

## SYLLABUS

**1. Course title:**

Fundamentals of Tribology and Lubrication Systems

**2. Code:**

**3. Cycle of study:**

(I)

**4. ECTS credits:**

3

**5. Type of course:**

Elective

**6. Prerequisites:**

No prerequisites

**7. Class restrictions:**

No restrictions

**8. Duration / semester(s):**

1

7

**9. Weekly contact hours and student workload:**

**10. Faculty:**

Faculty of Mechanical Engineering

**11. Department/study program:**

Manufacturing Engineering, Mechanical Production Engineering

**12. Lecturer:**

Adnan Mustafić, PhD

**13. Course aims:**

To acquire fundamental knowledge of tribology and lubrication systems: their function, design, configuration, and application.

#### 14. Learning outcomes:

Understanding the physical and technological conditions that affect machine elements and structures under tribological contact and wear, the design and application of lubrication systems, and the adoption of an engineering mindset based on acquired knowledge in tribology, strength of materials, and material science, as a prerequisite for designing more complex technical systems and their lubrication systems.

#### 15. Course content:

1. Introductory lecture: introducing students to the course, syllabus, methods of work, grading, etc.
2. Definition of tribology and its multidisciplinary nature. Historical development of tribology.
3. Basics of tribology theory, the concept and classification of tribological problems.
4. Tribological processes. Consequences of tribological processes in tribotechnical systems.
5. Friction: concept and types of friction. Theories of friction (adhesive, molecular, molecular-mechanical, energetic).
6. Wear: definition and classification. Relationship between friction and wear and wear intensity. Adhesive wear, abrasive wear, fatigue wear, erosive wear, and diffusion wear.
7. Oxidation corrosion, electrolytic corrosion, reduction corrosion.
8. Midterm knowledge assessment.
9. Theories of lubrication. Classification of lubrication modes and types. Boundary, mixed, hydrodynamic, hydrostatic, and elastohydrodynamic lubrication.
10. Lubricants: characteristics and classification. Lubricating oils and similar fluids, greases, synthetic lubricants, solid lubricants, and gaseous lubricants.
11. Lubrication of machine elements and mechanical systems.
12. Lubrication devices and systems.
13. Storage and handling of lubricants.
14. Project presentations on topics in the field of Fundamentals of Tribology and Lubrication Systems.
15. Midterm knowledge assessment.

#### 16. Learning methods:

To support successful learning within the course, the following activities are planned:

- Lectures – Theoretical lectures with active two-way communication between students and the professor. Student attendance is mandatory. As part of active participation, students will also be required to prepare and publicly present an assigned topic.
- Exercises
- Theory and problem-solving tests – Solving theoretical and practical problems through tests.
- Seminar papers – Independent student work focused on solving assigned problems.
- Consultations

#### 17. Assessment methods:

After the mid-semester point, students take the first written midterm exam, covering the material taught up to that point. The midterm consists of theoretical questions and problem-solving tasks. The maximum number of points a student can earn on the first midterm is 20.

At the end of the semester, students take the second written midterm exam, which also consists of theoretical questions and tasks, covering the material taught after the first midterm. A maximum of 20 points can be earned. Both midterms are prepared by the course instructor, ensuring that students can respond to the given questions within the allotted time. All students take the tests simultaneously to ensure consistency in the level of knowledge being tested and fairness in exam conditions.

As part of the pre-exam requirements, students are required to complete an individual seminar paper on a selected topic related to the course content. The seminar paper is submitted in written form for review and evaluation by the instructor, followed by an oral presentation and a Q&A session on the topic.

During auditory exercises, students solve problems and numerical examples related to the lecture topics. In laboratory exercises, students complete a semester project involving the design of a lubrication system.

- A presented and approved seminar paper can earn up to 10 points.
- Mandatory attendance and participation in lectures and exercises can earn up to 5 points.
- The final and retake exams are oral, and students can earn up to 45 points.

Student knowledge assessments are recognized as a cumulative exam if the student scores at least 50% of the possible points in each individual assessment component.

To pass the course, a student must accumulate a minimum of 54 points in total.

Grading System: (5) + (10) + (40) + (45) = 100 points

Grading scale is as follows:

Grade	Description	Letter/Points
5 (five)	Does not meet minimum criteria	F <54
6 (six)	Meets minimum criteria	E 54-64
7 (seven)	Generally good, but with significant shortcomings	D 65-74
8 (eight)	Average, with noticeable errors	C 75-84
9 (nine)	Above average, with some errors	B 85-94

10 (ten) Exceptional with no or minor errors

A 95-100

### 18. Assessment components:

Grading will be based on the following activities:

- Attendance in lectures = 5 points
  - Seminar paper + classroom participation = 10 points
  - Tests = 40 points
  - Pre-exam obligations = 55 points
  - Final exam = 45 points
- Total = 100 points

### 19. Mandatory reading list:

1. Ekinović, S. (2000): "Osnovi tribologije i sistema podmazivanja", Mašinski fakultet u Zenici, 2000. godine
2. Ekinović S., Vukojević N., : "Sistemi podmazivanja, Elementi, Konstrukcija, Proračun", Univerzitet u Zenici, Mašinski fakultet, Zenica 2007. godine

### 20. Additional reading list:

Shizu W., Huang P.,: "Principles of Tribology" Wiley, 2013.

### 21. Web sources:

<https://www.avxhome.se/ebooks/1118062892.html>

### 22. Applicable from the academic year:

### 23. Adopted in the Faculty/Academy session: