHYSICS

Semester: 5 semester
Type of Course: tutorials
Hours per week: 3 lectures hours and 2 laboratory hours/ Fall Semester
ECTS credits: 8 credits

Lecturer: Assoc. Prof. Plamen Svetoslavov Gramatikov, M.Eng., Ph.D.
University/Faculty/Department: SWU "Neofit Rilsky"-Blagoevgrad; 66, Ivan Mihailov Blvd./ Natural Sciences & Mathematics/ Physics
Status of the Subject: Eligible
Subject Description: Introduction to Atomic and Molecular Physics. Structure and Models of the Atom. Hydrogen Atom. Interaction of Atoms with Electromagnetic Radiation, External Electric and Magnetic Fields. Zeeman Effect. Intermolecular Interactions. Basic concepts of Nuclear Physics. Nuclear structure. Nuclear Forces. Isotopic Spin. Parity Violation, Neutron-Proton diagrams. Radiation α, β and γ. Nuclear models. Nuclear reactions. Neutron Physics. Fission. Fusion. Nuclear reactors. Basic concepts of Radiation Safety. Elementary particles.
Specific Goals of the Subject: The students acquire basic knowledges required about Atomic and Nuclear Physics. Material is selected depending of the specificity of the speciality. For that reason some specific topics are presented which are not included in the Physics programme for non-physical students.

Pedagogical Methods: Lectures are visualised by demonstrations and laboratory tasks performance during the laboratory classes. From methods point of view teaching material is grouped in sections by logical consistency from Structure of Atoms and Atomic and Nuclear Models to Nuclear Physics. Practical topics are directed to the laboratory classes.
Preliminary Requirements: Basic knowledge in General Physics and Maths.
Subsidiary Materials: Educational literature on Atomic and Nuclear Physics and printed materials on the topics given by lecturer.
Evaluation Method: Written examination. Some intermediate tests conduct through the semester.
Inscribing for tuition: Not necessary.
Inscribing for exam: Agreement with the lecturer.

ELECTRODYNAMICS

Semester: V
Type of presentation: Lectures/ Seminar classes /Laboratory classes
Hours per week / AS / SS: 2 Lecture hours /2 Seminar hours / AS
ECTS credits: 6
Lecturer: Assoc. Prof. Dimitrina Kerina, PhD;
Assistant Prof. Rumiana Popova
Department: Physics Department, Faculty of Mathematics and Natural Sciences
Course Status: Compulsory course for subject Chemistry and Physics, B.Sc. Curriculum.
Short Description: The general loading of the course is 60 hours (it includes 30 lecture hours and 30 hours seminar exercises) and 120 out auditorium hours. In this course are considered the following main topics: Electrical charges, Basic Laws of Electrostatic Fields, Mechanical influence of the Electrostatic Field, Basic Laws of the Stationary Fields, Mechanical influence of the Stationary Magnetic Fields, Alternative Electromagnetic Fields and Mechanical influence of the Electromagnetic Field.
Course Aims: Students acquire knowledge about Electromagnetic interactions in vacuum and Special theory of relativity.

Teaching Methods: Lectures are prepared on Power point. The contemporary technical equipment as multimedia, software, models, etc. is used for these lectures. Lectures are visualised by demonstrations and seminar tasks performance during the seminar classes.
Requirements / Prerequisites: Basic knowledge in General Physics and Mathematics.
Evaluation Method: The final rating is formed at the end of the course on the basis of the rating of a written test (WT) on all topics mentioned above and of the student's routine control (RC) in the following ratio: 0.4RC+0.6WT.

