

UNIVERZITET U ZENICI UNIVERSITY OF ZENICA



CURRICULUM OF I (FIRST) CYCLE STUDY ENGINEERING STUDY

FACULTY OF MECHANICAL ENGINEERING UNIVERSITY OF ZENICA

Zenica, May 2015.

UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING
ENGINEERING STUDY (3+2+3)

<i>MODEL OF I (first) CYCLE STUDY</i>		
<i>Year of Study</i>	<i>Lecturing courses: obligatory / election</i>	
I year (I + II) semester	obligatory 7 + 7	
II year (III + IV) semester	obligatory 7 + 7	
III year (V+VI) semester	obligatory 6 + 6 election 1+1 (shall be elected from the group of twelve elective courses)	
Total	obligatory: 40	election: 2 + Practical work + Final thesis

CURRICULUM



UNIVERSITY OF ZENICA FACULTY OF MECHANICAL ENGINEERING



CURRICULUM DEGREE PROGRAMME ENGINEERING STUDY

Course code	No.	COURSE TITLE	I semester (winter)						TEACHER
			L	E	No. st.	LE	No. st.	ECT(A)S	
01-04-K-02-062	1.	Mathematics I	3	3				7,0	Assistant prof. dr.sc . Almir Huskanović
01-03-K-11-010	2.	Technical mechanics I	2	2				5,0	Full professor dr.sc.Nermina Zaimović-Uzunović
01-02-K-08-037	3.	Materials I	2	2				5,0	Full professor dr.sc.Nadžija Haračić
01-03-K-05-076	4.	Physics	2	2				5,0	Full professor dr.sc.Suada Bikić
01-03-K-12-052	5.	Descriptive geometry	2	2				5,0	Assoc. prof. dr. sc. Amra Talić-Čikmiš
01-04-K-03-249	6.	English language I	2	0				2,0	Assistant prof. dr.sc .Aida Tarabar
01-04-K-01-103	7.	Physical education I	0	1				1,0	Assoc. prof. dr. sc. Mirjana Mađarević
		Number of hours per week L/E/LE	13	12					
		The total number of hours in a week	25						
		The total number of credit points							30.0
Course code	No.	COURSE TITLE	II semester (summer)						TEACHER
			L	E	No. st.	LE	No. st.	ECT(A)S	
01-04-K-02-063	1.	Mathematics II	3	3				7,0	Assistant prof. dr.sc .Almir Huskanović
01-04-K-02-064	2.	Informatics and computing	2	3				5,0	Assistant prof. dr.sc . Nevzudin Buzadžija
01-03-K-11-008	3.	Technical mechanics II	2	2				5,0	Assoc. prof. dr. sc. Elma Ekinović
01-03-K-12-021	4.	Technical drawing	2	2				5,0	Assoc. prof. dr. sc. Amra Talić-Čikmiš
01-02-K-08-038	5.	Materials II	2	2				5,0	Full professor dr.sc.Nadžija Haračić
01-04-K-03-250	6.	English language II	2	0				2,0	Assistant prof. dr.sc . Aida Tarabar
01-04-K-01-104	7.	Physical education II	0	1				1,0	Assoc. prof. dr. sc. Mirjana Mađarević
		Number of hours per week L/E/LE	13	13					
		The total number of hours in a week	26						
		The total number of credit points							30,0

Legend: L-lectures; E-exercise; LE laboratory exercise; No. St.-number of students in groups; ECT(A)S-number of credits



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Course code	No.	COURSE TITLE	III semester (winter)					TEACHER
			L	E	No. st.	LE	No. st.	
01-03-K-12-018	1.	Mechanical elements I	2	2				Assoc. prof. dr. sc. Nedeljko Vukojević
01-03-K-12-025	2.	Strength of materials	3	2				Full professor dr.sc.Aleksandar Karač
01-03-K-15-011	3.	Fluid mechanics	3	2				Assoc. prof. dr. sc. Nedim Hodžić
01-03-K-16-006	4.	Basics of Electrical Engineering	2	2				Assistant prof. dr.sc .Izet Džananović
01-03-K-13-056	5.	Surface engineering	2	2				Full professor dr.sc.Sabahudin Ekinović
01-04-K-03-251	6.	English language III	2	0				Assistant prof. dr.sc . Aida Tarabar
01-04-K-01-105	7.	Physical education III	0	1				Assoc. prof. dr. sc. Mirjana Mađarević
Number of hours per week L/E/LE			14	11				
The total number of hours in a week			25					
The total number of credit points								30.0
Course code	No.	COURSE TITLE	IV semester (summer)					TEACHER
			L	E	No. st.	LE	No. st.	
01-03-K-12-019	1.	Mechanical elements II	2	2				Assoc. prof. dr. sc. Nedeljko Vukojević
01-03-K-15-010	2.	Engineering thermodynamics	3	2				Full professor dr.sc.Nagib Neimarlija
01-03-K-12-065	3.	Construction, shaping and design	2	2				Assistant prof. dr.sc .Fuad Hadžikadunić
01-03-K-12-015	4.	CAD/CAE technology	3	3				Full professor dr.sc.Senad Balić
01-03-K-13-016	5.	Production technologies I	3	3				Assistant prof. dr.sc . Ibrahim Plančić
01-04-K-03-252	6.	English language IV	2	0				Assistant prof. dr.sc .Aida Tarabar
01-04-K-01-106	7.	Physical education IV	0	1				Assoc. prof. dr. sc. Mirjana Mađarević
Number of hours per week L/E/LE			15	13				
The total number of hours in a week			28					
The total number of credit points								30,0



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CURRICULUM DEGREE PROGRAMME ENGINEERING STUDY

Course code	No.	COURSE TITLE	V semester (winter)					TEACHER
			L	E	No. st.	LE	No. st.	
01-03-K-15-009	1.	Hydraulic and pneumatics	3	2				Assoc. prof. dr. sc. Nedim Hodžić
01-03-K-13-017	2.	Production technologies II	3	3				Full professor dr.sc.Sabahudin Ekinović
01-03-K-12-022	3.	Transportation systems	2	2				Assistant prof. dr.sc .Fuad Hadžikadunić
01-03-K-16-007	4.	Measurement technique	2	2				Full professor dr.sc. Nermina Zaimović-Uzunović
Prilog	5.	Elective Course	2	2				-
01-04-K-03-287	6.	English language V	2	0				Assistant prof. dr.sc .Aida Tarabar
01-03-M-SPr-V	7.	Industrial Practice	0	2				
Number of hours per week L/E/LE			14	13				
The total number of hours in a week			27					
The total number of credit points								30.0
Course code	No.	COURSE TITLE	VI semester (summer)					TEACHER
			L	E	No. st.	LE	No. st.	
01-03-K-17-030	1.	Proizvodnja i logistika	3	3				Full professor dr.sc.Darko Petković
01-03-K-17-012	2.	Upravljanje proizvodnjom	2	2				Assoc. prof. dr. sc. Sabahudin Jašarević
01-03-K-18-016	3.	Engineering ecology	2	2				Prof. dr. sc. Šefket Goletić
-	4.	Elective Course	2	2				-
01-04-K-03-288	5.	English language VI	2	0				Assistant prof. dr.sc .Aida Tarabar
01-03-M-SPr-VI	6.	Industrial Practice	0	2				-
01-03-M-ZR	7.	Final thesis	-	-				Mentor
Number of hours per week L/E/LE			11	11				
The total number of hours in a week			22					
The total number of credit points								30,0

Legend: L-lectures; E-exercise; LE laboratory exercise; No. St.-number of students in groups; ECT(A)S-number of credits



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CURRICULUM DEGREE PROGRAMME ENGINEERING STUDY – Elective Courses

I GROUP ELECTIVE COURSES

Course code	No	COURSE TITLE	V/VI						TEACHER
			P	V	Br.stu.	LV	Br. Stu.	ECT(a)S	
01-04-K-12-066	1.	Industrial design and ergonomics	2	2				4	Full professor dr.sc.Nermina Zaimović-Uzunović
01-04-K-13-057	2.	Cuting tools and jigs fixtures	2	2				4	Full professor dr.sc.Sabahudin Ekinović
01-04-K-13-058	3.	Advanced cutting tehnologies	2	2				4	Full professor dr.sc.Sabahudin Ekinović

II GROUP ELECTIVE COURSES

Course code	No	COURSE TITLE	V/VI					TEACHER	
			P	V	Br.stu.	LV	Br. Stu.		ECT(a)S
01-04-K-02-065	1.	Probability and statistics	2	2				4	Full professor dr.sc.Darko Petković
01-04-K-14-035	2.	Entrepreneurship	2	2				4	
01-04-K-14-034	3.	Maintenance of technical systems	2	2				4	Assoc. prof. dr. sc. Sabahudin Jašarević

III GROUP ELECTIVE COURSES

Course code	No	COURSE TITLE	V/VI						TEACHER
			P	V	Br.stu.	LV	Br. Stu.	ECT(a)S	
01-04-K-18-017	1.	Enviromental engineering	2	2				4	Assistant prof. dr.sc .Nusret Imamović
01-04-K-18-019	2.	Industrial waste management	2	2				4	Full professor dr.sc.Jovan Sredojević
01-04-K-18-020	3.	Sustainable development	2	2				4	Full professor dr.sc.Šefket Goletić

IV GROUP ELECTIVE COURSES

Course code	No	COURSE TITLE	V/VI						TEACHER
			P	V	Br.stu.	LV	Br. Stu.	ECT(a)S	
01-04-K-16-026	1.	Production metrology	2	2				4	Full professor dr.sc.Nermina Zaimović-Uzunović
01-04-K-17-031	2.	Product testing and quality	2	2				4	Assistant prof. dr.sc .Samir Lemeš
01-04-K-17-032	3.	Project management	2	2				4	Assoc. prof. dr. sc. Sabahudin Jašarević

* For elective courses number of hours per week and the number of ECT(A)S points included in the V and VI semester

PROGRAM STRUCTURE

FIRST YEAR



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Syllabus: MATHEMATICS I

Semester	Status	Classes per week		ECTS credits	Code
		Lectures	Practice		
I	Obligatory	3	3	7	01-04-K-02-062

Pre-requisites

-

Subject goal

- repeat and expand the knowledge about the structure of the set of the real numbers
- introduce basic concepts of linear algebra
- apply vector algebra to analytic geometry of space
- introduce differential calculus

Student's competence

- Students will be able to:
- investigate functions of a real variable and draw a graph of the function
 - solve systems of linear equations
 - perform operations with matrices and solve matrix equations
 - perform operations with vectors and apply these operations in geometry
 - solve all the basic types of indefinite integrals
 - optimize function of two variables

Lectures and practise syllabus:

The Field of Real Numbers. Determinants and Matrices. System of Linear Equations. Vectors. Operations with Vectors. Analytical geometry. Series and Limiting the Value of Series. Elementary Functions. Limiting Value of Function in Point. Continuous of a Function. Differential Calculus. Geometrically and Kinematic meaning of Derivation. Investigation and Graphical Representation of Functions.

Teaching process

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.

Literature

Primary	Dž. Zečić, A. Huskanović, H. Alajbegović: Matematika 1 za tehničke fakultete, Univerzitet u Zenici, Mašinski fakultet, 2009.
Secondary	<ol style="list-style-type: none">1. P. Javor, Matematička analiza 1, Element, Zagreb, 1999.2. M. P. Uščumlić, Zbirka zadataka iz više matematike I, Naučna knjiga, Beograd, 1979.3. G. N. Berman, Zbirka zadataka iz matematičke analize, Naučna knjiga Beograd, 1982.

Exam: The exam is graded in writing and orally, integrated. The written exam is exclusive.



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Subject title: TECHNICAL MECHANICS I

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
I	obligatory	2	2	5,0	01-03-K-11-010

Subject leader: r. prof. dr. sc. Nermina Zaimović-Uzunović

E-mail: nzaimovic@mf.unze.ba

Subject assistant: v. as. mr. sc. J. Kačmarčík, v. as. mr. sc. A. Žiga

E-mail: kjosip@mf.unze.ba, aziga@mf.unze.ba

Pre-requisites

- Physics, Statistics

Subject aims

introduce students to the basic concepts and axioms of statics.
Explain the concept of force and static torque and bending moment.
Explain the equilibrium conditions of arbitrary force systems in plane and in space.
define the concept of center of gravity of homogeneous lines, areas and volumes. introduce students to the basic concepts and axioms of statics.
Explain the concept of force and static torque and bending moment.
Explain the equilibrium conditions of arbitrary force systems in plane and in space.
define the concept of center of gravity of homogeneous lines, areas and volumes.

Competences (Learning outcomes)

Upon successful completion of the course, students will be able to:
- Define the equilibrium conditions of arbitrary force systems
- Solve reactions, bending moments, draw diagrams, and determine the forces in the grid.
- Determine the center of gravity of homogeneous lines, areas and volumes

Learning content

Task division and mechanics. Basic terms and axioms of statics. The concept of force. Systems of defining forces. Equivalent systems of forces. Resultant of concurrent forces and arbitrary system of forces in the plane. The types of loads. The balance of concurrent forces. Theorem of three non-parallel forces in the plane. Dismantling forces (components and projections). Torque and features. Varignon's theorem. Coupling of forces, torque coupling, features torque coupling. The balance of power in an arbitrary system level. The reduction of one or more force to an arbitrary point. Analytical and graphical requirements of balance flat arbitrary system of forces, parallel forces and torques. The system of the body. The supports and reactions. Truss and beams. Analytical and graphical determination reactions, bending moments, transverse and longitudinal forces. Relations between the moments, transverse forces and continuous load. Beams .Frames. (reactions and diagrams). Composite beam (reactions and diagrams). Bases simple and complex (reaction and reactions and diagrams). Indirectly loaded beams. Friction. Sliding friction. Rolling friction. Rope friction. Brakes. An arbitrary system of forces in space. Reduction of physical force systems in space. Moments force for wasps. Terms balance arbitrary spatial system of forces. Focal points. The center of gravity of homogeneous lines, areas and volumes. Pappus-Guldin rules.

Learning delivery: □ Auditory exercises and explanation the methods and procedures for the calculation of areas that were previously covered in lectures. Students are given two programs that work outside the hours of exercise, independently.

Assesment: Individual solving the tasks are required as a condition for approaching to the exam. Passing the written part of the exam is a requirement for taking the oral exam.

Assessment Criteria

Written exam	Activity in lectures and exercises (seminar)	Final exam
30%	30%	40%

Literature

Essential	<ol style="list-style-type: none"> 1. N. Zaimović-Uzunović, D. Vukojević, N. Hodžić, A. Žiga: Statika, ISBN 978-9958-617-37-9, Mašinski fakultet u Zenici, 2007. 2. N. Zaimović-Uzunović: Zbirka riješenih zadataka iz mehanike I Statika, Mašinski fakultet u Zenici, 1988.
Supplementary	<ol style="list-style-type: none"> 1. N. Zaimović-Uzunović, N. Hodžić: Statika - programi i uputstvo za izradu programa, Mašinski fakultet u Zenici, 1996.



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Subject title: MATERIALS I

Semester	Status	Number of lectures par week		ECTS bites	Signature
		Lectures	Training		
I	Obligatory	2	2	5	01-02-K-08-037

Teacher: Red.prof.dr.Nadija Haračić

E-mail: nharacic@mf.unze.ba

Saradnik: Doc.dr. Raza Sunulahpašić

E-mail: raza.sunulahpasic@famm.unze.ba

Subjects which are prerequisite for exams

-

Goal of the lecture

- Students introduction with properties and capabilities of the modern engineering materials
- Qualification of students for practical solving on the materials field problems
- Qualification of students for wried and verbally presentation of the investigation's results.

Kompetentions

After effectively passed the course students will be able to:

- Knowledge of the properties of engineering materials (metals and nonmetals)
- Correct selection of engineering materials
- Ability to do (exceptionally) investigation of mechanical properties of materials

Sylabus : Introduction; Material's selection; Alloy Structure, Selsection of materials; Metals in PS of elemets; Types of phase diagrams, Fe-Fe₃C phase diagram; Iron and steel alloys, Classification and designation of steels in accordance with BAS EN; Others hard metals and his alloys. Aluminium and his alloys; Other light metals and his alloys; Mechanical testing of materials in acordance with BAS EN (mechanical, metalographics, nondesructive testing);

Type of education : Lectures, auditory's and laboratorie's trainings

Type of examination: Classic lectures with consulting, independent students work, verbally and laboratories trainings. It pass an exam writing and verbally.

Criterion weight for knowldge examination

Lectures	Trainings	Independent students work	Colloqium	Writing exam	Verbaly exam
1,0	1,0	0,5	0,5	1,0	1,0

Literature

Obligatory

1. Savremeni materijali za mašinogradnju, Dr.N. Haračić, Univ. U Zenici, 2012.
2. Savremeni metalni materijali, Oruč M., Sunulahpašić R., Univ. U Zenici, 2005.

Addition

3. Inžinjerski metalni i nemetalni materijali, Haračić N.; Maš. Fak. U Zenici, 2003.
4. Čelik i čelični liv-podjela i označavanje, M.Oruč, F.Begovac, I.Vitez, R.Sunulahpašić
1. Materijali u građevinarstvu, M.Oruč, R.Sunulahpašić, UNZE, 2014.
2. BAS EN, JUS testig normes



Subject title: PHYSICS

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
I	Obligatory	2	2	5	01-03-K-05-076

Subject leader: Prof.dr.sci. Suada Bikić
E-mail: suada.bikic@famm.unze.ba

Subject assistant: v.a.mr.sci. Dijana Dujak
E-mail: dijana.dujak@famm.unze.ba

Pre-requisites

/

Subject aims

Introduction with fundamental terms and laws from Physics for realization and research to application during study.

Learning outcomes

Student need to know fundamental terms and laws from Physics, to apply through physical problems solving, to identify, through analyses physical units, physical nature of physical quantities.

Indicative syllabus content:

Program of lectures:

Introduction. Galilee transformation. Lawrence's transformation. The consequences of Lawrence's transformation. Mechanics of oscillations . Oscillations. Equation of motion. Resonance. Mechanical waves, types, properties. Acoustics. Optics. Geometric optics, photometry and physical optics. Physical images of atoms. The basis of quantum mechanics. Planck's law. Photoelectric effect. Compton's effect. Wave nature of particles. Origin of quantum numbers (principal quantum number, orbital quantum number, magnetic quantum number, spin). Pauli's principle. Heisenberg's relations. Physics of the nucleus. Mass defect and binding energy. Radioactivity. Law breakup of the nucleus. Nuclear reactions, examples and applications. Doses of radiation.

