Univerzitet u Zenici
Filozofski fakultet

University of Zenica
Faculty of Philosophy

INNOVATED CURRICULUM

FIRST (UNDERGRADUATE) CYCLE OF STUDIES

DEPARTMENT OF MATHEMATICS AND INFORMATICS

ACADEMIC YEAR

2019/2020

CONTENTS

INTRODUCTORY REMARKS

The structure of the study program

The study program at undergraduate courses for the acquiring of the professional title of *Teacher of Mathematics and Information Technology* at the Faculty of Philosophy lasts for four years, or eight semesters and involves passing of 44 exams (20 math exams, 14 information technology exams, 4 joint exams, 4 general education exams, 2 elective courses), and then the performing of teaching (methodical) practice at primary and secondary schools.

All subjects last for one semester. The percentage of groups of subjects according to total number of subjects is: general education subjects 9,1%, joint subjects 9,1%, mathematics subjects 45,245%, IT subjects 31,82%, and elective subjects 4,53%.

Students are also offered four different programs during elective courses. The elective courses are grouped as following: general education (1), mathematics (1), and IT (1).

The program of teaching practice is organized during fourth year of the study program (methodical practice). The teaching – methodical pratice is done in cooperation with schools, which are chosen by the Ministry of Education and Sport as appropriate, and teachers – mentors who in cooperation with university professors watch the work of students at practice.

Considering the fact that the innovation in curriculum has to be in accordance with the Bologna Declaration, this particular curriculum is edited and aligned with the principles of credit scoring system. Curriculums for four year study programs have such scoring system that full number of credit points for this four year study program is 240 (30 points per each semester).

During the conceptualization of a four year study of mathematics and information technology the following aspects were taken into account:

- necessary space for lectures
- personnel
- necessary laboratory and didactic equipment
- costs of the study program and
- scoring system according to ECTS and compliance with the Bologna Declaration

At the innovation of the curriculum for this study program, the similar curriculums in this area were taken into account in order to overcome big differences during changing of faculty at which one studies.

For the four year study program the system of scoring has been created according to ECTS, which is given in a curriculum. During the making of a curriculum, the following was taken into account:

- all subjects last for one semester, in accordance with the principles of the Bologna Declaration
- the number of subjects per semester is 5 to 6, which will increase the competitiveness of the Faculty of Philosophy in comparison with other relevant faculties in BiH
- weekly load ranges from 25 to 27 classes
- there are 2 elective subjects at higher years of studies, thus, to provide flexibility of studies
- subjects are arranged evenly, logically and chronologically across the years of studies to enable gradual adoption of knowledge, from elementary at lower years of studies to highly professional at higher years of studies.

The title which will be acquired at four year study of mathematics and information and technology is „ THE TEACHER OF MATHEMATICS AND INFORMATION AND TECHNOLOGY“.

The aim of the study program

The aim of the study program for the education of teachers of mathematics and information and technology is to prepare them for work in primary and secondary schools i.e. the education of highly professional teachers of mathematics and information and technology.
General education, joint, mathematics, and information and technology subjects provide a student with the necessary scientific, theoretical and practical preparation for performing of all types of educational work in primary and secondary schools. The necessary skills in the field of direct peagogical and educational work students acquire during the lessons of mathematics teaching methodology and IT teaching methodology, during fourth year of studies.

GOALS OF THE STUDY PROGRAM

The goals of the study program in accordance with the Vision of the Faculty of Philosophy are the education of a competent teacher-professor of mathematics and informatics, creating the conditions for their professional education and improvement after the first cycle of education has been completed. One of the major goals of the study program is to equip students in the field of mathematics and computer science competencies, and their integration of theoretical, professional and practical knowledge and skills in the educational process in primary and secondary schools.

The specific objectives of the Study Program are:

- Introducing students to the importance and function of student education in primary and secondary schools.
- Acquiring knowledge from various scientific fields that are necessary for quality work with students in Mathematics and Informatics, at the elementary and secondary school level.
- Enabling students to creatively apply the acquired knowledge that will function in the proper cognitive development of students and their education.
- Developing responsible behavior and acting in accordance with the social and ethical norms of the teaching call.
- Training of students for continuing professional development in mathematics and informatics.

COMPETENCIES OF STUDENTS WHO COMPLETED FIRST CYCLE

By mastering the study program, graduates gain the following skills:

- Analyzes, syntheses, deductions and predictions of solutions of mathematical and computer problems at primary and secondary school level
- Didactic-methodical, pedagogical-psychological competences necessary for successful realization of all educational programs in the field of mathematics and ICT at primary and secondary school level.
- By mastering the differential and integral calculus of the function of a real variable, and mastering the differential and integral calculus of the functions of several variables, and the ability to solve differential equations.
- Application of other knowledge in practice using software packages that can be applied in primary and secondary schools, such as Mathematica, Geogebra and the like.
- Creating web pages, mastering the elements of programming, creating and using databases and the like.
- Development of communication skills, and development of professional ethics.

- Further self-education (lifelong learning) in the fields of mathematical sciences, computer science (ICT) and educational sciences.

By mastering the study program, students acquire the following specific abilities:

- Basic knowledge and understanding of theoretical achievements in mathematics and informatics.
- Solving specific problems in the field of mathematics and / or computer science.
- Connecting basic knowledge from different fields and their application in working with elementary and high school students.
- Monitoring and application of innovations in the profession, eg new software packages that can be applied in teaching, new teaching methods, forms of work, etc.

CURRICULUM

The undergraduate study program for the title of Professor of Mathematics and Informatics lasts for four years, that is, eight semesters and involves the completion of 44 exams (42 compulsory and 2 elective courses), followed by methodical practice.
Students are offered 4 different programs in elective courses, namely 1 general education, 1 mathematics and 2 computer science courses.

Department of Mathematics and Computer Science

	University of Zenica **Faculty of Philosophy**	

Curriculum - Department of Mathematics and Computer Science

Course code	***No..***	***Course title***	**1st SEMESTER**				***Professor/ Assistant***
			L	**P**	**LP**	**ECT(A)S**	
04KO2-001	1.	*Computer Science Basics*	3	2		6	
04KO2-012	2.	*Elementary Mathematics 1*	2	2		5	
04KO2-123	3.	*Introduction to Mathematical Logic and Number Theory*	3	2		6	
04KO2-005	4.	*Introduction to a Linear Algebra*	3	3		7	
04KO2-006	5.	*Operating Systems and Computer Networks*	3	2		6	
		Hours per week L/P/LP[1]	***14***	***11***			
		Total hours per week	***25***				
		Total number of ECTS				***30***	
Course code	***No.***	***Course title***	**2nd SEMESTER**				***Professor/ Assistant***
			L	**P**	**LP**	**ECT(A)S**	
04KO2-003	1.	*Elementary Mathematics 2*	2	3		6	
04KO2-007	2.	*Principles of Programming*	2	3		7	
04KO2-009	3.	*Analytical Geometry*	3	2		6	
04KO2-004	4.	*Mathematical Analysis 1*	3	4		7	
04KO4-042	5.	*Pedagogy*	2	1		4	

[1] L-Lecture, P-Practicum, LP-Lab practicum

	Hours per week L/P/LP[2]	***12***	***13***			
	Total hours per week	***25***				
	Total number of ECTS				***30***	

	University of Zenica **Faculty of Philosophy**	

Curriculum - Department of Mathematics and Computer Science

Course code	***No..***	***Course title***	**3rd SEMESTER**				***Professor/ Assistant***
			L	**P**	**LP**	**ECT(A)S**	
04KO2-011	1.	*Applicative Software*	3	3		6	
04KO2-010	2.	*Mathematical Analysis 2*	3	3		7	
04KO2-013	3.	*Euclidean Geometry 1*	2	3		6	
04KO2-015	4.	*History of Mathematics*	2	0		3	
04KO3-755	5.	*Foreign Language 1*	2	2		4	
04KO2-023	6.	*The use of Computers in Education*	2	2		4	
		Hours per week L/P/LP[3]	***14***	***13***			
		Total hours per week	***27***				
		Total number of ECTS				***30***	
Course code	***No..***	***Course title***	**4th SEMESTER**				***Professor/ Assistant***
			L	**P**	**LP**	**ECT(A)S**	
04KO2-016	1.	*Algorithms and Data Structures*	2	3		5	
04KO2-017	2.	*Procedural Programming*	2	2		5	

[2] L-Lecture, P-Practicum, LP-Lab practicum
[3] L-Lecture, P-Practicum, LP-Lab practicum

04KO2-018	3.	*Euclidean Geometry 2*	2	3		5	
04KO2-012	4.	*Mathematical Analysis 3*	3	3		7	
04KO4-319	5.	*Foreign Language 2*	2	1		4	
04KO3-759	6.	*Didactics*	2	1		4	
		Hours per week L/P/LP[4]	***13***	***13***			
		Total hours per week	***26***				
		Total number of ECTS				***30***	

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Curriculum - Department of Mathematics and Computer Scienece

Course code	***No..***	***Course title***	**5th SEMESTER**				***Professor/ Assistant***
			L	**P**	**LP**	**ECT(A)S**	
04KO2-020	1.	*Object-oriented programming*	2	3		6	
04KO2-021	2.	*Probability and Statistics*	3	3		7	
04KO2-022	3.	*Graph Theory*	3	2		6	
	4.	*The Psihology of Education*	2	1		4	
04KO2-014	5.	*Numerical mathematics 1*	3	3		7	
		Hours per week L/P/LP[5]	***13***	***12***			
		Total hours per week	***25***				
		Total number of ECTS				***30***	

[4] L-Lecture, P-Practicum, LP-Lab practicum
[5] L-Lecture, P-Practicum, LP-Lab practicum

Course code	*No..*	*Course title*	**6th SEMESTER**				*Professor/ Assistant*
			L	**P**	**LP**	**ECT(A)S**	
04KO2-124	*1.*	*Web Design*	*2*	*3*		*5*	
04KO2-025	*2.*	*Differential Equations*	*3*	*2*		*5*	
04KO2-019	*3.*	*Numerical Mathematics 2*	*3*	*3*		*7*	
04KO2-184	*4.*	*Mathematics and Computer Science for Talented Students*	*2*	*1*		*4*	
04KO2-028	*5.*	*Differential Geometry*	*2*	*2*		*5*	
04KO2-125 04KO2-008	*6.*	*Elective course* *Security of Information Systems or* *Descriptive Geometry*	*2*	*2*		*4*	
		Hours per week L/P/LP[6]	***14***	***13***			
		Total hours per week	***27***				
		Total number of ECTS				***30***	

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Course code	*No.*	*Course title*	***7thSEMESTER***				*Professor/ Assistant*
			L	**P**	**LP**	***ECT(A)S***	
04KO2-024	*1.*	*Database 1*	*2*	*2*		*6*	
04KO2-093	*2.*	*Methods of Teaching Mathematics 1*	*3*	*2*		*6*	

[6] L-Lecture, P-Practicum, LP-Lab practicum

04KO2-094	*3.*	*Methods of Teaching Informaticscs 1*	*3*	*2*		*6*	
04KO2-031	*4.*	*Linear Algebra*	*3*	*2*		*5*	
04KO2-167	*5.*	*Web Programming*	*2*	*2*		*4*	
04KO2-035 04KO4-006	*6.*	*Elective course* *Distance Education or* *Teaching Communication*	*2*	*1*		*3*	
		Hours per week L/P/LP[7]	***15***	***11***		***30***	
		Total hours per week	***26***				
		Total number of ECTS					
Course code	***No..***	***Course title***	**8th SEMESTER**				***Professor/ Assistant***
			L	**P**	**LP**	**ECT(A)S**	
04KO2-026	1.	*Mathematical programming*	3	3		7	
04KO2-095	2.	*Methods of teaching mathematics 2*	2	2+1		6	
04KO2-093	3.	*Methods of teaching informaticscs 1*	2	2+1		6	
04KO2-034	4.	*Database 2*	2	2		5	
04KO2-030	5.	*Computer graphics*	2	3		6	
		Hours per week L/P/LP[8]	***11***	***12+2***			
		Total hours per week	***23+2***				
		Total number of ECTS				***30***	

[7] L-Lecture, P-Practicum, LP-Lab practicum
[8] L-Lecture, P-Practicum, LP-Lab practicum

COURSES - PROGRAM STRUCTURE

1st SEMESTER

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Subject title: BASICS OF COMPUTER SYSTEMS

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
I	**Mandatory**	**3**	**2**	**6,0**	**04K02-001**

Subject leader :	**Subject assistant**:
Pre-requisites :	No

Subject aims:	– Introduce students to the operation and basic elements of computer systems and platforms in terms of knowledge of hardware and software features – To equip students to understand the work of computers and to work independently with application software – The purpose of the exercises is to enable students to complete the tasks independently by using application software under the supervision of an assistant
Competences (Learning outcomes)	– Students should understand information technology, basic computer principles and programming elements, independently use application software in their daily work.

Subject curriculum:

Information technology and development. Basic concepts. Historical development. Areas of application. Computers and their application. Generations of computers. Types of computer systems. The concept of computers. Basic Computer Components. Computer mode. Numerous systems and data representation in the computer. Binary number system. Double complement. Sliding comma. Basic hardware elements. Logic circuit. Sequential circuits.Memory. Central, registry and peripheral memory. Central processing unit. Input / output components. Software. Types and software development. System software. Windows and Linux operating systems. Application software. Software tools. Programming languages. Word and image processing software packages. Software packages for mathematical calculations and analysis. Organization of data in a computer. File. Database. Programming basics. Algorithms. Boolean algebra. Classification of commands and program structures. Sequential, selective and cyclic structures. Input / Output Flows.

Learning delivery:

The lectures are taught as an auditorium with the active participation of students, where individual units are thematically covered. The exercises are performed as laboratories in a computerroom, where examples from the fields covered in the lectures are presented and the students independently create assigned tasks.

Assesment rationale:

Knowledge assessment is done through direct activity of students in classes and lectures, through periodic testing, assignment, consultations, and final exam.

Assesment critetia

Activities on lectures	Activities on excercises (partial tests)	Final exam	
30%	30%	40%	

Reading	
Essential	1. Ribarić S.: *Arhitektura računala*, Školska knjiga Zagreb, 2004. 2. Lagumdžija Z: *Informatika*, Ekonomski fakultet Sarajevo, 1999.
Additional	1. Jurić Ž.: *Informatika 1-3*, Sarajevo Publishing, 2003. 2. Brookshear J. G.: *Computer Science – An Overview*, Addison Wesley, 2012.

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Subject title: **INTRODUCTION TO LINEAR ALGEBRA**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
I	**Mandatory**	**3**	**3**	**7**	**04K02-005**

Subject leader : Naida Bikić, naida.bikic@ff.unze.ba	**Subject assistant**:

Pre-requisites :	None
Subject aims:	To get acquainted with basic algebraic structures, the concept of vector space, and the concept and properties of linear transformations in vector spaces. Give the term matrix and determinants, get to know the matrix algebra and see the connection between the matrix and the corresponding linear mapping. Use the acquired knowledge to solve the system of linear algebraic equations.
Competences (Learning outcomes)	Upon successful completion of the course, students will be able to: They thoroughly master the theory of vector spaces and linear transformations, as well as the algebra of matrices and determinants, and apply it in solving systems of linear equations.

Subject curriculum:

Forms of arguments. Sets. Binary relations. Function. Binary algebraic operation. Basic algebraic structures. Basic algebraic structures with one or two binary algebraic operations. Determinant. Properties of determinants. Laplace's development of the determinant. Matrices. Algebra matrix. Inverse matrix. Rank matrix. Elemental transformations of matrices. Equivalent matrices. Elementary matrices. The matrix equations. Systems of linear equations. Solutions and solvability of a system of linear equations. Cramer's rule. Gaussian method of elimination. The concept of vector space and subspace. Linear independence of vectors, bases and dimensions of vector space. Linear operators. Basic properties of linear mappings. Transition from one base to another by a linear mapping base and a similar mapping matrix. Eigenvalues and eigenvectors of linear mapping. Eigenvalue and minimum linear mapping polynomial. Cayley-Hamilton theorem. Diagonal matrix.