Final grade calculation is done by using a 6-point rating scale: the rating 6 equals level A on ECTS; the rating 5 equals level B on ECTS; the rating 4 equals level C on ECTS; the rating 3 equals level D on ECTS; the rating 2 equals level E on ECTS.
Inscribing for tuition: Not necessary.
Inscribing for exam: Agreement with the lecturer and the Students Service Department
References:

1. Христо Попов, *Електродинамика,* Унив. изд. Св. Климент Охридски, 1995 .
2. Димитър Трифонов, *Класическа електродинамика*, Ун. Издателство на ЮЗУ „Неофит Рилски", 1995.
3. В. Карлуковски, *Лекции по електродинамика и теория на относителността*, Херон Прес, 2004.
4. David J. Griffiths, *Introduction to Electrodynamics,* Prentice-Hall International, 1999.

Abbreviation:
AS: Autumn Semester
SS: Spring Semester

QUANTUM MECHANICS

Semester: 6 semester
Cours Tipe: Lectures and tutorials
Hours per week/FS/SS: 2 lecture hours, 2 tutorial hours per week/SS
ECTS credits: 6.0 credits
Lecturer: Prof. Lubomir Pavlov, DSc
Assistant prof. Rumiana Popova
Department: Department of Physics, telephone:+359 073 8889137, e-mail: l_pavlov2004@yahoo.com
Course Status: Obligatory course in the B.S. Curriculum of Pedagogy of Teaching Physics and mathematics
Short Description: Basic quantum mechanical postulates. Quantum mechanical formalism: state space and Hermitean operators. Schrodinger equation: exactly solvable models: Hydrogen atom, harmonic oscilator, potential well.Approximate methods: perturbation theory, Hartry-Fock method. Identical particles and Pauli principle. Angular momentum and spin. Many-electron atoms and periodic system of elements. Scattering theory and Rutherford formula. Klein-Gordon and Dirac equations.
Course Aims: The course aims at giving fundamentals knowledge of quantum physics and to serve as a foundation for courses as statistical phusics, quantum electronics astrophysics and other special courses.
Teaching Methods: lectures, tutorials, individual student's work

Requirements/Prerequisites: General knowledge in mathematical methods of physics and analysis Assessment Current evaluation at seminars and final written examination.
Registration for the Course: by request at the end of the current semester (when is not obligatory course).
Registration for the Exam: coordinated with the lecturer and Students Service Department
References:
Basic

1.A.Atanasov,Foundations of Quantum Mechanics, Plovdiv Univ. Press,, 1993.
2.S. Ivanov, Fopundations of Theoretical and Quantum Mechanics, Sofia Univ. Press 1998.
3. A.Dazev, Quantum Mechanics, Nauka I Izkustvo Press, Sofia, 1978.

Additional

1.P. Raichev, Physics of atomic systems, Nauka I Izkustvo Press, Sofia 1980.
2.L.Landau, E.Livshiz, Quantum Mechanics, Nauka Press, Moskou, 1976.

Abbreviation:
FS: Fall Semester, SS: Spring Semester

METHODOLOGY OF TEACHING MATHEMATICS - I

Semester: 6 semester
Course Type: Lectures
Hours per week /FS/SS: 2 lecture hours /SS
ECTS credits: 3,5 credits
Lecturer: Prof. Dr. Iliya Dimitrov Gyudzhenov
Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad, tel. ++35973588545, e-mail: iliadgl@swu.bg
Course Status: Compulsory course in the B.S. Curriculum Pedagogy of teaching Mathematics and Physics
Short Description: The education of that discipline includes some of the General Methodology of teaching mathematics.
Course Aims: To prepare the students, teach pupil in mathematics at school.
Teaching Methods: lectures, homework, and problem solving tests.
Requirements/Prerequisites: The students should have basics knowledge from school mathematics.
Assessment: permanent control during the semester including homework and two written exams, and written exam in the semester's end on topics from tutorials and on topics from lectures.
Registration for the exam: coordinated with the lecturer and student Service Department
References:
Basic Titles

1. 1. Ganchev Iv. And others, Methedology of teaching mathematics (General Methodology), Blagoevgrad, 2002