Program of exercises:

Exercises are auditorial and relate to the material from the lectures. Addresses the tasks and explains assistant with the analysis and discussion in which students participate.

Learning delivery: Lectures, Exercises, Home works, Consultations

Assessment Rationale: Exam consists of the written part of the exam and oral exam part. The written exam is exam eliminator. During the semester may carry out examination and tests, two times.

Assessment Criteria

Activity on exercises (periodic testing)	Activity on exercises (periodic testing)	Final exam Activity on lectures	Integral Activity on and exercises	Final exam Activity on lectures
I test 30 audit points	II test 30 audit points	40 audit points	60 audit points	40 audit points

Reading

Essential

1. Suada Bikić, Physics (the script Lectures in Physics),
2. Suada Bikić, Collection of calculated tasks in physics, Dom štampe-Zenica, 1998.

Supplementary

1. Stjepan Marić, Physics, Sarajevo, 2000.
2. E.Girt, G.Knežević, S.Bikić and...: Collection of tasks in physics with solutions, direction and results, Svjetlost-Sarajevo, 1991.



Subject title: DESCRIPTIVE GEOMETRY

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
I	Obligatory	2	2	5	01-03-K-12-052

Subject leader: doc.dr.sc. Amra Talić-Čikmiš

E-mail: acikmis@mf.unze.ba

Subject assistant: v. asis. mr. sc. Denis Spahić

E-mail: dspahic@mf.unze.ba

Pre-requisites

Subject aims The aim of the course is to learn contemporary graphical methods used in dealing with engineering, technical and design problems. Students develop spatial perception of three-dimensional objects and capability of displaying different reciprocal relationships of geometric characteristics of geometric figures in two-dimensional plane. In addition, a sense of accuracy and logic, as well as a sense of neatness, clarity and transparency are developed.

Learning outcomes Development of the ability of visual spatial perception. Insight into the structure and metrical properties of spatial objects. Orthogonal and oblique projections.

Indicative syllabus content:

Descriptive geometry: Basic geometric construction. The second-order curves. Orthographic projection (Monge projection). Basic geometric elements: point, line, plane and their interrelations. Projection of geometric shapes. Positional relations, special postures (parallelism, perpendicular) to the plane of projection. Metrics. Transformation. Rotation. Basic 3D (spatial) relationships, projecting 3D objects. Common methods of oblique 3D projection (axonomerty), presentation of objects in 3D. Common methods of oblique 3D projection (axonomerty), presentation of objects in 3D. Planar sections of the basic square and round bodies and faces (prisms, pyramids, cylinders, cones, spheres) with and without removing the section. Developments. Collineation and affinity.

Learning delivery:

The use of modern teaching aids. Computer support, using the appropriate graphics packages, is included in the presentation and resolution of educational examples in all segments.

Assessment Rationale:

Assesment is done through a variety of methods that includ graphic works, periodic tests and a final exam. Graphic works include tasks that students are required to solve and submit by the deadline. Tests are a form of continuous assesment, usually come at the end of a few topics to find out what students have learned. Final exam is written after previously fulfilled the conditions relating to regular attendance and submitted graphic works.

Assessment Criteria

Activity on lectures (periodic testing)	Activity on exercises (periodic testing)	Final exam	
10%	15%	30%	45%

Reading

Essential	1. A. Talić-Čikmiš, D. Spahić, Zbirka ispitnih zadataka iz tehničkog crtanja s nacrtom geometrijom, Mašinski fakultet, Zenica, 2014. 2. S. Olević, A. Talić-Čikmiš, Tehnička dokumentacija, Mašinski fakultet u Zenici, 2005.
Supplementary	(1) V. Niče: Deskriptivna geometrija I, II, ŠK Zagreb (1980.); (2) I. Babić, S. Gorjanac, A. Sliepčević, V. Szirovicza: Konstruktivna geometrija-vježbe, IGH Zagreb (1994.)



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Subject title: ENGLISH LANGUAGE I

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures			
I	obligatory	2		2,0	01-04-K-03-249

Subject leader: doc.dr.sc. Aida Tarabar

E-mail: atarabar@mf.unze.ba

Prerequisites:

-

Subject aims:

Work on basic grammar in order to level the knowledge of English language among the students.

**Learning
outcomes:**

Upon successfully completed course students will be able to:
- distinguish and use the basic vocabulary and grammar.

Indicative syllabus content:

- General language structure (parts of speech)
- Word classes: nouns, articles, pronouns, adjectives numbers, verbs, adverbs, prepositions and conjunctions.
 - Word classes subtypes: (eg. Nouns – subtypes: concrete, abstract nouns etc. Verbs –subtypes: auxiliary, modal and lexical verbs.
 - Simple Tenses: *Present Simple, Past Simple, Future Tense*
 - Practicing the above mentioned grammar structures through different situations: dialogue, monologue, repetition (drill), substitution, permutation, reduction, new element extension.
 - Practicing simple translations from mother tongue and into it. Another emphasis is on the comparison between foreign language structures and their equivalents in our language.

Learning delivery: Classes are carried out by using interactive method.

Assessment Rationale: Testing is carried out via two tests and a final exam. Also, regular check outs are carried out through the both students' activities in the classroom and their homeworks (portfolio).

Assesment Criteria

Lectures	Portfolio	Final Exam			
10%	20%	70%			

Reading:

Essential	1. Murphy R., Essential Grammar in Use, Cambridge University Press, Cambridge, 1998. 2. Makek V. i ostali: English for You, Book 1, Škola za strane jezike, Zagreb, 1991.
Supplementary	1. Dictionaries and English Grammar Textbooks (free choice)



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Subject title:: PHYSICAL EDUCATION I

Semester	Status	Number hours per week		ECTS credits	Code
		Lectures	Exercises		
I	obligatory		1	1	01-04-K-01-103
Teacher: Associate . professor.dr.sc.Mirjana Mađarević E-mail: mmadjarevic@yahoo.com			Associate:		
Courses that are a prerequisite for laying		No course as a prerequisite for the exercise			
The course goal	The course goal is intending to implement activities related to the sport as an extended social and media practice. Practically apply knowledge in certain sports in order to preserve health, good working condition. Regular application of kinesiology activities to maintain and upgrade the quality theoretical and health status of the student (positive impact on the anthropological status of students train and improve motor skills, functional skills, motor skills fund, with the aim of maintaining and improving the students health. Developing permanent habits and the need kinesiological activities in daily life and work, which would contribute to more easily overcome the effort during the study				
Competencies (Learning outcomes)	This course complements the students' practical skills and provides them with basic motor skills for successful work in their profession and contribute to the quality of life. Developing the skills and abilities to correlate with the practical work of other programs				
Course program: The subject includes the following topics:-Initial measurements of morphological characteristics.-Initial testing of motor skills.Work on the general physical preparation.-Improvement of motor skills-General power factor, and other motor skills:-Work on explosive force.Work on speed.-Work on flexibility.-Co-ordination.-Work on balance-Work precision.-Work out at the gym.Lady-fitness program -Field work in the pool, athletics stadium. Basic techniques: front crawl, breaststroke, backstroke, butterfly, training non-swimmers. athletics. -Training techniques from Ball Sports: basketball, volleyball, soccer.-Rhythm and dance.					
Teaching: Classes are held in physical hall, pool and stadium..					
Examination: Students have no verification as to other professional predmetima.Imaju obligation to attend and then get the signature of a professor who holds the collegium. Knowledge assessment.of their motor and functional abilities are valued for their personal status health.Weighted criteria for evaluating knowledge Lectures Practice Final Exam.					
Weighted criteria for evaluating knowledge					
lectures	Exersises	Final exem			
	100%	-			
Literature					
Obligatory literature:	Required Students are advised to literature related to sports and recreation.1. Sally Edwards; (2001)"Heart Zone Training" 2. Dr. med. Kenet H. Kuper;(1971)"Aerobik" 3. Dr. med.Kenet H. Kuper, (1975.) "Novi Aerobik" 4.Merliyn Glenvile;(2006) Osteoporoza tiha epidemija,Planetorija d.d. prevod SuzanaKeleković,Vlatka Lamot Lajšić.				
Additional literature					



UNIVERSITY OF ZENICA
MECHANICAL ENGINEERING FACULTY
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Subject title:: MATHEMATICS II

Semester	Status	Classes per week		ECTS credits	Code
		Lectures	Practice		
II	Obligatory	3	3	7	O1-04-K-02-063

Pre-requisites Mathematics I

Subject goal

- solving all types of indefinite integral
- teaching definite integrals and its applications
- learn how to solve differential equations
- learn how to functions can be represent as power series

Student's competence

Students will be able to:

- optimize function of two variables
- calculate perimeter and surface of plane figures
- solve differential equations
- claim convergence or divergence numerical and functional series

Lectures and practise syllabus:

Indefinite Integral. Definite Integral. The Application of Definite Integrals. Functions of two variables. Multiple integrals. Differential equations. Numerical series. Power series.

Teaching process 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.

Literature

Primary	V. Cigić, Matematika II, Sveučilište u Mostaru, Mostar 2001.
Secondary	<ol style="list-style-type: none">1. P. Javor, Matematička analiza 2, Element, Zagreb, 1999.2. M. P. Uščumlić, Zbirka zadataka iz više matematike II, Naučna knjiga, Beograd, 1979.3. V. Perić, M. Tomić, P. Karačić, Zbirka riješenih zadataka, Matematika II, 2. knjiga

Exam: The exam is graded in writing and orally, integrated. The written exam is exclusive.



UNIVERSITY OF ZENICA
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Subject title:: MATHEMATICS II

Semester	Status	Classes per week		ECTS credits	Code
		Lectures	Practice		
II	Obligatory	3	3	7	O1-04-K-02-063

Pre-requisites Mathematics I

Subject goal

- solving all types of indefinite integral
- teaching definite integrals and its applications
- learn how to solve differential equations
- learn how to functions can be represent as power series

Student's competence

Students will be able to:

- optimize function of two variables
- calculate perimeter and surface of plane figures
- solve differential equations
- claim convergence or divergence numerical and functional series

Lectures and practise syllabus:

Indefinite Integral. Definite Integral. The Application of Definite Integrals. Functions of two variables. Multiple integrals. Differential equations. Numerical series. Power series.

Teaching process 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.

Literature

Primary	V. Cigić, Matematika II, Sveučilište u Mostaru, Mostar 2001.
Secondary	<ol style="list-style-type: none">1. P. Javor, Matematička analiza 2, Element, Zagreb, 1999.2. M. P. Uščumlić, Zbirka zadataka iz više matematike II, Naučna knjiga, Beograd, 1979.3. V. Perić, M. Tomić, P. Karačić, Zbirka riješenih zadataka, Matematika II, 2. knjiga

Exam: The exam is graded in writing and orally, integrated. The written exam is exclusive.



Subject title: INFORMATICS AND COMPUTING

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
II.	Obligatory	2	3	5,0	01-04-K-02-064

Subject leader: Dr.Sc. Nevzudin Buzadžija

E-mail: sbalic@mf.unze.ba

Subject assistant:

E-mail:

Pre-requisites

Subject aims

- acquisition and upgrade of theoretical and applied knowledge in the field of informatics and computing,
- acquisition of the necessary basis for future work with the support of computers and the expected changes in the information and communication technologies.

Learning outcomes

- On successful completion of this subject student will be able to:
- have a complete picture of the function of information and communication technologies in various aspects of engineering and solving engineering tasks and problems and
 - will be able to use selected software for general and specific purposes, as the basis for their future work, solving engineering problems with the support of computers and the acquisition of new knowledge and technologies in the areas of engineering that are studied at the Faculty of Mechanical Engineering in Zenica.

Indicative syllabus content:

Information technology and development. Introduction. Technology-main components. Areas of application. Future trends. **Fundamentals.** Cybernetics. Informatics. Components of a data processing system. Data and information. **Computers and their applications.** Historical overview of the development of data processing devices. Generations of computers. Types of computer systems. The concept of computers and user-computer communication. Elements of hardware. **Software.** Software development. Types of software. System software. Application software. Programming languages. **Databases (Structured data storage).** **Information and control systems.** Information management in modern production systems. **Computer graphics.** Technical documentation and data management models. **Computer networks and the Internet.** **E-commerce and e-government.** **Decision support and business intelligence.**

Learning delivery:

Lectures are conducted with the use of multimedia resources, and active learning techniques to encourage students to actively participate in the classroom (talk, discussion, preparation and presentation of seminar papers).

Exercises are auditory and laboratory and performed with use of PCs. They cover: operating system Windows, software package MS Office, software package Autodesk AutoCAD, using the Internet, selected programs of general and special purpose.

Assessment 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 knowledge of students in computer science and computing.

Assessment Criteria

Lectures	Exercises	Final exam			
10%	30%	60%			

Reading

Essential	1. Balić, S. i saradnici: Osnovi informatike i računarstva, on-line predavanja na web stranici: www.lecad.unze.ba
Supplementary	1. Lagumdžija, Z.: Informatika, Ekonomski fakultet, Sarajevo



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Course: TECHNICAL MECHANICS II

Semester	Course type	Hours per week		ECTS credits	Course number
		Lectures	Tutorials		
II	obligatory	2	2	5,0	01-03-K-11-008

Teacher: Elma Ekinović, PhD

E-mail: eelma@mf.unze.ba

Assistant:

E-mail:

Pre-requisites

none

Course aims

- to introduce with basic concepts of kinematics of a particle and rigid bodies
- to introduce with basic concepts of dynamics of a moving particle and rigid bodies

**Competences
(learning
outcomes)**

After completion of this course students will be able to:

- calculate kinematic characteristics of a moving particle (governing equations, trajectory, velocity and acceleration),
- calculate kinematic characteristics of rigid bodies for different types of motion (translation, rotation, plane motion)
- to solve dynamic problems of a particle using the Newton's laws
- to use basic dynamic laws in a moving particle dynamics
- to use basic laws for dynamic analysis of mechanical systems and rigid bodies

Course syllabus:

KINEMATICS. Basic concepts. **Particle kinematics.** Definition of motion in different coordinate systems. Equations of motion. Position, trajectory, velocity and acceleration. Rectilinear and curvilinear particle motion. Kinematic diagrams. **Rigid body kinematics.** Translation. Rotation about a fixed axis. Angular displacement, angular velocity and angular acceleration. Linear velocity and linear acceleration of a rotating body point. Plane motion. Governing equations. Angular velocity and angular acceleration of plane motion. Instantaneous center of rotation. Centroids. Instantaneous center of acceleration. Velocity and acceleration of a body point.

DYNAMICS. Basic concepts. Restraints. **Particle dynamics.** Newton's laws. Differential equations of motion. Impulse. Momentum. Angular momentum. Work. Kinetic energy. Potential energy. Mechanical energy. General laws of particle dynamics (change of rate of momentum, angular momentum and kinetic energy). Conservation of mechanical energy. D'Alembert's principle for a particle. Relative motion of a particle. **Dynamics of mechanical systems and rigid bodies.** Center of mass. Moments of inertia. Steiner's theorem. General laws of system dynamics (motion of the mass center, change and conservation of momentum and angular momentum, work-kinetic energy theorem). **Collision (impact) problems.**

Teaching process

Lectures consist of oral presentations of theoretical background. Tutorials consist of solving problems through examples.

Assessments

Assessments are carried out through written exam consisting of solving specific problems and final exam in the form of test which covers understanding the basic theoretical principles.

Prerequisites for written exam – regular attendance to the lectures and tutorials.

Prerequisites for final exam – successfully passed written exam.

% of final grade

Lectures attendance	Tutorials attendance	Written exam	Final exam		
10%	10%	35%	45%		

Literature

Required	<ol style="list-style-type: none"> 1. Vukojević D.: Kinematika sa teorijom složenih mehanizama, Mašinski fakultet u Zenici, 1997. 2. Zaimović-Uzunović N.: Zbirka riješenih zadataka iz kinematike, Mašinski fakultet u Zenici, 1989. 3. Vukojević D., Ekinović E.: Dinamika, Mašinski fakultet, UNZE, 2008. 4. Doleček V., Lovren N., i dr.: Zbirka zadataka iz dinamike i oscilacija sa izvodima iz teorije, Svjetlost Sarajevo, 1981.
Recommended	<ol style="list-style-type: none"> 1. Karabegović I.: Kinematika, Univerzitet u Bihaću, 2008. 2. Karabegović I.: Dinamika, Univerzitet u Bihaću, 2008. 3. Rusov L.: Dinamika, Naučna knjiga, Beograd, 1989.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: TECHNICAL DRAWING

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
II	obligatory	2	2	5,0	01-03-K-12-021

Subject leader: doc.dr.sc. Amra Talić-Čikmiš

E-mail: acikmis@mf.unze.ba

Subject assistant: v. asis. mr. sc. Denis Spahić

E-mail: dspahic@mf.unze.ba

Pre-requisites

Subject aims	The aim of the course is to learn contemporary graphical methods used in dealing with engineering, technical and design problems. Students develop spatial perception of three-dimensional objects and capability of displaying different reciprocal relationships of geometric characteristics of geometric figures in two-dimensional plane. In addition, a sense of accuracy and logic, as well as a sense of neatness, clarity and transparency are developed.
Learning outcomes	Development of the ability of visual spatial perception. Insight into the structure and metrical properties of spatial objects. Orthogonal and oblique projections. The preparation of technical drawings.

Indicative syllabus content:

Technical documentation. Standards. Standard numbers. Types of drawings. Sheet sizes. Standard sheets. Folding of drawings. Standard layout elements. Title block. Lettering. Drawing Numbers. Sheet numbers. 3D drawing representation. Showing mechanical parts in the drawing views. Views of objects. Technique of lines. Scales. Dimensioning. Section views. Section-lining technique. Enlarged details. Assembly sections. Surface roughness and finish marks. Threads and fasteners. Tolerancing. Working drawings. Assembly drawings Application of CAD in the preparation of the technical documentation.

Learning delivery:

The use of modern teaching aids. Computer support, using the appropriate graphics packages, is included in the presentation and resolution of educational examples in all segments.

