

Course description

Course abbreviation:	KME/PDSTA	Page:	1 / 4
Course name:	Statics for designers		
Academic Year:	2023/2024	Printed:	01.06.2024 11:21

Department/Unit /	KME / PDSTA			Academic Year	2023/2024
Title	Statics for designers			Type of completion	Exam
Accredited/Credits	Yes, 4 Cred.			Type of completion	Oral
Number of hours	Lecture 2 [Hours/Week] Tutorial 2 [Hours/Week]			Course credit prior to	YES
Occ/max	Status A	Status B	Status C	Counted into average	YES
Summer semester	7 / -	0 / 3	0 / 0	Min. (B+C) students	10
Winter semester	0 / -	0 / -	0 / -	Repeated registration	NO
Timetable	Yes			Semester taught	Summer semester
Language of instruction	Czech			Internship duration	0
Optional course	Yes			Ev. sc. – cred.	S N
Evaluation scale	1 2 3 4				
No. of hours of on-premise	0				
Auto acc. of credit	No				
Periodicity	K				
Substituted course	None				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended courses	KME/PDZME				
Courses depending on this Course	N/A				

Course objectives:

Course objectives:

- to introduce students to analytical and graphical methods for the static analysis of mass particles and rigid bodies in 2D and 3D,
- to familiarise students with static analysis of planar and spatial rigid body systems (frames, trusses, mechanisms),
- to provide students with the basics of analytical statics and to introduce them to the principle of virtual work.

Requirements on student

Credit requirements

Preparation and submission of a semester work of adequate quality.

Credits from previous years of study are not accepted.

Exam requirements

Active knowledge of the lecture content and the ability to apply the acquired knowledge to the solution of specific problems.

Content

Time schedule:

1st week:

Lecture - System of concurrent coplanar forces. Placement and equilibrium of a mass particle in 2D (including passive effects) - analytical and graphical solutions.

Tutorials - Analytical and graphical solutions of particle equilibrium in 2D. Application to specific problems.

2nd week:

Lecture - Placement and equilibrium of a mass particle in 3D (including passive effects) - analytical solution.

Tutorials - Analytical solution of particle equilibrium in 3D. Application to specific problems.

3rd week:

Lecture - System of coplanar forces. Placement and equilibrium of a rigid body in 2D (including passive effects) - analytical and graphical solutions.

Tutorials - Analytical and graphical solutions of rigid body equilibrium in 2D. Application to specific problems.

4th week:

Lecture - Placement and equilibrium of a rigid body in 2D - continued. Frictional forces on flat belts, distributed loading.
Tutorials - Analytical and graphical solutions of rigid body equilibrium in 2D. Application to specific problems - continued.

5th week:

Lecture - System of three-dimensional forces. Placement and equilibrium of a rigid body in 3D - analytical solution.

Tutorials - Analytical solution of rigid body equilibrium in 3D. Application to specific problems.

6th week:

Lecture - Internal forces in a rigid body.

Tutorials - Analysis of internal forces in a rigid body. Application to problems.

7th week:

Lecture - Structure of planar rigid body systems. Mobility and statical determinacy.

Tutorials - Simulation examples of moving three- and four-member mechanisms. Model examples of selected mechanisms.

8th week:

Lecture - Static analysis of planar frames using free-body diagrams - analytical and graphical solutions.

Tutorials - Analytical and graphical solutions of static equilibrium of selected frame structures.

9th week:

Lecture - Trusses in engineering practice. Statical determinacy and internal stability, design of trusses. Methods of structural analysis for planar and space trusses (method of joints and method of sections).

Tutorials - Static analysis of planar and space trusses. Application to specific problems.

10th week:

Lecture - Static analysis of planar machines (including the determination of passive effects) - analytical and graphical solutions.

Tutorials - Analytical and graphical solutions of static equilibrium of selected planar mechanisms. Semester work assignment.

