Study Programme: Chemical engineering

Course Unit Title: Transport phenomena

Course Unit Code: DHPI02

Name of Lecturer(s): Svetlana Popović, Associate Professor

Type and Level of Studies: Master Academic Degree

Course Status (compulsory/elective): Elective for Chemical-process Engineering

Semester (winter/summer): Winter/summer

The language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 7

Prerequisites: -

Course Aims:

The aim of this course is to train students to create chemical engineering knowledge using the transport phenomena approach with a special focus on combined transport problems.

Learning Outcomes:

Student gain skills to: identify transport properties, compare, and analyze the mechanisms of molecular momentum, energy and mass transport. Select, locate and orient coordinate systems for transport phenomena problems (including rectangular and curvilinear). Formulate the differential forms of the equations of change for momentum, heat and mass transfer problems for steady-state and unsteady flows. Create solutions to fluid flow, heat transfer and mass transfer problems, and solve problems combining these transport phenomena.

Syllabus:

Theory

The course includes three topics: transport of momentum (fluid dynamics), heat and mass transfer. This course adheres to advanced solution methods, each solution beginning with differential forms of the equations of change. The course thus leverages prior training in differential equations. Formulates differential momentum balances and solves them to determine velocity and stress distributions. Also, constitutive models to describe fluid behavior. Formulates and solves differential equations of heat transfer to calculate temperature distributions and differential equations of mass transfer to calculate concentration distributions. Selects locates and orients coordinate systems for transport phenomena problems. Formulates and solves ordinary and partial differential equations and integral equations.

Practice

Solving problems related to the theory presented during lectures using software Mathlab or Mathcad. Selects and applies appropriate quantitative models, analyses, and boundary conditions to solve problems.

Required Reading:

1. Bird, R.B., W.E. Stewart and E.N. Lightfoot, *Transport Phenomena*, Wiley, New York (2002).

Weekly Contact Hours: 6	**Lectures:** 3	**Practical work:** 3

Teaching Methods:

Lectures, solving problems and laboratory practicum students group work

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	**Final exam**	points
Test I and Test II	50	oral exam	30
Seminar(s)	20		