Assessment Rationale:

Assesment is done through a variety of methods that includ graphic works, periodic tests and a final exam. Graphic works include tasks that students are required to solve and submit by the deadline. Tests are a form of continuous assesment, usually come at the end of a few topics to find out what students have learned. Final exam is written after previously fulfilled the conditions relating to regular attendance and submitted graphic works.

Assessment Criteria

Activity on lectures (periodic testing)	Activity on exercises (periodic testing)	Final exam	
10%	15%	30%	45%

Reading

Essential	A. Talić-Čikmiš, D. Spahić, Nacrtna geometrija, Mašinski fakultet, Zenica, (in progress) A. Talić-Čikmiš, D. Spahić, Tehničko crtanje-zbirka zadataka, Mašinski fakultet, Zenica, (in progress) S. Olević, A. Talić-Čikmiš, Tehnička dokumentacija, Mašinski fakultet u Zenici, 2005.
Supplementary	(1) V. Niče: Deskriptivna geometrija I, II, ŠK Zagreb (1980.); (2) I. Babić, S. Gorjanac, A. Sliepčević, V. Szivovicza: Konstruktivna geometrija-vježbe, IGH Zagreb (1994.)



UNIVERZITY IN ZENICA
FAKULTY OF MECHANICAL ENGINEERING
IN ZENICI



Subject title:: MATERIALS II

Semester	Status	Number of lectures par week		ECTS bites	Signature
		Lectures	Training		
II	Obligatory	2	2	5	01-02-K-08-038
Teacher: Red.prof.dr.Nadija Haračić E-mail: nharacic@mf.unze.ba			Saradnik: Doc.dr. Raza Sunulahpašić E-mail: raza.sunulahpasic@famm.unze.ba		
Subjects which are prerequisite for exams		Materials I			
Goal of the lecture	<ul style="list-style-type: none">– Students introduction with properties and capabilities of the modern engineering materials– Qualification of students for practical solving on the materials field problems– Qualification of students for writed and verbally presentation of the investigation's results.				
Kompetentions	After effectively passed the course students will be able to: <ul style="list-style-type: none">– Knowledge of the properties of engineering materials (metals and nonmetals)– Correct selection of engineering materials– Ability to do (exceptionally) investigation of mechanical properties of materials				
Sylabus : About of steels generally;Classification and designation of steels in accordance with BAS EN; Steel phase transformations; Alloys elements influence on the steel properties; influence of impurites and trace elements. Sructure's steels for mechanical constructions and engineering elements (Universal constructional steels, Fine grained constructional steels, Steels for nuts and screw, Steels for boilers and tubes, Tool steels); Engineering's plastics; Engineering's cheramics.					
Type of education :Lectures, auditory's and laboratorie's trainings.					
Type of examination: Classic lectures with consulting, independent students work, verbally and laboratories trainings. It pass an exam writing and verbally.					
Criterion weight for knowlidge examination					
Lectures	Trainings	Independent students work	Colloqium	Writing exam	Verbaly exam
1,0	1,0	0,5	0,5	1,0	1,0
Literature					
Obligatory	<ul style="list-style-type: none">1. Savremeni materijali za mašinogradnju, Dr.N. Haračić, Univ. U Zenici, 2012.2. Savremeni metalni materijali, Oruč M., Sunulahpašić R., Univ. U Zenici,2005.				
Addition	<ul style="list-style-type: none">3. Inženjerski metalni i nemetalni materijali, Haračić N.;Maš. Fak. U Zenici, 2003.4. „Nauka o materijalima-Novi materijali:Polimeri,keramike,kompoziti“, F.Čatović Mostar-Bihać, 2000.5. BAS EN, EN, ASTM, JUS testig normes				



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: ENGLISH LANGUAGE II

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures			
II	obligatory	2		2,0	01-04-K-03-250

Subject leader: doc.dr.sc. Aida Tarabar

E-mail: atarabar@mf.unze.ba

Prerequisites: English Language I

Subject aims: Work on an elementary English grammar in order to level the knowledge of English language among the students.

Learning outcomes: Upon successfully completed course students will be able to:
- use a more complex grammatical structures and vocabulary

Indicative syllabus content:

Tenses: Present Continuous , Past Continuous, ‘‘Going to’’ for future, Present Perfect, Plural of Nouns, Comparison of Adjectives, Adjectives vs. Adverbs

- Practicing the above mentioned grammar structures through different situations: dialogue, monologue, repetition (drill), substitution, permutation, reduction, new element extension.
- Practicing translations from mother tongue and into it. Writing small compositions in English. Comparison between foreign language structures and their equivalents in our language.

Learning delivery: Classes are carried out by using interactive method.

Assessment Rationale: Testing is carried out via two tests and a final exam. Also, regular check outs are carried out through the both students' activities in the classroom and their homeworks.

Assesment Criteria

Lectures	Portfolio	Final Exam			
10%	20%	70%			

Reading:

Essential	1. Murphy R., Essential Grammar in Use, Cambridge University Press, Cambridge, 1998. 2. Makek V. i ostali: English for You, Books 2,3, Škola za strane jezike, Zagreb,1991.
Supplementary	1. Dictionaries and English Grammar Textbooks (free choice)



UNIVERSITY OF ZENICA
MECANICAL FACULTY
IN ZENICA

Course: PHYSICAL EDUCATION II

Semester	Status	Number hours per week		ECTS credits	Šifra
		Lectures	Exercises		
II	Facultative		1	1,0	01-04-K-01-104

Teacher: Associate . professor.dr.sc.Mirjana Mađarević
E-mail: mmadjarevic@yahoo.com

Associate:

Courses that are a prerequisite for laying

No course as a prerequisite for the exercise

The course goal Content of the second semester of the subject physical education is intended to improve the health status of students. Practical skills acquired and expanded knowledge in certain sports are certainly in order to preserve health and good working condition. Regular application of kinesiology activities to maintain and upgrade the quality theoretical and health status of the student (positive impact on the anthropological status of students train and improve motor skills, functional skills, motor skills fund, with the aim of maintaining and improving the students health.The permanent developing habits and the need kinesiological activities in daily life and work, which would contribute to more easily overcome the effort during the

Competencies (Learning outcomes) The program complements the students' practical skills and provides them with basic motor skills for successful work in their profession and contribute to the quality of life. Developing the skills and abilities to correlate with the practical work of other programs

Course program: The subject includes the following topics:- Transitive measurement of morphological characteristics.Transitive-testing of motor skills.-Work on improving the overall physical fitness.-Work to increase motor skills-General power factor, and other motor skills:-Training explosive power-speed. -Aerobic exercise improve functional ability.-Work Program on speed.-Work program to coordinate.- Work Program on the factor of balance.-Work Program on precision.-Work out at the gym. Lady-fitness program.-Field work in the pool, athletics stadium. Basic techniques: front crawl, breaststroke, backstroke, butterfly, training non-swimmers.athletics.-Training techniques from sports ball football.-Rhythm and dance.

Teaching:

Classes are held in physical hall, pool and stadium..

Examination:

Students have no verification as to other professional courses. They have an obligation to attend and then get the signature of a professor who holds the collegium. Knowledge assessment.of their motor and functional abilities are valued for their personal status health.

Weighted criteria for evaluating knowledge

Lectures Practice Final Exam.

Weighted criteria for evaluating knowledge

lectures	Exersises	Final exem		
	100%	-		

Literature

Obligatory literature:

Required Students are advised to literature related to sports and recreation.
1.Hadžikadunić, M., Mađarević,M.(2004).Metodika nastave tjelesnog odgoja sa osnovama fiziologije tjelesnog vježbanja.Nacionalna Univerzitetska biblioteka. Sarajevo. 2.Ivančević,K.(1988 br.1).Relacije morfoloških karakteristika i eksplozivne snage kod žena.Kineziologija,Zagreb.3.Blašković,M.(1979 br2.).Relacije morfoloških karakteristika i motoričkih sposobnosti. Kineziologija , Zagreb.

SECOND YEAR



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: MECHANICAL ELEMENTS I

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
III	obligatory	2	2	5,0	01-03-K-12-018

Subject leader: prof.dr. Nedeljko Vukojević
E-mail: vukojevicn@mf.unze.ba

Subject assistant: prof.dr. Nedeljko Vukojević
E-mail: vukojevicn@mf.unze.ba

Pre-requisites

none

Subject aims

- Introduction to basic mechanical elements
- The calculation of standard machine elements
- Preparation of technical documentation

Learning outcomes

- Upon successful completion of the course students will be able to:
- calculated standard machine elements
 - they undertake a variety of mechanical units,
 - calculated degree of safety statically and dynamically loaded components
 - define working and critical stresses
 - prepares technical documentation

Indicative syllabus content:

The general part. Standardization of parts and assemblies. Basis for standardization. Tolerances of mechanical parts and assemblies. The choice of limits and fits.

Basis of calculation of machine elements. The working load of machine elements. Working stresses in mechanical parts. Stress concentration. The critical stresses of mechanical parts. The safety factor of machine parts.

Temporary joints. Fastenings. Screw fastenings. Screw thread profile. Permanent joints. Rivet fastenings Nailed joints. Soldered joints. Glued joints. Welded joints.

Springs. The basic characteristics. Materials for springs. Springs subjected to bending. Subjected to torsion springs. Spring exposed to complex stresses. Rubber elastic elements.

Sealing elements.

The compounds and elements returned. Keys, pins, cotters. Clamping joints. Clamping compounds with two-piece. Taper clamp connections. Precision joints. Compounds achieved by using special elements. Longitudinal pins. The cross pins. Connections for the transfer of axial forces.

Couplings.

Learning delivery:

Lectures are conducted auditory.

The exercises are auditory and laboratory. The exercises for the four tasks as follows:

- three tasks from the analytical part of the budget: tolerance, critical operating conditions, the calculation of threaded joints, and
- one tasks in the graphical part: basic drawings and assembly drawings.

Assessment Rationale:

When presenting the task, students orally present material related to the methodology of the task.

The exam is written and orally. The assessment is done in two parts, first part of the three tasks done at the end of seven weeks of lectures and teaches other part of the remaining three tasks at 15 weeks of lectures.

The written exam is eliminatory. The oral exam is final.

Assessment Criteria

Activity on lectures (periodic testing)	Activity on exercises (periodic testing)	Tasks	Eliminatory exam	Final exam	
10%	10%	20%	30%	30%	

Reading

Essential	1. Savić, Z. i grupa autora: Inženjersko mašinski priručnik, knjiga br.2, Zavod za udžbenike i nastavna sredstva Beograd, 1992.
Supplementary	2. Savić, Z., Ognjanović, M.: Mašinski elementi-praktikum za vježbe, Mašinski fakultet Beograd.
	3. Ognjanović, M.: Mašinski elementi, Naučna knjiga, Beograd, 1999.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Course: **STRENGTH OF MATERIALS**

Semester	Course type	Hours per week		ECTS credits	Course number
		Lectures	Tutorials		
III	Required	3	2	6,0	01-03-K-12-025

Teacher: Dr Aleksandar Karač

E-mail: akarac@mf.unze.ba

Teaching assistant: Alma Žiga, MSc, senior assistant

E-mail: aziga@mf.unze.ba

Pre-requisites

Statics

Course aims

- Develop analytical and problem-solving skills,
- Establish relationship between the external loads applied to a deformable body and the intensity of stresses and strains caused by those loads,
- Give the basic expressions for stress and strain calculations caused by various types of loads.

**Competences
(learning
outcomes)**

- After completion of this course students will be able to:
- distinguish between various types of loads, and be able to calculate stresses and strains caused by each type of load,
 - design and analyse simple structure elements using strength and stiffness criteria,
 - calculate principal and maximum shear stresses in a body, using analytical expressions and Mohr's circle of stress,
 - distinguish between statically determinate and indeterminate problems, and employ appropriate methods for their solution.

Course syllabus:

Stresses and strains. Normal and shear stresses and strains. Hooke's law. Material properties. Types of loads. **Axial loading.** Relationship between force and extension. Statically determinate problems. Statically indeterminate problems. Temperature effects. Stresses on inclined sections. **Torsion.** Stresses and strains of a circular bar. Statically indeterminate problems. **Bending.** Moments of inertia. Pure bending. Calculation of stresses under bending moments and shear stresses. Deflection of simple beams. **Plane stress and application of plane stress.** Principal and maximum shear stresses. Mohr's circle of stress. Stress transformation. Pressure vessels. Beams. Combined loading. **Theories of failure.** Ductile materials. Brittle materials.

Teaching process

The teaching is delivered by means of lectures and tutorials. The purpose of lectures is to give the theoretical background related to the course with applications of the knowledge through examples. Tutorials consist of solving specific problems given in homework assignments and some additional exercises necessary for successful completion of the course.

Assessments

Assessments are carried out continuously during semester through two homework assignments and two theory tests, and the final exam in written form at the end of semester. The final exam consists of 4-5 problems to be solved.

% of final grade					
Homework assignment	Tests	Written exam			
30	20	50			

Literature

Required	<ol style="list-style-type: none"> 1. Vlatko Doleček i dr., <i>Elastostatika I</i>, Tehnički fakultet, Bihać, 2003. 2. Vlatko Doleček i dr., <i>Elastostatika II</i>, Tehnički fakultet, Bihać, 2004. 3. Rašković D., <i>Tablice iz otpornosti materijala</i>, Naučna knjiga, Beograd, 1990.
Recommended	<ol style="list-style-type: none"> 1. RC Hibbeler, <i>Mechanics of Materials</i>, Prentice Hall, Eight Edition, 2011. 2. JM Gere, BJ Goodno, <i>Mechanics of Materials</i>, Cengage Learning, Seventh Edition, 2009. 3. JM Gere, BJ Goodno, <i>An Instructors Solution Manual to Accompany: Mechanics of Materials</i>, Cengage Learning, Seventh Edition, 2009. 4. Dž. Kudumović, S. Alagić, <i>Zbirka Rješениh Zadataka iz Otpornosti Materijala</i>, UNTZ, Tuzla, 2000.



**UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING**



The curriculum of the subject: FLUID MECHANICS

Semester	Status	Hours per week		ECTS credit values	Code
		Lectures	Exercises		
III	obligatory	3	2	6,0	01-03-K-15-011

Subject lecturer: Assoc. prof. dr. sc. Nedim Hodžić
E-mail: nhodzic@mf.unze.ba

Subject assistant: Assoc. prof. dr. sc. Nedim Hodžić
E-mail: nhodzic@mf.unze.ba

Pre-requisites: Mathematics, static, kinematics, dynamics

Subject aims

- to familiarize students with the basic characteristics of the fluid and the basic laws of fluid mechanics,
- to familiarize students with the practical application of the basic laws of fluid mechanics,
- to familiarize students with the determination of static and kinematics-dynamics fluid characteristics.

Learning outcomes

On successful completion of this subject student will be able to:

- comprehend and understand the concept and importance of fluids and fluid mechanics as a science,
- solve the basic problems of static, kinematics and dynamics of fluids,
- recognize the basic laws of fluid mechanics to solve practical problems,
- make an application of the principles of fluid mechanics to solve practical problems.

Indicative syllabus content:

Introduction. The subject of the research, the field of application and place in physics. Historical development of fluid mechanics. Aim and content of the course. Definition of fluid. The Continuum Concept. Field theory (definitions and notation, algebraic operations, differential operators, surfaces levels and field lines, integral theorems, types of fields). Physical properties of the fluid (density, viscosity, compressibility, vapor pressure, surface tension, thermal conductivity, specific heat). Rheological division of materials. Units, dimensions and dimensional analysis. Forces acting on the fluid (mass and surface forces, stress tensor, tangential stresses, Newtonian viscosity, normal stress, pressure). **Fluid statics.** Introduction. The basic equations of fluid statics. Fluid in the field of gravity, (incompressible fluid, equation of hydrostatics, compressible fluid, examples of the application of the equation of hydrostatics). Uniform flow of an incompressible fluid. Fluid pressure force on submerged surfaces (fluid pressure force on a flat surface, fluid pressure force on a curved surface). The pressure vessel –the formula of Mariotti. Buoyancy. The stability of the body in swimming. Relatively suspension of fluid (rectilinear rapidly moving of container with liquid in the horizontal plane, evenly turnaround of container filled with fluid over the vertical axis). **Kinematics of fluid.** Introduction. Lagrange and Euler's analysis of the movement of fluids. Material derivation. System and control volume. Reynolds transport theorem. Basic kinematic characteristics of flow (flow field, streamlines, trajectories, trace, flow area, flow tube, flow fiber, flow streamline, vortex line, vortex tube, the mean size of the flow values). Flow. Circulation. Movement of fluid elements (small piece or particles). Classification of movement of fluids. **Fluid Dynamics (basic laws of fluid mechanics).** Introduction. Basic laws of physics for the system. Basic equations of fluid mechanics (integral form and differential form). Approach to solving problems of fluid mechanics. **Integral flow analysis.** Introduction. Mass balance equations (continuity equation). The equation of momentum. The equation of angular momentum. The energy equation (energy, heat, work, equations of thermal energy, mechanical energy equation). Noninertial coordinate system. Integral analysis of flow in the boundary layer (thickness of the boundary layer, Von Karman integral equation of momentum, laminar boundary layer without pressure gradient, turbulent boundary layer without pressure gradient, separation of the boundary layer, vortex trace). One-dimensional analysis of steady incompressible flow (basic equations, flow through pipes). One-dimensional analysis of steady compressible flow (propagation of sound waves, basic equations, ideal gas flow in channels of variable cross-section, isentropic flow of an ideal gas, ideal gas flow through the shock wave). **Differential flow analysis.** Flow of perfect incompressible fluid (basic equations, the equation of hydrostatics as integral equations of hydrodynamics, Bernoulli integral of Euler equations, potential flow and the Cauchy - Lagrange integral of Euler equations, stream function for planar flow, complex potential and complex velocity, a simple non-vortex flows, conformal mapping, forces and moments acting on the body in a potential flow - Blasius - Čapljigin forms), Newton incompressible fluid flow, basic equations, exact analytical solutions (Couett solution Poiseuille solution, Hagen - Poiseuille solution, solution of flow between two coaxial cylinders), the approximate analytical solutions (hydrodynamic lubrication theory, differential analysis of the boundary layer flow), mathematical description of turbulent flows (basic equations, turbulence models), experimental solutions (similarity theory, the concept of similarity, similarity conditions, the physical meaning of dimensionless numbers), numerical solutions. Discharging through the holes and sockets. Discharging through the holes. Discharging through the sleeve.

