

## Course description

|                             |                                      |                 |                  |
|-----------------------------|--------------------------------------|-----------------|------------------|
| <b>Course abbreviation:</b> | KME/DPP                              | <b>Page:</b>    | 1 / 3            |
| <b>Course name:</b>         | Mechanics of Materials for Designers |                 |                  |
| <b>Academic Year:</b>       | 2023/2024                            | <b>Printed:</b> | 03.06.2024 09:37 |

|   |  |          |          |                               |                 |
|---|--|----------|----------|-------------------------------|-----------------|
| <b>Department/Unit /</b>                | KME / DPP                                      |          |          | <b>Academic Year</b>          | 2023/2024       |
| <b>Title</b>                            | Mechanics of Materials for Designers           |          |          | <b>Type of completion</b>     | Exam            |
| <b>Accredited/Credits</b>               | Yes, 5 Cred.                                   |          |          | <b>Type of completion</b>     | Combined        |
| <b>Number of hours</b>                  | Lecture 3 [Hours/Week] Tutorial 2 [Hours/Week] |          |          |                               |                 |
| <b>Occ/max</b>                          | Status A                                       | Status B | Status C | <b>Course credit prior to</b> | YES             |
| <b>Summer semester</b>                  | 0 / -  | 0 / -    | 0 / -    | <b>Counted into average</b>   | YES             |
| <b>Winter semester</b>                  | 0 / -  | 0 / -    | 0 / -    | <b>Min. (B+C) students</b>    | 10              |
| <b>Timetable</b>                        | Yes  |          |          | <b>Repeated registration</b>  | NO              |
| <b>Language of instruction</b>          | Czech, English                                 |          |          | <b>Semester taught</b>        | Summer semester |
| <b>Optional course</b>                  | Yes  |          |          | <b>Internship duration</b>    | 0               |
| <b>Evaluation scale</b>                 | 1 2 3 4  |          |          | <b>Ev. sc. – cred.</b>        | S N             |
| <b>No. of hours of on-premise</b>       |  |          |          |                               |                 |
| <b>Auto acc. of credit</b>              | No   |          |          |                               |                 |
| <b>Periodicity</b>                      | K  |          |          |                               |                 |
| <b>Substituted course</b>               | None   |          |          |                               |                 |
| <b>Preclusive courses</b>               | N/A  |          |          |                               |                 |
| <b>Prerequisite courses</b>             | N/A  |          |          |                               |                 |
| <b>Informally recommended courses</b>   | KME/DZM  |          |          |                               |                 |
| <b>Courses depending on this Course</b> | N/A  |          |          |                               |                 |

### Course objectives:

The main aim of this subject is to introduce students into principles of the linear mechanics of materials. Students acquaint themselves with basic types of mechanical loading in one-dimensional and two-dimensional problems.

### Requirements on student

Credit requirements:  
Elaboration of terminal paper.  
Credit obtained in previous years of study is not accepted.

Examination requirements:  
Active knowledge of theory and the ability to apply it to simple problems.

### Content

1. Introduction into the subject. Summary of standard physical units. Initial assumptions of linear mechanics of materials. External forces and their consequences. Stress definition.
2. Simple tension and compression. Tensile test, stress-strain diagram. The principle of displacement or stresses superposition.
3. Strain definition. Hooke's law for uniaxial loading. Strain of straight bar, failure and stiffness criterion. Thermal strains.
4. Torsional loading of shafts. Definition of simple torsion. Stress and strain distribution. Failure and stiffness criterion.
5. Moments of simple and composite areas. Parallel-axis theorem for moments of inertia.
6. Bending of straight beams. Pure bending. Internal forces in beams. Relationships between loads, shear forces and bending moments.
7. - 8. Solution of statically determinate and indeterminate beams.
9. Principles of triaxial stress. Generalized Hooke's law. Special cases of triaxial stress (uniaxial stress, plane stress).
10. Plane stress. Principal planes and stresses. Mohr's circle. Hooke's law for plane stress.
11. Ultimate states. Theories of elastic failure.
12. Modern computational methods for complex problems of mechanics of materials.
13. Experimental methods in mechanics of materials and their applications.

## Fields of study

## Guarantors and lecturers

- **Guarantors:** Ing. Vítězslav Adámek, Ph.D. (100%)

## Literature

- **Recommended:** Trebuňa, František; Jurica, Vladimír; Šimčák, František. *Příklady a úlohy z pružnosti a pevnosti I.* Vyd. 1. Košice : Viena, 2000. ISBN 80-7099-593-9.
- **Recommended:** Hájek, Emanuel; Reif, Pavel; Valenta, František. *Pružnost a pevnost I.* Praha : SNTL, 1988.
- **Recommended:** Trebuňa, František; Jurica, Vladimír; Šimčák, František. *Pružnost a pevnost I.* Vyd. 1. Košice : Viena, 2000. ISBN 80-7099-477-0.
- **Recommended:** Zeman, Vladimír; Laš, Vladislav. *Technická mechanika.* 2. přeprac. vyd. Plzeň : Západočeská univerzita, 2001. ISBN 80-7082-789-0.
- **Recommended:** Laš, Vladislav; Hlaváč, Zdeněk; Vacek, Vlastimil. *Technická mechanika v příkladech.* 4. vyd. Plzeň : Západočeská univerzita, 2005. ISBN 80-7043-409-0.

## Time requirements

## All forms of study

| Activities                                       | Time requirements for activity [h] |
|--|------------------------------------|
| Contact hours                                    | 60                                 |
| Undergraduate study programme term essay (20-40) | 25                                 |
| Preparation for an examination (30-60)           | 45                                 |
| <b>Total:</b>                                    | <b>130</b>                         |

## assessment methods

**Knowledge - knowledge achieved by taking this course are verified by the following means:**

Written exam

## prerequisite

**Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:**

The student knows and actively uses:

- principles of algebra
- principles of differential and integral calculus
- principles of physics

Recommended knowledge KME/DZM

## teaching methods

**Knowledge - the following training methods are used to achieve the required knowledge:**

Practicum

Interactive lecture

## learning outcomes

**Knowledge - knowledge resulting from the course:**

The student:

- acquires basic principles of linear mechanics of materials
- chooses and solves corresponding system of static equilibrium conditions
- defines quantities such as internal force, stress, strain
- determines internal forces in solids under simple type of loading
- analyses strain and stress states in solids under simple types of loading

- applies gained knowledge to component design
- acquires basic principles of experimental mechanics of materials

**Course is included in study programmes:**

| Study Programme | Type of  | Form of   | Branch                                      | Stage | St. plan | v. | Year | Block               | Status | R.year | R. |
|-----------------|----------|-----------|---|-------|----------|----|------|---------------------|--------|--------|----|
| Design          | Bachelor | Full-time | Design, specialization<br>Industrial Design | 1     | 4        |    | 2023 | Povinné<br>předměty | A      | 2      | LS |