Learning delivery:

Lectures and exercises are auditory, with active participation of students in teaching.

Assesment rationale:

Assessment is done through four tests with short theoretical questions and two partial exams with assignments during the semester, as well as the final exam.			
Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Final exam	
20%	40%	40%	

Reading	
Essential	1. S. Radenović, *Linearna algebra*, Beograd, 2007. 2. H. Jamak, *Linearna algebra I*, Sarajevo, 2007. 3. K. Horvatić, *Linearna algebra*, PMF-Matematički odjel i LPC, Zagreb 1995.
Additional	1. A. Odžak, S. Odžak: Linearna algebra i analitička geometrija sa primjenama, Univerzitet u Sarajevu, Sarajevo, 2017. 2. Carl D. Meyer, *Matrix Analysis and Applied Linear Algebra*, SIAM, 2000. 3. David C. Lay, *Linear Algebra and its applications*, Pearson, 2016.

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Subject title: **ELEMENTARY MATHEMATICS 1**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
I	**Mandatory**	**2**	**2**	**5,0**	**04K02-002**

Subject leader :	**Subject assistant**:
Pre-requisites :	None

Subject aims:	– Mastering basic facts in the field of mathematical logic, set theory, algebraic structures, and solving various types of equations, inequalities and systems.
Competences (Learning outcomes)	After successful completion of the course, students will be able to: – recognize basic algebraic structures – perform basic computational operations in sets of integer, rational, real and complex numbers – solve linear, quadratic, irrational, biquadratic, binomial, symmetric, exponential and logarithmic equations and inequalities – solve systems of linear and nonlinear equations

Subject curriculum:
Sets: **N, Z, Q, R** and **C**. Axiomatic design of set **N**. Method of mathematical induction. Algebraic, trigonometric and exponential form of a complex number. Solving linear, quadratic and irrational equations and inequalities. Exponential and logarithmic function. Solving exponential and logarithmic equations and inequalities. Biquadratic, binomial, trinomial and symmetric equations. Cubic equations. Systems of linear and nonlinear equations. Polynomials, algebraic equations.

Learning delivery:
Classes are held in the classroom through lectures, exercises and consultations with the oral presentation of teachers or the use of multimedia teaching aids.

Assesment rationale: The exam is consisted of a written and an oral part of the exam. The written part of the exam is taken through two tests (colloquium) or integrally. The written part of the exam is eliminatory.			
Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Final exam	
10%	50%	40%	

Reading	
Essential	1. M.Nurkanović i Z.Nurkanović: *Elementarna matematika*, Printcom, Tuzla 2011. *2. K. Subašić: Matematika sa zbirkom zadataka za studente razredne nastave*, Zenica 2000. 3. M. Pepić, *Uvod u matematiku,* Sarajevo 2004.
Additional	– Textbooks and workbooks for elementary and high school.

UNIVERSITY OF ZENICA
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Subject title: **INTRODUCTION TO MATHEMATICAL LOGIC AND NUMBER THEORY**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
I	**Mandatory**	**3**	**2**	**6,0**	**04K02-123**

Subject leader :	**Subject assistant**:
Pre-requisites :	None
Subject aims:	– Mastering the basic facts in the field of mathematical logic as well as mastering the basic number theory.
Competences (Learning outcomes)	Upon successful completion of the course, students will be able to: – learn and understand the basics of mathematical logic, – solve problems from congruence theory, – solve linear Diophantine equations and – solving the Pell's equations.

Subject curriculum:
Mathematical logic: Statement. Logical connectors - logical operations. Statement formulas. Tautology. Conjunctive and disjunctive form. Quantifiers.
Number theory: Divisibility. Congruences. Diophantine approximations and continued fractions. Linear Diophantine equations. Pell's equations.

Learning delivery:
Solving tasks related to certain areas provided by the lecture program. The exercises are auditory. Engagement, attendance at lectures and exercises of students in the teaching process is recorded. In order for a student to acquire the right to a teacher's signature, it is necessary for him to attend lectures and exercises regularly, and to do his/her homework with a positive grade.

Assesment rationale:
Knowledge assessment is done through the direct activity of students in classes of exercises and lectures, colloquia, and the final written and oral part of the exam. The exam consists of a written and an oral part of the exam. The written part of the exam is taken through two tests (colloquium) or integrally. The written part of the exam is eliminatory.

Assesment critetia			
Attendance and activity in exercises and lectures	Homework	Written exam	Final exam
10%	10%	40%	40%

Reading	
Essential	1. B. Ibrahimpašić: *Uvod u teoriju brojeva*, PF, Bihać, 2014. 2. N. Okičić, V. Pašić: *Elementi matematičke logike,* OFF–SET, Tuzla, 2015.
Additional	1. V. Devide: *Matematička logika*, Školska knjiga, Zagreb, 1960. 2. S. Prešić: *Elementi matematičke logike,* Beograd, 1968. 3. K. H. Rosen: *Elementary Number Theory and Its Applications*, Addison-Wesley, Reading, 1993. 4. B. Ibrahimpašić: *Kriptografija kroz primjere*, PF, Bihać, 2011.

2nd SEMESTER

UNIVERSITY OF ZENICA
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Subject title: Programming Principles

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
II	**Core**	**2**	**3**	**6,0**	**04K02-007**

Subject leader : Dr.Sc. Senad Balić, Full Prof. **E-mail**: sbalic@mf.unze.ba	**Subject assistant**: MSc. Edin Tabak **E-mail**: edin.tabak@gmail.com

Pre-requisites :	
Subject aims:	− Mastering the basic facts in the field of programming using the selected programming language from the BASIC family.
Competences (Learning outcomes)	On successful completion of this subject student will be able to: − solve computer support problems, − set up algorithms and flowcharts, − programmatically place loops, data structures, arrays, etc., − organize data files in a computer.

Subject curriculum:

Development and generation of programming languages. Language division by purpose. Characteristics of programming languages. Software technology in relation with programming. Introduction to programming using the chosen programming language from the BASIC family. Problem solving with the support of computers and application software development methodology. Algorithm, flow chart. Defining input and displaying of output. Defining Variables. Data processing. Program structure in structured programming. Loops. Data structure, arrays, matrices. Organization and management of data in a computer. Working with data files. Subroutines. Graphical interface programming. Visual programming and NET. Visual Basic.NET Development Environment.

Learning delivery: Exercises are auditory and laboratory and performed with use of PCs. During exercises, programs that solve the chosen mathematical and other problems, according to the lecture program. The programs are implemented using the chosen programming language from the BASIC family, as well as the Visual Basic.NET development environment. Engagement, attendance at student lectures and exercises in the teaching process are recorded and scored.
Assesment rationale: Assessment of students is done during the class, on the basis of tests and student work on exercises. The final exam should assess the theoretical and practical knowledge of students in area of programming.

Assesment critetia			
Attendance and activities on exercises and lectures	Tests	Final exam (written part)	Final exam (oral part)
10%	10%	40%	40%

Reading	
Essential	3. Balić, S., Šaranović, N.: *Principi programiranja*, Univerzitet u Zenici, Zenica, 2008. 4. Wang, W.: *Visual Basic.NET za neupućene*, Mikro knjiga, Beograd, 2002.
Additional	- Internet manuals - Books that study programming

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Subject title: **ANALYTICAL GEOMETRY**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
II	**Mandatory**	**3**	**2**	**6**	**04K02-009**

Subject leader : Naida Bikić, naida.bikic@ff.unze.ba	**Subject assistant**:
Pre-requisites :	None
Subject aims:	Starting from basic knowledge of geometry, the concept of vectors is introduced, and then attention is focused on achieving the following goals: - Adopting techniques of vector operations such as addition, scaling, scalar, vector and mixed product; - Mastering the concept of coordinate system and coordinates; - By mastering the equations of direction, curves in the plane and surface of the second order;
Competences (Learning outcomes)	Upon successful completion of the module the student will - Master the techniques of vector calculus; - Master the notion of the equation of straight and straight, and the notion of curves and surfaces in space; - Master the notion of geometric plane transformations;

	- Acquired knowledge to apply in various fields of mathematics and in other scientific disciplines.

Subject curriculum:

Definition of vectors. Operations with vectors. Linear vector dependence. Decomposing vectors by base. Coordinate system. Scalar product of vectors and properties. Vector product of two vectors and properties. Mixed product. Change of base. Surfaces and lines of 1st order. The parameter equation is straight and straight. Testing equations of II order. Equations of circle, ellipse, hyperbola and parabola. Area II. Equations of spherical surface, ellipsoid, single-sided hyperboloid, double-sided hyperboloid, elliptical paraboloid, hyperbolic paraboloid. Rotating surfaces. Cylindrical surface. Second order surfaces.

Learning delivery:

Lectures and exercises are auditory, with active participation of students in teaching.

Assesment rationale:

Assessment is done through four tests with short theoretical questions and two partial exams with assignments during the semester, as well as the final exam.

Assesment critetia			
Attendance and activity at lectures	Homeworks and periodical tests	Activities on excercises (partial tests)	Final exam
10%	10%	40%	40%

Readings	
Essential	1.N. Bikić, A.Huskanović, *Analitička geometrija – zbirka zadataka sa elementima teorije*, Univerzitet u Zenici, Zenica, 2018 2. N. Bokan, N. Blažić, Z. Lučić, Z. Rakić, *Analitička geometrija*, Beograd, 2000. 3. N. Elezović, A. Aglić, *Linearna algebra, zbirka zadataka*, Element, Zagreb, 1999 4.. K. Horvatić, *Linearna algebra*, Golden marketing – Tehnička knjiga, Zagreb, 2003.
Additional	1. J. T. Moore, *Elements of Linear Algebra and Matrix Theory*, Mc Graw-Hill, New York, 2. A. Odžak, S. Odžak: Linearna algebra i analitička geometrija sa primjenama, Univerzitet u Sarajevu, Sarajevo, 2017.

UNIVERSITY OF ZENICA
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Subject title: MATHEMATICAL ANALYSIS I

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
II	**Mandatory**	**3**	**4**	**7**	**04K02-004**

Subject leader :	**Subject assistant**:
Pre-requisites : NO	
Subject aims:	Introduction to the problem of axiomatically establishing a set of real numbers.

	Mastering the notion of a string limit value and standard tests for convergence of series and rows of real numbers; Differential calculus of real functions of a real variable and its application
Competences (Learning outcomes)	After completing the course, the student will: - Develop a sense of deductive reasoning; - Master the criteria for testing convergence at different boundary processes and ways of determining the limit value - To master the techniques of differential calculus of the function of a real variable; - Through examples in mathematics, physics, other sciences they will be able to present acquired knowledge of differential calculus.

Subject curriculum:

Real and complex number field: Axioms of real number field. Supremum and infimum. Absolute the value of the real number. Algebraic and geometric form of a complex number. Euler's formulas. Principle complete and incomplete mathematical inductions. Newton's binomial formula. Bernoulli's inequality. **Arrays:** The boundary and convergence of a series of real numbers. Properties of convergent arrays. They count e. Cauchy's strings. **Real functions of a real variable**. Limit value of a function. Properties of continuous function. Infinitesimal and infinitely large. Features of functions continuous on a segment. Uniform continuity. Some elementary functions. Hyperbolic and inverse functions. **Differential accoun**t. A function statement of a real variable; physical and geometric meaning of the statement. Differentiation rules. Table of statements of basic elementary functions. Extract of a complex function. Excerpt inverse logarithmic and exponential functions. Function differential. Higher order derivatives and differentials. Performs parameter-defined functions. Fermat's, Roole's, Lagrange's and Cauchy's theorems.
L'Hospital's rule. Taylor's polynomial and Taylor's formula. Monotonicity and extremes of function. Convexity and concavity. Asymptote functions. Function Flow Testing

Learning delivery:

Lectures and exercises are conducted in the classroom with the active participation of students.

Assesment rationale:

The exam is taken through two written tests - a colloquium and orally. The written part of the exam is
eliminatory.

Assesment critetia			
Attendance and activity at exercises and lectures	Homework	Written exam (partial tests)	Final exam
10%	10%	40%	40%

Reading

Essential	1. Lecture notes 2. D.Mihajlović i M. Janjić: *Elementi matematičke analize I*, Naučna knjiga, Beograd 1982 3. F. Dedagić: *Matematička analiza*, I knjiga, Univerzitet u Tuzli, Tuzla, 2005. 4. M. Ušćumlić, *Zbirka zadatak iz više matematike I*, Beograd 1980.
Additional	1. B. Guljaš: *Matematička analiza I i II*, predavanja, Zagreb 2018. 2. S. Kurepa: *Matematička analiza I,* TK, Zagreb, 1989.

UNIVERSITY OF ZENICA
FACULTY OF PHYLOSOPHY

Subject title: PEDAGOGY					
Semester	**Status**	**Hours per week**		**ECTS credit value**	**Code**
		Lectures	**Exercises**		
II	**Mandatory**	2	2	5	04K04-042
Subject leader: **Prof.dr. Amel Alić** **E-mail**: amel.alic@ff.unze.ba			**Subject assistant**: **E-mail**:		
Pre-requisites			-		

Subject aims	To acquire knowledge necessary for acting in several directions related to specific tasks in the field of pedagogy and realization of the teaching process. To understand, as experts, the nature of education; to monitor and evaluate the individual abilities of students through the process of teaching, and according to that to organize their own learning and teaching process; to become acquainted with the possibilities of pedagogical activity in the field of monitoring the development of students' abilities, with an emphasis on cross-cultural studies.
Learning outcomes	The intention is for students to be trained in the following: - Understand, as experts, the nature of educational activities in all areas of educational process; - Monitor, understand, apply, analyze, integrate, evaluate individual skills in the field of development, learning and application of knowledge through educational work with young people, and according to that, to organize and improve their own educational engagement - to get acquainted with the basic determinants of the methodology of educational research and its application in the teaching process - Students will study the role of the culture in the process of learning and teaching in order to understand the importance of culture; - The importance of recognition of the cultural context in conceptualization and research of ability, personality, learning, motivation, cognition, moral development, emotion, and the concept of health.

Indicative syllabus content:
Pedagogy - the science of education. Disciplines of the science of education. Basic pedagogical processes. Education as a basic pedagogical term. Educational ideals, goal and tasks. Theories of educational science. Lifelong education. Learning, socialization, enculturation. Childhood and adolescence - developmental theories. Cultural domains - Situations in which the upbringing is happening; fundamental concepts and processes. Definitions, manifestations and definitions of culture.

Tradition of cultural research Culture, family structures and systems. The concept of parenting in different cultural contexts. Cultural models of upbringing and childhood. Partnership between family and school. Identification of individual student's differences. The social - generational aspect of upbringing. The individual aspect of upbringing. Interactional - communicational aspect of education. Developmental model of intercultural sensitivity.

Learning delivery:

1. Lectures 50 %
2. Student's presentations 20%
3. debates / discussions 15%
4. individual and group work 15%

Assessment Rationale:

Students have the opportunity to pass the exam during the semester, through two partial exams (students who take the first partial exam can attend the second partial examination). Students who do not pass the exam through two partial examinations, take the exam integrally. After passing the written part of the exam, students access the oral evaluation.