Learning delivery:

Lectures will be conducted with the use of multimedia resources, active learning techniques, and with the active participation of students. Exercises are auditory and laboratory. Goal of an auditory exercises are assignments and calculation examples with from the areas under study as part of the lecture. Laboratory exercises include a demonstration of the basic laws of fluid mechanics at the appropriate laboratory experimental devices and systems.

Assessment Rationale

Examination on the fluid mechanics have written and oral form. Student is entitled to take the oral exam when passed the written exam.

Assessment Criteria

Lectures	Exercises	Writing exam	Oral exam		
10 %	10 %	40 %	40 %		

Reading

Essential	1. Demirdžić I.: Mehanika fluida I dio - Osnove, Mašinski fakultet u Sarajevu, Sarajevo, 1990. 2. Hodžić, N., Berberović, E.: Zbirka riješenih zadataka iz mehanike fluida, skripta, Mašinski fakultet u Zenici, Zenica, 2010.
Supplementary	1. Čantrak S., Crnojević C.: Hidraulika, DIP GK Beograd, Beograd, 1990. 2. Bukurov, Ž., Cvijanović, P.: Mehanika fluida – zadaci, FTN Novi Sad, Novi Sad, 1982. 3. Jović, V.: Osnove hidromehanike, Udžbenici Sveučilišta u Splitu, Element Zagreb, Zagreb, 2006.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING
IN ZENICA



Syllabus: BASICS OF ELECTRICAL ENGINEERING

Semester	Status	Number of classes per week		ECTS scores	Code
		Lectures	Practice		
III	obligatory	2	2	5.0	01-03-K-16-006
Teacher: doc.dr sc. Izet Džananović E-mail: i.dzananovic@elektroprivreda.ba			Teaching Assistant: asis. mr. sc.Sakib Jusić E-mail: s.jusic@elektroprivreda.ba		
Postulate subjects for taking an exam:		-			
Aim of subject:		Aim of the subject is developing of general competencies, knowledge and skills.			
Competences (Learning results)		Training students for analytical solving of specific practical problems and developing skills of logical reasoning based on available data.			
Subject agenda: Electrostatics. Electric charge and its validities. Electric field, its validities and representation by electric field lines. Electric capacity, types and merging of electric capacitor. Electrodynamics Electric circuit. Simple and complex, direct linear circuit laws and their usage. Nonlinear direct circuits. Laws of flux of electric power through electrolyte and gases, and their usage. Electro-magnetism. Theory of electro-magnetism. Magnetic field of flat conductor, two flat parallel conductors, wire sling and quirk. Types and magnetic characteristics of ferromagnetic materials. Magnetic circuits. Induced charge (transformations and rotations). Alternate powers and charges. Representation of alternate sizes by radium vectors and complex number. Characteristics of consumer resistance in alternate power circuits. Consumer's potency of uniphase alternate power. Triphase source and consumer's power. Transformers. Theory of uniphase transformer. Theory of triphase transformer. Special transformers. Electric drive Elements and types of electric drive. Electric machines. Basic theory and usage of induction motor, direct generators and motors, synchronous generators and motors, and small accumulative electric motors. Applied semi-conductive electronics. Components (diodes, transistors thyristors and converters). Basics of digital electronics (digital circuits and counters).					
Teaching: Usage of contemporary teaching means.					
Knowledge check : Students' knowledge check is performed by preliminary exams and final exams. Preliminary exams represent form of continual knowledge within which students solve assignments from particular section. Students take final exam in written form after fulfilling conditions which are related to regularly attendance and passed preliminary exams.					
Criteria for knowledge check:					
Attendance		Preliminary exam	Final exam		
10 %		45 %	45 %		
Literature					
Compulsory	1. A. Gavranović "Elektrotehnika", Mašinski fakultet u Zenici, Zenica, 2003.				
Additional	1. Narcis Behlilović „Osnove elektrotehnike“, Elektrotehnički fakultet Sarajevo, Sarajevo 2008.				



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: SURFACE ENGINEERING

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
III	Obligatory	2	2	5,0	03K-13-056

Subjects leader: Prof.dr. Sabahudin Ekinović
E-mail: sekinovic@mf.unze.ba

Subjects assistant: V.as.mr. Edin Begović
E-mail: ebegovic@mf.unze.ba

Pre-requisites

Subject aims

- basics of surface engineering
- understanding of tribological processes in mechanical systems
- understanding of friction, wear and lubrication of surface

Learning outcomes

- On successful completion of this subject student will be able to:
- identify main elements of machined surfaces integrity
 - calculate elements necessary for assessment of surface condition
 - select appropriate lubrication for a tribological system
 - understand and design central lubrication systems

Indicative syllabus content: Introduction, General consideration of surface, Relationship between surface integrity and machining technology, Fundamentals of tribology theory (definition and classification of a tribological system, tribological processes, tribotechnical systems), Friction (definition and type of friction, friction theory), Wear (definition and classification, a link between the friction and wear, the intensity of wear, wear types: adhesive, abrasive, fatigue wear, wear due to erosion, diffusion, oxidation), Lubrication theory (classification, forms and types of lubrication, boundary, mixed, hydrodynamic, hydrostatic and elastohydrodynamic lubrication), Lubricants (characteristics and distribution, lubricants, oils and similar liquids, greases, solid and gaseous lubricants), Lubrication of machine elements, Lubrication of mechanical systems, Lubrication equipment and systems (manual and central lubrication, lubrication systems: multi-line, continuous lubrication systems, single line with a distributors, two-line systems, progressive systems, oil mist lubrication systems, injection systems and combined systems).

Learning delivery: Lectures are conducted with the use of multimedia resources, technology and active learning with active participation of students. Exercises are performed as auditory and laboratory. The exercises are practical working examples and calculations, and practical laboratory exercises to explain certain topics.

Assesment Rationale: Assessment of students is carried out continuously during the realization of lectures and exercises in the form of active participation in lecture and written and oral reports of the calculations and laboratory exercises. The practical exam includes a student activity during the exercises. The theoretical part of the examination is written through the elaboration of a specified limited number of topics.

Assessment Criteria

Lecturing	Exercise	Practical work	Theory exam		
10%	10%	30%	50%		

Reading

Essential	1. Ekinović, S.: Osnove tribologije i sistema podmazivanja, Mašinski fakultet, Zenica, 2000. 2. Ekinović, S.: Integritet površine, Univerzitet u Zenici, Zenica 2015.
Supplementary	3. Savić, V.: Tribologija, Mašinski fakultet, Zenica, 1979. 4. Williams J.A.: Engineering tribology, Oxford University Press 1996.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title : ENGLISH LANGUAGE III

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures			
III	Obligatory	2		2,0	01-04-K-03-251

Subject leader: doc.dr.sc. Aida Tarabar

E-mail: atarabar@mf.unze.ba

Prerequisites: English Language II

Subject aims: To prepare students for a technical discourse through a work on more complex English grammar.

Learning outcomes: Upon successfully completed course students will be able to:
- distinguish and use a more complex vocabulary and syntax.

Indicative syllabus content:

Reported Speech, Past Perfect, Causative Have, Passive Voice – Present Simple, Past Simple, Future Tense

- Practicing the above mentioned grammar through different situations: dialogue, monologue, repetition (drill), substitution, permutation, reduction, new element extension.
- Practicing translations from mother tongue and into it. Writing longer compositions in English. Comparison between foreign language structures and their equivalents in our language.

Learning delivery: Classes are carried out by using interactive method.

Assessment Rationale: Testing is carried out via two tests and a final exam. Also, regular check outs are carried out through the both students' activities in the classroom and their homeworks.

Assesment Criteria

Lectures	Portfolio	Final Exam			
10%	20%	70%			

Reading:

Essential	1. Murphy R., Essential Grammar in Use, Cambridge University Press, Cambridge, 1998. 2. Makek V. i ostali: English for You, Book 2,3 Škola za strane jezike, Zagreb,1991.
Supplementary	1. Dictionaries and English Grammar Textbooks (free choice)



UNIVERSITY OF ZENICA
MECANICAL FACULTY
IN ZENICA



Course: PHYSICAL EDUCATION III

Semester	Status	Number hours per week		ECTS credits	Code
		Lectures	Exercises		
III	Obligatory		1	1,0	01-04-K-01-106

Teacher: Associate . professor.dr.sc.Mirjana Mađarević
E-mail: mmadjarevic@yahoo.com

Associate:

Courses that are a prerequisite for laying

No course as a prerequisite for the exercise

The course goal The area of physical education is actual reality of human society that is present in all stages of its development, as overall material and social values that mankind has created and directly created in the process of socio-historical practice. The aim of the course is to get through the courses designed and built fully developed personality. This process is accomplished morphological, motor, functional, moral and social development of student population, including the transformation of sport

Competencies (Learning outcomes) The program complements the students' practical skills and provides them with basic motor skills for successful work in their profession and contribute to the quality of life. Developing the skills and abilities to correlate with the practical work of other .

Course program: The subject includes the following topics:- Initial measurement of anthropometric characteristics.-Initial testing of motor skills.-Sports Games - basic program: basketball, volleyball, table tennis.-Technique of the basic elements of basketball.-Technique of the basic elements of volleyball.- The technique of table tennis.-Swimming: a program for swimmers.-Swimming-program for swimmers. - Optional programs:-Nature activities, tours, cross-country, athletics, corrective exercise, aerobics, health yoga, exercise, daily exercise and exercise students with special needs

Teaching:

Classes are held in physical hall, pool and stadium..

Examination:

Students have no verification as to other professional predmetima.Imaju obligation to attend and then get the signature of a professor who holds the collegium. Knowledge assessment.of their motor and functional abilities are valued for their personal status health.

Weighted criteria for evaluating knowledge

Lectures Practice Final Exam.

Weighted criteria for evaluating knowledge

lectures	Exersises	Final exem			
	100%	-			

Literature

Obligatory literature:	Required Students are advised to literature related to sports and recreation. Natalija Špehar, Đurđa Podvorac (2001). Metodika sportske rekreacije - aerobika, <i>Priručnik za obrazovanje voditelja sportske rekreacije</i> (103-128), Zagreb, Hrvatski savez sportske rekreacije "Sport za sve" i Hrvatski olimpijski odbor - Obrazovni centar
Additional literature	



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: MECHANICAL ELEMENTS II

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
IV	Obligatory	2	2	5,0	01-03-K-12-019

Subject leader: prof.dr. Nedeljko Vukojević
E-mail: vukojevicn@mf.unze.ba

Subject assistant: prof.dr. Nedeljko Vukojević
E-mail: vukojevicn@mf.unze.ba

Pre-requisites

none

Subject aims

- Introduction to basic mechanical elements
- The calculation of standard machine elements
- Preparation of technical documentation

Learning outcomes

- Upon successful completion of the course students will be able to:
- calculated standard machine elements and compounds of elements
 - they undertake a variety of mechanical units,
 - calculated safety factor statically and dynamically loaded components
 - calculated and select the power transmission
 - prepares technical documentation

Indicative syllabus content:

Elements the rotating motion. Shafts, shafts and pins. Structural forms and types of shafts, axles and pins. Rolling bearings. Types and characteristics of rolling bearings. Strength, capacity and service life of bearings. Plain bearings. The situation in the plain joint. Load bearing with sliding surfaces. Load bearing with hydrodynamic swimming. Radial, axial and radial-axial plain bearings. The elements for power transmission. Friction couples. General characteristics and classification. The choice of dimensions. Gears. General characteristics and classification. The cylindrical gear pairs. Bevel gear pairs. Worm pairs. Belts and couples. General characteristics and classification. Working and critical stress, capacity, choice of dimensions. Chain couples. General characteristics and classification. Shapes and dimensions of chains and sprockets. Strength and lifetime of chain pairs. Pressure vessels, piping and valves. Elements of the pressure vessel. Check the strength of the material and pressure vessels.

Learning delivery:

Lectures are conducted auditory.

The exercises are auditory and laboratory. The exercises for the four tasks as follows:

- three tasks from the analytical part of the estimation: shaft, bearings and gear pair
- one tasks in the graphical part: basic drawings and assembly drawings.

Assessment Rationale:

When presenting the task, students orally present material related to the methodology of the task.

The exam is written and orally. The assessment is done in two parts, first part of the three tasks done at the end of seven weeks of lectures and teaches other part of the remaining three tasks at 15 weeks of lectures.

The written exam is eliminatory. The oral exam is final.

Assessment Criteria

Activity on lectures (periodic testing)	Activity on exercises (periodic testing)	Tasks	Eliminatory exam	Final exam	
10%	10%	20%	30%	30%	

Reading

Essential	1. Savić, Z. i grupa autora: Inženjersko mašinski priručnik, knjiga br.2, Zavod za udžbenike i nastavna sredstva Beograd, 1992.
Supplementary	2. Savić, Z., Ognjanović, M.: Mašinski elementi-praktikum za vježbe, Mašinski fakultet Beograd. 3. Ognjanović, M.: Mašinski elementi, Naučna knjiga, Beograd, 1999.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title:: ENGINEERING THERMODYNAMICS

Semester	Status	Classes per week		ECTS	Code
		Lectures	Practice		
IV	Obligatory	3	2	5,0	01-03-K-15-010

Teacher: Red.prof.dr. Nagib Neimarlija

E-mail: nagibn@mf.unze.ba

Associate: Red.prof.dr. Nagib Neimarlija

E-mail: nagibn@mf.unze.ba

Pre-requisites

physics, mathematics.

Subject goal

To learn students about the thermodynamics laws, and their practical applications.

Student's competence

To make solution of practical problems using the laws in practical engineering applications.

Lecture program: Basic concepts of thermodynamics. Basic definitions. Dimensions and units. Basic thermodynamic units. The Zeroth law of thermodynamics. **The First law of thermodynamics.** Energy. Enthalpy. Moving boundary work. First law of thermodynamics for closed system. Specific heat. Mass and energy conservation. **Mass and Energy conservation.** Flow work and technical work. ***P-v-T* behavior of pure substance.** *P-v-T* surface. Thermodynamic diagrams. Thermodynamic tables. Ideal gases. Definition of ideal gas. Equation of state for ideal gas. Specific heat of ideal gas. Mixtures of ideal gases. Change of state of ideal gas for closed system. **The Second law of thermodynamics.** Reversible and irreversible processes. Statements of second law of thermodynamics. Clausius inequality. *Tds*-equations. Entropy increasing principle. Energy degradation. Availability of a system. **Gas power cycles.** Reversible Ericsson cycle. Ideal Joule-Brayton cycle. Ideal Otto cycle. Ideal Diesel cycle. Ideal Sabathe-Seilinger cycle. Ideal Atkinson cycle. Ideal jet-propulsion cycle. Analysis of irreversible effects in gas cycles. **Vapor power cycles.** Carnot cycle. Ideal Rankine cycle. Ideal Rankine cycle with reheating. Ideal Rankine cycle with regenerative heating. Effects of condensation pressure on ideal Rankine cycle. Effects of irreversibility in Rankine cycle. Combined cycle. Combined production of heat and electricity. **Refrigeration cycles.** Carnot cooling cycle. Ideal cooling cycle. Variations of ideal cooling cycle. Exergy efficiency in cooling processes. Effects of irreversibility in compression. Cooling media. Cycle of heat pump. **Moist air.** Basic properties of moist air. Enthalpy of moist air. Mollier *h-x* diagram. Heating and cooling of moist air. Mixing of air flows. Drying of material.

Teaching and exercising process: Exercises and lectures are auditory. Examples covering the topics are delivered, solved and discussed.

Examination: Examination is conducted at the end of semester. It consists of two parts: problems to be worked out and theoretical part, which are used in evaluation and issuing the final note.

Assessment:

lectures	practises	examples	theory		
5%	5%	45%	45%		

Literature:

Primary	(1) Neimarlija, N., <i>Termodinamika</i> , Dom Štampe Zenica, oktobar 2001; (2) Neimarlija, N., & Selimović S., <i>Zbirka zadataka iz Nauke o toploti</i> , Mašinski fakultet Zenica, april 2003.
Secondary	(1) Wark, K., & Richards, E. D., <i>Thermodynamics</i> , 6th ed., McGraw-Hill, 1999., (2) Black, W. Z., & Hartley, J. G., <i>Thermodynamics</i> , Harper Collins Collegel Publishers, 1996.

Student's obligations: Regular attendance to the lectures, exercises, and exam.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: CONSTRUCTION, SHAPING AND DESIGN

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
IV	Core	2	2	5,0	01-03-K-12-065
Subject leader: Assist. dr. sc. Fuad Hadžikadunić E-mail: hfud@mf.unze.ba			Subject assistant: Assist. dr. sc. Fuad Hadžikadunić E-mail: hfud@mf.unze.ba		

Pre-requisites

-

Subject aims

- Mastering the proper approach to the construction and design,
- Development and real engineering application of knowledge for the needs of the industrial environment,
- Application of different methods and analysis in accordance with construction type.

Learning outcomes

- Upon successful completion of the course, students will be able to:
- understand and apply the concept of engineering construction and design,
 - diagnose the real factors for proper design,
 - apply creative and analytical approaches to the planning, design and optimization of the idea of a real structure,
 - perform different types of design according to real requirements.

Indicative syllabus content:

The historical development of industrial design. Functional, aesthetic and ergonomic aspects of product development. The role of industrial design in the product development process. The main tasks of the design and construction. Stages of product design - product research, product design, product construction. Factors influencing the design, construction, purpose, function and form of construction. Safety at the work and working life of the structure. Transport, assembly and handling with structures. Economic conditions for design. The science of designing. A review of the science of designing and theoretical basis. The aim of the future development of the science of designing. Construction methodologies, wide-thinking method, method of forced relationships, optimal methods. The requirements and restrictions in the construction. The concept of conceptual design. The choice of optimal variants. Rating optimality of conceptual solutions. Methodical design. Basic principles of methodical design, implementation in practice and practical examples. Standardization. Aims of standardization and method of application. The design and dimensioning of mechanical constructions. Dimensioning based on assembly functions. Dimensioning based on the required rigidity of mechanical parts. The impact of mass of mechanical systems-economizing with material. Selection of service parameter, type, size and nature of the load, the length of mechanical parts, restraints and safety factor. Light alloys, their selection and usage examples. The influence of external factors on mechanical constructions. The critical stresses and safety. Construction and design of pressed assemblies in the field of elasticity and plasticity. The temperature effect on the pressed assemblies. Strength, safety and design of welded structures. The complex stresses and safety of welds. Methods of designing of elements. Forged, rolled and cast forms and elements. Instructions for the construction of castings. Computer-aided design - CAD. The importance of proper preparation of technical documentation. Management systems of technical documentation in the CAD process, forms of representation, CAD influence to industrial design. The importance of numerical analysis in the construction and design examples.

