SYLLABUS – DESIGN OF MACHINE ELEMENTS II – MECHANICAL ENGINEERING

Faculty:	Faculty of Mechanical Engineering and Computers	
Department	Mechanical Engineering	
Level	Bachelor	
Code of the Course	208ME	
Course	Design of Machine Elements II	
Course status	Mandatory	**Mandatory**, Elective
Semester	(IV)	Winter/**Summer**
Nr.of hours per week	3+2	
ECTS	6	
Orari/Salla	Monday, $9^{00} \div 11^{15}$, S305	
Academic Year	2024/2025	
Lecturer	Prof. Ass. Dr.sc. Fatmir Azemi	
Assistent	Granit Hajra, PhD	
Contact	Professor	Assistant
Email	fatmir.azemi@umib.net	granit.hajra@umib.net
Phone	+38344198368	

Content	Design of Machine Elements II is a course that builds upon the foundational concepts covered in Machine Element Design I. In this course, students will learn about the kinematics of gear transmissions and the fundamental laws of gearing. Topics such as gear ratios, tooth profiles, and gear dimensions will be covered, along with numerical exercises and graphical tasks related to gear transmissions. Students will also learn about cylindrical gears, and another types of gears, including their tolerances and geometric properties, and how to calculate their dimensions.
Purpose	The purpose of the course "Design of Machine Elements II" is to provide students with advanced knowledge and skills in the design, analysis, and selection of machine elements used in mechanical systems. The course focuses on the kinematics of gears and transmissions, the calculation and processing of cylindrical and conical gears, the selection and design of rolling bearings, and the design and analysis of shafts, keys, and couplings. Students will also learn how to evaluate the performance and reliability of machine elements under different types of loads and operating conditions. The course aims to prepare students to design and analyze complex mechanical systems that meet specific functional and performance requirements.

L e o r n i n g o u t c o m e s	Upon completion of the course on Design of Machine Elements II, students should be able to:
	1. Understand the kinematics of gear transmissions, including gear ratio, tooth profile displacement, dimensions on teeth, and number of teeth. Learners should also be able to solve numerical exercises on gear transmissions and prepare graphical tasks related to gear transmissions.
	2. Identify the dimensions and geometric sizes of involute cylindrical gears, as well as the machining process, tolerances, and quality of cylindrical gears. Learners should be able to check the gear body, calculate the geometric sizes of the involute cylindrical gears, and understand the base pitch and dimensions of bevel gears.
	3. Analyze bevel gear pairs, including division, straight and tapered bevel gears, and the base pitch of bevel gears. Learners should also be able to understand the dimensions, machining process, tolerances, and quality of spiral bevel gears and hypoid gears, as well as inspect and check bevel gears.
	4. Describe worm gear, including division, cylindrical worm gear, worm gear profile and form factor, and the major dimensions of worm gear . Learners should also be able to calculate the gear ratio, geometric dimensions, tolerances, quality, and checking of cylindrical screw pairs without end.
	5. Analyze the carrying of gear on cylindrical gears with straight, helical, bevel, and worm gears. Learners should also be able to describe the dynamic internal forces and vibrations of gears, the correction of the flank, profile and side clearance of gears, and the distribution of the gear load along the line of contact of the gear teeth.
	6. Understand the calculation of shafts and axles, shaft keys, and the coupling of shafts with rotating parts. Learners should also be able to identify the division, marking, and application of bearings.
	7. Solve numerical problems and apply theoretical knowledge to design machine elements, particularly gears and bearings, for industrial applications.

P r o g r a m	Weeks	Lecture
	First week:	Course overview and syllabus review Kinematics of gear transmissions Fundamental law of gearing.
	Second week:	Gear ratio and tooth profile displacement, dimensions on teeth and number of teeth.
	*Third week***:**	Machining of cylindrical gears, tolerances and quality of cylindrical gears, checking the gear body. Calculation of the geometric sizes of the involute cylindrical gears.

	Fourth week:	Bevel gear pairs, division of bevel gears, straight bevel gears, tapered bevel gears, base pitch of bevel gears and dimensions of bevel gears.
	Fifth week:	Spiral bevel gears and hypoid gears, machining of spiral bevel gears and hypoid gears, tolerances of spiral bevel gears, checking and inspection of bevel gears.
	Sixth week:	Worm gear, division of worm geard, cylindrical worm gear, worm gear profile and form factor, finite number of teeth and tooth displacement, major dimensions of worm gear, gear ratio.
	Seventh week:	Geometric dimensions of worm gear, machining of worm gear, tolerances, quality and checking of worm gear.
	Eighth week:	Carrying of gear on cylindrical gears with straight, helical, bevel and worm gears, dynamic internal forces and vibrations of gears.
	Ninth week:	Correction of the flank, profile and side clearance of gears. Distribution of the gear load along the line of contact of the gear teeth.
	Tenth week:	Selection of the basic sizes of the gear transmission
	Eleventh week:	Types of Mechanical keys
	Twelfth week:	Axles and Shafts
	Thirteenth week:	Calculation of shafts and axles and shaft keys.
	Fourteenth week:	Couplings of shafts with rotating parts.
	Fifteenth week :	Bearings, division, marking and application. Couplings Course evaluation and feedback

Li te ra tu re	**Literature :**
	Base Literature Dr. sc. Nijazi Ibrahimi, Detalet e Makinave II_1 dhe II_2, Prishtinë, 2004, Dr. Sc. Hakif Zeqiri, Praktikum, ushtrimeve numerike, FIMK, Mitrovicë, 2015 Dr. Sc. Azem Kyçyku, Udhëzime për detyra grafike, FIM, Prishtinë 2007 **Recommended Literature:** "Design of Machine Elements" by M.F. Spotts and T.E. Shoup, published in 1987. "Mechanical Design of Machine Elements and Machines: A Failure Prevention Perspective" by Jack A. Collins and Henry R. Busby, published in 2014. "Design of Machine Elements" by V.B. Bhandari, published in 2010. "Machine Design" by Robert L. Norton, published in 2013. "Design of Machine Elements" by S. Suresh and K. Ganesan, published in 2014. "Machine Elements in Mechanical Design" by Robert L. Mott and Edward M. Vavrek, published in 2018.