ASTRONOMY

Semester: 6 semester
Cours Tipe: Lectures and tutorials
Hours per week/FS/SS: 3 lecture hours per week/SS
ECTS credits: 5 credits
Lecturer: Assistant Prof. Ivo Angelov, PhD
Department: Department of Physics, telephone: 073I8889 137
Course Status: Obligatory course in the "Pedagogics of the teaching in physics and mathematics" B.S. Curriculum.
Short Description:

The course in *Astronomy* gives concept for our Universe, for the astrophysical objects and the processes going in it and creates grounding for acquaintance with the newest achievements of the modern science, in which the processes in the micro and macro space determine and overlay each other temporarily, being at the same time a subject of studding in new scientific branches, closely related with the modern all-wavelengths astronomy and astrophysics in exceptionally wide energetic range: from 1eV to 10^{20}eV.

Special attention is paid to the structure of our Galaxy, its place in the Universe and its relationship with other astronomical objects.

The visual positions and movements of the celestial objects, including the Sun, the planets and their satellites are examined. An accent is taken on the Solar system and the modern cosmic methods for its examination. A subject of explanation in details is the connection between the observed characteristics of the stars, their inner structure and the respective methods for observation and examination.

Course Aims:

The course in *Astronomy* has the task to acquaint the students with the basic methods and concepts of the classic astronomy and also with the modern ideas for the internal structure if the stars, their evolution, and the related with it observational characteristics.

Teaching Methods: lectures, tutorials, individual student's work
Requirements/Prerequisites: Physics, Mathematical analysis
Assessment: written terminal examination.

Two homeworks (marks D1, D2) and two written tests (marks K1, K2) are rated for continuous assessment during the semester. Only students with average rating from the continuous assessment greater than 3 are allowed to go on a examination.

The mark at the terminal examination (Exam) has the main weight in the final rating.

$$\textbf{Rating} = 0{,}05 .\left(\frac{D1+D2}{2}\right) + 0{,}15 .\left(\frac{K1+K2}{2}\right) + 0{,}8\ (Exam)$$

Registration for the Course: by request at the end of the current semester (when is not obligatory course).
Registration for the Exam: coordinated with the lecturer and Students Service Department
References:

1. П.И.Бакулин, Э.В.Кононович, В.И.Мороз ”Курс общей астрономии”, ”Наука”, Москва, 1983
2. ”Астрономический календар” (постоянная част) под редакцией В.К.Абалакина, “Наука”, Москва, 1981
3. М.Лонгейр “Астрофизика высоких енергии”, ”Мир”, Москва, 1984
4. А.Н.Михельсон “Оптические телескопы”, Наука, Москва, 1976

Abbreviation:
FS: Fall Semester
SS: Spring Semester

METHODS AND TECHNIQUE OF THE SCHOOL PHYSICS EXPERIMENT

Semester: 6 semester
Cours Tipe: Laboratory exercises
Hours per week/FS/SS: 2 Laboratory hours / Spring semester
ECTS credits: 3,5 credits
Lecturers: Assoc. Prof. Radost Ivanova Vassileva, Ph.D.
University / Faculty / Department: South-West University „Neofit Rilski” – Blagoevgrad; 66 Ivan Mihailov Blvd. / Natural Sciences & Mathematics/ Physics
Course Status: Obligatory course in Pedagogy of Teaching Physics and Mathematics B.S. Curriculum
Course Description: Introduction. Kinematics. Dynamics and Statics. Mechanical Work and Energy. Fluid Mechanics. Structure and Properties of Gases, Solids and Liquids. Transition between physical conditions of the substance. Electrostatics. Direct electrical current. Current in different media. Mechanical oscillations and waves. Sound. Magnetism. Optics.
Specific Goals of the Course: Learning this course is connected with the formation of practical skills and habits in students for organization, preparation and implementation of the physics experiment in education, and all types of the physics experiment are taught. The curriculum allows implementing a close connection between the students' theoretical knowledge about particular physics phenomena and processes, and the practical realization of the various experiments, chosen in accordance with them. Their elaboration is precisely conformed to the high school physics curriculum. The main goal of the course is to prepare students for teaching physics as an experimental science.
Pedagogical Methods: Students perform demonstration experiments, frontal experiments, laboratory and experimental work. After each laboratory class, students prepare the respective protocols.
Requirements/Prerequisites: Basic knowledge in Physics and Methods for teaching physics.
Subsidiary Materials: High school physics textbooks, physics experiment textbooks and manuals, handbooks, physics encyclopedic dictionaries.
Assessment: Current grade at the end of the course. This grade is formed on the basis of the theoretical knowledge and practical skills to perform school physics experiment, demonstrated by students during the course, as well as on the basis of grades got for the defense of laboratory experiment protocols.