Learning delivery: Lectures are performed with the use of modern educational equipment with the active participation of students, with a special emphasis directed to the engineering logic thinking. Exercises are auditory and laboratory. The exercises are performed with analytical tasks and computational examples of specific areas which are covered in lectures, on the basis of practical examples. At laboratory exercises students are introduced to the basic principles of design over concrete examples applied in the industry and with the use of laboratory measuring equipment. Exercises include three individual work tasks in specific areas of application of design principles.

Assessment Rationale: The assessment of students is carried out continuously during the implementation of lectures and exercises in the form of active participation of students in terms of developing engineering logic essentials, and later to solve engineering problems. After the finalization of individual work tasks, the colloquium tests are performed. The exam is taken in writing and orally.

Assessment Criteria

Lectures	Exercises	Seminar paper	Colloquium (of exercises)	Theoretical exam	
10%	15%	20 %	25%	30%	

Reading

Essential	<ol style="list-style-type: none"> 1. Electronic form of lectures, 2. L. Krstulović-Opara, Ž. Domazet: Dizajn industrijskih proizvoda, FESB, 2009, 3. A. Muminović, E. Mešić: Oblikovanje i proračun zavarenih konstrukcija, MF Sarajevo, 2013. 4. S. Olević, R. Seferović: Zbirka zadataka iz mašinskih sistema, MF UNZE, 2008.
Supplementary	<ol style="list-style-type: none"> 1. Budynas-Nisbett: Mechanical Engineering design, McGraw Hill, 2006. 2. J.G.Skakoon: The Elements of Mechanical Design, ASME Press, 2008, 3. J. Haik, T. Shahin: Engineering Design Process, Global Engineering, 2011, 4. Ognjanović M., Metode konstruisanja mašina, Mašinski fakultet, Beograd, 1988.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: CAD/CAE technologies

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
IV	Core	3	3	6.0	01-03-K-12-015

Subject leader: Dr.Sc. Senad Balić, Professor
E-mail: sbalic@mf.unze.ba

Subject assistant: MSc. Ernad Bešliagić
E-mail: ebeslagic@mf.unze.ba

Pre-requisites

Subject aims

- adoption of CAD tools and technologies, in the field of geometric modeling, as one of the primary means of mechanical engineers,
- acquisition of theoretical and practical knowledge of computer graphics and geometric modeling,
- introduction to the basic principles of 3D modeling in virtual environment, and mastering work in selected CAD software for mentioned modeling,
- acquisition of the basis informations about CAE and CAX technologies necessary for future work in the areas of engineering that are studied at the Faculty of Mechanical Engineering in Zenica.

Learning outcomes

- On successful completion of this subject student will be able to:
- have a complete picture of the role and place of CAD and CAE technologies in mechanical engineering,
 - have the creative ability to solve 3D problems and display 3D ideas in space and projections,
 - be able to create 3D models of individual parts and assemblies and, on the basis of these models, make relevant technical documentation,
 - be able to use selected CAD software as the basis for their future work in various fields of engineering and to solve various engineering problems with support of computers, where the starting point is 3D model.

Indicative syllabus content:

Introduction and definition of CAD. Fundamentals and Methods in CAD with an emphasis on information system. Computer graphics and geometric modeling. Graphic standards and formats. Mathematical foundations of computer graphics. Transformation of graphical objects. Curves. Surfaces. Three-dimensional modeling. Creating imaging and visualization. CAD database. Standards for the exchange of CAD data. Relationship with CAE and other CAX technologies.

Learning delivery:

Lectures are conducted with the use of multimedia resources, and active learning techniques to encourage students to actively participate in the classroom (talk, discussion, preparation and presentation of seminar papers). Exercises are auditory and laboratory. During exercises, demonstration examples of design and 3D modeling are done, using selected commercial CAD software. During the exercises, assessment is done based on the creating of two seminar papers and two tests, the first in designing and 3D modeling of individual parts and the other in designing and 3D modeling, assemblies and drafting technical documents.

Assessment Rationale:

Assessment of students is done during the class, on the basis of tests and student work on exercises. When submitting seminar papers on exercises, students orally defend the matter in connection with the methods of making these works. The final exam should assess the theoretical knowledge of students from areas that include topics presented in lectures. The final score is based on the evaluation of tests, term papers and final exams, and the presence and engagement of students in lectures and exercises.

Assessment Criteria

Lectures	Exercises	Seminar paper	Final exam		
10%	20%	20%	50%		

Reading

Essential	1. Balić, S. i saradnici: Inženjersko računarsko modeliranje, on-line predavanja na web stranici: www.lecad.unze.ba
Supplementary	1. Duhovnik, J., Kljajin, M. i Opalić, M.: Inženirska grafika, Univerza v Ljubljani, Ljubljana, 2009.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: PRODUCTION TECHNOLOGIES I

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
IV	Core	3	3		03K13-047

Subject leader: Doc.dr. Ibrahim Plančić, Prof.dr. Sead Pašić; **E-mail:** iplancic@mf.unze.ba;

Subject assistant: Doc.dr. Ibrahim Plančić; v.as.mr. Behar Alić; **E-mail:** behar.alic@yahoo.com

Pre-requisites

No

Subject aims

- introduction the theoretical bases of metal forming and welding,
- introduction to metal forming and welding procedures, tools, mashines and devices
- training to metal forming and welding technology design

Learning outcomes

- On successful completion of this subject student will be able to:
- understand the importance of metal forming and welding,
 - mastering of theoretical basics of metal forming and welding ,
 - adopt general approaches to design of metal forming and welding technology,
 - design metal forming and welding technologies.

Indicative syllabus content: Fundamentals of plastic deformation. Significance and features of metal forming. Nominal and true stresses. Strain degree. Forming velocity and strain rate. Hypotheses of plastic flow (yield criterion). **Metal forming processes.** Shearing. Sheet metal forming technology (deep drawing, bending, spinning, stretch drawing). Bulk (solid) design technology (forging, extrusion, redrawing with wall thinning (ironing), drawing wires, pipes and profiles). **New methods of metal forming** /nonconventional metal forming processes (forming of superplastic material, electromagnetic forming, hydroforming, explosive forming). Machines and tools. Basic terms and regulations of the of welding. Physical fundamentals of welding. Thermal and deformation cycles. Sources of heat for welding. Power sources for welding. Reactions of liquid metals with gases. Alloying of the weld metal. The concept of weldability. Weldability of Steel. Testing of weldability, preheating during welding. Structural transformations during welding. Welding procedures. Conventional and unconventional welding processes. Thermal cutting processes. Welding of steel. Defects in welded joints. Internal stresses in welded structures. Testing and inspection of welds.

Learning delivery: Lectures are conducted with the use of multimedia resources. Exercises are performed as auditory and laboratory. The exercises are practical working examples from the theoretical basis and design of technology. Laboratory exercises are performed in universities laboratories and some external organizations.

Assessment Rationale: Assessment of students is carried out continuously during the realization of lectures and exercises in the form of active participation in lecture and written and oral reports of the calculations and laboratory exercises. The practical exam includes a student activity during the exercises. In the exercise, each student is required to do two programs: one from the forming and one of welding technology design. The theoretical part of the examination is written through the elaboration of a specified limited number of topics.

Assessment Criteria

Lectures	Exercises	Practice	Teoretical exam		
10%	10%	20%	60%		

Reading

- | | |
|---------------|---|
| Essential | <ol style="list-style-type: none"> 1. Mirna Nožić, Proizvodne tehnologije, Mostar 1988. 2. Pašić O.: Zavarivanje, I.P. Svjetlost, Sarajevo, 1998. |
| Supplementary | <ol style="list-style-type: none"> 3. Musafia B.: Obrada metala plastičnom deformacijom, Svjetlost, 1988. 4. Majstorović A, Jovanović M.: Osnovi zavarivanja, lemjenja i lijepljenja, Naučna knjiga, Beograd, 1995. |



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title : ENGLISH LANGUAGE IV

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures			
IV	Obligatory	2		2,0	01-04-K-03-252

Subject leader: doc.dr.sc. Aida Tarabar

E-mail: atarabar@mf.unze.ba

Prerequisites: English Language III

Subject aims: To further prepare students for a technical discourse through a work on more complex English grammar.

Learning outcomes: Upon successfully completed course students will be able to:

- distinguish and use pretty complex vocabulary and grammar.
- be more fluent in general English

Indicative syllabus content:

- Passive Voice (continued) – Present Continuous, Past Continuous, “Going to” for Future, Modals, Present Perfect, Past Perfect,
- Relative Clauses,
- Conditional Clauses
- Practicing the above mentioned grammar through different situations: dialogue, monologue, repetition (drill), substitution, permutation, reduction, new element extension.
- Practicing translations from mother tongue and into it. Writing essays and dictations in English. Making comparison between foreign language structures and their equivalents in our language.

Learning delivery: Classes are carried out by using interactive method.

Assessment Rationale: Testing is carried out via two tests and a final exam. Also, regular check outs are carried out through the both students' activities in the classroom and their homeworks.

Assesment Criteria

Lectures	Portfolio	Final Exam			
10%	20%	70%			

Reading:

Essential	1. Murphy R., Essential Grammar in Use, Cambridge University Press, Cambridge, 1998. 2. Makek V. i ostali: English for You, Book 2, 3 Škola za strane jezike, Zagreb, 1991.
Supplementary	1. Dictionaries and English Grammar Textbooks (free choice)



UNIVERSITY OF ZENICA
MECANICAL FACULTY
IN ZENICA



Course: PHYSICAL EDUCATION IV

Semester	Status	Number hours per week		ECTS credits	Code
		Lectures	Exercises		
IV	Obligatory		1	1	01-04-K-01-106

Teacher: Associate . professor.dr.sc.Mirjana Madarević
E-mail: mmadjarevic@yahoo.com

Associate:

Courses that are a prerequisite for layin No course as a prerequisite for the exercise

The course goal The goal of course is to get through classroom training and to build fully developed personality.
Through the content offered in addition to general goals which are clearly differentiated in previous semesters, it allows for the transformation of the sport and those who want to have the conditions to be confirmed in that area.

Competencies (Learning outcomes) The program complements the students' practical skills and provides them with basic motor skills for successful work in their profession and contribute to the quality of life. Develops motor skills and determined to correlate with the practical work of other programs.

Course program: The subject includes the following topics:- Transitive measure anthropometric characteristics.- Transitive testing of motor skills.-Sports Games - Basic program: football, handball, table tennis.-Technique of the basic elements of football.-Technique of the basic elements of handball.- Table Tennis.-Swimming: a program for swimmers.-Swimming-program for swimmers.-Training Techniques crawl.-Training Techniques Breaststroke.- Optional programs:-Nature activities, tours, cross-country, athletics, corrective exercise, aerobics, health yoga, exercise, daily exercise and exercise students with special needs

Teaching:
Classes are held in physical hall, pool and stadium..

Examination:
Students have no verification as to other professional courses. They have an obligation to attend and then get the signature of a professor who holds the collegium. Knowledge assessment.of their motor and functional abilities are valued for their personal status health.
Weighted criteria for evaluating knowledge
Lectures Practice Final Exam.

Weighted criteria for evaluating knowledge



lectures	Exersises	Final exem			
	100%	-			

Literature

Obligatory literature: Students are advised to literature related to sports and recreation..
1.Beveridge, G.S., Schlecheter R.S.(1970). Optimization Theory andPraktice,Mc Grew-Hill New York.2Kurelić, N. , i saradnici(1980).Struktura motoričkih sposobnosti i njihove relacije s ostalim dimenzijama ličnosti. Kineziologija , Zagreb.
3.Kurelić,N.,Momirović,K.,Stojanović,M.,Šturm,J.Radojević,N.,Viskić-Štaleks (1975).Struktura i razvoj morfoloških i motoričkih dimenzija omladine. Institut za naučna istraživanja Fakulteta za Fizičko vaspitanje , Beograd.
4.Kurelić, N. , Momirović ,K., Mraković ,M., Šturm J.(1979,br.9).Struktura motoričkih sposobnosti. Kineziologija , Zagreb.

Additional literature

THIRD YEAR

	<div>UNIVERSITY OF ZENICA</div> <div>FACULTY OF MECHANICAL ENGINEERING</div>																
The curriculum of the subject: HYDRAULICS AND PNEUMATICS																	
Semester	Status	Hours per week		ECTS credit values	Code												
		Lectures	Exercises														
V	obligatory	3	2	6,0	01-03-K-15-009												
Subject lecturer: Assoc. prof. dr. sc. Nedim Hodžić E-mail: nhodzic@mf.unze.ba			Subject assistant: Assoc. prof. dr. sc. Nedim Hodžić E-mail: nhodzic@mf.unze.ba														
Pre-requisites:		Fluid mechanics, Thermodynamics															
Subject aims	<div><div></div><div>– to familiarize students with the hydraulics as applied fluid mechanics,</div><div>– to familiarize students with the pneumatics and the basic laws that it is based on,</div><div>– to familiarize students with the calculation of operating parameters and characteristics of hydraulic and pneumatic components and systems.</div></div>																
Learning outcomes	<div>On successful completion of this subject student will be able to:</div> <div><div></div><div>– perceive and understand the concept and importance of hydraulics and pneumatics in engineering practice,</div><div>– define and calculate working performances of hydraulic and pneumatic components and systems,</div><div>– solve the basic calculation problems of characteristics of hydraulic components and systems,</div><div>– solve the basic calculation problems of characteristics of pneumatic components and systems,</div><div>– application of basic principles of hydraulics and pneumatics to solve practical problems.</div></div>																
<div>Indicative syllabus content:</div> <div>Introduction. The concept of hydraulics and pneumatics. Historical development of hydraulics and pneumatics. Scope of hydraulics. Scope of pneumatics. Basic concepts and characteristics of hydraulics. Introduction. General information about the transfer of power. The principle of operation of hydraulic systems. Advantages and disadvantages of hydraulic systems. Basic hydraulic variables. Basic laws of fluid flow. Hydraulic shock. Cavitation. Designation of elements of hydraulic systems. Types of hydraulic systems. Hydraulic oils and fluids. Classification of hydraulic oils and fluids. Physical and other properties of hydraulic oils and fluids. Elements of an energy transformation. Volumetric pumps and motors. Piston pumps and motors. Vane pumps and motors. Gear pumps and motors. Screw pumps. Rotating hydraulic motors. Capacity control of volume pumps. Hydraulic cylinders. Hydraulic accumulators. Elements of management and regulation. Spool valves. Pressure valves. Circuit valves. Managing-regulating elements of mobile hydraulics. Additional elements. Tanks. Filters. Pipelines. Connecting elements. Apparatus for cooling. Apparatus for heating. Examples of basic hydraulic system. Hydraulic systems of machine tools. Hydraulic systems of industrial plants. Hydraulic systems of mobile technology. Sealing in hydraulics. Classification and material of seals. Sealing of stationary surfaces. Sealing of moving surfaces. Fundamentals of proportional hydraulics. Introduction. Basic components of proportional hydraulics and their characteristics. The basic construction of the hydraulic system in proportional hydraulics. Fundamentals of servo hydraulics. Introduction. The basic components of servo hydraulics and their characteristics. The basic construction of the hydraulic system in servo hydraulics. Basics of control electronics and regulation circuits. Control systems and regulation circuits. The basic elements of the control electronics. Construction of regulation circuits. Maintenance of hydraulic components and systems. Maintenance of hydraulic components. Maintenance of hydraulic systems. Basics of pneumatics. Introduction. The basic characteristics of pneumatic systems work. Advantages and disadvantages of pneumatic systems. Designation of elements of pneumatic systems. Basic terms and principles in pneumatics. Air as the working fluid. Physical properties of air. Changes of the air stages. Basic thermodynamic processes. The basic principles of air flow - air leakage. Humidity and condensation. Creating an air pressure and piping. Compressor. Operating characteristics of the compressor. Reservoir for air. Piping and valves. Air Cleaning. Oiling of compressed air. Sets for air treatment. Pneumatic components. Introduction. Slide valves. Fast discharging valves. One direction valves. Throttle valves. Silencer. Pneumatic motors. Pneumatic measuring instruments. Pneumatic working units. Turning workbench. Unit for delivering materials. Operating unit for drilling. Automatic pneumatic cylinder. Examples of the application. Pneumatic sealing. Classification and material of seals. Sealing of stationary surfaces. Sealing of moving surfaces. Design of pneumatic systems. Introduction. Methods and procedures of design. Maintenance of pneumatic components and systems. Maintenance of pneumatic components. Maintenance of pneumatic systems.</div>																	
<div>Learning delivery:</div> <div>Lectures will be conducted with the use of multimedia resources, active learning techniques, and with the active participation of students. Exercises are performed as auditory and practical. Goals of auditory exercises are tasks and calculation examples from the areas under study as part of the lecture. The practical part of the training is conducted in real industrial plants where students learn about some hydraulic and pneumatic components and systems, and the demonstration of its work.</div>																	
<div>Assessment Rationale</div> <div>Assessment of student knowledge is carried out as written and oral exams. Student is entitled to take the oral exam when he/she passes the written part of the exam.</div>																	
<div>Assessment Criteria</div> <table><tr><td>Lectures</td><td>Exercises</td><td>Writing exam</td><td>Final exam</td><td></td><td></td></tr><tr><td>10 %</td><td>10 %</td><td>40 %</td><td>40 %</td><td></td><td></td></tr></table>						Lectures	Exercises	Writing exam	Final exam			10 %	10 %	40 %	40 %		
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UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: PRODUCTION TECHNOLOGIES II

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V	obligatory	3	3	6,0	01-03-K-13-017

Subjects leader: Prof.dr. Sabahudin Ekinović
E-mail: sekinovic@mf.unze.ba

Subjects assistant: V.as.mr. Edin Begović
E-mail: ebegovic@mf.unze.ba

Pre-requisites Mechanics, Mathematics, Tribology, Materials

Subject aims	<ul style="list-style-type: none"> – basics of the machining science – a practical introduction to methods of machining – a practical introduction to machine tools
Learning outcomes	<p>On successful completion of this subject student will be able to:</p> <ul style="list-style-type: none"> – understand the complexity of the cutting process as a production technology – identifies machining procedures for the realization of the production task – analytically approaches to the design technology of machining processes – select cutting and machine tools for a specific products – run the conventionally controlled machine tools – write and understand machine codes for NC and CNC machine tools

Indicative syllabus content: **Basics of the machining science** (cutting kinematics, the theory of cutting, cutting mechanics, thermodynamics of cutting, cutting tribology, the integrity of the machined surface, cutting conditions, cutting tool materials), **Conventional machining methods** (continuous cutting procedures with single-edge cutting tools, machining of openings, discontinued machining methods with multi-edge cutting tools, methods of threads and gears machining, highly productive machining processes), **Choice of machining process, machine tool, jigs and fixtures** (workpieces and machining allowances, bars, forgings, castings), **Machining accuracy** (machine surface quality requirements, achieving prescribed dimensional and shape tolerances), **Design of technological processes using computers** (automation of the design process, design process methods using computers), **Construction of machine tools for metal cutting** (structural variants, the basic elements), **with conventional machines control** (Machine tools with main revolving motion, machine tools with main linear motion, machine tools for thread and gears production), **NC and CNC machine tools** (main elements, drives, measuring systems, and computer numerical control, programming).