Assessment Criteria

Activity and attendance	Student's presentations	debates / discussions / individual and group work	Written exam	Oral exam
10	20	20	30	20

Readings

Essential	Bratanić, M. (1993). *Mikropedagogija.* Zagreb: Školska knjiga. Giesecke, H. (1993). *Uvod u pedagogiju.* Zagreb: Educa. (selected pages) Gudions, H. (1994). *Pedagogija, temeljna znanja.* Zagreb: Educa. (selected pages) Pašalić-Kreso, A. (2004 ili 2012). *Koordinate obiteljskog odgoja.* Sarajevo: Dobra knjiga. (selected pages) Slatina, M. (2005). *Od individue do ličnosti.* Zenica: Dom štampe. (selected pages)
Supplementary	Konig, E., Zedler, P. (2000). *Teorije znanosti o odgoju*. Zagreb: Educa. Kyriacou, C. (1997). *Temeljna nastavna umijeća – Metodički priručnik za uspješno poučavanje i učenje.* Zagreb: Educa. Thomas, G. (2015). *Kratak uvod u pedagogiju.* Zagreb: Educa.

3RD SEMESTER

Subject title: APPLICATION SOFTWARE					
Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
III	**Mandatory**	**3**	**3**	**6,0**	**04K02-011**
Subject leader :			**Subject assistant**:		
Pre-requisites :		No			
Subject aims:	– Introduce students to working in the MS Office environment and the application of teaching and learning tools in the advanced use of office tools, – Introduce students to the construction and types of UML diagrams regarding application creation and code generation based on flowcharts, – Designing UML diagrams in the perception of solving real-world problems using applications.				
Competences (Learning outcomes)	Upon successful completion of the course, students will be able to: – Solve problems related to the selection and implementation of appropriate office tools and their use in real time, – Independently use the Solver method to solve complex problems and program real problems, – Troubleshoot using advanced features in Excel, animate dynamic-type objects in PowerPoint, and use macros and tabs within a word document. – Designs a realistic problem using seven flowcharts in UML.				

Subject curriculum:

Software. Application software. Application development technology and tools. Application development phases. Methods in application development. UML modeling. UML diagrams: use case diagram, class diagram, sequence diagram, activity diagram, component diagram, scheduling diagram. Data logging formats. Using the Office suite. Word processing - advanced use and programming. Tabular calculations - advanced functions, Solver method, statistical tools. Presentations - Animation and programming of dynamic objects. TeX and LaTeX mathematical text editing packages. Mathematica - Wolfram Research (symbolic and numerical computation, visualization of results.

Learning delivery:

The lectures are taught as an auditorium with the active participation of students, where individual units are thematically covered. The exercises are performed as laboratories in a computerroom, where examples from the fields covered in the lectures are presented and the students independently create assigned tasks.

Assesment rationale:

Knowledge assessment is done through direct activity of students in classes and lectures, through periodic testing, assignment, consultations, and final exam.

Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Final exam	
305	30%	40%	

Reading	
Essential	1. Alempije Veljović: UML, ISBN broj: 86-7310-315-0 2. L.Lamport, LaTex: A Document Preparation System, Addison-Wesley, ReadingMA 1986.
Additional	1. H.Kopka and W.Daly, A Guide to LaTeX 2î. Addison-Wesley, Wokingham, England 1995.

	2. M.L.Abell, J.P.Braselton, Mathematica by Example, Academic Press, OrlandoFL 1992.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: ANALYSIS II

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
III	**Mandatory**	**3**	**4**	**7**	**04K02-010**

Subject leader : **Subject assistant**:

Pre-requisites : ANALYSIS I

Subject aims:	● To master integration techniques and integration methods; ● Apply the Reimann integral; ● Mastering standard tests for convergence of the real series numbers and rows of functions; ● Develop elementary functions in Taylor order.
Competences (Learning outcomes)	● Develop a sense of deductive reasoning; ● Master the integration techniques and integration methods. ● Be able to develop functions in Taylor's order. ● Through examples in mathematics, physics, other sciences they will be able present the acquired knowledge of differential and integral calculus.

Subject curriculum:
Primitive function and indefinite integral. Table of integrals of elementary functions. Methods of integration: Substitution method. Integration methods: Partial integration. Integration of rational functions. Euler's shifts. Binomial differential integral. Integration of trigonometric functions A certain integral.
Darboux sums. Riemann integral sum. Examples. Lebesgue's Riemann's criterion integrability. The first theorem on the mean for integrals. Basic theorem of differential and integral account. Partial integration in a given integral. Taylor's formula in integral form. Variable shift in a given integral.Other theorem on the mean of the integral. Applications of a certain integral. The surface of the characters in the plane. Volume of rotating bodies. Length of arc of curves. Surface of rotating bodies. Non-inherent Riemann integral. Criteria for convergence of non-inherent integrals. An integral criterion for row convergence. Function lines and uniform convergence. Rows potency. Taylor's order and Taylor's development of elementary functions.

Learning delivery:
Lectures and exercises are conducted in the classroom with the active participation of students.

Assesment rationale:
The exam is taken through two written tests - a colloquium and orally. The written part of the exam is
eliminatory.

Assesment critetia

Attendance and activity at exercises and lectures	Homework	Written exam (partial tests)	Final exam
10%	10%	40%	40%

Reading	
Essential	1. Lecture notes 2. D.Mihajlović i M. Janjić: *Elementi matematičke analize I*, Naučna knjiga, Beograd 1982 3. F. Dedagić: *Matematička analiza*, I and II book, Univerzitet u Tuzli, Tuzla, 2005. 4. M. Ušćumlić, *Zbirka zadatak iz više matematike I i II*, Beograd 1980.
Additional	1. B. Guljaš: *Matematička analiza I i II*, predavanja, Zagreb 2018. 2. S. Kurepa: *Matematička analiza I,* TK, Zagreb, 1989.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **EUCLIDEAN GEOMETRY I**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
III	**Mandatory**	**2**	**3**	**6**	**04K02-013**

Subject leader : Naida Bikić, naida.bikic@ff.unze.ba	**Subject assistant**:

Pre-requisites :	None
Subject aims:	- Mastering the axiomatic way of founding mathematical discipline through the example of the Hilbert system of axioms of absolute geometry - Gaining and developing knowledge of basic geometric objects and the relationships between them - Developing deductive reasoning
Competences (Learning outcomes)	Upon successful completion of the course, students should - Master the concepts and methods that are the subject of study - Applied theoretical knowledge is applied to solving problems

Subject curriculum:

1. Introduction; Axioms of incidence; Axioms of order; Segment line; Broken line; Semiline; Orientation of semiline; Semiplane; Angle and dieder; Triangle
2. Axioms of congurence and their consequences; Relation „...
3. Axioms of coincidence and their immediate consequences, The relation "… less than…" and "… greater than "for line segment; The relation "… less than…" and "… greater than…" for angles; right angle, normality of lines; normality of two planes.

4. Axial symmetry in the plane; Plane matching transformations; Application of matching transformations; Rotation; Central symmetry; Translation; Symmetry with respect to a plane; Transformation of matching in space; Circle and sphere

Learning delivery:
Lectures and exercises are auditory, with active participation of students in teaching.

Assesment rationale:
Assessment is done through four tests with short theoretical questions and two partial exams with assignments during the semester, as well as the final exam.

Assesment critetia			
Tests (activity in lectures) and attendance at lectures and exercises	Partial exams (activity on exercises)	Final exam	
20%	40%	40%	

Reading	
Essential	1. M. Prvanović: *Osnovi geometrije*, Građevinska knjiga, Beograd. 2. V. Petrović i R. Tošić: *Zbirka zadataka iz osnovne geometrije*, Građevinska knjiga, Beograd.
Additional	1. R. Hartshorne: *Euclid and beyond*, Springer, 2000 2. D. Lopandić, *Geometrija*, Naučna knjiga, Beograd, 1988 3. M. Radojčić: *Elementarna geometrija*, Naučna knjiga, Beograd

UNIVERSITY OF ZENICA
FACULTY OF PHILOSOPHY

Subject title: ENGLISH LANGUAGE I

Semester	**Status**	**Number of classes per week**		**ECTS credits**	**Code**
		Lectures (L)	**Practical classes (PC)**		
III	**Required**	**2**	**2**	**4**	

Subjects as prerequisites:	None
Subject aims	The aim of this subject is to practice grammatical structures, vocabulary and receptive and productive language competencies. Therefore, the course is designed to encompass receptive activities, i.e. Understanding through listening and reading as well as productive activities, i.e. Speaking and writing activities. Level of language competence: B1 to B2
Competencies (learning outcomes)	Students should acquire, i.e. Consolidate middle level of language competence in grammatical, as well as in productive and receptive language skills (speaking, writing, listening, reading).

Course delivery plan:
Grammatical contents: Word types (repetition), present, past and future tenses, forms and meaning of modal verbs, passive voice, conditional sentences and direct and indirect speech.
Lexical contents: Vocabulary enriching exercises
Reading: Understanding texts, short translation.
Writing: Dictations, short descriptions.
Listening and speaking: Developing understanding skills while listening various language materials (used in everyday English language).
Exercises develop receptive language skills (understanding through reading, listening), vocabulary, writing (short compositions/presentations/descriptions/letters). Lecture classes aim at clarifying grammatical units and structures.
Language materials encompass both formal and colloquial style and they will be based on short texts, newspaper articles, published prose and audio recordings.

Teaching:
Students will attend lectures (by teacher) and practical classes (teaching assistant) done in groups.

Testing:
Testing is done during classes (quizzes, tests, colloquiums) and it is used for testing understanding and speaking in English language. It can be implemented in the form of various vocabulary tests, short written essays (retelling, describing etc.); final exam is based on testing understanding and on language test *Use of English*.

Testing criteria:			
Lectures (L)	Practical classes (PC)	In-class exams	Final exam
-	-	50%	50%

Reading list	
Required	Hashemi, L. and Thomas, B. (2003) *Grammar for First Certificate, self-study grammar reference and practice*, Cambridge Books for Cambridge Exams Prodromou, L. (2006) *Grammar and Vocabulary for First Certificate*, Longman Cambridge First Certificate in English 3, Examination Papers from the Cambridge Local Examinations Syndicate, Cambridge University Press, 2001
Supplementary	Thomas, B. and Matthews, L. (2008) *Cambridge Vocabulary for First Certificate*, Cambridge University Press

UNIVERSITY IN ZENICA
FACULTY OF PHILOSOPHY
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Subject title: **GERMAN LANGUAGE I**

Semester	**Status**	**Hours per week**		**ECTS credit value**	**Code**
		Lectures	**Exercises**		

III	Undergraduate study – Bachelor Degree Compulsory subject	2	2	4	04K03-764
		Teacher e-mail	assistant e-mail		

Pre-requisites	-
Subject aims	The aim of the course is to acquire the level of speaking and written competences of the European framework of Reference for Languages A1 to level A2. Training students to acquire knowledge independently, expanding knowledge and developing the ability of thinking, memory and judgment. The program includes learning of expressions that we use every day, understanding and using of simple sentences. It is able to introduce itself and others, to be understood in some routine situations, to describe their background and education and their environment with simple expressions.
Learning outcomes	Basic knowledge of German language A1. It is able to communicate in a simple way, to present itself and to have some basic communicative competences with other interlocutors in the enviroment.

Indicative syllabus content:

WEEK	TOPIC
Week 1	First contacts greeting and presentation
Week 2	Ocuppations, numbers
Week 3	Food and drink
Week 4	Free time, daily activities
Week 5	Objects at home (appointment and description)
Week 6	In the supermarket
Week 7	First colloquium (part exam)
Week 8	Parts of the body, illness, health
Week 9	Job
Week 10	Orientation in the city and enviroment
Week 11	Wirtting letters and postcards
Week 12	shopping
Week 13	German culture
Week 14	Second colloquium (part exam)
Week 15	Final evaluation of the course

Learning delivery:

The course is performed in the form of lectures and exercises.
1. ex cathedra 60%
2. Presentations 40%

Exercises target auditory processing skills. The aim of the exercise is to enable students to critically view and understand the issues and problems handled during lectures, which are related to this subject area.

Assessment Rationale:

The condition for recognition of points is attending classes, and fullfilling of all obligations (teaching and exam). The categories that are ranked are activity during classes, attendance at lectures, written

colloquium, seminar work (successfully oral presentation in written form) and final exam. The students are constantly followed.

The engagement and interest of students in the teaching process are recorded and awarded according to comparability and complementarity of the ECTS system.

The criteria for the final assessment of the progress made by student on the subject are aligned with the Statute of the University of Zenica and are listed in the table below:

Grading		
ECTS credits earned	Grade	(ECTS grade)
54 and <	5	F
55-64	6	E
65-74	7	D
75-84	8	C
85-94	9	B
95-100	10	A

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **APPLICATION OF COMPUTERS IN TEACHING**

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
III	**Mandatory**	**2**	**2**	**4,0**	**04K02-023**

Subject leader :	**Subject assistant**: **Musić Rabija**
Pre-requisites :	**None**

Subject aims:	- Aim of the subject is student's education about deliberation of computer-based mathematical ideas to solve problems in an easier and more efficient way using software tools.
Competences (Learning outcomes)	After completion of the module, students will be able to: - Create mathematical documents using LaTeX software tool; - Use GeoGebra software package for presentation and solving algebraic and geometric problems; - Use Geometer's Sketchpad software package for presentation and solving geometric problems; - Use Mathematica software package for presentation and solving algebraic and mathematical analysis problems.

Subject curriculum:

Use of computers in the process of creation, development, using and distributing educational content. Basics of TeX I LaTeX technologies, Document structures and classes. Functions. Operators. Creating commands. Entering theorems and definitions. Floating objects. Graphics. GeoGebra software package. Geometric input. Examples. Algebraic input. Examples. "The Geometer's Sketchpad" software package. Dynamic geometry. Commands. Examples. Algebraic examples.

Basics of Mathematica software package. Variables. Symbolic computation. Programming basics in Mathematica software package. Matrix, functions and applications in analysis. Application of the mentioned tools in mathematics and informatics teaching.
Learning delivery: Lectures are conducted using multimedial tools, active learning technique and with the active participation of students. Exercises are performed as laboratory exercises, in computer center.
Assessment rationale: Assessment is done through direct student activity in exercise and lecture classes, monthly testing, consultation, making reports and projects, and final written and oral part of exam.

Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Final exam	
20%	40%	40%	

Reading	
Essential	1. Š. Ungar, *Ne baš tako kratak uvod u TeX* 2. Internet skripte: *GeoGebra, The Geometer's Sketchpad* 3. S. Wolfram: *Mathematica book*, 5th edition, Wolfram Media Inc. 2003.
Additional	1. Donald E. Knuth, The TeXbook, Addison-Wesley Professional, 1984. 2. Indian TeX users group, LaTeX tutorials: a primer 3. G. Grätzer, Math into LaTeX Don Eugene: Mathematica, Schaum's Outline Series, McGraw-Hill, 2001.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: HISTORY OF MATHEMATICS

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
III	**Mandatory**	**2**	**0**	**3,0**	**04K02-015**

Subject leader : **Prof. dr. sc. Dževad Zečić**	**Subject assistant**: ----------
Pre-requisites :	
Subject aims:	-Introduce students to the mathematics of Old age; -Introduce students to the mathematics of the Middle Ages; - Introduce students to modern mathematics.
Competences (Learning outcomes)	Upon successful completion of the module-course students will: To get acquainted with the development of ideas of mathematics of the old, middle and new ages. Get acquainted with the emergence of modern mathematics and the emergence of the latest mathematical ideas and claims.

Program of the course

The subject of research into the history of science. Research methodology for the history of science. The position of the history of science in science in general. Mathematics of the Old Age. First civilizations (Concrete notion and empirics). The transition from concrete to abstract. Proof of claim. Atomistic structure of mathematics. Plato and Aristotle. Separation of arithmetic and geometry - the

concept of continuity and infinity. Deductive method and axiomatics. Euclidean Elements. A Methodological Approach to Mathematics in Ancient Greece. Mathematics of the Middle Ages. Numerous value as the foundation of Indian science. Arabic mathematics. The Impact of Arabic Mathematics on Europe. Contemporary mathematics. The birth of symbolic mathematics. How real is the infinitesimal account, the discovery of natural logarithms, Newton and Leibniz as the discoverers of the infinitesimal account. Joseph Louis Lagrange, Augustine Louis Cauchy - Strict account establishment. How set theory was created. Georg Cantor - Continuity countlessness and the emergence of set theory. How mathematical logic was created. Syndems of numbers. Binary number system. Mathematical logic as the theoretical basis of computer science. Application of Boolean algebra in computing. Turing machine.