11th week:

Lecture - Gear systems and spatial rigid body systems.

Tutorials - Static analysis of gear systems.

12th week:

Lecture - Fundamentals of analytical statics. Coordinates and kinematic pairs. Principle of virtual work.

Tutorials - Application of the principle of virtual work in statics.

13th week:

Lecture - Stability analysis of the static equilibrium position.

Tutorials - Application of the principle of virtual work in statics - continued.

Fields of study

Guarantors and lecturers

- **Guarantors:** Prof. Ing. Jan Vimmr, Ph.D.
- **Lecturer:** Ing. Alena Jonášová, Ph.D. (100%), Prof. Ing. Jan Vimmr, Ph.D. (25%)
- **Tutorial lecturer:** Ing. Alena Jonášová, Ph.D. (100%)

Literature

- **Basic:** Juliš, K.-Tepřík, O.-Slavík, A. *Statika. SNLT/*. ALFA Praha, 1987.
- **Extending:** Hlaváč, Zdeněk; Vimmr, Jan. *Sbírka příkladů ze statiky a kinematiky*. 2. vyd. V Plzni : Západočeská univerzita, 2012. ISBN 978-80-261-0138-3.
- **Recommended:** Křen, Jiří. *Řešené příklady ze statiky. I. část*. Plzeň : VŠSE, 1985.
- **Recommended:** Křen, Jiří. *Řešené příklady ze statiky. II. část*. 1. vyd. Plzeň : VŠSE, 1985.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Preparation for an examination (30-60)	35
Contact hours	52
Undergraduate study programme term essay (20-40)	20

Total:

107

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

Seminar work

Oral exam

Skills - skills achieved by taking this course are verified by the following means:

Seminar work

Oral exam

Competences - competence achieved by taking this course are verified by the following means:

Seminar work

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

definovat elementární trigonometrické funkce

vysvětlit a orientovat se v základech vektorového počtu

disponovat znalostmi maticového počtu

orientovat se v základních metodách derivování a integrování

vysvětlit význam síly a momentu

klasifikovat silové soustavy

Skills - students are expected to possess the following skills before the course commences to finish it successfully:

definovat sílu a moment k bodu i ose

provést výpočet náhrady a ekvivalence silové soustavy

určit polohu střediska hmotnosti těles

řešit soustavy lineárních algebraických rovnic

Competences - students are expected to possess the following competences before the course commences to finish it successfully:

N/A

N/A

N/A

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

Lecture with visual aids

Practicum

One-to-One tutorial

Textual studies

Skills - the following training methods are used to achieve the required skills:

Lecture with visual aids

Practicum

One-to-One tutorial

Textual studies

Competences - the following training methods are used to achieve the required competences:

Practicum

Textual studies

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

- definovat počet stupňů volnosti hmotného objektu
- stanovit příslušný počet podmínek rovnováhy hmotného objektu
- vysvětlit základní analytické a grafické metody pro statické řešení hmotného bodu
- vysvětlit základní analytické a grafické metody pro statické řešení tuhého tělesa a soustav těles v rovině
- orientovat se v principu virtuálních prací
- vymezit základy analytické statiky

Skills - skills resulting from the course:

- řešit problémy statiky hmotného bodu v rovině a prostoru
- řešit problémy statiky tuhého tělesa v rovině a prostoru
- aplikovat metody pro statické řešení rovinných a prostorových prutových soustav
- vyšetřovat vnitřní statické účinky v tělese

Competences - competences resulting from the course:

N/A

N/A

N/A

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Design and Applied Arts	Bachelor	Full-time	Industrial Design	1	1	2023	Povinné předměty	A	2	LS
Design and Applied Arts	Bachelor	Full-time	Design Modelling	1	1	2023	B2 - doplňující blok	B		LS
Design and Applied Arts	Bachelor	Full-time	Product Design	1	1	2023	B2 - doplňující blok	B		LS