Learning delivery: Lectures are conducted with the use of multimedia resources, technology and active learning with active participation of students. Exercises are performed as auditory and laboratory. The exercises are practical working examples and calculations, and practical laboratory exercises to explain certain topics.

Assesment Rationale: Assessment of students is carried out continuously during the realization of lectures and exercises in the form of active participation in lecture and written and oral reports of the calculations and laboratory exercises. The practical exam includes a student activity during the exercises. The theoretical part of the examination is written through the elaboration of a specified limited number of topics.

Assessment Criteria

Lecturing	Exercise	Practical work	Theory exam		
10%	10%	30%	50%		

Reading

Essential	1. Ekinović, S.: Obrada rezanjem (tehnologija, mašine, sistemi, alati i pribori), Univerzitet u Zenici, Zenica, 2011.
Supplementary	2. Ekinović, S., Begović E.: Proizvodne tehnologije – osnove, (materijal u pripremi), Univerzitet u Zenici
	3. Urošević, S.: Proizvodno mašinstvo, Naučna knjiga, Beograd, 1987.
	4. Urošević, S.: Proizvodno mašinstvo, II deo, proizvodne mašine i numeričko upravljanje alatnim mašinama, Naučna knjiga, Beograd, 1991.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: TRANSPORTATION SYSTEMS

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V	obligatory	2	2	5,0	01-03-K-12-022

Subject leader:
Assist. Prof. dr. Fuad Hadžikadunić
E-mail: hfud@mf.unze.ba

Subject assistant:
Assist. Prof. dr. Fuad Hadžikadunić
E-mail: hfud@mf.unze.ba

Pre-requisites

none

Subject aims

- Understanding the importance of the transportation in the industry.
- Understanding the specifics of individual transportation systems.
- Understanding the basics of engineering calculations and modeling of transport systems.
- Understanding the construction, technological and maintenance aspects of transport system.

Learning outcomes

- On successful completion of this subject student will be able to:
- Identify the application of various types of transportation systems and devices to specific cases of industrial applications
 - Apply engineering calculations and / or modeling of transport system
 - Form a complete technical documentation of the transport system with structural, technological maintenance aspects.

Indicative syllabus content:

The role and importance of transportation: the transport of materials (raw materials, processed materials semifinal products, final products, etc.), energy and people, the participation rates of transport in the total price of the product. **General information about systems for transport of materials (MHS):** Significance, classification and basic characteristics of the transport system. European and other standards and regulations for the design, operation and maintenance of transportation systems and facilities. Designing, functional, economic, environmental, production-technological aspects and aspects for the maintenance of transportation systems. Examples of application of means of transport in thermal, environmental, manufacturing, industrial process-technological systems, etc. **Transportation systems for cyclic transportation of materials:** The areas of application, classification, description, structural elements, technical features, the basics of modern conceptual design calculations of crane systems with the carrying devices (bridge, portal, jib cranes, overhead platforms, single tracking cranes, etc.). An analysis of driving, supporting, operating, carrying, braking and controlling system components. Criteria for the design and optimization of steel structures of cranes and their associated mechanisms. Structural, technical and maintenance aspects. **Continuous handling equipment for material transportation:** Scope, classification, description, structural elements, technical features, the basics of modern conceptual design calculation of transport systems for continuous transport of materials (belt conveyors of classic and modern performance, modular systems, scraper conveyors, steel conveyors, elevators, screw conveyors, pneumatic transport, hydraulic transport). Structural, technical and maintenance aspects. **Lifts and working platforms:** Areas of application, classification, description, structural elements, technical features, the basics of the calculation. Structural, technical and maintenance aspects. **The basics of modeling, numerical (FEM) analysis and optimization of parts or assemblies of certain types of transportation devices.** **Fundamentals of industrial technical documentation preparation** for transporting devices according to the technical rules and European standards: general documentation, technical description, calculation-technical part, instructions for production, assembling, maintenance, etc.

Learning delivery:

Lectures are conducted with the need of multimedia resources, the techniques of active learning with active participation of students. Exercises are auditory and laboratory: Laboratory exercises are performed on the site or in a production hall with the goal of students acquainted with the types of transportation devices and conditions of exploitation and maintenance. **Auditory exercises:** Preparation of the project for the selected type of transport device (theoretical part, the calculation, preparation of technical documentation of the appropriate level, and / or modeling with a numerical calculation, manuals, etc.).

Assessment Rationale:

is carried out during the lectures and exercises, and through preliminary project exams and two partial exams. Exams are taken in writing with the possibility of verbal expression.

Assessment Criteria

Lectures	Exercises	Project	Writing exam	Oral exam	
10%	15%	20%	25%	30%	

Reading

Essential	1. S. Olević: „Transportna sredstva“, MF, Zenica 2000.
Supplementary	2. Repčić N., Čolić M.: Transportna sredstva, Univerzitet u Sarajevu, 2008.
	3. Šelo R., Tufekčić Dž.: Fleksibilni transport, Univerzitet u Tuzli, 2002.
	4. Tošić S.: Transportni uređaji, Univerzitet u Beogradu, 1990.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: MEASUREMENT TECHNIQUE

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V	obligatory	2	2	5	01-03-K-16-007

Subject leader: r. prof. dr. sc. Nermina Zaimović-Uzunović

E-mail: nzaimovic@mf.unze.ba

Subject assistant: Emina Begović

Pre-requisites

- Physics, Statistics

Subject aims

- get the knowledge about basics in measurement techniques
- measurements of dimensional and physical values
- errors and uncertainty calculation

Competences (Learning outcomes)

- Students, who successfully complete the course, will be able to:
- understand importance of measurements and use instruments for dimensional and physical measurement
 - to calculate errors and estimate measurement uncertainty
 - to understand the principles and how to use sensors

Course Contents

Introduction, terms and definitions. The objectives and the areas of metrology, units and their evolution through history, traceability. Measurement of size. Measurement principles. Measuring converters. Temperature measurement, weight and force, time and frequency, length, spacing, positioning, speed measurement, measuring the speed of rotation. Measurement of pressure and fluid flow. Measurement of vibrations. The uncertainty of the measurements, errors and types of errors, the procedure for determining measurement uncertainty GUM. Processing of measurement results. Calibration.

Learning delivery:

Lectures are performed with the use of multimedia resources, active learning techniques and with the active participation of students. Exercises are performed such calculations and laboratory with measuring equipment for mjerenje dužine, force, temperature, pressure, time.

Assessment:

The assessment is based on constant work with the students throughout the semester. After each lab students will be given a test with short answers, and will also have practical exercises measurement methods to different instruments or machines to learn to work independently and in a team. At the end of the semester is taken in the final written exam.

Assessment Criteria

Periodic tests	Activity in lectures and exercises (seminar)	Final exam
-	30%	70%

Reading

Essential	2. Zaimović-Uzunović N., Mjerna tehnika, ISBN 9958-617-00-5, Mašinski fakultet u Zenici, 1997.
Supplementary	4. Zaimović-Uzunović, N.: Mjeriteljska infrastruktura, ISBN 9958-617-16-1, Mašinski fakultet u Zenici, 2003. 5. BAS ENV 13005:2010 Vodič za izražavanje mjerne nesigurnosti.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: ENGLISH LANGUAGE V

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures			
V	obligatory	2		2,0	01-04-K-03-287

Subject leader: prof.assist. dr.sc. Aida Tarabar

E-mail: atarabar@mf.unze.ba

Prerequisites: English Language IV

Subject aims: To prepare students use the simplest technical text.

Learning outcomes: Upon successfully completed course students will be able to:
use the basic vocabulary and technical English syntax in their written and oral communication.

Indicative syllabus content:

- Morphological and Syntactical structure of a technical text. Standard morphologic and syntactic exercises with the aim to master vocabulary and grammatical structures which are typical of technical language sentence.
- Practicing the oral skills within technical register through different situations: dialogue, monologue, repetition (drill), substitution, permutation, reduction, new element extension.

Learning delivery: Classes are carried out by using interactive method.

Assessment Rationale: Testing is carried out via two tests and a final exam. Also, regular check outs are carried out through the both students' activities in the classroom and their homeworks.

Assesment Criteria

Lectures	Portfolio	Final Exam			
10%	20%	70%			

Reading:

Essential	1. Šestić, Lada: Gramatika tehničkog engleskog s rječnikom, Minex, Zenica 2002. 2. Šestić, Lada: English for Mechanical Engineering Students, Univerzitet u Sarajevu,, Mašinski fakultet Zenica, 1994.
Supplementary	1. Dictionaries and English Grammar Textbooks (free choice)



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: PRODUCTION TECHNOLOGIES II

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V	obligatory	3	3	6,0	01-03-K-13-017

Subjects leader: Prof.dr. Sabahudin Ekinović
E-mail: sekinovic@mf.unze.ba

Subjects assistant: V.as.mr. Edin Begović
E-mail: ebegovic@mf.unze.ba

Pre-requisites Mechanics, Mathematics, Tribology, Materials

Subject aims	<ul style="list-style-type: none"> – basics of the machining science – a practical introduction to methods of machining – a practical introduction to machine tools
Learning outcomes	<p>On successful completion of this subject student will be able to:</p> <ul style="list-style-type: none"> – understand the complexity of the cutting process as a production technology – identifies machining procedures for the realization of the production task – analytically approaches to the design technology of machining processes – select cutting and machine tools for a specific products – run the conventionally controlled machine tools – write and understand machine codes for NC and CNC machine tools

Indicative syllabus content: **Basics of the machining science** (cutting kinematics, the theory of cutting, cutting mechanics, thermodynamics of cutting, cutting tribology, the integrity of the machined surface, cutting conditions, cutting tool materials), **Conventional machining methods** (continuous cutting procedures with single-edge cutting tools, machining of openings, discontinued machining methods with multi-edge cutting tools, methods of threads and gears machining, highly productive machining processes), **Choice of machining process, machine tool, jigs and fixtures** (workpieces and machining allowances, bars, forgings, castings), **Machining accuracy** (machine surface quality requirements, achieving prescribed dimensional and shape tolerances), **Design of technological processes using computers** (automation of the design process, design process methods using computers), **Construction of machine tools for metal cutting** (structural variants, the basic elements), **with conventional machines control** (Machine tools with main revolving motion, machine tools with main linear motion, machine tools for thread and gears production), **NC and CNC machine tools** (main elements, drives, measuring systems, and computer numerical control, programming).

Learning delivery: Lectures are conducted with the use of multimedia resources, technology and active learning with active participation of students. Exercises are performed as auditory and laboratory. The exercises are practical working examples and calculations, and practical laboratory exercises to explain certain topics.

Assesment Rationale: Assessment of students is carried out continuously during the realization of lectures and exercises in the form of active participation in lecture and written and oral reports of the calculations and laboratory exercises. The practical exam includes a student activity during the exercises. The theoretical part of the examination is written through the elaboration of a specified limited number of topics.

Assessment Criteria

Lecturing	Exercise	Practical work	Theory exam		
10%	10%	30%	50%		

Reading

Essential	1. Ekinović, S.: Obrada rezanjem (tehnologija, mašine, sistemi, alati i pribori), Univerzitet u Zenici, Zenica, 2011.
Supplementary	2. Ekinović, S., Begović E.: Proizvodne tehnologije – osnove, (materijal u pripremi), Univerzitet u Zenici
	3. Urošević, S.: Proizvodno mašinstvo, Naučna knjiga, Beograd, 1987.
	4. Urošević, S.: Proizvodno mašinstvo, II deo, proizvodne mašine i numeričko upravljanje alatnim mašinama, Naučna knjiga, Beograd, 1991.



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: PRODUCTION MANAGEMENT

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
VI	Obavezni	2	2	5	01-03-K-17-012

Subject leader:
E-mail:

Subject assistant:
E-mail:

Pre-requisites

Subject aims

- to introduce students to basic concepts of production,
- ability to interpret the basic requirements of production and management system,
- possibility of planning and production management.

Learning outcomes

- On successful completion of this subject student will be able to:
- participate in the process of formulating and business process management,
 - participating in the processes of managing business systems,
 - dimensioned and controls basic resources of production processes and systems.

Indicative syllabus content: Product and production. Production programs. Production system as part of the business system. The need to manage. **The subsystems of the production system:** material, tools, energy, personnel, equipment, facilities. **Shaping process.** The aim of production processes. Selection of production. Production planning. The process of planning the production process. Designing and manufacturing services. The basic flow of production processes. Production structure by types of production. Types of jobs. Modeling and execution process. **Planning:** Objectives, principles, stages. Gauges in planning. The division plans. Planning Methods. Evidence, control and analysis of the execution plan. Problems of planning. The organization planning. **Preparation of production:** goals and tasks. Technological preparation. Operational preparation. Working documentation. Place the preparation in the organizational structure of the business system. **Capacity:** concept and types, expression, measure, degree of efficiency. **Control:** concept, needs and division. Technical control. Economic control. Methods and control resources. **Inventory management,** concept, needs and management. Types of warehouse. Storage costs and inventories. The organization of the warehouse. **Internal transport:** definition, classification, systems approach. Choice relations and means of internal transport. The costs of internal transport. Efficiency and organization of internal transport. **The basis of economics:** The funding, fixed assets, working capital, costs, calculation, the total income breakeven point. **The organizational structure.** Term. Types. The process of construction.

Learning delivery: Lectures are performed with the use of multimedia resources, with the techniques of active learning and student participation. Exercises are performed as problem solving and computer. On Exercises are done practical examples and calculations, and the computer are processed topics related to the exposed material

Assessment Rationale: Student assessment is carried out continuously during the realization of lectures and exercises in the form of active participation of students. Written exam includes activities students during the training, while the theoretical part of working through two partial exams through the elaboration given the limited number of topics.

Assessment Criteria

Lectures	Exercises	Written exam	Theor. exam		
10%	10%	15%	65%		

Reading

Essential

1. Brdarević, S.: Organizacija proizvodnje, Mašinski fakultet u Zenici, 1986.
2. Brdarević, S., Jašarević S.: Upravljanje proizvodnjom (u pripremi)

Supplementary

3. Mikac, T., Blažević, D.: Planiranje i upravljanje proizvodnjom, Tehnički fakultet u Rijeci, 2007
4. Roger G. Schroeder: Upravljanje proizvodnjom, MATE, Zagreb, 1999
5. Zelenović, D.M.: Upravljanje proizvodnim sistemima, FTN Novi Sad, 2008
6. Polajnar, A. Buchmeister B., Leber, M.: Proizvodni menadžment, Fakulteta za strojništvo v Mariboru, 2001



Subject title: ENGINEERING ECOLOGY

Semester	Status	Number per week		ECTS	Code
		Lectures	Exercises		
VI	Obligatory	2	2	5,0	01-03-K-18-016
Teacher: Full professor dr.sc. Šefket Goletić E-mail: goletic@mf.unze.ba			Associate: Assistant professor dr.sci. Nusret Imamović E-mail: nimamovic@mf.unze.ba		
Prerequisites		-			
Subject aims	The acquisition of theoretical knowledge and practical skills about the impact of industrial facilities on the environment, the implementation of preventive environmental strategies to processes, products and services (cleaner production, sustainable development), and equipment and devices for the purification and treatment of waste.				
Competences (Learning outcomes)	Introduction to wide range of industrial activities that have an impact on the environment and possible ways to reduce emissions and harmful impact on the environment.				
Syllabus: Basic concepts, definitions and principles of ecology, engineering and industrial ecology, environmental engineering and environmental protection. Introduction to Environmental Engineering. The impact of process industry on the environment. Pollution and protection of air, water and land. Industrial noise and noise protection. Rational use of raw materials, water and energy, and pressures and impacts on the environment. The principles of cleaner technologies. Industrialized waste and industrial waste management. Analysis of the impact on the environment. The role of environmental engineering in ensuring sustainable development. Environmental management in industrial systems.					
Teaching process: Lectures are performed with the use of multimedia resources, active learning techniques and with the active participation of students. Exercises are performed in the laboratory and in the field, in typical industrial plants.					
Assessment of knowledge: The assessment of students is carried out continuously during lectures and exercises in the form of short test questions. In the practical part of the exam is done assessing individual and group work of students in the final project. The theoretical part of the examination is carried out in oral form, after the fulfillment of previous commitments.					
Assessment Criteria					
Lectures	Exercises	Practical exam	Theoretical exam		
10%	15%	40%	35%		
Literature					
Obligatory	1. Savić I. i Terezija V.: Ekologija i zaštita životne sredine, Zavod za udžbenike i nastavna sredstva, Beograd, 2002. 2. Hodolič, J., Badida, M., Majernik, M., Šebo, D: Mašinstvo u inženjerstvu zaštite životne sredine, Fakultet Tehničkih nauka Univerziteta u Novom Sadu, 2003.				
Additional	1. Šefket Goletić: Okolinsko upravljanje, Univerzitet u Zenici, 2005. 2. Kiely, G.: Environmental Engineering, Mc Graw-Hill, 1998. 3. Persson, Per Olof: Environmental Technology, KTH, Stockholm, 2008.				



