

Basic Theory of Vehicle Engineering

Code: MK3ALJGJ04JX20-EN

ECTS Credit Points: 4

Evaluation: exam

Semester: 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+1

Topics:

Physical quantities, systems of measurement. Basics of Measurement Technology. Concept of machines, their grouping. Physical quantities and their relationships. Types of machine operations. Mechanical work, power, efficiency concept. Friction and rolling resistance. Modification and transfer of mechanical work. Variable speed operation of machines with advanced and rotary motion. The work of changing forces. Variable machine losses, efficiency, optimal load. Periodic movements of vehicles and machines, damping of swinging movements, reduction of degree of inequality. Work of spring forces, spring characteristics. Crankshaft gear. Flywheel. Resting fluid balance, energy content and performance, hydrostatic lift. Swimming and stability of ships. Flowability of flowing fluid, flow in piping systems. Liquid transport by pump. Fluid impulse change machines, simple turbines. Operational processes in gas engines, gas compression and expansion, circuits in thermal power plants, efficiency. Machine Characteristics, Collaboration, Operating Point and Stability. Basic concepts of vehicle and machine control, control and regulation.

Literature:

Compulsory:

- Tiba Zs.: Basic constructions of machine design DUPRESS 2017.
- Tiba Zs.: Drivetrain optimization. DUPRESS 2017.
- Kutz, M.: Mechanical Engineers' Handbook, 4 Volume Set, 4th Edition, ISBN: 978-1-118-11899-3, 2015.
- Sanny, J.; Ling, S.: University Physics Volume 1, ISBN 13: 9781938168277, 2016.
- Lindeburg, M.R.: Mechanical Engineering Reference Manual for the PE Exam, 13th Ed, ISBN: 978-1591264149, 2013.

Schedule

1st week Registration week

2nd week:

Lecture: SI units, basic and derived quantities, prefixes. Translational and rotational motion, moment of inertia, torque, work, power

Practice: Overview of The International System of Units (SI). Elaboration of kinetic and kinematic exercises. Elaborating exercises in the following topics: losses of machines, efficiency, specific consumption, economical efficiency.

4th week:

3rd week:

Lecture: Efficiency, power loss of machines
Practice: Elaborating exercises in the topic of flywheels and hydrostatics. Utilization of Bernoulli's principle.

5th week:

Lecture: Bernoulli's equation, law of continuity, Venturi tube, water jet force.

Practice: Elaborating calculation exercises in the field of hydrodynamics.

6th week:

Lecture: Classification of machines, power drives

Practice: Elaborating calculation exercises: machines transmitting fluid and the water vapor as energy source.

8th week: Mid-term test

9th week:

Lecture: Otto engines, Diesel engines I.

Practice: Elaborating calculation exercises in connection with water vapor

11th week:

Lecture: Positive displacement pumps, centrifugal pumps and gear pumps.

Practice: Elaborating calculation exercises: steam-engines, steam-boilers

13th week:

Lecture: Steam boilers, steam turbines, steam power plants **Practice:** Elaborating calculation exercises: water turbines, topics of hydraulic and pneumatic machines.

15th week: End-term Test

Entropy, specific heat capacity, latent heat, temperature-entropy diagram for steam.

Practice: Elaborating calculation exercises: the air as energy source.

7th week:

Lecture: Drive gears, flywheels, breaks, springs **Practice:** Elaborating calculation exercises in connection with water vapor elements.

10th week:

Lecture: Otto engines, Diesel engines II.

Practice: Elaborating calculation exercises: machines transmitting gas.

12th week:

Lecture: Fans, compressors.

Practice: Elaborating calculation exercises: internal combustion engines.

14th week:

Lecture: Water turbines, wind power plants, swimming and stability of ships
Adaptation of prime movers and driven machines

Practice: Elaborating calculation exercises in the field of machine groups.

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. Students must attend the practice classes and may not miss more than three of the during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students cannot make up practice classes with another group. Attendance at practices will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, being discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice class. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their participation as an absence because of the lack of active participation in class.

Students have to **take part in laboratory measures** and submit the measuring reports minimum on a sufficient level.

During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade:

The course ends in an **examination**. Based on the average of the grades of the measuring reports and the examination, the exam grade is calculated as an average of them:

- the average grade of the measuring reports
- the result of the examination

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the score of any test is below 60, students can take a retake test in conformity with the EDUCATION AND EXAMINATION RULES AND REGULATIONS.