	Rolloff/Matek Maschinenelemente; Mechanical desktop.
Te ach ing me tho dol ogy	1. Lecture-based instruction: Instructors can use lectures to cover theoretical concepts, derivations, and mathematical modeling. Students can take notes and ask questions during lectures to clarify their understanding. 2. Hands-on design projects: Students can work on hands-on design projects that involve the design, analysis, and testing of machine elements such as gears, screws, bearings, and shafts. These projects can help students to apply theoretical concepts to practical problems and gain practical experience in designing machine elements. 3. Use of computer-aided design (CAD) software: Instructors can use CAD software such as SolidWorks, AutoCAD, or Pro/Engineer to teach students how to design and analyze machine elements. CAD software can help students to visualize and analyze 3D models of machine elements and to simulate their behavior under different loading conditions. 4. Individual and group assignments: Instructors can assign individual and group assignments to students to reinforce their learning and to provide opportunities for them to work independently or collaboratively. Assignments can include problem sets, case studies, design challenges, and research projects. 5. Design project reports: Students can be asked to write design project reports that document their design process, analysis, and testing of machine elements. These reports can help students to develop technical writing skills and to communicate their ideas effectively. 6. In-class tests: Instructors can use in-class tests to assess students' understanding of the course material and their ability to solve problems related to machine design. Tests can include multiple-choice questions, short-answer questions, and problem-solving questions.

Contribution to student workload (which should correspond to student learning outcomes - 1 ECTS credit = 25 hours)			
Activity	**Hours**	**Days/weeks**	**Total**
Lectures	3	15	45
Exercise sessions (with TA)	2	15	30
Practical work	4	3	12
Office hours	2	4	8
Fieldwork	2	3	6
Midterms, seminars	2	3	6
Homework	3	3	9
Self-study	4	4	16
Final exam preparation	2	3	6
Time spent in exams	2	2	4
Projects, presentations, etc	2	4	8
Total			**150**

E v a l u a t i o n	**Assessment methodology:** (according to the Statute and Regulation for studies of UMIB)
	Assignments: This involves assigning homework, problem sets, and design projects to students to test their understanding of the course materials and their ability to apply them in practical settings. Tests: Regular tests are conducted to evaluate the students' understanding of the course materials, their problem-solving skills, and their ability to apply theoretical concepts to practical problems. Class participation: Students are expected to actively participate in class discussions and activities, ask questions, and provide feedback to their peers and the instructor. Final project: A final project is typically assigned to students, which requires them to apply the knowledge and skills gained throughout the course to solve a practical design problem. Exams: There may be midterm and final exams that test the students' understanding of the entire course.

Tests / Colloquia (First Test) (Second test) (Third test)	10 %; 10 %; 10%
Practical test during exercises (Essay)	
Workshop seminar	
Interpretation and presentation of artistic creativity and other works.	
Assignments and courses during the semester	10 %
Professional practice.	10 %
Other, Continuity	10 %
Final exam	40 %
Total	100%
Final grade	Points (%) Mark
	91 – 100 10
	81 - 90 9
	71 - 80 8
	61 - 70 7
	51 - 60 6

Academic policies	**Criteria for regular attendance and rules of etiquette during the organization of the lesson are set.** **Computer work:** Graphic works, I have to draw and write with a computer. In the works it is obligatory to respect the criteria for both the visual and the content aspect of the required works. **Ethics in teaching:** Graphic works should be personal works of each student. There will be no tolerance for copying, "borrowing" from the Internet or any other material. The same or similar works will have negative evaluations in the final evaluation of the student. **Time:** In agreement with the students, the deadlines for submitting works will be determined. There will be no tolerance for delays in the submission of works. Failure to arrive at the time when the assignment is explained does not justify the student for not submitting the paper. The deadline will be given earlier. If you are going to travel abroad, then you need to submit the paperwork in advance. The student has the right to request a consultation with the professor whenever he / she deems it reasonable and necessary for the performance of his / her work. **Rules of conduct and academic policies:** ● active participation of students in lectures o participation in discussion, comments and free expression of opinion, opinion and academic position (with arguments) ● Mandatory independent work and use of additional sources of information (various scientific websites, scientific journals, conference proceedings, etc.) ● Respecting lecture schedules without compromising academic freedom (silent cell phones) of respecting the word, thoughts and ideas of colleagues, ● It is not allowed to arrive late and leave without a valid reason from the lecture, test or exam o preparation and holding of relevant lectures, (obligation of the teacher). ● if the student is absent more than four times without reason in lectures and exercises, does not receive the signature for attendance. o the student cannot take the exam without an official document, ● if the student is dissatisfied with the grade obtained, has the right to complain in writing to the dean, within two working days after the announcement of the results, UMIB Statute o if the student does not follow the rules, in the exam uses tools that are not allowed, it is evaluated with a negative grade.

Mitrovicë   Course Provider
28/10/2022   Prof.ass.dr Fatmir Azemi

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