Reg No: EMAD19/20202

Faculty of Health, Science and Technology
Environmental and Energy Systems

Syllabus

Applied Heat and Mass Transfer

Course Code:	EMAD19
Course Title:	Applied Heat and Mass Transfer *Tillämpad värme- och masstransport*
Credits:	7.5
Degree Level:	Master's level
Progressive Specialisation:	Second cycle, has only first-cycle course/s as entry requirements (A1N)

Major Field of Study:
KTA (Chemical Engineering)
MEI (Environmental and Energy Systems)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2020-03-11, and is valid from the Autumn semester 2020 at Karlstad University.

Prerequisites
Fluid Mechanics (7.5 ECTS credits) and Heat and Mass Transfer (7.5 ECTS credits), plus upper secondary level Swedish 3 or Swedish as a second language 3 and English 6, or equivalent

Learning Outcomes
Upon completion of the course, students should be able to:
1. understand and give an account of the content of scientific literature on heat and mass transfer,
2. use concepts and theories of fluid mechanics and heat and mass transfer to formulate mathematical models for heat and mass transfer in a given physical system,
3. formulate mathematical models of varying complexity for heat and mass transfer processes and be able to assess what degree of complexity is required,

4. assess the plausibility of and interpret calculation results such as transfer speed, temperature profiles, and concentration profiles for a given physical system, and
5. use a numerical calculation tool to solve mathematical models of heat and mass transfer processes.

Content
The aim of the course is for students to apply concepts of fluid mechanics and heat and mass transfer to analyse processes and systems with a certain degree of complexity. Students practice mathematical modelling connected to the field of heat and mass transfer:
(i) description of a real process/a real system;
(ii) formulation of a mathematical model;
(iii) solution of the mathematical model;
(iv) probablility assessment and interpretation of the results.

The application examples in the course are mainly taken from the current and historical research questions of the research environment Pro2BE (Processes and Products for a Circular Bioeconomy). Examples from other areas of application can also be used, if they are technically relevant. Students mainly use calculation tools that they are already familiar with.

Instruction is in the form of seminars which cover relevant theory, supervision in connection with the formulation of mathematical models, and supervision in the computer lab.

Students process two sample applications. The first application, which is selected by the teacher, is the same for all registered students. The second application is selected by the student in consultation with the teacher.

For each sample application, the following process will be observed:
- identification and reading of relevant theory
- seminar on relevant theory
- formulation of mathematical model
- numerical (or analytical) solution of the mathematical model
- probability assessment and interpretation of results in relation to a real process/real system
- seminar on the completed task

Reading List
See separate document.

Examination
Assessment is based on oral seminars and written documentation of completed application assignments.

If students have a decision from Karlstad University entitling them to special pedagogical support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades
One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course. For students in Engineering programmes, one of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) is awarded in the examination of the course.

Quality Assurance
Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be

taken.

Course Certificate
A course certificate will be provided upon request.

Additional information
The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.