# COURSE DESCRIPTION CARD - SYLLABUS

Course name

Modeling of systems in the food industry

## Course

Field of study

Construction and Exploitation of Means of Transport

Year/Semester

2/3

Area of study (specialization)

Food Industry Machines and Refrigeration

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

## Number of hours

| Lecture | Laboratory classes | Other (e.g. online) |
|---|---|---|
| 30 | 30 | 0 |
| **Tutorials** | **Projects/seminars** | |
| 0 | 0 | |

## Number of credit points

4

## Lecturers

Responsible for the course/lecturer:

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Faculty of Civil and Transport Engineering

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

## Prerequisites

Knowledge: Has basic knowledge of mechanics, fluid mechanics, the basics of machine design, machine construction, thermodynamics

Social competences: Is aware of responsibility for his own work.

Skills: Can make a CAD-3D model of the machine. Can perform basic calculations of basic elements and assemblies of machines, including shafts, bearings, clutches, brakes and gears. Has theoretical knowledge in the field of thermodynamics and numerical modeling and analysis methods

## Course objective

Mastering theoretical and practical knowledge in the field of engineering modeling methods and engineering analyzes regarding flows occurring in virtual models of food machines.

## Course-related learning outcomes

Knowledge

1. Has extended knowledge in the field of computer science, concerning computer programming and engineering calculation programs in the field of computer simulation of physical systems.

2. Knows contemporary engineering methods of computer graphics and theoretical foundations of engineering calculations using the finite element method.

3. Has extended knowledge of the strength of materials in the field of nonlinear models, fracture and fatigue strength, calculations of statically indeterminate structures, structural stability.

Skills

1. Can use a popular numerical calculation system to program a simple system simulation task with a small number of degrees of freedom.

2. Can write a simple computer program with the use of modern RAD environments in a known language for calculations of structure optimization with the use of assimilated elementary numerical methods.

3. Can make a medium complex design of a working machine or its assembly using modern CAD tools, including tools for spatial modeling of machines and calculations using the finite element method.

Social competences

1. Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on its own.

2. Is willing to think and act in an entrepreneurial manner.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Current control of the mastery of the lecture content. Written exam in the theory of flow modeling and engineering analyzes including the solution of a practical problem.

## Programme content

The structure of the solid model for the purposes of running computer simulations in terms of generating flow phenomena. Influence of the design features of the food machine working unit on the parameters of the raw materials processing.

## Teaching methods

1. Lecture with multimedia presentation.

2. Practical method - in the form of auditorium exercises at computer stations.

## Bibliography

Basic

1. Bathe K.J., Finite Element Procedures, Prentice Hall, New Jersey 1996

2. Gryboś R., Podstawy mechaniki płynów, PWN, Warszawa 1989.

3. Zienkiewicz O.C., Metoda elementów skończonych, Arkady, Warszawa 1972

4. X-FLOW system. User?s Manual

Additional

1. Ascher U. M., Petzold L. R. (1998) Computer methods for Ordinary Differential Equations and Difference-Algebraic Equations, SIAM, Philadelphia

2. Stoer J., (1979): Wstęp do metod numerycznych. Tom I, PWN Warszawa;

3. Stoer J., Bulirsch R., (1980): Wstęp do metod numerycznych Tom II, PWN Warszawa

4. Chaudhry H. F. (2008): Open Channel Flow. Springer

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 120 | 4,0 |
| Classes requiring direct contact with the teacher | 60 | 2,0 |
| Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, execution of reports) [1] | 60 | 2,0 |

[1] delete or add other activities as appropriate