References:

Basic Titles:

1. Попов, Б., Др. Иванов. Учебният експеримент по физика – част първа. С., Народна просвета, 1990.
2. Попов, Б., Др. Иванов. Учебният експеримент по физика – част втора. С., Народна просвета, 1992.
3. Иванов, Др. Забавни опити по физика. 1. Механика. С., „Просвета" АД, 2001.
4. Иванов, Др. Забавни опити по физика. 2. Термодинамика и молекулна физика. С., „Просвета – София" АД, 2003.
5. Иванов, Др. Забавни опити по физика. 3. Електричество и магнетизъм. С., „Просвета – София" АД, 2005.
6. Иванов, Др. Забавни опити по физика. 4. Оптика. С., „Просвета – София" АД, 2007.

Additional Titles:

1. Христозов, Д., И. Младенов, С. Арменски, Н. Андреев, М. Минев, Х. Манев. Лабораторен практикум по физика. С., Наука и изкуство, 1990.
2. Методика преподавания физики в средней школе. Под редакцией С.Е. Каменецкого, Л.А. Ивановой. М., Просвещение, 1987.
3. Попов, Х., В. Караиванов, Ст. Станев, Др. Иванов. Ооо, физика! Пак ли?! С., „Просвета – София" АД, 2005.

MODERN METHODS FOR EXAMINATION OF AEROSPACE AND NATURAL ENVIRONMENT

Semester: 6 semester
Cours Tipe: Lectures and practical exercises
Hours per week/FS/SS: 2 lecture hours, per week/SS
ECTS credits: 3,5 credits
Lecturer: Assistant Prof. Ivo Angelov, PhD
Department: Department of Physics, telephone: 8889/137
Course Status: Eligible course in the "Pedagogics of the teaching in physics and mathematics" B.S Curriculum.
Short Description:

The aerospace and natural environment is closely related, because of the continuous solar- terrestrial interactions. The Sun as a main source of energy gives serious influence on: litho-, magneto-, atmo-, hydro- and biosphere of the Earth, which destiny is determined of the going global processes of changes and also of the possible and occasional interactions with other small celestial objects.

The particles and the photons of the cosmic background are main carriers of information for the parameters of the aerospace environment, explored with satellite and also with ground based instruments.

The atmosphere and going in it transport processes are in close relation with the aerozol transfer of radionuclides, heavy and toxic metals and chemical pollutions.

The content of ozone, radon and carbon dioxide is of essential significance for the global climatic changes at the Earth. The influence of the cosmic background on the changes of some meteorological parameters is noticeable.

The importance of the radioecology in the complex monitoring and control of the environment is undisputable. All this subjects closely related each other into an integrated *noisy* information system, are the main source of information for the parameters of the aerospace and natural environment, which could be obtained by solving this complex inverse problems.

Teaching Methods: lectures, practical exercises, individual student's work

Requirements/Prerequisites:

Assessment: 2 homework D1,D2; 2 tests K1, K2.

Rating: $= 0{,}2 \,.\left(\frac{D1+D2}{2}\right) + 0{,}8 \,.\left(\frac{K1+K2}{2}\right)$

Registration for the Course: by request at the end of the current semester (when is not obligatory course).