Learning delivery:
The lectures are conducted as an auditorium with the active participation of students, where the topics of each unit are thematically discussed.

Assesment rationale:
Assessment is done through direct activity of students in classes, consultations, seminar papers and final-oral part of the exam.

Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Final exam	
Lecture Activity (Periodic Tests) 30%	Seminar 30%	Final Exam 40%	

Reading	
Essential	Dž. Zečić, Fragmenti iz povijesti matematike, Univerzitet u Zenici, 2004. D.J. Struik , A Concise History of Mathematics , Dover , New York 1966. Z. Šikić, Kako je stvarana novovjekovna matematika , Školska knjiga , Zagreb 1989.
Additional	Ž. Dadić, Razvoj matematičke ideje i metode egzaktnih znanosti u njihovu povijesnom razvoju, Školska knjiga , Zagreb 1975.

4th SEMESTER

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **Algorithms and Data Structures**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
IV	**Mandatory**	**2**	**3**	**5,0**	**04K02-016**
Subject leader : doc. dr. Esad Kadušić			**Subject assistant**: v. ass. Edin Tabak		

Pre-requisites : None	
Subject aims:	- Introduce students to basic data structures, operations with them and their implementation in C programming language. - Introduce students to the construction, types of algorithms and their analysis with examples based on sorting algorithms.
Competences (Learning outcomes)	- Solve problems related to the selection and implementation of adequate data structures using the C programming language, including operations on structures. - Implement and analyze different algorithms using C programming language or other programming environment (Mathematica, Matlab, Maple ...).

Subject curriculum:

The concept of type, abstract type and data structure. Elements that build the structure: field, record, pointer, cursor. The concept of algorithm, logging and analyzing algorithms. Overview of various abstract types: list, stack, row, ordered and binary tree, mapping, etc. Operating data structures: static, semi-static and dynamic structures. General techniques for constructing algorithms: recursive algorithms, divide-and-conquer algorithms, dynamic programming, greedy algorithm, backtracking, breadth first search and depth first search. Quantitative aspects. Complexity of algorithms. Big O notation. Asymptotic behavior of functions. Types of algorithms by complexity. Sorting algorithms, division by sorting location and algorithm construction. Internal sorting algorithms: priority queues, divide-and-conquer, key insertion methods, Insertion Sort, Shell Sort, Selection Sort, Bubble Sort. Recursive Sorting Algorithms, Merge Sort, Quick Sort. Tree sorting algorithms. External sorting, hashing. algorithm complexity analysis. Searching algorithms. Algorithms in number theory: Extended Euclidean algorithm, prime numbers and factorization. Probabilistic approach.

Learning delivery:

The lectures are conducted using multimedia tools, active learning techniques and with the active participation of students. The exercises are computer-based and held in a laboratory.

Assesment rationale:

Assessment is based on three periodic written examinations during the semester, three practical exams, and a final oral examination.

Assesment critetia			
Activities on lectures (partial tests)	Activities on excercises (partial tests)	Final exam	
30%	30%	40%	

Reading

Essential	1. D. S. Malik, "Data Structures Using C++", Second Edition, Course Technology, 2010. 2. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Addison-Wesley, 1997. 3. R. Thareja, "Data Structures Using C", Department of Computer Science, Oxford University Press, 2014.
Additional	1. N. Bijedić i dr., "Strukture podataka i algoritmi", FIT, Mostar, 2004. 2. D. Živković, "Uvod u algoritme i strukture podataka", Singidunum, Beograd, 2010. 3. M. Tomašević, "Algoritmi i structure podataka", Akademska misao, 2015.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **EUCLIDEAN GEOMETRY II**

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
IV	**Mandatory**	**2**	**3**	**5**	**04K02-018**

Subject leader : Naida Bikić, naida.bikic@ff.unze.ba	**Subject assistant**:
Pre-requisites :	None

Subject aims:	- Introduction to the axioms of Euclidean geometry and mastering their use to solve problems in planimetry and stereometry - Acquiring knowledge about the transformations of coincidence and similarity in the plane and in space - Acquiring knowledge about basic geometric figures in space - Acquiring knowledge about constructive tasks.
Competences (Learning outcomes)	Upon successful completion of the course, students should – Master the concepts and methods that are the subject of study – Applied acquired theoretical knowledge to solve problems

Subject curriculum:

1. The axioms of continuity. Measuring line segment. Archimedes' axiom. Kantor's axiom. Dedekind's principle. The measurement number of line segment in various measurement systems. Measuring angles. Some consequences of the continuity axiom.

2. The axiom of parallelism. Equivalents of parallelism axioms. Fifth Euclid Postulate. Some consequences of the axiom of parallelism. Orientation of parallel semi-lines. Translation in the Euclidean plane. Sliding symmetry. Classification of coincidence transformations in space.

3. Similarity. Definition and properties of proportional line segments. Proportionality of line segments and axioms of continuity. Thales theorem. Application of the Thales theorem. Homothety. Transformation of plane similarities and consequences.

4. Transformation of similarities in space and consequences.

5. About line segments and their projections. Rogalj. Triedar. Polyhedron surfaces. Euler's theorem on polyhedra.

6. About famous Greek problems. Constructive tasks in plane and space. Primary and basic constructive tasks.

Learning delivery:
Lectures and auditory exercises

Assesment rationale:
Assessment is done through four tests with short theoretical questions and two partial exams with assignments during the semester, as well as the final exam.

Assesment critetia			
Tests (activity in lectures) and attendance at lectures and exercises	Parcijalni ispiti (aktivnost na vježbama)	Final exam	
20%	40%	40%	

Reading	
Essential	1. M. Prvanović: *Osnovi geometrije*, Građevinska knjiga, Beograd. 3. M. Malenica: *O osnovnim konstruktivnim zadacima u ravni i prostoru*, Svjetlost, 1989,
Additional	1. R. Hartshorne: *Euclid and beyond*, Springer 2. D. Lopandić, *Geometrija*, Naučna knjiga, Beograd, 1988 3. M. Radojčić: *Elementarna geometrija*, Naučna knjiga, Beograd

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: ANALYSIS III

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
IV	**Mandatory**	**3**	**3**	**7**	**04K02-012**

Subject leader :	**Subject assistant**:
Pre-requisites : ANALYSIS II	

Subject aims:	After learning about the Fourier series and partial excerpts, module implementation concentrates on: ● Getting to know surfaces and curves of spaces; ● Functional flow testing of multiple variables; ● Application of double and triple integrals ● Studying the functions of complex variables
Competences (Learning outcomes)	After completing the course module, the student will ● Develop functions in F-row ● Master the techniques of integrating double and triple integrals. ● Be able to determine the extremes and conditional extremes of a function of multiple variables.

	• Through examples in mathematics, physics, other sciences they will be able present the acquired knowledge of differential and integral calculus.

Subject curriculum:

Fourier series (definition and basic properties). Curve in space. Curve rectifications. Curvilinear types I and II integrals. Continuity and limes functions of multiple variables (examples). Partial derivatives
(definition and geometric interpretation). Implicit default functions. Extremes of function two variables. Extremes of function of multiple variables. Conditional extremes. Riemann integral of functions two and three variables. Substitution of variables in double and triple integral. Integration in polar and
cylindrical coordinates. Applications of double and triple integrals. Smooth paths in R^n. Integral realistic functions along the way. Integral independence of the path of integration. Green's theorem. The curves in R^n and their length. Curve integrals. Complex numbers and functions. Derivation of a complex function. Integral of complex functions. Cauchy's theorem on the disappearance of integrals by a closed curve.Cauchy's integral formula. Holomorphic functions. Morerin's theorem.

Learning delivery:

The exercises are auditory. Engagement, attendance at student lectures and exercises in the process classes are recorded and scored. In order for a student to qualify for a teacher's signature, it is necessary that
attends lectures and exercises regularly and regularly.

Assesment rationale:

Knowledge assessment is done through the students' direct activity in the classes and classes, through monthly tests, consultations, midterm examinations and final written and oral examinations. The written part
the exam is eliminatory.

Assesment critetia

Attendance and activity at exercises and lectures	Homework	Written exam (partial tests)	Final exam
10%	10%	40%	40%

Reading

Essential	1. Lecture notes 2. S. Kurepa, *Matematička analiza I,II, III* Tehnička knjiga, Zagreb (više izdanja). 3. Š. Ungar, *Matematička analiza IV*, Matematički odjel PMF, Zagreb 2001. 4. H. Kraljević, S. Kurepa, *Matematička analiza IV,* Tehnička knjiga, Zagreb 1986.
Additional	1. I. C. Burkill, H. Burkill, *Mathematical Analysis,* Cambridge University Press, 1970. 2. M.Lavrentjev, B.Šabat, *Metody teorii funkcij kompleksnogo peremennogo,* Nauka, Moskva 1973.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: PROCEDURAL PROGRAMMING

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
IV	**Mandatory**	**2**	**2**	**5,00**	**04K02-017**

Subject leader :	**Subject assistant**:
Pre-requisites :	Programming principles

Subject aims:	– Introduce students to the essential elements and method of procedural programming through application in the C ++ programming language – Enable students to understand syntax and write C ++ programs – The purpose of the exercises is to enable students to independently complete the assignments (original programs) from the problems covered during the lecture, under the supervision of an assistant.
Competences (Learning outcomes)	Upon successful completion of the course, students will be able to: – understand basic C ++ syntax at the level of procedural programming – independently write source codes to solve specific tasks

Subject curriculum:

Introduction. A brief history of programming languages. About procedural programming. Dev-C ++ software package. Programming basics. Program structure. The compilation process. Variables. Memory. Input / output flow meters. Comments. Identifiers. Data types. Operators. Arithmetic, relational, logical, bit, incremental, decremental, conditional, join and separation operator (comma-operator), sizeof operator. The typedef keyword. Operator hierarchy. Commands. Simple and complex commands. The if command. Switch command. While command. Command to. The for command. Functions. Function definition. Parameters and arguments. Global and local variables. Recursive functions. Overloaded functions. Arrays. Defining and initializing fields. Multidimensional fields. Pointers. Basics about pointers. Dynamic memory. Pointers and fields. Pointer arithmetic. Function pointers. References. Files. The standard fstream library. File access lifecycle. To meet object-oriented programming. Procedural and object oriented programming. Advantages of object oriented programming. Features of object oriented languages.

Learning delivery:

The lectures are taught as an auditorium with the active participation of students, where individual units are thematically covered. The exercises are performed as laboratories in a computerroom, where examples from the fields covered in the lectures are presented and the students independently create assigned tasks.

Assesment rationale:

Knowledge assessment is done through direct activity of students in classes and lectures, through periodic testing, assignment, consultations, and final exam.

Assesment critetia

Activities on lectures	Activities on excercises (partial tests)	Final exam	
30%	30%	40%	

Reading

Essential	1. 1. A. Karač, Proceduralno programiranje, Pedagoški fakultet, Zenica, 2007. 2. 2. B. Motik, J. Šribar: Demistificirani C++, Lemenet, Zagreb, 2001.
Additional	1. Lippman S., Lajoie J., C++ Primer, Addison Wesley, 2005. 2. Bjarne Stroustrup, The C++ Programming Language, Addison-Wesley, 2000. 3. Stephen R. Davis, C++ for Dummies, Wiley Publishing, 2004.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: Didactics

Semeste	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
IV	**Regular**	**2**	**1**	**4**	**04K04-319**

Subject leader : doc.dr. Amer Ćaro — **Subject assistant**:-

Pre-requisites :

Subject aims:	The primary aim of the instruction is to provide students with an insight into fundamental teaching skills that present the result of the most recent scientific achievements with an aim to acquire basic teaching competences.
Competences (Learning outcomes)	Upon passing of the course, students will be familiar with models of relationships between theory and teaching practice and will advance in fundamental teaching competences i.e. professional teacher's competences, teaching communication procedure, teaching forms of work, methods as well as teaching means, and the system and structure of organizing instruction in primary and secondary schools.

Subject curriculum: Introducing students to their duties in the course of instruction, introducing students to the reading material, Scope of didactics, tasks and relations between didactics and other sciences, Basic didactic terms (teacher, student, teaching content, curriculum, didactic triangle, instruction, upbringing, education.), Learning and teaching strategies, Laws of didactics, principles and rules, Defining teaching objectives and tasks, Midterm exam (MtE), Teaching systems, Problem, exemplary and programmed instruction, Internal and external organization of instruction, teaching means and type of lesson, Teaching methods and forms of work, Planning and preparing of teachers for work, Assessment and grading of students' knowledge, Socio-emotional climate, elements of successful rapport between the teacher and students, End-of-Term exam (EoT)

Learning delivery: Presentation, dialogue, discussion

Assesment rationale:
Students' grading mode: Midterm max 40 points, End-of-Term max 40 points, class delivery 15 points andattendance in classes max 5 points.

Assesment critetia

Activities on lectures	Activities on excercises (partial tests)	Final exam	
5	15	80	

Reading	
Essential	1. Muminović, H. (2013). Osnovi didaktike. Sarajevo 2. Kyriacou, C. (1997). Temeljna nastavna umijeća. Zagreb 3. Slatina, M. (1998). Nastavni metod. Sarajevo 4. Poljak, V. (1988). Didaktika. Zagreb
Additional	1. Jensen, E. (2001). Super nastava. Zagreb 2. Seitz, M., Hallwachs, U. (1997). Motessori ili Waldorf. Zagreb 3. Bognar, L. Matijević, M. (1993). Didaktika, Zagreb

UNIVERSITY OF ZENICA
FACULTY OF PHILOSOPHY

Subject title: ENGLISH LANGUAGE II

Semester	Status	Number of classes per week		ECTS credits	Code
		Lectures (L)	Practical classes (PC)		
IV	Required	2	1	4	

Subjects as prerequisites:	ENGLISH LANGUAGE I
Subject aims	Learning basic terminology in English Language from the realm of Mathematics and Information Technology and as accurate as possible use of grammatical structures specific for certain professional area. Preparing students for reading professional texts and making conversations about primary topics from their field of expertise.
Competencies (learning outcomes)	Upon completion of the course students will be able to: - differentiate, define, understand and use basic terminology from Mathematics and Information Technology in English language

Course delivery plan:
Work on short texts in English language: *The Internet distance education, My future profession, Arithmetic operations, Fermat's last theorem, Fractions, J.E. Freud's System of Natural Numbers Postulates, Inequalities, Mathematical signs and symbols, Thinking and reasoning in Math, The Pythagorean property, The coordinate plane, Ratio and proportion, What is an electronic computer, Sequences obtained by repeated multiplication*, and grammatical units from them: Tensed, participles, infinitives, conditionals, modal verbs, comparisons.

Teaching:

Teaching is interactive. The aim of practical classes is to prepare students for using and understanding professional terminology in Mathematics and Information Technology. Participation, presence at lectures and practical classes during semester is recorded and awarded accordingly.
Testing: Testing will be done during student participation in practical classes and lectures, at monthly testing, office hours and final oral and written exam.

