Faculty of Mechanical Engineering / MECHATRONICS / MACHINE ELEMENTS II

Course:	MACHINE ELEMENTS II			
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
1615	Mandatory	4	6	3+2+0
Programs	MECHATRONICS			
Prerequisites	Passed subject Machine elements I			
Aims	In this subject is taught converting and guidance mechanical energy from shaft power machines to shaft working machines. In this subject is taught theory, calculation, structural forms all parts power transmission.			
Learning outcomes	Upon completion of this course the student will be able to: 1. commit estimate of geometry and firmness cylindrical gear with straight teeth and with helical teeth 2. commit estimate of geometry and firmness conical gears with straight teeth and with helical teeth 3. commit estimate of geometry and firmness worm gears 4. commit choice and calculation dimensions of chain transmission 5. commit choice and calculation dimensions gear with flat belt, with a trapeze belt and with toothed belt 6. determine capacity and working life a friction transmission 7. commit choice rolling element bearings given the dynamic load and the static load 8. determine capacity radial and axial slide bearings 9. commit choice appropriate couplings (inseparable couplings, rigid couplings, on-off couplings and special couplings)			
Lecturer / Teaching assistant	Prof. dr Janko Jovanović, Mirjana Šoškić			
Methodology	Lectures, exercises, homeworks, colloquiums and laboratory exercises			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Gears. Introduction. Basic terms. Fundamental law of gearing. Line of action. Curves profile.			
I week exercises	Gears. Fundamental law of gearing. Line of action. Curves profile.			
II week lectures	Gear geometry – spur gears. Introduction. Basic rack profile. Involute curve. Base pitch. Change of center distance. Movement profile tools. Circular tooth thickness.			
II week exercises	Gear geometry – spur gears. Basic rack profile. Involute curve. Base pitch. Change of center distance. Movement profile tools. Circular tooth thickness.			
III week lectures	Gear geometry – spur gears. Pressure angle. Shortening head tooth. Gear diameters. Bordering number tooth. Transverse contact ratio. Gear geometry – helical gears. Gear tooth profile. Gear dimensions. Equivalent gear. Measuring and control of spur and hel			
III week exercises	Gear geometry – spur gears. Pressure angle. Gear diameters. Bordering number tooth. Transverse contact ratio. Gear geometry – helical gears. Gear tooth profile. Gear dimensions. Equivalent gear. Measuring and control of spur and helical gears. Labaratory			
IV week lectures	Cylindrical gear – load and stresses. Loads. Load factors. The calculation by criteria endurance flank tooth and foothills tooth. Materials gears. Choice of basic dimensions.			
IV week exercises	Cylindrical gear – load and stresses. Loads. Load factors. The calculation by criteria endurance flank tooth and foothills tooth. Choice of basic dimensions.			
V week lectures	Bevel gears. Characteristics and application. Gear tooth profiles. Gear dimensions. The calculation by criteria endurance flank tooth and foothills tooth.			
V week exercises	Bevel gears. The calculation by criteria endurance flank tooth and foothills tooth.			
VI week lectures	Worm gear. Characteristics and application. Types of worm gears and tooth flank profiles. Loads. Energy loses. Degree of efficiency.			
VI week exercises	Worm gear. Loads. Energy loses. Degree of efficiency.			
VII week lectures	The calculation by criteria endurance flank tooth and foothills tooth. Materials. ILubrication. Choice of basic dimensions.			
VII week exercises	The calculation by criteria endurance flank tooth and foothills tooth. Choice of basic dimensions. Homework.			
VIII week lectures	Belt transmission. Characteristics. Types of belt transmissions. Belt tension. Belt profiles. Materials. Calculation of flat belt transmission.			
VIII week exercises	I Colloquium			