Registration for the Exam: coordinated with the lecturer and Students Service Department

References:

1. Murzin, V. S. , Introduction in Cosmic Rays Physics, Moscow, Atomizdat , 1979
2. Dorman, L. I. , Variations of Galactic Cosmic Rays, Moscow University Publishing House, 1975

Abbreviation:

FS: Fall Semester

SS: Spring Semester

EDUCATION AND DEVELOPMENT OF SPECIAL NEEDS PUPILS

Semester: 6 semester

Type of Course: lectures and seminars

Hours per week: 2 hour lecture and 1 hour seminar / Summer Semester

ECTS credits: 5,0 credits

Lecturers: Assoc. Prof. Pelagia Terziyska, PhD

Department: Department of Pedagogy, Faculty of Pedagogy, South-West University "Neofit Rilski" – Blagoevgrad, e-mail: pterziyska@abv.bg

Course Status: Compulsory course in the B.S. Curriculum of Mathematics and Informatics.

Course description: The course is aimed at training, development and socialization of children with special educational needs integrated into mainstream schools. Designed for the acquisition of knowledge about the specifics of working with these students. The main objective is introduces the students with the most effective methods, approaches and the pedagogical technologies for teaching, of different groups of pupils with SEN, to clarify the psychological and pedagogical problems of education and social adaptation in the midst from their peers in norm.

Content of the course:

The main substantive points were: initial knowledge of the main characteristics of children and pupils with SEN; specifics of the educational process in the mainstream

school in terms of integrated training; features of academic activities and teaching methods for different groups of pupils with SEN; specific requirements to the teacher.

Teaching and assessment:

Training includes lectures. Knowledge available in the system, using interactive methods - case studies, discussions, debates, role-plays, planning and conducting analysis mini-experiments behavior of children with SEN in different situations and different social and cultural environment. There were strict criteria for the development of papers, which are transmitted within a given period for checking. After that all papers will be discussed in class.

Registration for the Exam: coordinated with the lecturer and the Student Service Office

References:

1. Ainscow M., Booth T. (2003) The Index for Inclusion: Developing Learning & Participation in Schools. Bristol: Center for Studies in Inclusive Education
2. Cortiella, C. (2009). The State of Learning Disabilities. New York, NY: National Center for Learning Disabilities.
3. Stainback, W., & Stainback, S. (1995). *Controversial Issues Confronting Special Education*. Allyn & Bacon.
4. Strully, J., & Strully, C. (1996). Friendships as an educational goal: What we have learned and where we are headed. In W. Stainback & S.
5. Thomas, G., & Loxley, A. (2007) *Deconstructing Special Education and Constructing Inclusion* (2nd Edition). Maidenhead: Open University Press.
6. Terziyska, P. (2012) Children with special educational needs in the mainstream environment.
7. Trainer, M. (1991). *Differences in common: Straight talk on mental retardation, Down Syndrome, and life*. Rockville, MD" Woodbine house.

METHODOLOGY OF TEACHING MATHEMATICS - II

Term (Semester): 7th term

Course type: lectures and tutorials

Classes (weekly): 2 classes weekly and 2 tutorial hours

Number of points: 6,0

Teachers (Lecturers). Assoc. Professor Ph.D. Elena Karashtranova

Chair: Mathematics, South West University "Neofit Rilski" – Blagoevgrad, Tel: 073 /8889532

Statute of the subject in the educational scheme: Obligatory for subject "Pedagogy of teaching mathematics and computer science"

Description of the subject: The subject includes problems of the Special Methodology of teaching mathematics, that is the themes: functions, relations and operations, equations and inequations, samenesses (identities) and likenesses, vector, geometric figures (Shapes) in the plane and in the space.

Purpose (Aim) of the subject: To prepare the students, teach pupil in mathematics at school.

Methods of teaching: Lectures and practices (exercises)

Precursory conditions: Knowledge in the content of the school course in mathematics, and also knowledge in psychology and pedagogy.