Testing criteria:			
Presence and activity during lectures and practical classes	Homework (Seminar papers)	Written exam	Final exam
10%	20%	30%	40%

Reading list	
Required	1. Phuong, H. T. and Van, L. T. K., English for Mathematics, Ho Chi Minh City University of Education, 2003 2.Mathematics for New Speakers of English, Saddleback Educational Publishing, 2005,3. Murphy R., Essential Grammar in Use, Cambridge University Press, Cambridge, 1998.
Supplementary	1. Maddox, R. B., Mathematical Thinking and Writing, A Transition to Abstract Mathematics, Academic Press, 2002 2. IEE Standard Glossary of Mathematics and Computing Terminology, 3. Professional and scientific magazines dealing with Mathematics and Information Technology

UNIVERSITY IN ZENICA
FACULTY OF PHILOSOPHY
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Subject title: **GERMAN LANGUAGE II**

Semester	**Status**	**Hours per week**		**ECTS credit value**	**Code**
		Lectures	**Exercises**		
IV	Undergraduate study – Bachelor Degree Compulsory subject	2	1	4	04K03-765
		Teacher e-mail	assistant e-mail		

Pre-requisites	-
Subject aims	The aim of the course is to acquire the level of speaking and written competences of the European framework of Reference for Languages A2 to level B1. Training students to acquire knowledge independently, expanding knowledge and developing the ability of thinking, memory and judgment. The program includes learning of expressions and terminology that are characteristic for the linguistics. The lexical semantics is extended and practiced to the level of the active lexical fund by both non-prudential and translation methods. As part of the teaching objective of this reference

	European framework, it is envisaged to acquire the ability to translate correctly from a foreign language to b/h/s and opposite, first some themes that are the most important for this study.
Learning outcomes	The student will be able to understand and explain most of the situations he meets on a daily basis. It can be easy and closely related to relevant topics and interest areas and it can acquire the A2-B2 language level competences.

Indicative syllabus content:

WEEK	TOPIC
Week 1	Characterisation of persons
Week 2	Motivation, work, study, subjects
Week 3	Entertainment and media
Week 4	Industry,work,business
Week 5	Family and personal relations
Week 6	Nature, enviroment and weather
Week 7	First colloquium (part exam)
Week 8	Germans abroad and strangers in Germany
Week 9	News and politics
Week 10	Old people - where are grandparetns?
Week 11	Memories- life stations
Week 12	Relationships- dating, partnership and friendship
Week 13	Personal Reports Diseases and Remedies
Week 14	second colloquium (part exam)
Week 15	Final evaluation of the course

Learning delivery:

The course is performed in the form of lectures and exercises.
1. ex cathedra 60%
2. Presentations 40%

Exercises target auditory processing skills. The aim of the exercise is to enable students to critically view and understand the issues and problems handled during lectures, which are related to this subject area.

Assessment Rationale:

The condition for recognition of points is attending classes, and fullfilling of all obligations (teaching and exam). The categories that are ranked are activity during classes, attendance at lectures, written colloquium, seminar work (successfully oral presentation in written form) and final exam. The students are constantly followed.

The engagement and interest of students in the teaching process are recorded and awarded according to comparability and complementarity of the ECTS system.

The criteria for the final assessment of the progress made by student on the subject are aligned with the Statute of the University of Zenica and are listed in the table below:

Grading		
ECTS credits earned	Grade	(ECTS grade)
54 and <	5	F
55-64	6	E
65-74	7	D
75-84	8	C
85-94	9	B
95-100	10	A

Assessment Criteria					
Lectures	Exercises	Practice (practical work)	Theory (theoretical exam)		
5%	20%	20%	55		

Reading	
Essential	1. Aufderstraße, H. et al. (2000) *Themen neu, Lehrwerk für Deutsch als Fremdsprache, Kursbuch und Arbeitsbuch 1*, Ismaning, Max Hueber Verlag 2. Marčetić, T. (2003) *Pregled njemačke gramatike – Deutsche Grammatik im Überblik*, Školska knjiga Zagreb Medić, I. (1999) *Kleine deutsche Grammatik,* Školska knjiga Zagreb
Supplementary	1. Dallapiazza, R.-M. et al., (2002) *Tangram, Deutsch als Fremdsprache 1A - Kursbuch und Arbeitsbuch*, Ismaning, Max Hueber Verlag 2. Dallapiazza, R.-M. et al., (2002) *Tangram, Deutsch als Fremdsprache 2A - Kursbuch und Arbeitsbuch*, Ismaning, Max Hueber Verlag R.Baltzer, B.Stenzel und D. Strauss (1999): Alles Gute! Ein deutscher Fernsehsprachkurs, Lese- und Arbeitsbuch, Langenscheidt

5TH SEMESTER

UNIVERSITY OF ZENICA

Faculty of Philosophy

Subject title: **Object-oriented programming**					
Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
V	**Mandatory**	**2**	**3**	**6,0**	**04K02-020**
Subject leader : doc. dr. Esad Kadušić			**Subject assistant**: v. ass. Edin Tabak		
Pre-requisites :		Procedural programming			
Subject aims:	– Introduce students to the basic elements and methods of object-oriented programming with the implementation using C ++ programming language. – Understand C ++ syntax in an object-oriented approach to programming. – The purpose of the exercises is to enable students to independently complete the assignments (original programs) from the problems covered during the lecture, under the supervision of an assistant.				
Competences (Learning outcomes)	Upon successful completion of the course, students will be able to: – Understand the basic C ++ syntax at the level of object-oriented programming. – Independently write source codes to solve specific tasks.				

Subject curriculum:

Introduction to OOP. Generations of programming languages. Approaches to analyzing programming problems. The benefits of OOP. OOP characteristics. Classes. About classes. Declaring classes and objects. Constructors. Destructor. Constant members. Static members. Class area. Class objects as members. Pointers to class members. Structures. Unions. Selected Chapters. Class string. Parsers. Overloading. Method overloading. Operator overloading (+, -, *, /, <<, >>, (), []). Initializing objects. Inheritance. About inheritance. Specifying inheritance. Access to inherited members. Access rights. Initializing and destroying derived classes. Standard conversion. Inheritance of overloaded operators. Virtual functions and polymorphism. Files and Streams.

Learning delivery:

The lectures are conducted using multimedia tools, active learning techniques and with the active participation of students. The exercises are computer-based and held in a laboratory.

Assesment rationale:

Assessment is done through direct activity of students in practical classes and lectures, ie through 3 periodic practical tests - partial exam I, partial exam II and final exam. Knowledge assessment is done by awarding points, which determines the final grade at the final exam. To successfully pass the exam, a student must earn more than 50% points in each of the 3 sections of the exam.

Assesment critetia			
Partial exam 1	Partial exam 2	Final exam	
30%	30%	40%	

Reading	
Essential	4. B. Motik, J. Šribar: Demistificirani C++, Element, Zagreb, 2014. 5. D. Milićev, *Objektno orijentisano programiranje na jeziku C++*, Mikro knjiga, Beograd 2001.
Additional	1. The C++ Programming Language, Bjarne Stroustrup, Addison-Wesley 2009.

	2. C++ An Introduction To Computing, Joel Adams, Sanford Leestma, Larry Nyhoff; Prentice Hall, 2007. 3. C++ Primer, Lippman S., Lajoie J., Addison Wesley, 2005.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **PROBABILITY AND STATISTICS**

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
V	**Mandatory**	**3**	**3**	**7.0**	**04K02-021**

Subject leader :	**Subject assistant**:

Pre-requisites :	None
Subject aims:	Introduce students to: - basic concepts from probability theory, - basic statistical concepts, - some statistical distributions and linear regression.
Competences (Learning outcomes)	Students completing the course will be able to: - calculate the probability of an event - apply some important statistical distributions - perform linear regression and analysis of variance.

Subject curriculum:

Probability space. Basic properties of probability. Conditional probability. Independence of events. Law of total probability and Bayes' rule. Repeat the experiment. Sequence of Bernoulli trials. Limit theorems for Bernoulli trials. *Bernoulli's law of large numbers*. Random variables. Discrete distributions. Probability mass function and cumulative distribution function. Moment generating function. Some common discrete distributions. Continuous distributions. Probability distribution function and cumulative distribution function. Some common continuous distributions. Functions of random variables and applications. Random vectors. Multivariate normal distribution. Order statistics. Expectation and variance. Moments. Methods of transformation. Conditional distributions and expectations. Inequalities. Strong laws of large numbers and central limit theorems. Markov chain: definition and basic properties. *Poisson process*. Theory of estimation. Point estimation. Interval estimation. Method of moments. Method of maximum likelihood. Hypothesis testing. Student's t-test. Chi-squared test. Linear regression and correlation. Analysis of variance.

Learning delivery:

The exercises are oral. Participation and attendance at lectures and exercises are recorded and scored. Lectures and exercises are obligatory.

Assesment rationale:

Assessment is carried out through the students' classroom activity, monthly tests, *homework* assignments and the final written and oral part of the exam. The written part of the exam is eliminatory.

Assesment critetia

Classroom activities (lectures)	Classroom activities (excercises)	Final exam (written part)	Final exam (oral part)
10	10	40	40

Reading	
Essential	N.Sarapa, *Teorija vjerojatnosti*, Školska knjiga, Zagreb 1992. J.S.Milton, J.C.Arnold, *Introduction to Probability and Statistics*, New York 1986. T. Subašić: *Vjerovatnoća i matematička statistika–zbirka riješenih zadataka*, Zenica, 2007.
Additional	K.S.Trived, Probability and Statistics with Reliability, Prentice-Hall, London 1982. R.B.Ash, Basic Probability Theory, J.Wiley, New York 1970.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: TEORY OF GRAPHS

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
V	**Mandatory**	**3**	**2**	**6**	**04K02-021**

Subject leader : prof. dr. Amir Nuhanović
Subject assistant: Musić Rabija

Pre-requisites : NONE

Subject aims:
- Introduce students to the basics types od graphs, their presentation and impementation in creating different models.
- Introduce studensts to the methods and extremization algorithms in graph teory and networks
- Introduce students with random graph teory, their types and examples of free scale networks

Competences (Learning outcomes)

After completion of the module, students will be able to:
- Solve problems related to modeling and implementation of different extremization algorithms over graphs and networks using some programming environment (Mathematica, Matlab, Maple,…)

Subject curriculum:

Teory of graphs: basic terms, graph types, graph elements, subgraphs, chromatic graph number, number of internal and external stability of the graph. Euler and Hamilton roads, connectivity of graphs, graph search. Matrix presentation of graphs. Planar and dual graph. Basic theorems of planar graphs, Euler's theorem and its consequences. Application in teory of convex polyhedron. Chromatic graph number, basic theorems and coloring of graphs. Graph extremization, algorithms: Dijkstra, Bellman, Floyd, Yen. Modification. Networks. Static flows. Theorem of the maximum flow and minimum cross section. Ford-Fulkerson-Flow algorithm. Network planning. Combinatorial optimization: the shortest connecting network, extreme roads in the network, the problem of merchant traveler and Chinese postman. Pairing in graphs. Perfect pairing. Pairing in bipartite graphs. Independent sets, covers and clicks. Ramsey's graph teory. The complexity of graph algorithms. Heuristic algorithms for NP problems. Elements of random graph teory. Algorithms for random graphs creation. Free scale networks and the effect of the small world. Examples and applications.

Learning delivery:

Assesment rationale:

Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Final exam	
30%	30%	40%	

Reading	
Essential	1. Reinhard Diestel, "Graph Theory", Springer-Verlag Berlin Heidelberg, 2017 2. Jovo Vuleta, "Metode ekstremizacije na grafovima", Naučna knjiga, Beograd, 1985
Additional	3. D.Cvetković, S.Simić, "Odabrana poglavlja iz diskretne matematike", Akademska misao, Beograd, 2002. 4. M. E. J. Newman, "Random graphs as models of networks", arXiv:cond-mat/0202208 v1, 2002.s

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: *The Psihology of Education*

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
V	**Mandatory**	**2**	**1**	**4**	

Subject leader : Dženan Skelić	**Subject assistant**:
Pre-requisites :	None
Subject aims:	-Introduction to various aspects of child development. -Acquiring knowledge about the structure and development of personality. - Acquisition of knowledge in psychology that can affect the understanding of educational practice.
Competences (Learning outcomes)	Upon successful completion of the module-course student: - understands the importance of psychology in education, - understands learning methods and learning process - can motivate students to learn.

The origin and importance of the psychology of education and upbringing; The concept of personality and its structure; Intelligence development, intelligence structure, origin of individual differences, school contribution; Intercultural research of mathematical achievement; Development of emotional and motivational traits; Temperament; Moral development; Developing a positive self-image; Specifics of adolescence, adolescent subculture; Psychological background of addiction

Memory and learning. Division of memory according to information retention time, Oblivion; Metamemory; Ways (forms of learning), classical conditioning, operant conditioning, model learning, insight learning; The process of learning in education, the cognitive concept of meaningful learning in education, the model of learning in education, learning to learn. Motivation in the classroom; Fatigue and boredom at school; School discipline; Education at school.
Learning delivery: The exercises are auditory. Engagement, attendance at lectures and exercises of students in the teaching process is recorded and scored. In order for a student to acquire the right to a teacher's signature, it is necessary for him to attend lectures and exercises regularly and regularly.
Assesment rationale: Knowledge assessment is done through the direct activity of students in classes of exercises and lectures, through monthly tests, consultations, preparation of papers and the final-oral part of the exam.

Assesment critetia			
Tests (activity in lectures) and attendance at lectures and exercises	Assignments - seminar paper	Written part of the exam	Oral part of the exam
10%	30%	30%	30%

Reading	
Essential	1. Michael J. A. Howe, *Psihologija učenja.* Jastrebarsko, Naklada Slap, 2002.2. V.Andrilović, M.Čudina-Obradović, *Psihologija učenja i nastave*. Školska knjiga, Zagreb (Izabrana poglavlja), 1996.
Additional	1. R.Vasta., M.Haith, S.A.Miller, *Dječja psihologija*. Jastrebarsko, Naklada Slap. (Izabrana poglavlja), 2000.

6th SEMESTAR

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **WEB DESIGN**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Exercise**		

VI	Mandatory	2	3	5	04K02-124
Subject leader :			**Subject assistant**:		
Pre-requisites :			**NONE**		
Subject aims:	To introduce students with the elements of website design and web application development.				
Competences (Learning outcomes)	Upon successful completion of the course, students will be able to: • Build Web applications of different uses and complexities • Distinguish between Web technologies • Understand the properties of scripting programming languages and to use them in the implementation of a Web application • Understand and apply hypertext and hypermedia linking of documents • Understand and apply Web design recommendations.				

Subject curriculum: Internet, Web, protocols, HTTP protocol, HTML language – introduction: DTD, XML, XHTML, basic tags, HTML language – tables, frames, forms, cascading style sheets (CSS), website design, authoring tools, introduction to server-side programming, JavaScript – language introduction and syntax, basic objects, JavaScript – embedded objects, event management, JavaScript – document object model – DOM, JavaScript – Allowed expressions, new trends in Web technologies, HTML 5, CSS 3, working with events, working with form elements.
Practical curriculum: Creating a website, posting it on the internet. Using CSS formatting as well as JavaScript. Linking a website to a database, using XSL and XSLT technologies. Creating a dynamic web page (resizing the page based on screen size). Website animation. Forming a banner, and inserting it into a web page.

Learning delivery:
The lectures are performed using multimedia tools, active learning technologies and with the active participation of students. The practical is performed as laboratory exercises in a computer center.

Assessment rationale:
Assessment is based on three periodic written exams throughout the semester, projects, assignments and practice tests. If a student fails to pass the tests during the semester, a student is given the opportunity to take the same test in the term of the Final exam.

Assessment criteria		
Activities on lectures (periodical tests, project)	Activities on exercises (partial tests)	Final exam
(3x10 + 20) =50%	50%	

Reading

Essential	1. N. Kojić: *Web dizajn: HTML, CSS i JavaScript*, Beograd, Univerzitet Singidunum 2017., prvo izdanje 2. J. N. Robbins: *Learning Web Design*, August 2012: Fourth edition, Beijing • Cambridge • Farnham • Köln • Sebastopol • Tokyo, Published by O'Reilly Media, Inc.,
Additional	1. D. K. Van Duyne, J. A. Landay, J. I. Hong: *The Design of Sites*, Addison-Wesley, 2003. 2. P. Van Dijck: *Information Architecture for Designers*, Roto Vision, 2003. 3. G. Kappel, B. Pröll, S. Reich, W. Retschitzegger: *Web Engineering*, John Willey, 2006. 4. T. Powel: *Web Design: The Complete Reference*, McGraw-Hill Osborne Media, 2000.

