# Course description

Course abbreviation: Course name:	KME/OC Steel Structure	\$				Page:	1 / 4
Academic Year:	2023/2024	-			Printed:	30.06.2025	3 23:36
Department/Unit /	KME / OC				Academic Year	2023/2024	ļ
Title	Steel Structure	es			Type of completion	Exam	
Accredited/Credits	Yes, 5 Cred.				Type of completion	Combined	
Number of hours	Lecture 3 [Hor	Lecture 3 [Hours/Week] Tutorial 2 [Hours/Week]					
Occ/max	Status A	Status B	Status C		Course credit prior to	Yes	
Summer semester	0 / -	0 / -	0 / -		Counted into average	YES	
Winter semester	0 / -	0 / -	0 / -		Min. (B+C) students	10	
Timetable	Yes				Repeated registration	NO	
Language of instruction	Czech				Semester taught	Winter ser	nester
Optional course	Yes				Internship duration	0	
Evaluation scale	1 2 3 4				Ev. sc. – cred.	S N	
No. of hours of on-premise							
Auto acc. of credit	Yes in the case	Yes in the case of a previous evaluation 4 nebo nic.					
Periodicity	every year						
Specification periodicity							
Substituted course	None						
Preclusive courses	N/A						
Prerequisite courses	N/A						
Informally recomm	nended courses	KME/ZTM1					
Courses depending	on this Course	KME/PPS1					
		and					
		KME/STI N/A					
		1 N/ PA					

## Course objectives:

The student

- will understand the design of steel and steel-concrete structures and the basic principles
- will be informed about the valid standards for the different materials and structures and for the calculation of loads
- will understand the design of steel structures and steel-concrete structures in accordance with the standard ČSN EN 1993
- will understand the ultimate limit state and the serviceability limit state

#### Requirements on student

Requirements for credit:

The student will elaborate and hand in a semestral project of an adequate level. Preparation of seminars crash of steel structures, steel structures model development.

Credits from the subject KME/OC obtained in previous studies are not acknowledged

## Requirements for exam:

Active knowledge of the content of the course, ability to apply the knowledge to solve practical exercises.

## Content

1st week: Process for the design of structures, designed lifetime, design situation, principles for design with regard to reliability, resistance of the structure, ultimate limit state and serviceability limit state, materials for steel structures, corrosion. Production of steel structures.

2nd week: Designing steel elements with regard to the standard ČSN EN 1993, classification of sections. Tension, compression, stability of the ideal beam, local stability, effective length.

3rd week: Definition for planar buckling, effective length for torsion, effective lengths for the different members, systems of members and frames. Second order theory, buckling resistance, bearing capacity of compressed members, articulated members.

4th week: Bending, bearing capacity during bending, bi-axial bending, stability in bending, economic design, deflection and oscillation of members, buckling of walls and local loads.

5th week: Combination of tension and bending, compression and bending, bending and torsion.

6th week: Joints, welded joints, screw joints, bolted joints, rivet joints, distribution of forces in the connection points.

7the week: Steel-concrete structures as defined by the standard ČSN EN 1994. Materials, interaction between the materials, bonding elements, principles for design.

8th week: Limit states for the design, beams, classification of sections, bearing capacity of the section, stability, shear connection, structural details. Centric compression, bending, compression and bending, serviceability limit state, metallic-concrete slabs.

9th week: Thin cold-rolled structures, material, production, reinforcing the material, local buckling, main types of sollicitation, tension, compression, bending, shear, combination of effects, joints, thin elements.

10th week: Corrosion of steel structures, production of steel structures, documents of the supplier. Typical steel structures ? halls and their design.

11th week: Calculation of fire resistance of steel and steel-concrete structures, mechanical loads during fire, principles for design.

12th week: Transmission of heat in the structure, analysis of elements and joints.

13th week: Single cases for steel elements during fire ? beam, beam with loss of stability, column of a tall building, connection between the beam and the column.

## Fields of study

## Guarantors and lecturers

• Guarantors: Ing. Petr Kesl, Ph.D. (100%)

## Literature

• Basic:	Studnička J. Ocelové a ocelo-betonové konstrukce. ČKAIT TK9 Praha, 2000.
• Recommended:	ČSN EN 1990 - Základy navrhování.
• Recommended:	ČSN EN 1991 - Zatížení stavebních konstrukcí.
• Recommended:	ČSN EN 1993 - Navrhování ocelových konstrukcí.
• Recommended:	ČSN EN 1994 - Navrhování ocelobetonových konstrukcí.
• Recommended:	Wald Fr. a kolektiv. Výpočet požární odolnosti stavebních konstrukcí. ČVUT Praha, 2005

## Time requirements

## All forms of study

Activities	Time requirements for activity [h]
Contact hours	65
Preparation for an examination (30-60)	40
Undergraduate study programme term essay (20-40)	40

Total:

## assessment methods

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

Oral exam

Seminar work

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

Oral exam

Seminar work

## 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:

characterize and get acquainted with the mechanics of the continuum

characterize and get acquainted with the technical science of elasticity and strength

characterize and get acquainted with the mathematical theory of elasticity

characterize and get acquainted with the stability of bars

characterize and get acquainted with the theory of plasticity

characterize and get acquainted with the theory of failure

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

classify and solve complex cases of elasticity and strength

classify and solve variational methods

classify and solve shells

classify and solve the nonlinear theory of elasticity

classify and solve the state of plasticity under general stresses

classify and address safety assessments according to internal force limits

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

N/A N/A

N/A

N/A

#### teaching methods

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

Lecture

Practicum

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

Lecture

Practicum

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

Lecture

Practicum

# learning outcomes

## Knowledge - knowledge resulting from the course:

describe forming, heat treatment and properties of steels

describe production methods, metallurgical materials and assortment of rolled products

explain methods for solving welded, screw and riveted joints

state the procedures of analysis of drawn, pressed and bent structural elements, as well as combined stressed

describe the fatigue process and design principles with respect to fatigue phenomena

state the principles of designing thin-walled structures

describe light alloy constructions

# Skills - skills resulting from the course:

systematize the tolerances of the rolled material

to solve combinations of stresses acting on frame structures

apply elastic and plastic torsion theory to steel structural elements

determine experimentally the residual life of structures

to solve the tasks of the economy of corrosion protection

# 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 H	R.year	R.
Civil Engineering	Bachelor	Full-time	Building Structures	1 2022	2023	Povinné předměty	А	3	ZS
Civil Engineering	Bachelor	Full-time	Building Structures	1 2023	2023	Povinné předměty	А	3	ZS
Civil Engineering	Bachelor	Full-time	Building Structures	1 2018	2023	Povinné předměty	А	3	ZS