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Subject title: ENGLISH LANGUAGE VI

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures			
VI	obligatory	2		2,0	01-04-K-03-288

Subject leader: prof.assist. dr.sc. Aida Tarabar

E-mail: atarabar@mf.unze.ba

Prerequisites: English Language V

Subject aims: To teach students how to use technical expert literature (minimal use of dictionaries).

Learning outcomes: Upon successfully completed course students will be able to:
- to use a more complex lexis and syntax of a technical English in their written and oral communication.

Indicative syllabus content:

- Retic techniques at the level of a sentence, a paragraph and a wider discourse. Time sequence, space sequence, (while describing a plant), cause-consequence relation, comparison, contrast, analogy, exemplifying, illustrating, combining text and visual presentation.
- Developing oral skills within technical register.
- Standard morphological and syntactical practice, aiming on students' mastering a more complex vocabulary and grammatical structures typical of a sentence construction within a technical register.

Learning delivery: Classes are carried out by using interactive method.

Assessment Rationale: Testing is carried out via two tests and a final exam. Also, regular check outs are carried out through the both students' activities in the classroom and their homeworks.

Assesment Criteria

Lectures	Portfolio	Final Exam			
10%	20%	70%			

Reading:

Essential	1. Šestić, Lada: Gramatika tehničkog engleskog s rječnikom, Minex, Zenica 2002.
	2. Šestić, Lada: English for Mechanical Engineering Students, Univerzitet u Sarajevu,, Mašinski fakultet Zenica, 1994.
Supplementary	1. Dictionaries and English Grammar Textbooks (free choice)

ELECTIVE COURSE



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: Industrial design and ergonomics

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V/VI	elective	2	2	4	01-03-K-12-066

Subject leader: r. prof. dr. sc. Nermina Zaimović-Uzunović

E-mail: nzaimovic@mf.unze.ba

Subject assistant: v.s.mr.Damir Ćurić

Pre-requisites

Subject aims

- Introduce students to the basic principles of industrial design
- Application of the principles of industrial design at the system man-machine
- Understanding and application of ergonomic principles in the design of machinery

**Competences
(Learning
outcomes)**

- Upon successful completion of the course, students will be able to:
- Apply the principles of industrial design in order to improve product quality
- recognize the different impacts on work capacity
- Blueprint workspace user friendly

Course Contents

Definition and methods of industrial design. Industrial design as the integration of art and industry. Industrial Design: creative discipline, the quality of the product. Shape. Artistic and aesthetic elements of the form. Quality factors. Structuring of the development process of product design. The design of the marketing function. Art work and industrial design. Business ethics and copyright. Methodology and research in the field of ergonomics. The system of man-machine. The quantitative and qualitative visual indicators. Physical work, occupational physiology and muscle. Power consumption, borders, power and endurance. Biomechanics of movement, types and ranges of motion. The control system of man-machine. Compatibility. Control bodies function, sensitivity and resistance. Principles of hand tools and accessories. Anthropometry, static and dynamic dimensions. The workspace and its design. Principles of Planning workplace. Methodology Planning workspace. Lighting. Visibility. Noise. Protection against noise. Vibration, impact on the human body and the ability to work.

Learning delivery: Lectures are performed with the use of multimedia resources, active learning techniques and with the active participation of students. Exercises are performed such calculations and laboratory. Within the lab is the one seminar that involves solving various engineering problems in the field of industrial design, with the support of appropriate software tools and user application software solutions..

Assessment:

After submission and oral examinations seminar paper, the final examination, which consists of written and oral part.

Assessment Criteria

Written exam	Activity in lectures and exercises (seminar)	Final exam
30%	30%	40%

Reading

Essential	<ol style="list-style-type: none"> 1. M.Fruht: Dizajn u proizvodnji, Naučna knjiga, Beograd, 1990. 2. Sanders, M. and McCormick, E.,:Human Factors in Engineering and Design (7th Edition), McGraw-Hill, New York, 1993.
Supplementary	<ol style="list-style-type: none"> 1. Nanua Singh: Systems Approach to Computer-Integrated Design and Manufacturing, JWS, USA 1998. 2. Salvendy, G.: Handbook of Industrial Engineering, John Wiley and Sons, New York, 1993. 2. Bulat, B.: Sistem čovjek-stroj, Informator, Zagreb, 1985



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: CUTTING TOOLS AND JIGS AND FIXTURES

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V/VI	elective	3	3	4,0	01-04-K-13-057

Subjects leader: Prof.dr. Sabahudin Ekinović

E-mail: sekinovic@mf.unze.ba

Subjects assistant: V.as.mr. Edin Begović

E-mail: ebegovic@mf.unze.ba

Pre-requisites

Metal cutting, Machining processes

Subject aims

- introduction of cutting tool materials
- introduction with practical usage of the systems of cutting tools
- jigs and fixture introduction (universal, special, modular)
- the design of special tooling system, jigs and fixtures

Learning outcomes

- On successful completion of this subject student will be able to:
- select appropriate material and geometry of the cutting tool
 - design special cutting tools
 - define technology and chooses the jigs and fixture
 - design special jigs and fixture
 - manages and maintains systems of cutting tools, jigs and fixture

Indicative syllabus content: The role of cutting tools, jigs and fixtures in the machining process (elements and geometry of cutting tool, materials), **Systems of cutting tools** (the concept of cutting tools system, the examples of the cutting tools systems), **Turning profile cutting tool** (classification, the analysis of profile turning, design, determination of the profile), **Broaching Tools** (the broaching schemes, internal and external cutting, structural analysis of various broaches, calculations of the key designing elements), **Tools for gear cutting** (tools for the production of cylindrical and conical gears – milling tools, cutters, knives), **Tools for making gear and worm transmission** (milling cutters, knives), **Tools for making non-evolute profiles** (profiling theory, cutting tools), **Jigs and fixtures** (classification, main components, design basis), **Universal jigs and fixtures** (cutting tools fixture and clamping - tool holders, workpieces clamping), **Special jigs and fixtures** (positioning elements, clamping elements, tool body, fasteners, extension building elements), **The examples of jigs and fixtures design** (in turning, grinding, milling, drilling, ...), **Modular jigs and fixtures** (classification, basic characteristics, examples), **Phase-removable jigs and fixture** (classification, basic characteristics), **Jigs and fixture in flexible production** (basic features)

Learning delivery: Lectures are conducted with the use of multimedia resources, technology and active learning with active participation of students. Exercises are performed as auditory and laboratory. The exercises are practical working examples and calculations, and practical laboratory exercises to explain certain topics.

Assessment Rationale: Assessment of students is carried out continuously during the realization of lectures and exercises in the form of active participation in lecture and written and oral reports of the calculations and laboratory exercises. The practical exam includes a student activity during the exercises. The theoretical part of the examination is written through the elaboration of a specified limited number of topics.

Assessment Criteria

Lecturing	Exercise	Practical work	Theory exam		
10%	10%	30%	50%		

Reading

Essential	1. Ekinović, S.: Obrada rezanjem (tehnologija, mašine, sistemi, alati i pribori), Univerzitet u Zenici, Zenica, 2011.
Supplementary	1. Ekinović, S.: Rezni alati, Univerzitet u Zenici, Zenica, 2007. 2. Ekinović, S.: Pomoćni pribori, Univerzitet u Zenici, Zenica, 2009.



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FACULTY OF MECHANICAL ENGINEERING



Subject title: ADVANCED CUTTING TECHNOLOGIES

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V/VI	elective	2	2	4,0	01-04-K-13-058
Subjects leader: Prof.dr. Sabahudin Ekinović E-mail: sekinovic@mf.unze.ba			Subjects assistant: V.as.mr. Edin Begović E-mail: ebegovic@mf.unze.ba		
Pre-requisites		Metal machining, Machine tools			
Subject aims	<ul style="list-style-type: none">– introduction new, advanced manufacturing technologies– introduction to the elements for the improvement of production technology– introduction to the effects of applications of new production technologies				
Learning outcomes	<p>On successful completion of this subject student will be able to:</p> <ul style="list-style-type: none">– identify the benefits arising from the application of new production technologies– apply new production technologies in terms of increased productivity, quality treatment and protection of the environment– design technology with increased efficiency and productivity				
Indicative syllabus content: Introduction (cutting tool material development, workpiece materials and cutting processes, cooling and lubrication, cutting performance, research, semi-industrial and industrial level of production technology), High speed machining (basic concepts, physical aspects, technology, applications, examples), Dry and near-dry cutting (introduction, tools and equipment for dry cutting, operations, near-dry cutting, classification, cooling in near dry cutting, machine tools for near-dry cutting), Hard machining (basic concepts, physical aspects, application, finishing hard cutting, equipment and machines for hard cutting), High performance and high efficiency machining (the basic aspects, machine tools, simplified machine operations, examples), Multitasking and one-pass machining (the basic concepts, multitasking machine tools and cutting tools, one-pass machining - complete machining in one pass), Ultrasonically and thermally assisted machining (ultrasonically assisted machining, ultrasonic vibration cutting, laser assisted machining, plasma assisted machining), Sustainable Production, Eco-friendly production technologies (the development of eco-friendly technologies, dry, hard and near dry cutting, cooling media for near dry cutting based on vegetable oils), Micro and nano technologies, examples of recent research in the field of machining					
Learning delivery: Lectures are conducted with the use of multimedia resources, technology and active learning with active participation of students. Exercises are performed as auditory and laboratory. The exercises are practical working examples and calculations, and practical laboratory exercises to explain certain topics.					
Assessment Rationale: Assessment of students is carried out continuously during the realization of lectures and exercises in the form of active participation in lecture and written and oral reports of the calculations and laboratory exercises. The practical exam includes a student activity during the exercises. The theoretical part of the examination is written through the elaboration of a specified limited number of topics.					
Assessment Criteria					
Lecturing	Exercise	Practical work	Theory exam		
10%	10%	30%	50%		
Reading					
Essential	1. Ekinović, S., Begović, E.: Napredne proizvodne tehnologije, Univerzitet u Zenici (postupak izdavanja u toku), Zenica, 2012.				
Supplementary	2. Ekinović, S., Begović, E.: Nove proizvodne tehnologije (izabrana poglavlja), materijala za nastavni proces, Univerzitet u Zenici, 2012. 3. Byrne, G., et al.: Advancing cutting technology, CIRP Annals, V.52/2, 2003.				



UNIVERSITY OF ZENICA
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OF ZENICA



Syllabus Probability and statistics

Semester	Status	Classes per week		ECTS credits	Code
		Lectures	Practice		
V/VI	elective	2	2	4,0	01-04-K-02-065
Pre-requisites		Mathematics I			
Subject goal	– Introduce basic statistical concepts and the most important statistical methods				
Student's competence	Students will be able to: – sort and group data in the table and calculate all relevant statistical quantity – to use statistical tests – find equation for linear regression – use confidence interval				
Lectures and practise syllabus: Probability theory. Random variables. Mathematical statistics. Empirical distribution function and convergence. Evaluating parameters of distribution. Statistical hypothesis testing. Linear regression.					
Teaching process	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.				
Literature					
Primary	1. Zoran A. Ivković, Matematička statistika, Naučna knjiga, 1980.				
Secondary	2. Milan J. Merkle i Petar M. Vasić, Verovatnoća i statistika, Beograd, 1998				
Exam: The exam is graded in writing and orally, integrated. The written exam is exclusive.					



UNIVERSITY OF ZENICA
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Subject title: ENTREPRENEURSHIP

Semester	Status	Number per week		ECTS	Code
		Lectures	Excercises		
V/VI	Elective	2	2	4	01-03-K-14-035

Teacher: Full Professor Dr sc. Darko Petković

E-mail: dpetkovic@mf.unze.ba

Associate:

E-mail:

Prerequisites

Subject aims	<ul style="list-style-type: none"> – Introduction to importance of entrepreneurship – Development of entrepreneurial knowledge and skills – Studying the role of entrepreneurship in the contemporary business world – Acquiring knowledge on application of various methods for encouraging entrepreneurship
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Competences (Learning outcomes)	<p>Students, who successfully complete the course, will be able to:</p> <ul style="list-style-type: none"> – understand complexity of process of entrepreneurship – diagnose the influential business factors – have an analytical approach to the planning the functions of entrepreneurship – do various kinds of designing the business systems with an emphasis on development of self-employment skills – present the work results, both orally and in writing, and discuss about the work topic (an emphasis is on the team work).
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Syllabus: 1) Introduction to Entrepreneurship. 2) Development of successful business ideas. 3) Feasibility analysis. 4) Business plan writing. 5) Analysis of business branch and competition. 6) Development of efficient business model. 7) Preparation of correct ethical and legal basis. 8) Assessment of financial strength and sustainability. 9) Creating a team for new venture. 10) Funding new ventures. 11) Marketing issues. 12) Intellectual property. 13) Evaluation and growth of business. Growth strategy. 14) Forms of development of companies (spin-off, spin-out, SME, Business zones, Incubators, Clusters, Franchises, etc. 15) Science-technology parks and importance for development of entrepreneurship.

Teaching process: Lectures are ex-cathedra and they include: use of modern multimedia resources, visits to business systems, e-learning including delivery of materials via e-mail and the Internet. The emphasis is put on active learning of students. Exercises are auditory and laboratory (factory). Auditory exercises encompass the practical examples (case study), and the factory exercises are used for explaining, in practice, examples of development of entrepreneurial ideas.

Assessment of knowledge: In the course of lectures and exercises, assessment of student knowledge is undertaken continuously on the basis of an active participation in lectures and team work on seminar paper preparations, which are later presented and discussed publicly. Also, there are written reports regarding the executed calculation exercises, which are part of a colloquium. The exam practical part covers the engagement of a student during the exercises. The theoretical part is done in writing or verbally and requires elaboration of certain amount of assigned topics.

Assessment Criteria

Lectures	Exercises	Seminar paper	Colloquium (of exercises)	Theoretical exam
10%	10%	25 %	25%	30%

Literature

Obligatory	1. B. Barringer, R. D. Ireland: Entrepreneurship; Prentice Hall, New York, 2011. 2. D. Petković, J. Bejić, N. Serdarević: Vodič za preduzetništvo; Ekonomski fakultet UNZE, 2010. 3. D. Petković: Naučno-tehnološki parkovi-Više od mjesta za razvoj preduzetništva; Ekonomski fakultet UNZE, 2006.
Additional	1. S. D. Strauss: The Small Business Bible; John Willey and Sons; New York, 2012. 2. W. Beech: Guide to Starting Your Own Business; John Wiley&Sons, 2010.



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Subject title: MAINTENANCE OF TECHNICAL SYSTEMS

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V/VI	elective	2	2	4,0	01-04-K-14-034

Subject leader: Assoc. prof. dr. sc. Sabahudin Jašarević
E-mail: jasarevic@mf.unze.ba

Subject assistant:
E-mail:

Pre-requisites

Subject aims

- introduction to the aims and tasks of maintenance as a function of the company,
- introduce basic policies (strategies) maintenance,
- introduce basic pathogens that cause states of failure and the definition of their manifestations,
- use the tools and techniques of measuring certain parameters, such as vibration, unbalance, based alignment, temperature at the noise

Learning outcomes

- On successful completion of this subject student will be able to:
- knowledge of the role of maintenance of technical systems,
 - choice of optimal strategy and goals of maintenance,
 - actively applying some of the methods of measurement in practical terms,
 - actively solve the problems of eliminating the occurrence of vibration, misalignment, imbalance,

Indicative syllabus content: Basic maintenance. The concept of maintenance. Objectives. Tasks. Maintenance policy. The concept of maintenance. Strategies and methods. Maintenance as a function of the system. Maintenance work. Cleaning and lubrication. Removal of the cancellation. Planned repairs (overhauls). Health check-ups. Security checks. Searching and eliminating weak points. Production and repair of spare parts. Reconstruction. Maintenance Scheduling. Work planning and capacity. Scheduling. Planning spare parts and maintenance materials. Planning staff. Planning overhaul. Planning costs. Organizing maintenance. Selection of the work program. Privacy hiring foreign employees. Economics of maintenance. Maintenance costs. Calculation of costs by type of work. Special maintenance functions. Maintenance and protection of the environment. Maintenance of assets of the business system. Safety at work.

Needs to diagnose the state of technical systems. The goals of technical diagnostics. Terms and definitions. Methods of determining the defect. Systematization of diagnosis. Diagnostic procedures. The classification, based on the theory and characteristics. Evaluation of the state of technical systems. The process of application: problem identification, selection methods, choice of measurement points, processing and display of data, analysis, diagnosis of the condition, the prognosis condition. Software for technical diagnostics. Selected examples of technical diagnostics in terms of real technical systems.

Learning delivery: Lectures are performed with the use of multimedia resources, active learning techniques and with the active participation of students. Exercises are auditory, computational and practical. On Exercises are done practical examples of vibration measurements, based alignment, imbalance, temperature, ... and removing the causes of the application of appropriate equipment and certain software.