	5. D. Goodman: *Dynamic HTML: The Definitive Reference*, 2nd Edition, O'Reilly, 2002.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: *Differential Equations*

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
VI	**Mandatory**	**3**	**2**	**5**	**04K02-025**

Subject leader : Dževad Burgić	**Subject assistant**:
Pre-requisites :	None

Subject aims:	After getting acquainted with the problem of solving differential equations, the realization of the module concentrates on the goals: • Master the techniques of solving various types of differential equations; • Solving inhomogeneous higher order differential equations
Competences (Learning outcomes)	After completing the course, the student will • Master the techniques of solving linear differential equations and inhomogeneous higher order differential equations, • Through examples from mathematics, physics, other sciences they will be able to present the acquired knowledge from differential equations.

Course program:
Ordinary first order differential equations (concept of solution, field of directions, theorems on existence and uniqueness, elementary methods of solving, examples and applications). DJ with detachable variable. Homogeneous DJ.Linear DJ and ways of solving. Bernoulli's DJ. Lagrange and Claurinat DJ. Ordinary higher order differential equations (equations solvable by the highest derivative, system of ordinary differential equations, reduction to a normal first order system, theorem on existence and uniqueness). Linear differential equations (equations with constant coefficients, existence and uniqueness theorem for systems of linear equations, method of constant variation, solving DJ systems by rows).
Exercise program
The exercises are auditory. The aim of the exercises is to enable students to critically look at and understand the issues and problems treated during the lecture, and related to this subject area. Engagement, attendance at lectures and exercises of students in the teaching process is recorded and scored. In order for a student to acquire the right to a teacher's signature, it is necessary for him to attend lectures and exercises regularly and regularly.

Learning delivery: Lectures and exercises are performed in the classroom with the active participation of students.

Assesment rationale:			
Knowledge assessment is done through the direct activity of students in classes of exercises and lectures, through monthly tests, assignments, colloquia and the final written and oral part of the exam. The written part of the exam is eliminatory.			
Assesment critetia			
Tests (activity in lectures) and attendance at lectures and exercises	Assignments	Written part of the exam	Final exam
10%	10%	40%	40%

Reading	
Essential	1. Lecture notes 2. E. Pilav i S.Kalabušić: *Obične diferencijalne jednačine,* PMF Sarajevo 2014. 3. M.Alić, *Obične diferencijalne jednadžbe,* PMF - Matematički odjel, 1994.
Additional	1. V. Perić i M. Tomić, *Zbirka riješenih zadataka-Matematika II-1.diferencijalne jednačine,* Svjetlost, Sarajevo 1987. 2. M. Vuković, *Diferencijalne jednačine I,* Univerzitetska knjiga, Sarajevo 2000. 3. S. Janković i J. K. Miljanović, *Diferencijalne jednačine I*, Matematički fakultet, Beograd 2001.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: NUMERICAL MATHEMATICS II

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
VI	**Mandatory**	**3**	**3**	**7**	**04K02-019**

Subject leader : Assistant professor ISMET KALČO	**Subject assistant**: Senior Assistant SAFET HAMEDOVIĆNO

Pre-requisites :	
Subject aims:	Acquiring knowledge about numerical solving of nonlinear equations, eigenvalues. Acquiring knowledge about numerical solving of differential equations by various methods.
Competences (Learning outcomes)	Upon successful completion of the course, students will be able to extend their current knowledge of Numerical Mathematics 1, ie students will be able to numerically solve nonlinear equations, ordinary differential equations as well as solve so-called boundary problems using the finite difference method.

Subject curriculum: Systems of nonlinear equations. Newton's method. Gradient methods. Eigenvalues and eigenvectors of matrices. A complete eigenvalue problem. Danilevsky's method. The Wings Method. The Le Verrier method. Partial eigenvalue problem. Arbitrary vector method.

The trace method. Numerical solution of ordinary differential equations - Cauchy problems. Analytical methods. Taylor's method. The method of unspecified coefficients. Method of consecutive approximations. Runge-Kutta type methods. Euler's method. Runge-Kutta method. Predictor-corrector method. Adams method. Milne's Method. Numerical solution of ordinary differential equations - boundary problems. Discretization. Finite difference method.
Learning delivery: The exercises are auditory. The engagement, attendance of students' lectures and exercises in the teaching process continues records and scores. In order for a student to be eligible for a teacher's signature, it is necessary that they are duly and regularly attends lectures and exercises
Assesment rationale: Assessment is carried out through the students' direct activity in the classes and lectures, through monthly tests, assignments, tests, and the final written and oral part of the exam. The written part of the exam is eliminatory

Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Final exam	
20	40	40	

Reading	
Essential	1. K. Subašić, *Elementi numeričke matematike i linearno programiranje*, Zenica, 2005. 2. A. Zolić, *Numerička metematika*, Matematički fakultet, Beograd, 2008. 3. R. Scitovski, *Numerička matematika*, Osijek 2015.
Additional	4. Cheney, W., Kincaid, D., *Numerical Mathematics and Computing* (6 ed), Thomson Brooks/Cole, Belmont, 2008.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: Mathematics and Informatics for the gifted

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
VI	**Mandatory**	**2**	**1**	**4,0**	**04K02-184**

Subject leader :	**Subject assistant**:
Pre-requisites :	No
Subject aims:	Achieving the necessary level of competence in the knowledge and application of different methods in proving algebraic and geometric inequalities, solving diophantine equations of more complex forms, solving problems of logical-combinatorial type. Raise the level of knowledge in object-oriented programming. Improve computer skills, design and test programs, and implement them using an integrated development environment (IDE).
Competences (Learning outcomes)	- To master different methods of solving diophantine and Pell equations; - Master the methods of proving algebraic and geometric inequalities and applications

	- To be able to solve tasks of logical-combinatorial type; - Develop simple computer programs independently using the Java programming language as well as the SWING library; - Be able to use java commands that allow exception handling; - Use patterns like Strategy, Observer, Factory, Decorator, Singleton;

Subject curriculum:

Diophantine equations (different methods for solving simpler and very complicated Diophantine equations) Pell's equation. Inequalities (inequalities between numerical means, Cauchy-Schwartz-Bounjakovski inequality, Shur inequality, Chebishev inequality, Hölder inequality, some important geometric inequalities). Application of complex numbers in geometry. Functional equations. Maximum and minimum. Problems in elementary geometry. Schwarz's triangle problem. Steiner's problem. Logic-combinatorial type tasks.

SWING Library, basics (JFrame, JPanel, JTextField, JButton, paintComponent, BorderLayout). Java and Object Oriented Programming: A Comparison with Python (Observer). SWING and Observer Library (various ActionListener). Java and object-oriented programming: anonymous inner classes. Decorator. Programming a multithreaded program within a SWING environment (SwingWorker). Factory method and Abstract factory; Singleton, double-checked locking algorithm.

Learning delivery:

The lectures are taught as an auditorium with the active participation of students, where individual units are thematically covered. The exercises are performed as laboratories in a computerroom, where examples from the fields covered in the lectures are presented and the students independently create assigned tasks.

Assesment rationale:

Knowledge assessment is done through direct activity of students in classes and lectures, through periodic testing, assignment, consultations, and final exam.

Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Written exam	Final exam
10%	10%	40%	40%

Reading

Essential	1. T. Andreescu, D. Andrica: An Introduction to Diophantine Equations, Zalau, 2002. 2. T. Andreescu, O. Mushkarov, L. Stozanov: Geometric Problems on Maxima and Minima, Birkhauser, Boston-BaselBerlin, 2006. 3. Š. Arslanagić: Matematika za nadarene, Bosanska riječ, Sarajevo, 2004. 4. E. T. Freeman, E. Robson, B. Bates, K. Sierra, Head First Design Patterns, O'Reilly Media, 2004 5. R. Sedgewick, K. Wayne, R. Dondero: „Introduction to Programming in Python: An Interdisciplinary Approach“, 2015.
Additional	1. R.B. Manfrino, J.A.G. Ortega, R.V. Delgado: Inequalities – A Mathematical Olympiad Approach, Birkhauser, BostonBasel-Berlin, 2009. 2. W. Savitch:„Problem Solving with C++“, 9th Edition, Pearson, 2014.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **DIFFERENTIAL GEOMETRY**

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
VI	**Mandatory**	**2**	**2**	**5**	**04K02-028**

Subject leader :	**Subject assistant**:
Pre-requisites : NO	

Subject aims:	Introduce students to vector fields, derivation of vector functions, ● Master the surface parameterizations ● Introduce students to natural surface parameterization.
Competences (Learning outcomes)	After completing the course, the student will ● Master the functions of multiple variables as well as vector fields ● Parameterize surfaces.

Subject curriculum:
Level sets of the function of multiple variables. Gradient vector field. Vector outdoor fields expensive Euclidean space. Integral curves (existence and uniqueness theorem). Bad and hyperplots. Tangential vectors and tangential space. Orientation vector field and orientation tangential space. Gaussian mapping of a hyperplane into a unit sphere. Derivation of functions and vector fields by vector. The covariant derivation. The notion of a parallel vector field. Parallel displacement along (in parts) smooth parameterized curves on the hyperplane. Weingarten mapping. Curvature (flexion) of plane curves, arc length. Differential 1-forms and curve integrals. Rotation index. Normal curvature, Gauss-Kronecker's and mean the curvature of the hyperplane. The first and second fundamental forms. Parametric plots. Examples. Local equivalence of surfaces and parameterized surfaces.

Exercise program
The exercises are auditory. Engagement, attendance at student lectures and exercises in the process classes are recorded and scored. In order for a student to qualify for a teacher's signature, it is necessary that attends lectures and exercises regularly and regularly.

Learning delivery:
Lectures and exercises are conducted in the classroom with the active participation of students.

Assesment rationale:
Knowledge assessment is done through the students' direct activity in the classes and classes, through monthly tests, consultations, midterm examinations and final written and oral examinations. The written part
the exam is eliminatory.

Assesment critetia

Attendance and activity at exercises and lectures	Homework	Written exam (partial tests)	Final exam
10%	10%	40%	40%

Reading

Essential	1. Lecture notes 2. J. Oprea, *Differential Geometry and its applications*, Prentice Hall, 2003

	3. A. Pressley, *Elementary Differential geometry*, Spriger Verlag, 2001.
Additional	• 1. J.A.Thorpe, *Elementary Topics in Differential Geometry*, New York 1979. • 2.A.S.Miščenko, Ju.P.Solovcev, A.T.Fomenko*, Zbornik zadač po differencial'novi geometrii i topologii*, Mosk.Univerzitet, Moskva 1981.

7th SEMESTAR

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: DATABASES 1

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
VII	**Mandatory**	**2**	**2**	**6,0**	**04K02-024**

Subject leader :	**Subject assistant**:
Pre-requisites :	
Subject aims:	The goal of the course is to familiarize students with key concepts and issues related to entities, relationships, models, SQL Database Language, as well as logical design and database integrity. The course introduce students to the methodology of problem solving in relational databases.
Competences (Learning outcomes)	Upon successful completion of the course students will be able to: - use the database language, as a means of designing and implementing an information system, as well as enabling students to design these systems.

Subject curriculum:
Introduction to Databases. Basic terms and definitions. Database architecture. Database lifecycle. Relational data modeling. Entity and Relationship Modeling. Relational model. Normalization based on functional and multivalued dependencies. Relational database languages. Relational algebra. Relational calculus. SQL language. Query optimization. Physical structure of the database. Elements of physical structure. Primary key based approach. Access based on other data. Hash tables, indexes, B-trees.
Implementation of relational operations. Implementation of natural join. Implementation of other operations. Optimal evaluation of algebraic expressions. Database integrity and security. Maintaining integrity. Simultaneous approach. Failure recovery. Protection against unauthorized access.

Learning delivery:
The lectures are conducted using multimedia tools, active learning techniques and with the active participation of students. The exercises are performed as a laboratory exercises, in a computer center, with the practical use of commercial software packages.

Assesment rationale:

Assessment is based on three periodic written tests during the semester, three practical tests on the exercises, and a final written exam.			
Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Tests (two tests)	Final exam
25%	20%	30%	25%

Reading	
Essential	1. Materials from the lectures 2. S. Alagić, Relacione baze podataka, Svijetlost. Sarajevo 1985. 3. C.J. Data, An Introduction to Database Systems, Addison-Wesly, 1989. 4. B.Lazarević, Z.Marjanović i d r., Baze podataka, FON, Beograd 2008.
Additional	1. J.D. Ullman. Principles of Database Systems. Computer Science Press.1980. 2. B.C.Desiai. An Introduction to Database Systems. West Publishing Company 1997. 3. C.Ricardo, *Database Systems*.Macmillan Publishing Company 1999.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: Teaching Methodology of Mathematics I

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
VII	**Mandatory**	**3**	**2**	**6**	**04K02-093**

Subject leader :	**Subject assistant**:
Pre-requisites :	-
Subject aims:	Acquiring knowledge about various methods in mathematics teaching and learning about contemporary problems in teaching mathematics
Competences (Learning outcomes)	After having the course, students are expected to: - give methodical interpretation of the task solution in Elementary Mathematics - analyze task solution step by step - prove theorems and solve tasks in many ways

Subject curriculum:
Concept and significance of teaching methodology of Mathematics. The role of the history of Mathematics in the teaching of Mathematics. Theorems and axioms. Proofs and types of proof. The logical foundations of Mathematics, basic methods of scientific thinkinkg. The role and significanse mathematical tasks in the teaching of Mathematics. Types of mathematical tasks. Solving tasks in many ways.

Learning delivery:
Classes are taught in the classroom through lectures, exercises, and consultation with an oral presentation of the teacher or the use of multimedia teaching resources.

Assesment rationale:

The examination consists of the written and the oral part. The oral part can be taken after completion of written part.			
Assesment criteria			
Activities on lectures	Homework	Written exam	Oral exam
10%	10%	40%	40%

Reading	
Essential	1. K. Pjanić Lipovača: Opšta metodika matematičkog obrazovanja, PF Bihać, 2014. 2.M.Pavleković: Metodika nastave matematike s informatikom I, Element, Zagreb, 1997. 3. M.Pavleković: Metodika nastave matematike s informatikom II, Element, Zagreb, 1998. 4. Š. Arslanagić: Matematička čitanka 1, 2, 3, 4 ,5 i 6, Sarajevo 2009-2013.
Additional	1.G.Polya: Kako ću riješiti matematički zadatak, Školska knjiga, Zagreb 1956. 2. M. Dejić, Metodika nastave matematike, Jagodina 2000. 3. Š. Arslanagić, Matematika za nadarene, Bosanska riječ, Sarajevo 2004. 4. Udžbenici i zbirke zadataka za osnovnu i srednju školu.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: Methodology of teaching informatics I

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
VII	**Mandatory**	**3**	**2**	**6,0**	**04K02-094**

Subject leader :	**Subject assistant**:
Pre-requisites :	No

Subject aims:	- Educate students to work on computers in the relevant areas (programming, database languages to finished modules). - Familiarize yourself with the methodology for troubleshooting computer problems.
Competences (Learning outcomes)	Upon successful completion of the course, students will be able, through independent work on the exercises, to master the use of many finished tools, as well as programming languages and database languages, as a means of designing and implementing an information system.

Subject curriculum:

Program analysis of computer science subjects in schools.Hardware structure of modern computers. Word processing. Editors and word processors. Basic features of word processing on a computer. Enter, modify, and save text on your computer. Editing drawings. Possibility of graphic packages in drawing processing. Analysis of methodological approaches in drawing processing on a computer. Working tables. Scope of application of worksheets. Demonstrating the ability of spreadsheets. Worksheets. Scope of application of worksheets. Demonstrating the ability of spreadsheets. Computer combinations. Local area networks and the Internet. Description of some Internet services (WWW, email, file transfer). Numerous systems, logic circuits. Registers. Data transfer. Memories. Outdoor units, elementary school computer. The concept and construction of the algorithm.