IX week lectures	Calculation of V-belt transmisssion. Calculation of synhronous belt transmisssion. Pulley design.
IX week exercises	Belt transmission. Calculation of flat belt transmission. Calculation of V-belt transmisssion. Calculation of synhronous belt transmisssion.
X week lectures	Friction transmission. Characteristics and types. Friction transmission design and application. Materials. Kinematics of friction transmission. Kinetic and elastic sliding. Loads. Choice of basic dimensions.
X week exercises	Friction transmission. Kinematics of friction transmission. Kinetic and elastic sliding. Loads. Choice of basic dimensions.
XI week lectures	Chain transmission. Characteristics and application. Types of chain transmissions. Choice number teeth. Powers. Load capacity the chains with rollers. Choice and calculation dimensions of chain transmission.
XI week exercises	Chain transmission. Choice number teeth. Powers. Load capacity the chains with rollers. Choice and calculation dimensions of chain transmission. Homework.
XII week lectures	Rolling element bearings. Characteristics and types. Marking system. Standard forms. Choice of bearing type. Load capacity and service life. Lubrication. Sealing. Assemblage.
XII week exercises	Rolling element bearings. Marking system. Standard forms. Choice of bearing type. Load capacity and service life.
XIII week lectures	Sliding bearings. Characteristics and types. Friction and lubricant role. Hydrostatic and hydrodynamic lubrication. Lubrication systems. Materials. Load capacity. Slider bearings design.
XIII week exercises	Sliding bearings. Hydrostatic and hydrodynamic lubrication. Load capacity. Slider bearings design. Homework.
XIV week lectures	Couplings. Application and types. Rigid couplings. Flexible couplings. on-off couplings. Torque limiting couplings. Centrifugal couplings. One-way couplings. Induction couplings and hydrodynamic couplings.
XIV week exercises	Couplings. Rigid couplings. Flexible couplings. On-off couplings. Torque limiting couplings.
XV week lectures	II Colloquium
XV week exercises	Centrifugal couplings. One-way couplings. Induction couplings and hydrodynamic couplings.
Student workload	Nedjeljno 6 kredita x 40/30 = 8 sati Struktura: 3 sata predavanja 2 sata vježbi 3 sata samostalnog rada, uključujući konsultacije U toku semestra Nastava i završni ispit: (8 sati) x 16 = 128 sati Neophodne pripreme prije početka semestra (administracija, upis, ovjera): 2 x (8 sati) = 16 sati Ukupno opterećenje za predmet: 6x30 = 180 sati Dopunski rad: 36 sati za pripremu ispita u popravnom ispitnom roku, uključujući i polaganje popravnog ispita (preostalo vrijeme od prve dvije stavke do ukupnog opterećenja za predmet 180 sati) Struktura opterećenja: 128 sati (Nastava)+16 sati (Priprema)+36 sata (Dopunski rad)

Per week	**Per semester**
6 credits x 40/30=8 hours and 0 minuts 3 sat(a) theoretical classes 0 sat(a) practical classes 2 excercises **3 hour(s) i 0 minuts** of independent work, including consultations	Classes and final exam: **8 hour(s) i 0 minuts x 16 =128 hour(s) i 0 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **8 hour(s) i 0 minuts x 2 =16 hour(s) i 0 minuts** Total workload for the subject: **6 x 30=180 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **36 hour(s) i 0 minuts** Workload structure: **128 hour(s) i 0 minuts (cources), 16 hour(s) i 0 minuts (preparation), 36 hour(s) i 0 minuts (additional work)**
Student obligations	Students are required to attend classes and exercises, to work and surrender homeworks and working both colloquiums.
Consultations	2 times per week
Literature	1. Radoš Bulatović, Mašinski elementi II, 2. Vojislav Miltenović, Mašinski elementi, 3. Milosav Ognjanović, Mašinski elementi, 4. Radoš Bulatović, Janko Jovanović, Mašinski elementi – riješeni zadaci, 5. Zoran Savić i grupa autora, Praktikum za vežbe.
Examination methods	Homeworks 5 points each (total 20 points), colloquiums 15 points each (total 30 points) and are prerequisite for final exam. Final exam 50 points. Grading Scale: 100 - 90 A; 90 - 80 B; 80 - 70 C; 70 - 60 D; 60 - 50 E; 50 - 0 F
Special remarks	

Comment			For addtional information on subject contact proffesor			
Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points