Assessment Rationale: Done through the defense programs and two partial exams

Assessment Criteria

Lectures	Exercises	Written exam	Theor. exam		
5%	5%	20%	70%		

Reading

Essential	<ol style="list-style-type: none"> 1. Brdarević, Safet (1996): Održavanje sredstava za rad, Mašinski fakultet, Zenica, 2. Šaravanja, D.; Petković, D.: Vibracijska dijagnostika, teorija i praksa, FSIR Mostar, Mašinski fakultet u Zenici, 2010 3. Adamović Živoslav: Tehnička dijagnostika, ZUNS, Beograd, 1998
Supplementary	<ol style="list-style-type: none"> 4. Avdić, Hasan; Tufekčić Džemo (2005): Održavanje, Univerzitet u Tuzli 5. Bulatović Miodrag 2008: Održavanje i efektivnost tehničkih sistema, Univerzitet Crne Gore, Podgorica 6. Novinc, Ž.; Halep, A.: Tehnička dijagnostika i monitoring u industriji, Kigen, Zagreb 2010



Subject title: ENVIRONMENTAL ENGINEERING

Semester	Status	Number per week		ECTS	Code
		Lectures	Exercises		
V/VI	Elctive	2	2	4,0	01-04-K-18-017
Teacher: Assistant professor dr.sci. Nusret Imamović			Associate		
E-mail: nimamovic@mf.unze.ba			E-mail:		
Prerequisites		Engineering ecology			
Subject aims	Acquiring knowledge on environmental engineering, the conflict between the environment and social needs, pollution and environmental protection measures, as well as acquiring knowledge and skills on realization of measurement and control of environmental pollution.				
Competences (Learning outcomes)	Ability to identify, preclusion and repair problems related to environmental protection in the context of mechanical engineering.				
Syllabus: The concept, the definition and the significance of environmental engineering. Basic concepts in the field of environmental engineering. The structure of the system environment. Systemic conflict between the environment and the needs of society. Critical enviromentalne field of industrial production. Engineering and Environmental: air pollution, water and soil, waste generation and noise and overload the living environment. Greening technology. Technical measures for the protection of the environment. Technology and technical systems purification of waste materials and environmental protection. Methodology of evaluating the impact of technology and activities on the environment. Fundamentals of emission control and waste streams. Systems-management enviromentalnog (purpose, introduction, features, evaluation, and others.). Methodology enviromentalnog evaluation and labeling of products. Multi-criteria evaluation of environmental burdens.					
Teaching process: Lectures are performed with the use of multimedia resources, active learning techniques and with the active participation of students. Exercises are performed in the laboratory and in the field, in typical industrial plants.					
Assessment of knowledge: The assessment of students is carried out continuously during lectures and exercises in the form of short test questions. In the practical part of the exam is done assessing individual and group work of students in the final project. The theoretical part of the examination is carried out in oral form, after the fulfillment of previous commitments.					
Assessment Criteria					
Lectures	Exercises	Practical exam	Theoretical exam		
10%	10%	40%	40%		
Literature					
Obligatory	1. Šećerov-Sokolović, R., Sokolović, S.: Inženjerstvo u zaštiti okoline, Fakultet tehničkih nauka, Novi Sad, 2002. 2. Janko Hodolič, Miroslav Badida, Milan Majernik, Dušan Šebo: Mašinstvo u inženjerstvu zaštite životne sredine, Fakultet tehničkih nauka, Novi Sad, 2005.				
Additional	3. S. E. Jorgensen, I. Johnsen: Principles of Environmental Science and Technology: Elsevier Sciece Publishers Company, New York, 1989. 4. Budak, I.; Hodolič, J.; Stević, M.; Vukelić, Đ. i dr.: Označavanje proizvoda o zaštiti životne sredine, Fakultet tehničkih nauka, Novi Sad, 2009.				



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: INDUSTRIAL WASTE MANAGEMENT

Semester	Status	Number per week		ECTS	Code
		Lectures	Exercises		
V/VI	elctive	2	2	4,0	01-04-K-18-019
Teacher: Full professor dr.sc. Jovan Sredojević E-mail: jsredojevic@mf.unze.ba			Associate: Assistant professor dr.sci. Džafer Dautbegović E-mail: dautbegovic@alba.ba		
Prerequisites		Engineering ecology			
Subject aims	Introducing students and learning about the overall system of management of industrial waste generation, collection, transportation, recycling and recovery to final disposal of industrial waste, with a special emphasis on finding appropriate solutions to the real situation.				
Competences (Learning outcomes)	Ability of students to solve problems of waste selection systems and equipment for waste treatment, monitoring of their work and control work efficiency. The acquired knowledge the student should be able to solid waste management in industrial plants under the regulations on waste management.				
Syllabus: Definition and properties of industrial waste. Legal regulations on waste management. The classification of industrial waste. Industrial waste management. Waste Management Plan. Reducing the production of industrial waste. Collection, recovery and recycling of waste. The methods and technologies of treatment of industrial waste. The financial implications of waste management. Disposal of industrial waste. Industrial landfills and their impact on the environment.					
Teaching process: Lectures are performed with the use of multimedia resources, active learning techniques and with the active participation of students. Exercises are performed in the laboratory and in the field, in typical industrial plants.					
Assessment of knowledge: The assessment of students is carried out continuously during lectures and exercises in the form of short test questions. In the practical part of the exam is done assessing individual and group work of students in the final project. The theoretical part of the examination is carried out in oral form, after the fulfillment of previous commitments.					
Assessment Criteria					
Lectures	Exercises	Practical exam	Theoretical exam		
10%	10%	40%	40%		
Literature					
Obligatory	1. Sredojević, J.: Otpad i deponije otpada, Mašinski fakultet u Zenici, 2003. 2. Kozmiensky K.: Materialrecycling durch Abfallaufbereitung, EF-Verlag für Energie und Umwelttechnik GmbH, Berlin, 1992.				
Additional	3. Sredojević J.: Obrada i deponije otpada, Mašinski fakultet, Zenica, 2003. 4. Sredojević J.: Postupci i oprema za reciklažu otpada, Mašinski fakulet, Zenica, 2004. 5. Milanović Z., Radović S., Vučić V.: Otpad nije smeće, Zagreb, 2002. 6. Petruk, W.: Waste Characterization and Treatment, Society for Mining Metallurgy & Exploration, Montral, 1998.				



Subject title: INDUSTRIAL WASTE MANAGEMENT

Semester	Status	Number per week		ECTS	Code
		Lectures	Exercises		
V/VI	elctive	2	2	4,0	01-04-K-18-019
Teacher: Full professor dr.sc. Jovan Sredojević E-mail: jsredojevic@mf.unze.ba			Associate: Assistant professor dr.sci. Džafer Dautbegović E-mail: dautbegovic@alba.ba		
Prerequisites		Engineering ecology			
Subject aims	Introducing students and learning about the overall system of management of industrial waste generation, collection, transportation, recycling and recovery to final disposal of industrial waste, with a special emphasis on finding appropriate solutions to the real situation.				
Competences (Learning outcomes)	Ability of students to solve problems of waste selection systems and equipment for waste treatment, monitoring of their work and control work efficiency. The acquired knowledge the student should be able to solid waste management in industrial plants under the regulations on waste management.				
Syllabus: Definition and properties of industrial waste. Legal regulations on waste management. The classification of industrial waste. Industrial waste management. Waste Management Plan. Reducing the production of industrial waste. Collection, recovery and recycling of waste. The methods and technologies of treatment of industrial waste. The financial implications of waste management. Disposal of industrial waste. Industrial landfills and their impact on the environment.					
Teaching process: Lectures are performed with the use of multimedia resources, active learning techniques and with the active participation of students. Exercises are performed in the laboratory and in the field, in typical industrial plants.					
Assessment of knowledge: The assessment of students is carried out continuously during lectures and exercises in the form of short test questions. In the practical part of the exam is done assessing individual and group work of students in the final project. The theoretical part of the examination is carried out in oral form, after the fulfillment of previous commitments.					
Assessment Criteria					
Lectures	Exercises	Practical exam	Theoretical exam		
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Literature					
Obligatory	1. Sredojević, J.: Otpad i deponije otpada, Mašinski fakultet u Zenici, 2003. 2. Kozmiensky K.: Materialrecycling durch Abfallaufbereitung, EF-Verlag für Energie und Umwelttechnik GmbH, Berlin, 1992.				
Additional	3. Sredojević J.: Obrada i deponije otpada, Mašinski fakultet, Zenica, 2003. 4. Sredojević J.: Postupci i oprema za reciklažu otpada, Mašinski fakulet, Zenica, 2004. 5. Milanović Z., Radović S., Vučić V.: Otpad nije smeće, Zagreb, 2002. 6. Petruk, W.: Waste Characterization and Treatment, Society for Mining Metallurgy & Exploration, Montral, 1998.				



UNIVERSITY OF ZENICA
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Subject title: SUSTAINABLE DEVELOPMENT

Semester	Status	Number per week		ECTS	Code
		Lectures	Exercises		
V/VI	Elctive	2	2	5	03-EK-18-

Teacher: Full professor dr.sc. Šefket Goletić
E-mail: goletic@mf.unze.ba

Associate: Assistant professor dr.sci. Nusret Imamović
E-mail: nimamovic@mf.unze.ba

Prerequisites

Engineering ecology

Subject aims Acquiring knowledge about the objectives, principles, components and strategies of sustainable development of the industrial sector. Enabling students to design, analyze and implement the basic principles of the sustainable development strategy.

Competences (Learning outcomes) Students who have successfully overcome the scheduled contents is capable of independently or in a team working on the implementation of sustainable development strategies and to implement development projects.

Syllabus: The concept, definition and history of sustainable development. Concept and direction of sustainable development. Strategic principles and objectives of sustainable development. The principles of sustainable development. Dimensions of sustainable development: economic, social and environmental dimension (environmental protection). Planning for sustainable development. Planning the sustainable development of plants and facilities. Sustainable development indicators. The principles of sustainable production. Environmental, economic and social base of sustainable production. Ways to achieve sustainable production. The basic principles and characteristics of cleaner technologies. Model balance of material flows. Guiding technological development towards sustainability. Methodology prevent environmental impact. Recycling Technologies and Sustainable Development. Project management for sustainable development of plants and facilities. Regulations and standards for sustainable development.

Teaching process: Lectures are performed with the use of multimedia resources, active learning techniques and with the active participation of students. Exercises are performed in the laboratory and in the field, in typical industrial plants.

Assessment of knowledge: The assessment of students is carried out continuously during lectures and exercises in the form of short test questions. In the practical part of the exam is done assessing individual and group work of students in the final project. The theoretical part of the examination is carried out in oral form, after the fulfillment of previous commitments.

Assessment Criteria

Lectures	Exercises	Practical exam	Theoretical exam		
10%	10%	40%	40%		

Literature

Obligatory	1. Knežević A.: Održivi razvoj u obnovi i razvoju privrede Bosne i Hercegovine, CETEOR, Sarajevo, 1995. 2. Baker S. et all.: The Politics of Sustainable Development, Routhledge, London, 1997.
Additional	3. Milutinović, S.: Uvod u planiranje održivog razvoja, Stalna konferencija gradova i opština, Beograd, 2004. 4. Milutinović, S.: Lokalni održivi razvoj: izazovi planiranja na lokalnom nivou, Beograd: Stalna konferencija gradova i opština, 2006. 5. Omanović M.: Prilog strategiji održivog razvoja u BiH, Traeqs biro, Sarajevo-Zenica, 2000. 6. Omanović M., Pašalić I.: Energija i ekologija u održivom razvoju, Traeqs biro, Bihać-Zenica, 2000.



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Subject title: PRODUCTION METROLOGY

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V/VI	elective	2	2	4,0	01-03-K-16-031

Subject leader: prof. dr. Nermina Zaimović-Uzunović
E-mail: nzaimovic@mf.unze.ba

Subject assistant: : v. as. mr. sc. Muriz Arifović
E-mail: amuriz@gmail.com

Pre-requisites

Statistics, Machine elements II

Subject aims

introduce students to the basic concepts of production metrology
introduce students to the organizations that make up the infrastructure of quality measurement of length, angle, and the deviation of the geometry of the product
analysis and calculating measurement uncertainty.

**Competences
(Learning
outcomes)**

Upon successful completion of the course, students will be able to:
use mechanical and optical devices for control and measurement of angles and distances
calculated and evaluated errors and measurement uncertainty in production measurements
understand the principles of sensors in production measurements
performe measuring lengths, angles, and deviations from the geometry of the product
understand and apply the basics of coordinate metrology

Indicative syllabus content:

Production measurements and quality. The basics of production measurements. Mechanical devices for control and measurement of angles and distances. Errors and uncertainty in production measurements. Electrical sensors in production measurements. Optical and optoelectronic measurements of dimensional characteristics of the product and process control. The basics of coordinate metrology. Measurement of surface characteristics. Management of measuring and control equipment for production measurements.

Learning delivery: Lectures are performed with the use of multimedia resources, active learning techniques and with the active participation of students. Exercises are performed as auditory and laboratory, with measuring equipment for measuring dimensions and angles, and the coordinate measuring machine.

Assessment Rationale:

The assessment is based on constant work with the students throughout the semester. After each lab students will be given a test with short answers, and will also have practical exercises measurement methods to different instruments or machines to learn to work independently and in a team. The method of assessment is based on the scoring of active attendance and proficiency tests during the semester and at the end of the semester is taken in the final written exam.

Assessment Criteria

Activity during lectures	Activity during exercises	Final exam
10%	20%	70%

Literature

Essential

1. Zaimović-Uzunović Nermina; Lemeš Samir; Denjo Daut; Softić Almira: "Proizvodna mjerenja", ISBN 9958-617-44-7, Univerzitet u Zenici, 2009.
2. Kačmarčik Josip, Nermina Zaimović-Uzunović: Koordinatna metrologija, skripta, Mašinski fakultet, Zenica, 2008.

Supplementary

1. Zaimović-Uzunović, N.: Mjeriteljska infrastruktura, ISBN 9958-617-16-1, Mašinski fakultet u Zenici, 2003.
2. B.N. Taylor, C.E. Kuyatt: Guideline for evaluating and expressing the uncertainty of NIST measurement results, NIST Technical Note 1297, 1994.
3. S. Białas, Z. Humienny (Editors): Geometrical product specifications - Leonardo da Vinci Programme", ISBN 8391219089, Warsaw University of Technology Print. House, 2001.



Subject title: PRODUCT TESTING AND QUALITY

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V/VI	elective	2	2	4,0	01-04-K-17-031

Subject leader: as.prof.dr. Samir Lemeš

E-mail: slemes@mf.unze.ba

Subject assistant:

E-mail:

Pre-requisites

Metrology

Subject aims

- To introduce students to various techniques for testing final product quality
- To educate students how to choose methods and devices for product testing in accordance with the requirements of design, function, regulation and standards

Learning outcomes

- On successful completion of this subject student will be able to:
- choose adequate methods of destructive and non-destructive product testing
 - using experimental methods, check whether a prototype or sample of finished product meets the functional requirements used as the design criterion
 - understand the principles and characteristics of product testing devices
 - choose the method of sampling corresponding to a given product
 - are able to apply their knowledge to check the status of products in service

Indicative syllabus content:

The concept of product quality. Techniques of quality management: QMS, TQM, Six-Sigma, SPC, verification and validation. Non-destructive testing methods: visual and optical testing, dye penetrant, eddy current, magnetic particle, acoustic emission, microwave, thermal, ultrasonic testing, radiographic methods, imaging, computer vision, industrial CT, strain gauges, residual stress measurement, photoelasticity. Virtual prototype. Rapid prototyping. Mechanical testing of products. Crash tests. Reliability testing. Sampling and statistical analysis of test results. FAI, FMEA, HALT, HASS, MTBF testing. Software quality. Standards in product testing. CE marking.

Learning delivery:

Lectures are conducted with the use of multimedia resources, active learning technology and with active participation of students. Exercises are performed as auditory and laboratory, with measuring equipment for non destructive testing.

Assessment Rationale:

The assessment is based on three periodic written examinations during the semester, preparation and defence of the essay, and final written exam. Students independently prepare the seminar on selected topics, in the form of written surveys and public presentations with a discussion in front of other students.

Assessment Criteria

Activity on lectures and exercises (periodic testing)	Seminar	Final exam	
30%	30%	40%	

Reading

Essential	1. M. Oruč, R. Sunulahpašić: "Ispitivanja metalnih materijala II - defektoskopija", Fakultet za metalurgiju i materijale Zenica, 2012
Supplementary	1. M. Levin, T. Kalal : "Improving Product Reliability: Strategies and Implementation", Wiley, 2003, ISBN: 0470854499 2. P.E. Mix: "Introduction to Nondestructive Testing: A Training Guide", Wiley, 2005, ISBN 0471420298 3. K.B. Misra: "Handbook of Performability Engineering ", Springer, 2008, ISBN 1848001304



UNIVERSITY OF ZENICA
FACULTY OF MECHANICAL ENGINEERING



Subject title: **PROJECT MANAGEMENT**

Semester	Status	Hours per week		ECTS credit value	Code
		Lectures	Exercises		
V/VI	elective	2	2	4,0	01-04-K-17-032

Subject leader: Assoc. prof. dr. sc. Sabahudin Jašarević
E-mail: jasarevic@mf.unze.ba

Subject assistant:
E-mail:

Pre-requisites

Subject aims

- introduction to the basic elements of project management,
- overcoming project management methodology,
- introduction to methods and tools for project management.

Learning outcomes

- On successful completion of this subject student will be able to:
- working on the project development in many areas of their operation,
 - opportunities work in teams,
 - capability to connect the technical, economic and organizational knowledge

Indicative syllabus content: The concept and definition of project, Types and importance of projects (project as a temporary endeavor, as a unique product or service, as a transformational process, ..), **Strategy and project management** (the role of strategy, multiproject management as part of the strategic process, change management, ..) , **Interesting influential groups in the project** (project manager, project team, project sponsor, the identification of groups on the project, ..), **Project organizational structure** (functional organization structure, project organization, matrix, network organization, selection structures, ..), **Stages of on the project, Initial phase of work** (project initiation, selection, planning, project objectives, project scope, making a Gantt chart and network diagrams, structure analysis, analysis of time and resources, responsibilities on the project, budgeting, leveling, risk assessment, ...), **Implementation phase** (conflict and negotiation, procurement and contracting, project management, communications management, reporting, risk management, control of the implementation stage, the calculation of financial parameters, ..), **Concluding stage projects** (project audit, the purpose of audit, enforcement, audit report, completion of the project, the decision to completion, completion methods, the final report, postimplementation review, knowledge Base, ...), **Computer support projects** (software, software selection, types of software, ...), **Project team**, organization and training for creative work team, **Examples of projects from environment**

Learning delivery: Lectures are conducted with the use of multimedia resources, the techniques of active learning and involvement of students. Exercises are performed as an auditory and computer. The exercises are practical working examples and calculations, and the computer that require specific software.

Assessment Rationale: Assessment of students is carried out continuously during the realization of lectures and exercises in the form of active participation of students in lectures and written and oral reports on the exercises. The written exam covers the activities of students during the exercises, while the theoretical works through two partial exams through the elaboration given the limited number of topics.

Assessment Criteria

Lectures	Exercises	Written exam	Theor. exam		
10%	10%	40%	40%		

Reading

Essential	1. Omazić M. A., Baljkas, S.: Projektni menadžment, Sinergija, Zagreb 2005
Supplementary	1. Hauc, A.:Projektni menadžment i projektno poslovanje, MEP Consult, Zagreb 2007
	2. Jovanović, P.: Upravljanje projektom, Beograd 2008