



Machine Design

MF2018 Tribology 6 credits (hp)

Course PM

Autumn 2021

Course coordinator

Sergei Glavatskih

Brinellvägen 85

E-mail: segla@kth.se

The course intends to provide you, future designers of sustainable machinery, with important knowledge on friction, wear and lubrication. In the course we combine theoretical and practical exercises. The learning process is complimented by invited lectures given by the leading scientists and industry professionals.

Aim

After completion of this course, you will be able to:

- explain and analyse friction phenomena
- identify dominating mechanisms of surface wear
- explain mechanisms of lubrication
- evaluate contact pressure, temperature and lubricant film thickness
- motivate lubricant selection
- motivate material selection
- characterise surface topography
- explain some typical failure modes of machine components (related to tribology)

Course components

- Lectures about contact mechanics, wear, friction and lubrication with a special reference to mechanical components and systems
- Two laboratory works (video + individual data) on topics introduced during the lectures. The reports must be submitted and approved before the examination date.
- Three home assignments: individual reports must be submitted and approved before the examination date.

Grading

Final grading (A-F) is based on the written examination.

Reports of three individual assignments and two laboratory works must be approved not later than on January 16, 2022, to get a final grade.

Prerequisites

This is an advanced level course. Prerequisites are the basic courses such as Design and Product or equivalent. It is very helpful if you have had courses in Solid Mechanics, Fluid Mechanics and Chemistry.

Course literature

Anton van Beek, “Advanced engineering design. Lifetime performance and reliability”, TU Delft, 2008 (or an equivalent latest edition).

Lecture notes in *Canvas*.

Lectures

Week 44

Mon 1 Nov 13:15-15:00 **Introduction**

Location: M23

Tue 2 Nov 13:15-15:00 **Contact Mechanics, Smooth Surfaces**

Location: M37

Wed 3 Nov 08:15-10:00 **Adhesion, Rough Surfaces**

Location: M37

Fri 5 Nov 13:15-15:00 **Invited talk:** Prof Ian Sherrington – Impact of Tribology

Location: M37

Introduction to **Assignment 1 (deadline: 14 November)**

Week 45

Mon 8 Nov 13:15-15:00 **Wear Mechanisms I**

Location: M23

Tue 9 Nov 14:15-16:00 **Wear Mechanisms II**

Location: M37

Wed 10 Nov 08:15-10:00 **Sliding Friction**

Location: M37

Fri 12 Nov 13:15-15:00 **Rolling Friction**

Location: M37

Introduction to **Laboratory work 1 (deadline: 21 November)**

Week 46

Mon 15 Nov 13:15-15:00 **Lubrication regimes**

Location: M37

Tue 16 Nov 13:15-15:00 **Lubricant properties**

Location: M37

Wed 17 Nov 08:15-10:00 **Invited talk:** Prof Johan Leckner – All about greases

Location: M37

Fri 19 Nov 13:15-15:00 **Lubrication systems**

Location: M24 introduction to **Assignment 2 (deadline: 28 November)**

Week 47

Mon 22 Nov 13:15-15:00 **Hydrostatic Lubrication**

Location: M37

Tue 23 Nov 13:15-15:00 **Friction phenomena in mechanical systems I**

Location: M37

Thu 25 Nov 13:15-15:00 **Friction phenomena in mechanical systems II**

Location: M37

Fri 26 Nov 13:15-15:00 **Seminar**

Location: M37 Introduction to **Laboratory work 2 (deadline: 5 December)**

Week 48

Mon 29 Nov 13:15-15:00 **Invited talk:** Dr Erik Persson – Influence of friction on reliability

Location: M37 of threaded fastener joints

Fri 3 Dec 13:15-15:00 **Materials I**

Location: M37 Introduction to **Assignment 3 (deadline: 12 December)**

Week 49

Mon 6 Dec 13:15-15:00 **Materials II**

Location: M37

Tue 7 Dec 13:15-15:00 **Invited talk:** Prof. Thomas Norrby – Oil formulations

Location: M37

Fri 10 Dec 13:15-15:00 **Seminar**

Location: M37