Appraisement: Examination in written form
Registration (enrolment) for the examination: concerted with the teacher and the school department.
Literature:

1. Ganchev Ivan and others: "Methodology of teaching mathematics /General Methodology /, Blagoevgrad, 2002.
2. Ganchev Ivan and others "Methodology of teaching mathematics from 8th to 11th class" Sofia 1998

DIFFERENTIAL GEOMETRY

Semester: 7 semester
Course Type: Lectures and tutorials
Hours per week: 3 lecture hours and 2 tutorial hours / Fall Semester
ECTS credits: 7,5 credits
Lecturer: Prof. Dr. Adrian Borisov
Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad,
tel. +35973588532, e-mail: adribor@swu.bg
Course Status: Compulsory course
Short Description: The course includes: studying of basic themes of the classical differential geometry of the curves, the one-parametric sets of straight lines and the surfaces in the three-dimensional real Euclidean space.
Course Aims: The students have to obtain knowledge and skills for application of the differential-geometric methods for learning of geometric objects.
Teaching Methods: Lectures, tutorials, home works, problem solving tests.
Requirements/ Prerequisites: Analytic Geometry, Mathematical Analysis, Differential Equations.
Assessment: written exam on topics from tutorials and on topics from lectures.
Registration for the Exam: coordinated with the lecturer and Student Service Department.
References:
Basic Titles

1. Borisov, A. Differential Geometry. University Press, South-West University "Neofit Rilski" Blagoevgrad, 1994(in Bulgarian).
2. Gjonov, A. Handbook on Differential Geometry. Sofia, 1999 (in Bulgarian).

Additional Titles:

1. Ivanova-Karatopraklieva, I. Differential Geometry. University Press "St. Kl. Ohridski", Sofia, 1994 (in Bulgarian).
2. Petkanchin, B. Differential Geometry. Sofia, 1964 (in Bulgarian).
3. Stanilov, G. Differential Geometry. Sofia, 1997 (in Bulgarian).

METHODS OF SOLVING PHYSICS PROBLEMS

Semester: 7 semester
Course Type: Lectures and seminars
Hours per week: 1 lecture hours and 2 seminar hours / Fall Semester

ECTS credits: 4,5 credits
Lecturers: Assoc. Prof. Radost Ivanova Vassileva, Ph.D.
University / Faculty / Department: South-West University „Neofit Rilski" – Blagoevgrad; 66 Ivan Mihailov Blvd. / Natural Sciences & Mathematics/ Physics
Course Status: Obligatory course in Pedagogy of Teaching Physics and Mathematics B.S. Curriculum
Course Description: The course reveals the essence of the concept *physics problem*, the place, role and didactic functions of physics problems in the process of education, as well as their classification, the methods of solving the basic problem types, the system of units of measurement in physics as an object and means of cognition. Special attention is paid to the opportunities problem solving offers for establishing inter-disciplinary connections in education.
Specific Goals of the Course: The course aims at providing students with both theoretical and practically oriented knowledge for efficient application of adequate didactic techniques for using physics problems in the education in physics at middle and secondary school. In the pursuit of this goal, the syllabus focuses on the profound methodological preparation of would-be teachers, the formation of criteria and skills for selecting the proper physics problems and the methods for their application in the teaching process.
Pedagogical Methods: Lectures, tutorials, individual student's work
Requirements/Prerequisites: Basic knowledge in Physics, Mathematics and Methods for teaching physics
Subsidiary Materials: Physics textbooks for the high and higher schools, textbooks on methods for teaching physics, books of physical problems, reference books and encyclopedic dictionaries on Physics
Assessment: Written exam on the theoretical material from the lectures
Registration for the exam: Coordinated with the lecturer and Student Service Department
References:
Basic Titles:

1. Орехов. В. Методика решения задач по физике. Москва, Просвещение, 1989.
2. Тулчински, М. Е. Качествени задачи по физика в средното училище. С., Народна просвета, 1984.
3. Иванов, Др. Експериментални задачи по физика. С., 1988.
4. Сборници със задачи по физика.

Additional Titles:

4. Бижков, Г. Теория и методика на дидактическите тестове. С., 1996.
5. Милкоева, Б., Д. Беев. Справочник по физика и астрономия за 4. – 12. клас. С., Сънрей Профешънъл, 2011.

SCHOOL PRACTICE IN PHYSICS

Семестър: 7
ECTS credits: 3
Weekly credid hours: 2 seminar classes

Grading format: Continuous assessment
Type of discipline: Obligatory
Methodical guidance: Department of Physics, Faculty of Natural Sciences
Teachers: Chief Assistant Prof. Rumyana Popova, Department of Physics
Course description: "**School practice in Physics**" is an inseparable part of the "Physics and Mathematics" learning course. It follows the theoretical courses in "Methods of Teaching Physics" and "Attendance of Physics Lessons" and fills the requirements for real-time training of the students that are to receive a teaching degree. Successful participation in the course lays the ground for coping with the pre-graduate methodological practice in Physics.
Course description: Students prepare in advance and enact lessons based on the "Human and Nature" for the 5^{th} and 6^{th} grades, as well as the "Physics and Astronomy" for 7^{th}-12^{th} grades teaching curriculum.
Grading criteria: Each student prepares in advance at least two different lessons for new material acquisition, which are then carried out with different target groups. Students are required to observe the lessons of their peers who are stationed in the same school. Together with their mentor, they discuss the methodological procedures used in each observed lesson. Grades are based on the following two criteria: continuous assessment and final mark. The final mark (FM) is based on the grade from the participation in seminars (SG) as well as the grades for the two practical lessons (PG1 and PG2). All three grades must be at least passing grades. The final mark is calculated based on the following formula:

$$FM = 0,4*SG+0,6(PG1+PG2)/2.$$

SCHOOL PRACTICE IN MATHEMATICS

Semester: 7 semester
Course type: tutorials
Hours per week: 2 hours tutorials / Summer Semester
ECTS credits: 3,0 credits
Lecturers: Assistant Prof. Mariana Katsarska
Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad,
tel. +35973588532, e-mail: mariana@swu.bg
Course Status: Compulsory course.
Course description: The course "Current Pedagogical Practice in Mathematics" prepares students to their future profession. Each student taught two lessons – one in the secondary school grades 5-8 and one in the upper grades 8-12. The other of the students observed lessons.
Course aims: The aim of the course is to give students an idea of the basic requirements for a lesson in mathematics, the skills to develop various kinds of lessons, to select and streamline tasks offered to students, to evaluate the performance of the individual student and the class as a whole.
Methods of teaching: tutorials, observations at school, discussion.
Pre-requirements: Didactics of Mathematics I and II, and School course in Mathematics. **Assessment and Evaluation**

- Presentation of two lessons at school – 60%

- Presented analysis of three lessons – 40%.

Registration for the Exam: coordinated with the lecturer and the Student Service Office

OBSERVATION OF LESSONS IN MATHEMATICS AT SCHOOL

Semester: 7-th semester
Course type: observation in real educational environment
Hours per week: 1 hour observation and discussions in lab / Fall Semester
ECTS credits: 1,5 credits
Lecturers: Assistant Prof. Mariana Katsarska
Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad,
tel. +35973588532, e-mail: mariana@swu.bg
Course Status: Compulsory course in the B.S. Curriculum of Mathematics and Informatics.
Course description: The course introduces students to their future profession. The students observe lessons taught by supervised theachers at school, conferencing observed lessons and present three analyses of observed lessons in writing.
Course aims: The aim of the course is to give students an idea of the basic requirements for a lesson in mathematics, the skills to develop various kinds of lessons, to select and streamline tasks offered to students, to evaluate the performance of the individual student and the class as a whole.
Methods of teaching: tutorials - observations at school, discussion.
Pre-requirements: Didactics of Mathematics I and II, and School course in Mathematics. **Assessment and Evaluation**

- Participation in the discussions - 60%
- Analysis of the lessons – 40%.