Programming in low programming languages. Programming in Advanced Visual Tools. Database. The role of databases and database processing systems. Models and languages, logical design. Making presentations on the Internet. Basic HTML elements. Using images in presentations.
Learning delivery: Classes are taught in the classroom-cabinet through lectures, exercises and consultations with oral presentation by teachers and the use of multimedia teaching aids.
Assesment rationale: Assessment is based on two partial written examinations during the semester and the final exam, either in writing or in oral form - in combination.

Assesment critetia			
Activities on excercises (partial tests)	Tests - two tests	Defense of the test lesson	Final-written part of the exam
25%	25%	25%	25%

Reading	
Essential	1. M.Pavleković: Metodika nastave matematike s informatikom I, Element, Zagreb, 1997. 2. S. Alagić,Relacionebazepodataka.Svijetlost. Sarajevo 1985. 3. G.Smiljanić, Osnove Digitalnih računala. Školska knjiga Zagreb 1998. 4. N. Wirth. Algoritams + Data Structure = Programs. Prentece Hall. 1976.
Additional	1. K. Jamsa, S. Lalani, S. Weakley. WEB programing. Jamsa Prtess 1996. 2. Skripte MS Word, MS Excel, Internet, Power Point. 3. M.Pavleković: Metodika nastave matematike s informatikom II, Element, Zagreb, 1998.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **LINEAR ALGEBRA**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
VII	**Mandatory**	**3**	**2**	**5**	**04K02-031**

Subject leader :	**Subject assistant**:
Pre-requisites :	-

Subject aims:	The aims of the subject is for the students to learn the general concept of a polynomial defined over any field, and to adopt the concepts of eigenvalues and vectors in vector spaces as well as canonical forms of a matrix.
Competences (Learning outcomes)	After successfully completing the course, students will be able to grasp the previously acquired knowledge of the Introduction to Linear Algebra in a new and better way, because the matter is presented at a higher level. Also, students will notice that some objects and geometric concepts they encountered earlier can be seen as special cases of more general algebraic structures.
Subject curriculum: Polynomials over an arbitrary field. Algebra of polynomials over an arbitrary field. Euclidean algorithm. Polynomials over field R, basic theorems and applications. Algebra matrix. Concept of	

linear mapping matrix. Transposed and complex-conjugated transposed matrix. Sub matrices. Vector spaces. Base and dimension of vector space. Linear mappings of vector spaces. Transition from one base to another by a linear mapping base and a similar mapping matrix. Isomorphism between the vector space of matrices and the vector space of linear mappings. Metric spaces. Normalized spaces. Relationship between norm and metric in vector space. Internal product and unitary vector space. Cauchy-Schwartz's inequality. Relation of parallelograms. Important relationships between norm and scalar product in unitary space. Orthogonal and orthonormal set of vectors. Gram-Schmidt orthonormalization algorithm. Definition and elemental properties of nth order determinants. Minors and cofactors. Adjuvant matrix and adjuvant determinant. Vandermonde determinant. Inverse matrices. Systems of linear equations. Rank matrix. Elemental operations on species and columns. Kronecker–Capelli theorem. Gaussian reduction. Matrix analysis. Characteristic values and characteristic vectors. Characteristic polynomial. Cayley-Hamilton theorem. Diagonal and Jordan form matrix. Matrix norms. Adjunct linear transformation and adjunct matrix. Schur's theorem. Normal linear and Hermitian linear transformation. Unitary and orthogonal linear transformations and matrices and applications.

Learning delivery:

Lectures and exercises are auditory, with active participation of students in teaching.

Assesment rationale:

Assessment is based on two partial written examinations during the semester and the final exam done in writing or verbally, or in combination.

Assessment criteria			
Activities on lectures	Activities on excercises (partial tests)	Final exam	
20%	40%	40%	

Reading	
Essential	1. H. Jamak, Linearna algebra-skripta, PMF Sarajevo, 2009. 2. V. Perić, Linearna algebra, Svjetlost Sarajevo, 1991.
Additional	1. K. Horvatić, Linearna algebra, PMF, Zagreb, 1999. 2. J. T. Moore, Elements of Linear Algebra and Matrix Theory, Mc Graw-Hill Book Company, New York, 1969.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: Web programming

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
VII	**Mandatory**	**2**	**2**	**4,0**	**04K02-167**

Subject leader :	**Subject assistant**:
Pre-requisites :	None
Subject aims:	Module objectives are to introduce students to the basics of web programming, through different tools such as HTML, CSS, XML and JavaScript. In addition, students are introduced to the methodology of solving various problems using the Web programming.

Competences (Learning outcomes)	A student who successfully completes the course will have the following competencies: - Using language for web programming. - Stand-alone website development using HTML. - Using CSS. - The development of the web based content on XML. - Implementation of Java scripts.

Subject curriculum:
HTML. Edit text, lists, insertion of graphics, colors, links, frames, forms. CSS styles, selectors and declarations. Class. External style sheet. Internal style sheet. CSS properties. XML. The goals of XML. The elements and attributes. The syntax of XML. Nested tags in XML. Namespaces. DTD scheme. XML schema. XSL language for defining style. Term. Methods and functions. Windows in JavaScript. Background. Basic images. Navigator. The graphics and sound. Mapping and animation. Events in JavaScript. Fundamentals of scripting language PHP.

Learning delivery:
In addition to lectures, the course covers laboratory exercises where the student gains experience in teamwork, gains practical knowledge of information security, as well as connecting theory and practice.

Assesment rationale:
Assessment is done through direct activity of students in classes and lectures, through monthly tests, consultations, development of papers and final-oral part of the exam.

Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Final practical exam	Final oral exam
10%	30%	30%	30%

Reading	
Essential	1. HTML, XHTML, and CSS: Visual Quick Start Guide; MobiPocket; Elizabeth Castro, 2006. 2. HTML & CSS: The Complete Reference, Fifth Edition;, McGraw-Hill Osborne Media; Thomas A. Powell, 2010.
Additional	- Teaching materials placed on the DL system - HTML &XHTML: The Definitive Guide;O'Reilly; Chuck Musciano and Bill Kennedy, 2009. - JavaScript, David Flanagan, O'Reilly, 2006.

8TH SEMESTER

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **MATHEMATICAL PROGRAMMING**

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
VII	**Mandatory**	**3**	**3**	**7**	**04K02-026**
Subject leader :			**Subject assistant**:		
Pre-requisites :			-		
Subject aims:	Introduce students to the basic concepts of mathematical programming and to: - theory of nonlinear programming - simplex and dual simplex methods - transport problem.				
Competences (Learning outcomes)	After completing the module-course students will know: - basic models and linear programming methods, - apply some nonlinear programming methods, - apply simplex method, dual simplex method and transport problem.				

Subject curriculum:

Introduction. A general formulation of mathematical programming problems. Mathematical models of some practical problems. Elements of convex analysis. Convex sets. Separation theorems. Convex functions. Jensen's inequality. Criteria of convexity of the function in n-dimensional space. Theory of nonlinear programming. Convex programming. Slater's condition. Lagrange function. Kuhn-Tucker's theorem. Differential programming. Duality in nonlinear programming. Linear Programming Theory. Formulation of the problem. Alternative theorems. Farkas's lemma. Duality in linear programming. Simplex method. Basic linear programming theorem. The classic (tabular) form of a simplex algorithm. The finality of the simplex method. Bland's rule. Determination of basic solution. Two-phase simplex method. Geometric interpretation of the simplex method. Dual simplex method. Parameter linear programming. Transportation problem. Characterization of the basics of transport problems. Potential Method.

Exercise program

The exercises are auditory. Engagement, attendance at student lectures and exercises in the teaching process are recorded and scored. In order for a student to be eligible for a teacher's signature, it is necessary to attend lectures and exercises regularly and regularly.

Learning delivery:

Lectures and exercises are auditory, with active participation of students in teaching.

Assesment rationale:

Assessment is done through direct activity of students in the classes of exercises and lectures, assignments, colloquiums and final written and oral part of the exam. The written part of the exam is eliminatory.

Assessment criteria

Attendance and Activity in Exercises and Lectures	Homeworks	Written part of the exam	Final exam
10%	10%	40%	40%

Reading

Essential	1. Lecture notes 2. V.Vujčić, M. Ašić i N. Miličić, Matematičko Programiranje, Beograd, 1980. 3. K. Subašić, Elementi numeričke matematike i linearno programiranje, Zenica, 2005.
Additional	1. M. S. Bazaraa, H. D. Sherali, C. M. Shetty, Nonlinear Programming, theory and Algorithms, John Wiley, 1993.

	2. L. Čaklović: Linearno programiranje

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: Teaching Methodology of Mathematics II

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
VIII	**Mandatory**	**2**	**2+1**	**6**	**04K02-095**

Subject leader :	**Subject assistant**:
Pre-requisites :	Teaching Methodology of Mathematics I
Subject aims:	Acquiring knowledge about various methods in mathematics teaching and learning about contemporary problems in teaching mathematics
Competences (Learning outcomes)	After having the course, students are expected to: - make preparation for hour lecture - deliver a lecture for various themes in Mathematics

Subject curriculum:
Lecture types, teaching methods, teaching aids, types of instruction, hour goal, hour objectives: educational, upbringing, functional. Parts of the lecture: introductory part, main part, final part. Instruction for gifted students, preparation for math competition.

Learning delivery:
Classes are taught in the classroom through lectures, exercises, and consultation with an oral presentation of the teacher or the use of multimedia teaching resources.

Assesment rationale:
The examination consists of several parts: delivering a lecture, seminar paper and written exam.

Assesment criteria			
Homework	Delivering a lecture	Written exam	Seminar paper
20%	35%	25%	20%

Reading	
Essential	1. K. Pjanić Lipovača: Opšta metodika matematičkog obrazovanja, PF Bihać, 2014. 2.M.Pavleković: Metodika nastave matematike s informatikom I, Element, Zagreb, 1997.

	3. M.Pavleković: Metodika nastave matematike s informatikom II, Element, Zagreb, 1998. 4. J. Markovac: Metodika početne nastave matematike, Zagreb, 1992. 5. Š. Arslanagić: Matematička čitanka 1, 2, 3, 4 ,5 i 6, Sarajevo 2009-2013.
Additional	1.G.Polya: Kako ću riješiti matematički zadatak, Školska knjiga, Zagreb 1956. 2. M. Dejić, Metodika nastave matematike, Jagodina 2000. 3. Š. Arslanagić, Matematika za nadarene, Bosanska riječ, Sarajevo 2004. 4. Udžbenici i zbirke zadataka za osnovnu i srednju školu.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: Methodology of teaching informatics II

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
VIII	**Mandatory**	**2**	**2+1**	**6,0**	**04K02-093**

Subject leader :	**Subject assistant**:
Pre-requisites :	Methods of teaching informatics I
Subject aims:	To enable future teachers of mathematics and informatics for quality preparation, teaching and analysis of all types of informatics teaching at primary and secondary level.
Competences (Learning outcomes)	Students 'ability to teach computer science classes at primary and secondary levels. Students' lifelong learning skills in information and communication technology (ICT).

Subject curriculum:
Information and Communication Technology (ICT). Scientific aspects of ICT: theoretical computing as a basic mathematical scientific discipline, computing as technical science, information science as social science. ICT terminology. ICT in the education system. Concepts of computer, digital and information literacy. ECDL International Information Literacy Standards. ICT education didactics. Teaching methodology of informatics and its role in education of future informatics teachers. Objective of informatics teaching: general goal and specific goals for each stage of education. Three basic components of IT education: Acquisition of basic knowledge of ICT concepts (time invariants - a prerequisite for lifelong education), development of ICT application skills (agility in managing the current ICT - practical application of ICT), development of problem solving skills using ICT. Principles of informatics teaching. Inference methods in informatics teaching. Selected topics in the curriculum of teaching informatics in primary and secondary school - didactic approach. Computer basics and build. The mathematical basics of computer operation. Drawing with a computer. Computer drawing software. Resolution. Web technologies. The concept and construction of the algorithm. Logical languages. Functional languages. Programming in Advanced Visal Tools. Database. Role of databases and database processing systems. Models and languages, logical design. Making presentations on the Internet.

Learning delivery:
Classes are taught in the classroom-cabinet through lectures, exercises and consultations with oral presentation by teachers and the use of multimedia teaching aids.

Assesment rationale:

Assessment is based on two partial written examinations during the semester and the final exam, either in writing or in oral form - in combination.			
Assesment critetia			
Activities on excercises (partial tests)	Activities on excercises (partial tests)	Activities on excercises (partial tests)	Activities on excercises (partial tests)
25%	25%	25%	25%

Reading	
Essential	1. Nastavni planovi i programi informatike za srednju školu. 2. Udžbenici iz informatike/računarstva za srednje škole. 3. Skripta sa predavanja.
Additional	1. Programski jezik C++,VB,Java. 2. HTML, Java Script 3. M.Pavleković: Metodika nastave matematike s informatikom II, Element, Zagreb, 2000.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: Computer Graphics

Semester	Status	Hours per week		ECTS	Code
		Lectures	Excercise		
VIII	**Mandatory**	**2**	**3**	**6,0**	**04K02-030**

Subject leader :	**Subject assistant**:
Pre-requisites : n/a	

Subject aims:	- To introduce students to the basics of computer graphics and the possibilities of application of computers in the collecting, processing and representing of digital images and video - To provide students with basic skills for raster and 2D/3D vector graphical tools
Competences (Learning outcomes)	On successful completion of this subject student will be able to: - recognize and understand the capabilities and limitations of computers graphics - use independently raster and vector software - apply their knowledge and skills to create math illustrations

Subject curriculum: Computer Graphics Hardware: Input Devices, Image Processing Hardware, Storage Media, Output Devices, Drivers, and APIs. Raster graphics: light perception, color models, color model conversion, raster graphics software, raster image properties, raster image compression, raster file formats. Vector graphics: advantages and disadvantages, coordinate systems, primitives, vector graphics software. Geometric transformations: homogeneous coordinates, plane transformations, space transformations. Parametric curves and surfaces: modeling of curved surfaces, continuities, forms of parameter curves, blending functions, parametric surfaces. Visualization: rendering, materials, textures and lighting, shading. Digital video: animation techniques, codec, HD video, video broadcasting and distribution. Fractals.

Learning delivery: Lectures are conducted with the use of multimedia resources, active learning technology and with active participation of students. The exercises are performed in a computer laboratory, with the practical use of commercial software packages for raster, 2D and 3D vector computer graphics.	
Assesment rationale: Assessment is based on three periodic written examinations during the semester, three practical tests on exercises (2D raster, 2D vector, 3D vector) and a final written exam.	

Assesment critetia			
Activities on lectures (periodical tests)	Activities on excercises (periodical tests)	Final exam	
30%	30%	40%	

Reading	
Essential	1. Samir Lemeš (2017), Računarska grafika i geometrijsko modeliranje, ISBN 978-9958-639-97-5, Univerzitet u Zenici, Zenica
Additional	1. Vesna Egić, Dejan Gambiroža: Adobe Photoshop za početnike, 2004, ISBN 86-84379-17-9 2. Peter Shirley, Michael Ashikhmin, Steve Marschner: Fundamentals of Computer Graphics, 2009, ISBN 978-1-4398-6552-1 3. Aidan Chopra: Introduction to Google Sketchup, 2011, ISBN 978-1-118-21438-1 4. David Salomon: Curves and Surfaces for Computer Graphics, 2006, ISBN: 0-387-24196-5

IZBORNI PREDMETI

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **Information systems security**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
VI	**Non-mandatory**	**2**	**2**	**4,0**	**04K02-125**

Subject leader : doc. dr. Esad Kadušić	**Subject assistant**: v. as. Anela Hrnjičić
Pre-requisites : None	

Subject aims:	Acquiring knowledge of various security systems and technologies, of providing security about information systems and networks. Introduce students to security threats and security breaches, types of security services, and how to manage the security of information systems.
Competences (Learning outcomes)	- Understanding the basics of information security. - Able to use security technology to secure information systems. - Work independently in the field of information systems security. - Uses security services, assesses risks and establishes controls.