Registration for the Exam: coordinated with the lecturer and the Student Service Office
References:

1. School books of Mathematics approved by Ministry of education and used in cooperated schools by supervised teachers.

PRE-GRADUATION SCHOOL PRACTICE IN PHYSICS

Semester: 8
ECTS credits: 4,5
Weekly credid hours: 3 seminar classes
Grading format: Continuous assessment
Type of discipline: Obligatory
Methodical guidance: Department of Physics, Faculty of Natural Sciences
Teachers: Chief Assistant Prof. Rumyana Popova, Department of Physics
Course description: "Pre-graduation School Practice in Physics" is an inseparable part of the "Physics and Mathematics" learning course. It follows the "Attendance of Physics Lessons" and the "School Practice in Physics" courses and fills the requirements for real-time training of the students that are to receive a teaching degree. Successful participation

in the learning process provides the students with the required knowledge to be able to work in a professional teaching environment.

Objectives and aims: The main purpose of the course is to provide the aspiring teachers with the skills necessary to cope with the challenges in a real-time teaching environment. The participants are expected to: become acquainted with the requirements and the approaches in developing methodological procedures on a given topic; acquire rudimentary skills in planning, organizing and managing the educational process of a given target group; to carry out at least ten lessons on given different topics, which they will on a later stage reenact with different target groups, thus raising their own professional teaching competency; get used to the norms in public speaking, optimal teaching tempo, setting up student discussions, monitoring class behaviour, conducting physical experiments, encouraging student development through individual work etc.

Grading criteria: Each student prepares in advance at least ten different lessons for new material acquisition, which are then carried out with different target groups. Students are required to observe the lessons of their peers who are stationed in the same school. Together with their mentor, they discuss the methodological procedures used in each observed lesson. Grades are based on the following three continuous assessment marks: mark assigned by the teacher in charge of the practical course and based on given lesson that he/she observes (OM); mark assigned by the mentor and based on overall performance in the practical course (MM); and a mark on turned in written lesson plans and observation sheets (DM). The final mark (FM) is calculated according to the following formula:

$$FM = 0,5*(OM) + 0,3*(MM) + 0,2*(DM)$$

PRE-GRADUATION PEDAGOGICAL PRACTICE IN MATHEMATICS

Semester: 8-th semester

Course type: Practice in real environment

Hours per week: 3 hours practice / Summer Semester

ECTS credits: 4,5 credits

Lecturers: Assistant Prof. Mariana Katsarska

Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad,
tel. +35973588532, e-mail: mariana@swu.bg

Course Status: Compulsory course in the B.S. Curriculum of Mathematics and Informatics.

Course description: The course prepares students to their future profession. By Order of the Rector students are assigned to a school for 10 weeks practice. Each week they presented three lessons and observed two lessons of their colleagues. For the whole practice they must present 15 lessons at Secondary school and 15 lessons at High school. The cooperative teacher (mentor) assists students in the development of the lessons and oversees the work of trainees in school. If the trainee is not prepared for the lesson, the mentor and the director of the school may require interruption of the practice.

Course aims: The aim of the course is to give students an idea of the basic requirements for a lesson in mathematics, the skills to develop various kinds of lessons, to select and

streamline tasks offered to students, to evaluate the performance of the individual student and the class as a whole.

Methods of teaching: observations at school, discussion, teaching.

Pre-requirements: Didactics of Mathematics I and II, and School course in Mathematics. **Assessment and Evaluation**

- Presentation of two or three lessons at school – 60%
- Presented papers of the lessons – 40%.

Registration for the Exam: coordinated with the lecturer and the cooperative teacher.

References:

1. School books of Mathematics approved by Ministry of education and used in cooperated schools by supervised teachers.