Subject curriculum:
Introduction, basic concepts, security threats. Basics of cryptography, symmetric and asymmetric encryption. Hash features. Security services: types of services, position in certain layers of architecture, information and communication system, different security services realisation types.

Security technologies and systems: user accounts, codes and access rights, security protocols (IPSec, SSL / TLS, Kerberos, S / MIME, WAP and WEP), firewalls, attack detection and protection systems, virtual private networks (VPN), antivirus, anti-spam protection. Information security management: social engineering, security policies, security update of information systems, information security management. Classification and control of assets. Staff safety. Physical and environmental safety. Managing communications and work. Access control. System development and maintenance.
Learning delivery: In addition to lectures, the course covers laboratory exercises where the student gains experience in teamwork, gains practical knowledge of information security, as well as connecting theory and practice.
Assesment rationale: Assessment is done through direct activity of students in classes and lectures, through monthly tests, consultations, preparation of papers and final-oral part of the exam.

Assesment critetia			
Attendance and activity in lectures and exercises	Tasks – seminar paper	Written part of the exam	Oral part of the exam
10%	30%	30%	30%

Reading	
Essential	1. Priručnik - Sigurnost informacijskih sustava, Visoka škola za primijenjeno računarstvo, grupa autora, Zagreb, 2010. 2. D. Pleskonjić, B. Đorđević, N. Maček i M. Carić: Sigurnost računarskih sistema i mreža, mikro knjiga, Beograd 2007. 3. D. Pleskonjić, B. Đorđević, N. Maček i M. Carić: Sigurnost računarskih sistema-zbirka riješenih zadataka, Viša tehnička škola, Beograd 2006.
Additional	1. Stamp, Mark, Information Security: Principles and Practice. Hoboken, New Jersey, 2006.

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: **DESCRIPTIVE GEOMETRY**

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		
VI	**Obligatory**	**2**	**2**	**4,0**	**04K02-008**

Subject leader :	**Subject assistant**:
Pre-requisites :	
Subject aims:	Introduce students to: - perspective mappings, - normal design, - cross-sections, penetrations and shadows.
Competences (Learning outcomes)	After the adopted module-course students will be able to: - project on one or two planes, - correctly determine the cross sections and penetrations of geometric bodies.
Subject curriculum:	

Perspective mapping: Basic geometric shapes; infinitely distant elements; design; Desargue's attitude; perspective collinear mapping of two flat fields of points; perspective collinear mapping invariants; perspective affine mapping; invariants of perspective affine mapping; perspective collinear mapping of a circle; perspective affine mapping of second-order curves.
Normal projection on one plane (distance method): point, line, plane, traces straight and straight; leveling; perspective affine mapping when leveling; projection of a flat figure: triangle, polygon, circle, regular polygons; two planes; penetration straight through the plane; normality straight and straight; projections of some geometric bodies: pyramid, prism, cup, roller, ball.
Normal design on two or more planes: point, line, plane; traces straight and flat; knocking down straight and flat; tilts and sutures, tilt angles straight and straight; perspective affine mapping of the first and second projections of points of one plane; projections of a flat figure: polygon, circle; two planes; penetration straight through the plane; normality straight and straight; projections of some geometric bodies: pyramid, prism, cup, roller, ball; introduction of a new projection plane.
Sections, penetrations and shadows: sections of a ball, pyramid, prism, coupe and roller by some plane by the method of distance and by the method of two normal projections; penetration through the surface; penetration of two surfaces: two pyramids, pyramid and prism, two prisms; the shadow of the point is straight and longer in central and parallel illumination; the shadow of a flat figure and the shadow of a circle; shadows of some geometric bodies.

Learning delivery:
Solving tasks related to certain areas provided by the lecture program. The exercises are auditory with the use of appropriate drawing equipment. Students are required to do the appropriate tasks assigned by the professor and submit them to the assistant for examination before taking the exam.

Assesment rationale:
Consultations are held according to the needs of students and according to the established schedule of classes.
The exam is taken in writing and orally. The written exam is eliminatory.

Assesment critetia			
Activities on lectures	Activities on excercises (partial tests)	Final exam	
10	10	40	40

Reading	
Essential	1. Zagorka Šnajder: Nacrtna geometrija, Naučna knjiga, Beograd, 1991.
Additional	

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: DISTANCE EDUCATION

Semester	**Status**	**Hours per week**	**ECTS**	**Code**

		Lectures	Excercise		
VII	**Elective**	**2**	**1**	**3,0**	**04K02-035**
Subject leader :			**Subject assistant**:		
Pre-requisites :		No			
Subject aims:	Introduce students to: - participants in the distance education process, - media and e-education, - video conferencing technologies.				
Competences (Learning outcomes)	After the course module has been adopted, students will be able to: - use streaming technology, - use videoconferencing technologies independently.				

Subject curriculum:

Definition, characteristics, advantages and disadvantages of distance education. Participants in the distance education process. The structure of the distance education system. Media and technologies in distance education systems. Models of distance education. e-Education and e-learning content. The role of the Internet in distance education systems. Web based distance education. Streaming technology. Videoconferencing technology.

Learning delivery:

The exercises are laboratory. The laboratory exercises are practically tested and media, technologies and models presented in the lectures are applied. The student is required to do 90% of all lab work. Students are also required to independently do and defend seminar work. In order for a student to be eligible for a teacher's signature, it is necessary to attend lectures and exercises regularly and regularly.

Assesment rationale:

Assessment is done through direct activity of students in classes and lectures, through monthly tests, consultations, preparation of papers and final-oral part of the exam.

Assesment critetia			
Seminar paper		Final exam	
60%		40%	

Reading	
Essential	1. M.Simonson, S.E.Smaldino, M.Albright, S.Zvacek: *Teaching and Learning at a Distance*: Foundations of Distance Education (2nd Edition), Prentice Hall, 2002 2.S.Carliner: Designing E-Learning, American Society for Training&Development, 2002
Additional	1. Brandon Hall: Web-based Training Cookbook, John Wiley & Sons, 1997 2. Druga dostupna literatura

UNIVERSITY OF ZENICA
Faculty of Philosophy

Subject title: TEACHING COMMUNICATION SKILLS

Semester	**Status**	**Hours per week**		**ECTS**	**Code**
		Lectures	**Excercise**		

VIII	ELECTIVE	**2**	**2**		
Subject leader :			**Subject assistant**:		
Pre-requisites :			**Pedagogy**		
Subject aims:	To master the knowledge necessary to act in several directions related to specific tasks in the field of micropedagogical work and the implementation of the teaching process. Get acquainted with the characteristics of teachers as a subject of education. The personality of the educator. Interaction and communication in education. Verbal and nonverbal communication. Feedback and listening in conversation. Ways and styles of conversation in school. Communication with students' parents. Resolving complex problems and conflicts. Socio-emotional climate in the classroom.				
Competences (Learning outcomes)	- Acquire knowledge and skills for analysis and adequate intervention in the teacher-student relationship. - To understand as experts the nature of educational activities in all areas of implementation of teaching and extracurricular activities; - To monitor and assess the individual abilities of students through educational work, and to organize their own educational work accordingly; - To get acquainted with the possibilities of pedagogical activity in the field of communication skill; - Application of communication skills in the teaching process.				

Subject curriculum:

Introductory lecture - expectations, introduction to the program
Areas of realization - situations in which interaction and communication occur; basic concepts and processes
Interaction-communication aspects of education
Interpersonal relationship - the foundation of the educational process
Factors that contribute to the success of interpersonal relationships
Interaction in education and communication skills
Upbringing, education and development of social competencies
Verbal and nonverbal communication.
Feedback and listening in conversation.
Ways and styles of conversation at home and at school.
Resolving complex problems and conflicts.
Socio-emotional climate in the classroom.

Learning delivery:

1. Lectures 50 %
2. Student's presentations 20%
3. debates / discussions 15%
4. individual and group work 15%

Assesment rationale:

Students have the opportunity to pass the exam during the semester, through two partial exams (students who take the first partial exam can attend the second partial examination). Students who do not pass the exam through two partial examinations, take the exam integrally. After passing the written part of the exam, students access the oral evaluation.

Assesment critetia				
Activity and attendance	Student's presentations	debates / discussions /	Written exam	Oral exam

		individual and group work		
10	20	20	30	20

Reading	
Essential	Bratanić, M. (1993). *Mikropedagogija.* Zagreb: Školska knjiga. Brajša, P. (1993). *Pedagoška komunikologija*. Zagreb: Školske novine. Kyriacou, C. (1997). *Temeljna nastavna umijeća – Metodički priručnik za uspješno poučavanje i učenje.* Zagreb: Educa. Von Thun, S. (2001). *Kako međusobno razgovaramo?* Zagreb: Erudita Satir, V. (1988). *The New Peoplemaking*. California: Science and Behavior Books, Inc.
Additional	Bašić, J., Hudina, B., Trbović, N.K., Žižak, A., (1994). *Integralna metoda*. Zagreb: Alinea. Greenspan, S.I. (2008). *Zahtjevna djeca*. Zagreb: Ostvarenje. Honore, C. (2009). *Pod pritiskom – spašavanje djece od kulture hiperroditeljstva*. Zagreb: Facta. Juul, J. (1995). *Razgovori s roditeljima* - prespektive i procesi. Zagreb: Alinea. Rosenberg, M.B. (2006). *Nenasilna komunikacija*. Osijek: Centar za mir, nenasilje i ljudska prava. Runkel, H.E. (2008). *Odgojite svoje dijete bez vikanja*. Zagreb: VBZ. Sigman, A. (2012). *Razmažena generacija*. Beograd: Psihopolis. Winkel, R. (1996). *Djeca koju je teško odgajati*. Zagreb: Educa. Winterhoff, M. (2010). *Zašto nam djeca postaju nasilnici*. Zagreb: Znanje.

Prilog 1.

OPIS IZMJENA I DOPUNA STUDIJSKOG PROGRAMA

OPĆE INFORMACIJE O IZMJENAMA I DOPUNAMA STUDIJSKOG PROGRAMA				
1. Nazivstudijskog programa	**Matematika i informatika**			
2. Nosilacstudijskog programa	**Filozofski fakultet Univerziteta u Zenici**			
3. Tipstudijskog programa	Stručni studijski program		**Univerzitetski studijski program**	
4. Nivostudijskog programa	Preddiplomski	**Diplomski**		Integrirani
5. Načinizvođenja studijskoga programa	**Klasični**	Mješoviti (klasični + *on line*)		*On line* u cijelosti
6. Akademski/stručni naziv pozavršetku studija	**Profesor matematike i informatike**			
7. Ukupni brojECTS bodova	Prije promjene	**240**	Poslije promjene	**240**
8. Odluka NNV o prihvatanju izmjena i dopuna (dostaviti uprilogu)				

9. Odluka ili rješenje o odobrenju studijskog programa (dostaviti uprilogu)		
10. Opseg izmjena i dopuna studijskogaprograma	Broj ECTS bodova nepromijenjenoga dijela programa:	**206**
	Broj ECTS bodova promijenjenoga dijela programa:	**34**
11. Redni broj izmjena i dopuna studijskoga programa:	**Druga izmjena**	
12. Procjena postotka promjena, izmjena i dopuna studijskoga programa	**a) manje od20%** b) više od 20%, a manje od40% c) više od 40%	

UNIVERZITET UZENICI

Obrazac 1

OPIS IZMJENA I DOPUNA STUDIJSKIH PROGRAMA

Tabela 1. Opis izmjena i dopunastudijskog programa Matematika i informatika na Filozofskom fakultetu.
/naziv studijskog programa/ /FILOZOFSKI FAKULTET/

R. br.	Naziv predmeta koji se mijenja/ koji se nadopunjuje	Boj ECTS bodova predmeta koji se mijenja		Obrazloženje promjene
		Prije promjene	Poslije promjene	
1.	*Elementarna matematika 1*	5	5	Promjena broja časova sa 2+3 na 2+2.
2.	*Elementarna matematika II*	6	6	Promjena broja časova sa 2+2 na 2+3.
3.	*Principi programiranja*	7	6	Zbog fonda sati na predmetu broj ECTS se smanjuje.
4.	*Strani jezik 1*	5	4	Promjena broja časova sa 1+2 na 2+2 kako bi se predmet Strani jezik 1 mogao predavati na više odsjeka istovremeno, predmet se prebacuje iz drugog semestra u treći.
5.	*Strani jezik 2*	4	4	Promjena broja časova sa 1+2 na 2+1, predmet je prebačen iz trećeg semestra u četvrti semester.
6.	*Analitička geometrija*	6	6	Fond sati se mijenja sa 2+2 na 3+2.
7.	*Diferencijalne jednačine*	5	5	Promjena broja časova sa 2+2 na 3+2.
8.	*Teorija grafova*	5	6	Promjena broja časova sa 2+2 na 3+2.
9.	*Psihologija odgoja i obrazovanja*	5	4	Promjena ECTS bodova sa 5 na 4 i promjena fonda sati sa 2+2 na 2+1. Predmet se prebacuje iz petog u četvrti semester.
10.	*Didaktika*	5	4	Promjena ECTS bodova sa 5 na 4 i promjena fonda sati sa 2+2 na

				2+1. Predmet se prebacuje iz četvrtog u peti semestar.
11.	*Numerička matematika 2*	5	7	Povećanje ECTS za 2 zbog fonda sati 3+3.
12.	*Metodika nastave matematike 1*	6	6	Promjena broja časova sa 2+3 na 3+2.
13.	*Metodika nastave informatike 1*	6	6	Promjena broja časova sa 2+3 na 3+2.
14.	*Linearna algebra*	5	5	Predmet se sa liste izbornih predmeta prebacuje u listu obaveznih predmeta sa promjenom broja časova sa 2+2 na 3+2.
15.	*Računarska grafika*	7	6	Promjena broja časova sa 3+3 na 2+3, također predmet se prebacuje iz osmog u sedmi a semestar radi racionalizacije nastavnog procesa, odnosno navedeni predmet studenti matematike i informatike će slušati sa studentima Politehničkog fakulteta – odsjek Softversko inžinjerstvo.
16.	*Pedagogija*	6	4	Predmet se prebacuje iz trećeg u drugi semestar i broj ECTS se umanjuje sa 6 na 4, kao i fond sati sa 2+2 na 2+1.
17.	*Matematika i informatika za nadarene*	---	4	Uvodi se novi predmet u peti semestar sa fondom sati 2+1.
18.	*Web programiranje*	---	4	Uvodi se novi predmet u sedmi semestar sa fondom sati 2+2, 4 ECTS.
19.	*Izborni predmeti: Obrazovanje na daljinu ili Nastavna komunikacija*	---	3	Uvode se nova dva izborna predmeta u sedmom semestru Nastavna komunikacija (umjesto Linearne algebre koji je dobio status obaveznog predmeta) i Obrazovanje na daljinu (umjesto Metričkih prostora).
20.	*Primjena računara*	5	4	Broj ECTS bodova se smanjuje. Predmet dobiva status obaveznog predmeta.
21.	*Izborni predmet: Sigurnost informacionih Sistema ili Nacrtna geometrija*	5	4	Broj ECTS bodova se smanjuje.

22.	*Aplikativni softver*	7	6	Broj ECTS bodova se smanjuje.
23.	*Metodika nastave matematike 2*	5	6	Broj ECTS bodova se povećava.
24.	*Metodika nastave informatike 2*	5	6	Broj ECTS bodova se povećava.
25.	*Završni rad*	8	0	Ukida se završni rad.
26.	*Analiza 1*	7	7	Fond sati se mijenja sa 3+3 na 3+4.